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*Research Article*

# Behind the numbers: A mixed method inquiry into the workplace loneliness of middle school mathematics teachers

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The aim of this study is to determine the levels of workplace loneliness among middle school mathematics teachers and to examine whether these levels differ based on specific demographic variables, as well as to conduct an in-depth analysis of teachers' experiences with workplace loneliness. Employing an explanatory mixed-methods design, the research integrates both quantitative and qualitative approaches. The quantitative phase included 145 mathematics teachers working in public and private middle schools in Istanbul, selected through convenience sampling. The qualitative phase consisted of in-depth interviews with five participants, selected using maximum variation sampling. Quantitative data were collected using "Loneliness in the Workplace Scale". The data were analyzed using statistical software to assess normality and identify differences across demographic variables. Qualitative data were obtained through semi-structured interviews and analyzed using content analysis techniques with the help of MAXQDA software. The results revealed that the participants experienced a moderate level of workplace loneliness overall. Marital status, school type and age group were found to produce significant differences in particular dimensions of loneliness. Participants highlighted the importance of fostering collaboration, role of school administration, and organizing inclusive school-wide activities when addressing issues related to workplace loneliness.

Keywords: Loneliness; Middle school mathematics teacher; Mixed-method research; Workplace loneliness

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## 1. Introduction

The success of education systems largely depends on the quality of teachers. One of the most important factors affecting student achievement is the teacher. It is not enough for a teacher to possess subject knowledge; pedagogical competence, communication with students, and physical and mental well-being are directly reflected in the teaching process. No matter how comprehensive, up-to-date, and innovative a curriculum may be, it is the teacher who implements it and brings it into the classroom. Therefore, it is of great importance to create a social and psychological environment in which teachers can sustain their professional development and feel valued and at peace (Day, 2013). From the perspective of educational organizations, efficiency is

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only possible through the human factor; hence, teacher motivation, emotional state, and overall life satisfaction stand out as key elements that directly influence the quality of education.

Loneliness, beyond being a psychological condition individual may experience from time to time, becomes a significant variable that directly affects personal productivity and organizational success when experienced in the workplace. In the literature, the concept of loneliness is discussed from various perspectives, such as an individual's lack of social relationships, feeling disconnected from their surroundings, and experiencing emotionally unsatisfying social interactions (Wax et al., 2022). Rook (1984) defined loneliness as a stressful and negative emotional state that arises when an individual's feelings are rejected, misunderstood, or ignored by others. Loneliness is a distressing emotion that arises from the perception that one's social needs are unmet by the quantity or quality of their relationships and is influenced by factors such as the establishment of social bonds, perceived social support, participation in social activities, and self-isolation (Akkaya & Duy, 2024; Emerson et al., 2021). Weiss (1973) categorized loneliness into two dimensions: emotional loneliness and social loneliness. This conceptual framework has later been adapted to the context of workplace loneliness. Workplace loneliness is a psychological state resulting from insufficient social interaction, diminished sense of belonging, and inadequate social support within an organizational context (Wright, 2005). In educational institutions, teachers' social relationships, organizational culture, administrator support, and collegial communication are among the key determinants of loneliness (Einav et al., 2024).

Teaching is a profession filled with interactions that require continuous emotional regulation (Kariou et al., 2021); this characteristic may increase the risk of loneliness when social bonds in the workplace weaken. The social structure inherent in human nature is a determinant not only of psychological health but also of professional success (Baumeister & Leary, 1995). In environments where individuals feel socially comfortable, they are more likely to share their ideas and feel safer. Particularly in social environments where individuals know they will not be judged, excluded, or mistreated—a condition conceptualized as psychological safety—sharing becomes easier (Edmondson, 1999; Edmondson & Lei, 2014). This applies to all professions based on human interaction. The teaching profession is one of those professions where such social bonds are extremely important, as it requires multidimensional and continuous communication, particularly with students, parents, school administrators, and other teachers (Collie et al., 2015a; Skaalvik & Skaalvik, 2018).

However, although teaching appears to be a social profession from an external perspective, it also encompasses structural and organizational conditions that can occasionally lead to feelings of loneliness (Buchanan, 2012; Pressley et al., 2021). When the classroom door closes, teachers are left alone with their students; they typically face the challenges of lesson preparation, problems encountered during instruction, and assessment or development processes on their own (Lortie, 1986; Vangrieken et al., 2017). In addition, the loneliness experienced by teachers has been directly associated with their relationships with various individuals within the school and the level of support they receive from them (Mullen & Hutinger, 2008).

Insufficient communication with colleagues in the same subject area, limited opportunities for professional sharing, lack of organizational support, and inadequate social interaction environments can reinforce feelings of loneliness (Lam & Lau, 2012). In addition, loneliness experienced by teachers and school administrators has been associated with their relationships with various individuals within the school, as well as the level of support they receive from them (Dor-Haim, 2021; Dor-Haim & Oplatka, 2019).

A teacher's feeling of loneliness may result in decreased professional motivation, emotional burnout, and weakened commitment to their school and profession (Johnson et al., 2014). A study by Tabak and Argon (2018) on secondary school teachers showed that teachers do experience workplace loneliness, even if at low levels. The prevalence of teachers' loneliness appears to be linked to limited opportunities for professional exchange, a lack of meaningful workplace relationships, and inadequate social support—an interpretation supported by international studies

(e.g., Lewis, 1999; Yuh & Choi, 2017) that highlight a positive correlation between social support at school and teachers' well-being, suggesting that the quality of teacher–school relationships may influence feelings of loneliness. A lack of social support is one of the primary factors negatively affecting job satisfaction, productivity, and motivation among employees. Research has demonstrated the positive impact of strong social relationships on organizational commitment, job satisfaction, and performance (Aselage & Eisenberger, 2003; Rhoades & Eisenberger, 2002). In contrast, weak social ties make it difficult for individuals to feel a sense of belonging to the organization and may lead to emotional exhaustion, anxiety, outbursts of anger, and a decline in job performance (Adamson & Axmith, 2003; Sîrbu & Dumbravă, 2019).

Mathematics teachers, in particular, face discipline-specific challenges including societal perceptions that mathematics is inherently difficult, lower student achievement in mathematics compared to other subjects, and implicit accountability pressures (Hodgen & Askew, 2007). Mathematics is viewed as a subject associated with performance anxiety by students and parents, making the teacher's role even more critical (Ashcraft & Krause, 2007; Ramirez et al., 2018). The prevalence of mathematics anxiety - a condition affecting approximately 17% of the adult population - increases mathematics teachers' responsibilities for sustaining student motivation, communicating effectively with parents, and creating psychological safety in learning environments (Dowker et al., 2016).

Understanding the demographic and organizational factors that shape teachers' loneliness experiences is essential for developing targeted interventions that support professional well-being and thereby enhance educational quality (Collie et al., 2015b; Haw et al., 2023). For curricula to be implemented effectively, it is essential to create collaborative environments where teachers can discuss programs together and share their experiences (Vangrieken et al., 2015). Professional interaction among teachers not only reduces feelings of loneliness but also contributes to the development of pedagogical content knowledge, improvement of instructional practices, and strengthening of collective efficacy beliefs (Goddard et al., 2015; Horn & Little, 2010). These collaborative structures, which are particularly important for mathematics teachers, facilitate the sharing of strategies for teaching complex mathematical concepts, joint analysis of student thinking, and coordination of curriculum adaptations (Harvey & Teledahl, 2022; McKie, 2024).

Despite the increasing recognition of workplace loneliness as a significant occupational health issue affecting professional burnout and instructional quality (Higinio et al., 2025; Taylor et al., 2024), research examining this phenomenon among mathematics teachers remains limited. The existing literature predominantly treats teachers as a general group, overlooking how discipline-specific challenges - mathematics anxiety, accountability pressures, pedagogical complexity - may differentiate loneliness experiences (Hofman, 2023; Jian et al., 2022; Polizzi et al., 2021).

In this context, determining the workplace loneliness levels of middle school mathematics teachers and examining whether these levels differ based on specific demographic variables—such as gender, years of professional experience, and educational background—constitute a significant step toward improving the overall quality of education. Furthermore, the in-depth exploration of teachers' workplace loneliness experiences adds qualitative depth to the study. Given the limited number of studies addressing workplace loneliness among teachers, this research holds the potential to make a valuable contribution to the literature.

## 1.1. Theoretical Framework

### *1.1.1. Workplace loneliness: Wright's two-dimensional model*

Wright's (2005) two-dimensional model of workplace loneliness forms the conceptual foundation of this study. The model addresses loneliness across two independent dimensions: emotional deprivation and social companionship deficiency. Emotional deprivation reflects the absence of meaningful and intimate connections with colleagues—the feeling of lacking close confidants with whom to share professional challenges and personal concerns. Social companionship deficiency, on the other hand, represents the lack of belonging to a professional community—the sense of

exclusion from informal networks, collaborative activities, and collegial interactions (Wright et al., 2006).

This distinction is particularly important in educational settings where teachers may experience these dimensions independently. A teacher may participate in regular meetings and collaborative activities yet feel emotionally isolated due to the absence of close, trust-based relationships. Conversely, a teacher may have close colleague friends but feel excluded from broader school networks. Research indicates that these two dimensions can operate independently and may respond differently to organizational interventions (Lam & Lau, 2012). According to Bryan et al. (2025), workplace loneliness encompasses not only dissatisfaction with interpersonal relationships but also a sense of disconnection from the organization and society and can negatively affect organizational citizenship behaviors and creative performance (Firoz & Chaudhary, 2022; Peng et al., 2017).

*1.1.2. Organizational and social context of teacher loneliness*

The loneliness experienced by teachers in the workplace is a multidimensional phenomenon that can emerge because of organizational structures and social dynamics beyond individual characteristics. Different theoretical approaches have been developed to understand this situation. One of these perspectives, Organizational Support Theory (Eisenberger et al., 1986), posits that employees' feeling valued and supported by the organization strengthens their sense of belonging and organizational commitment. In the educational context, this perception encompasses elements such as managerial encouragement, resource allocation, administrative responsiveness, and emotional support.

Research demonstrates that teachers' perceived organizational support has a determining effect on job satisfaction, motivation, and loneliness levels (Collie et al., 2015b; Skaalvik & Skaalvik, 2018). An organizational climate characterized by open communication processes, management approaches responsive to teacher needs, and supportive leadership can create a strong buffer against feelings of workplace loneliness by enabling teachers to feel valued and connected (Kachchhap & Horo, 2021). Indeed, a significant negative relationship has been established between Perceived Organizational Support and workplace loneliness (Bryan et al., 2025).

It is observed that organizational support is nourished not only by managerial policies but also by structural mechanisms that strengthen individuals' interaction with each other and professional sharing (Tian et al., 2023). One of these mechanisms, Professional Learning Communities [PLCs], provides a social structure that enables teachers to develop professional solidarity and a sense of belonging through collaboration, reflective dialogue, and collective learning (DuFour et al., 2007; DuFour et al., 2006). PLCs encompass interactions based on structured collaboration, joint reflection, and experience sharing for teachers to continuously improve their professional practices (Hord, 1997). These communities enable teachers to learn from each other, act together toward common goals, and develop professional solidarity.

Reports from the Organisation for Economic Co-operation and Development [OECD] also demonstrate that collaboration among teachers creates positive effects on teaching quality, self-efficacy perceptions, and student achievement (OECD, 2009; Schleicher, 2015). However, for this collaboration to be effective, shared leadership, clear goals, and a trust-based school climate are necessary (Campbell et al., 2016; Datnow, 2011). Hord (1997), and Hord and Sommers (2008) emphasize five key characteristics of an effective PLC. These characteristics include: supportive and shared leadership, where administrators share leadership by considering teachers' needs and ensuring teachers' participation in decision-making processes (Boone, 2010); shared values, vision and goals where trust based on common purposes and norms is established among teachers (Newmann, 1996; Webb et al., 2009); collective learning and application, where teachers continuously share their knowledge and experiences to improve instructional practices (DuFour & Eaker, 1998); shared individual practice, based on peer observations, reflective dialogues, and practice sharing (Hord, 1997; Webb et al., 2009); and the presence of supportive conditions that

include physical elements such as time and space, as well as human elements such as trust and participation (Boone, 2010; Webb et al., 2009). When these dimensions are considered together, it is evident that PLCs constitute the fundamental components of a sustainable professional learning culture.

PLCs function as a "connection space" where teachers can find emotional and professional support. In quality PLC environments, shared vision, collective learning, and trust-based communication are protective factors that reduce teachers' experiences of both emotional deprivation and social companionship deficiency (Ronfeldt et al., 2015; Vangrieken et al., 2015).

PLCs are of great importance particularly for mathematics teachers. Since mathematics teaching is a field that requires conceptual complexity, analysis of student thinking, and sharing of pedagogical strategies, collaboration-based learning communities strengthen these teachers' professional development and social connectedness (Chauraya & Brodie, 2017; Jaworski, 2006; Jaworski et al., 2017). Therefore, the establishment of strong PLC cultures contributes not only to reducing loneliness but also to improving teaching quality (Jaworski, 2006). Although intra-departmental group teacher council meetings in Turkey provide a formal PLC infrastructure, for these structures to be effective, shared leadership, collective learning, and supportive human conditions need to be strengthened (Vangrieken et al., 2017; Vescio et al., 2008). When these conditions are provided, PLCs can become a mechanism that reduces the feeling of loneliness by increasing teachers' organizational belonging.

When these theoretical perspectives are evaluated together, it is understood that teacher loneliness is not merely an individual emotional state but also a phenomenon embedded in the organizational and social structure of the school. Therefore, strategies aimed at preventing teacher loneliness should focus on building school cultures that strengthen organizational support systems and enhance professional learning communities rather than individual interventions.

### 1.2. Purpose of the Study

This study aimed to determine the workplace loneliness levels of middle school mathematics teachers working in the Maltepe district of Istanbul and to examine whether these levels differ based on various variables. In addition, the study aims to examine in depth the workplace loneliness experiences of the teachers. In this study, a mixed method approach was adopted and the following research questions were addressed:

RQ 1) What are the workplace loneliness levels of middle school mathematics teachers?

RQ 2) Do the workplace loneliness levels of middle school mathematics teachers differ significantly based on a) gender, b) education level, c) duration of service, d) age groups, e) marital status, and e) school type (public/private)?

RQ 3) What are the experiences of middle school mathematics teachers regarding the concept of workplace loneliness?

RQ 4) How do middle school mathematics teachers evaluate their relationships with colleagues within their departments?

RQ 5) What are the solutions for middle school mathematics teachers to cope with workplace loneliness?

RQ 6) How do middle school mathematics teachers' personal experiences support the levels of workplace loneliness identified through quantitative data?

## 2. Method

### 2.1. Research Design

In this study, a mixed-methods approach combining both quantitative and qualitative research methods was adopted to examine the workplace loneliness levels of middle school mathematics teachers. Mixed-methods research provides significant advantages in offering both broad and in-depth insights into the research topic. These advantages include the ability to overcome the limitations of quantitative and qualitative methods by complementing each other, addressing the

topic more comprehensively, enhancing the interpretability and validity of findings, supporting or interpreting the results of one method with the other, and answering different types of research questions (Bryman, 2006). Accordingly, an explanatory sequential design was chosen for this study. In this design, data collection starts with the quantitative phase, and the findings obtained are then explored in greater depth through qualitative methods. The main purpose of this design is to elaborate on the trends identified in the quantitative data using qualitative data (Creswell & Plano Clark, 2007).

### 2.2. Participants

Since this study does not aim to generalize findings to a wider population, a specific group of participants was selected rather than defining a target population. For the quantitative part, 145 middle school mathematics teachers working in public and private middle schools in the Maltepe district of Istanbul during the 2024–2025 academic year were selected using convenience sampling (Creswell, 2013). Demographic characteristics of these participants are provided in Table 1.

Table 1
*Demographic Characteristics of the Participants in Quantitative Part*

| *Demographic Characteristics* | *N* | *%* |
|---|---|---|
| Gender | | |
| Female | 107 | 75 |
| Male | 36 | 25 |
| Education Level | | |
| Undergraduate | 113 | 79 |
| Graduate | 30 | 21 |
| Duration of Service (Year) | | |
| 1-13 | 66 | 46 |
| 14-25 | 58 | 41 |
| 26-40 | 19 | 13 |
| Age Groups | | |
| 23-35 years old | 51 | 36 |
| 36-44 years old | 54 | 38 |
| 45 years old and older | 37 | 26 |
| Marital Status | | |
| Single | 39 | 27 |
| Married | 103 | 73 |
| School Types | | |
| Public | 113 | 80 |
| Private | 28 | 20 |

For the qualitative part, purposeful sampling, specifically maximum variation sampling, was used based on the quantitative data (Merriam, 2009). Interview participants were categorized into low, moderate, and high workplace loneliness levels based on their scores on the Loneliness in the Workplace Scale, which ranges from 13 to 65. Participants whose scores were below the midpoint (39) were classified as 'low,' those with scores around the midpoint were considered 'moderate,' and those with scores above the midpoint were categorized as 'high.' This classification enabled a more structured examination of qualitative findings in relation to the participants' perceived levels of workplace loneliness. Five volunteer teachers—two from the low and moderate groups, and one from the high group—based on their "Loneliness in the Workplace Scale" scores, were selected for in-depth individual online interviews. In addition, maximum variation was tried to be provided for each demographic variable (gender, education level, duration of service, age group, marital status, school type). Demographic characteristics of these participants are presented in Table 2.

Table 2
*Demographic Characteristics of the Participants in Qualitative Part*

| *P* | *Gender* | *Education Level* | *Duration of Service (Year)* | *Age Group* | *Marital status* | *School Types* | *Workplace Loneliness Levels* |
|---|---|---|---|---|---|---|---|
| P1 | Female | Undergraduate | 14-25 | 36-44 | Single | Public | Low |
| P2 | Male | Graduate | 1-13 | 23-35 | Married | Public | Low |
| P3 | Female | Undergraduate | 1-13 | 23-35 | Single | Private | Moderate |
| P4 | Male | Graduate | 14-25 | 36-44 | Married | Public | Moderate |
| P5 | Male | Undergraduate | 26-40 | 45+ | Single | Private | High |

*Note.* P: Participants.

### 2.3. Data Collection Tools

*2.3.1. Personal information form*

To determine whether the workplace loneliness levels of middle school mathematics teachers differ by demographic variables, a Personal Information Form was developed by the researchers. The form includes six questions regarding gender, education level, duration of service, age, marital status and school type (public/private).

*2.3.2. Lonelines in the workplace scale*

To collect quantitative data, the "Loneliness in the Workplace Scale" developed by Wright et al. (2006) and adapted into Turkish by Doğan et al. (2009) was used. The scale consists of 16 items and two sub-dimensions: "emotional deprivation" and "social companionship." It is rated on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree), with total scores ranging from 16 to 80. Higher scores indicate a greater perception of workplace loneliness. The original internal consistency coefficient (Cronbach's Alpha) was reported as .905, indicating high reliability. In this study, Confirmatory Factor Analysis [CFA] was conducted to test the construct validity of the scale. Items 5 and 6 from the "Emotional Deprivation" sub-dimension and item 13 from the "Social Companionship" sub-dimension were removed due to low factor loadings. CFA conducted with the remaining 13 items showed acceptable factor loadings (all above .50). Model fit indices were CFI = .940, TLI = .926, SRMR = .0616, and RMSEA = .0809, indicating acceptable model fit (Kline, 2011). Cronbach's Alpha reliability coefficients in this study were: $\alpha$ = .879 for Emotional Deprivation, $\alpha$ = .878 for Social Companionship, and $\alpha$ = .872 for the overall scale, confirming good reliability (Mallery & George, 2003).

*2.3.3. Semi-structured interview form*

Qualitative data were collected using a semi-structured interview form developed by the researchers. This method allows participants to express their experiences, thoughts, and perceptions in their own words, and enables flexibility to explore deeper insights during the interviews (Merriam, 2009). The form was developed based on relevant literature and aligned with the research questions. To ensure content validity, expert feedback from three qualitative research specialists was obtained, and necessary revisions were made. A pilot study was conducted to evaluate the functionality of the interview questions, and revisions were made based on the feedback received.

### 2.4. Researchers Role

According to Lincoln et al. (2011), it is important for researchers to position themselves and explicitly state their values to establish an ethical relationship with both participants and readers. In this context, the researchers played an active role in both the quantitative and qualitative processes in line with the explanatory sequential mixed methods design adopted in the study. Theoretical framework was constructed, data collection tools were developed, and validity and reliability studies were conducted. In the quantitative phase, significant differences were assessed

using both parametric and non-parametric statistical techniques. In the qualitative phase, semi-structured interviews were conducted with participants selected through maximum variation sampling. The interview protocol was revised based on expert opinions and the results of a pilot study to enhance the validity and reliability of the qualitative data collection process (Merriam, 2009). The data were analyzed using content analysis with the help of the MAXQDA software, and the validity of the findings was supported by incorporating both descriptive and direct quotations (Lincoln & Guba, 1985). Furthermore, the analysis results were reviewed by field experts and revised accordingly as part of the triangulation approach to enhance the credibility of the study (Patton, 2002). Throughout the entire process, scientific ethical principles were upheld, and particular attention was paid to participant rights, confidentiality, and maintaining scientific objectivity.

### 2.5. Data Collection Processes

#### *2.5.1. Quantitative data collection*

Necessary permissions were obtained before starting the data collection process. The quantitative data were collected first. Public middle schools in Maltepe were visited, and relevant school administrators were contacted. Participants were informed about the study's purpose, scope, and confidentiality. The "Loneliness in the Workplace Scale" was administered in two formats: printed forms for in-person participants and an online version for those who preferred digital participation. This flexible approach helped improve participation rates.

#### *2.5.2. Qualitative data collection*

**Pilot Study.** Before collecting qualitative data, a pilot study was conducted using the semi-structured interview form. Pilot interviews are essential in qualitative research to assess the clarity of questions, appropriateness of language, duration of the interview, and alignment with research objectives (Glesne, 2011; Merriam, 2009). Two online pilot interviews were held with teachers in similar positions to the target group. Participants were informed that the purpose was to evaluate and improve the questions. The interviews, lasting about 20 minutes each, were recorded with consent and followed by feedback collection. Based on the feedback, the interview form was finalized.

**Semi-Structured Interviews.** Five participants were selected from low, moderate, and high scorers on the scale for online individual interviews. Interviews were scheduled according to participant availability. To ensure comfort, interviews began with brief, casual conversations. Then, questions from the semi-structured form were asked. Each session lasted around 20 minutes and was conducted by one of the researchers. All interviews were recorded with participant consent.

### 2.6. Data Analysis

#### *2.6.1. Quantitative data analysis*

Quantitative data were analyzed using a suitable statistical software package. Initially, normality assumptions were checked via skewness and kurtosis values. For large samples, values within ±1.96 indicate normality (Tabachnick & Fidell, 2013). The cases where the data show a normal distribution are presented in Appendix 1. As seen in the Appendix 1, the normal distribution status was examined for the groups belonging to each variable. In this context, parametric tests were applied for variables showing normal distribution and non-parametric tests were applied for variables not showing normal distribution.

Levene's test was used to check homogeneity of variances. Parametric tests were applied where assumptions were met. The significance level was set at .05. To address the first sub-question, scale score means were examined. For the second sub-question, comparisons were made using independent *t*-tests (for two groups when assumptions held), Welch *t*-test (when not), Mann-Whitney U tests (when not), one-way ANOVA (for three or more groups), or Kruskal-Wallis tests,

depending on the assumption checks. Post-hoc tests were applied for significant differences. Analyses were also conducted separately for the subdimensions.

*2.6.2. Qualitative data analysis*

Qualitative data were analyzed using content analysis, which systematically uncovers meanings expressed by participants. Both inductive and thematic approaches were used (Creswell, 2013). Coding and theme development were done with MAXQDA 24.9.1. The process included:

*Data Preparation:* Interview transcripts were checked and uploaded to MAXQDA.

*Open Coding:* Statements were read line by line, segmented into meaning units, and labeled with open codes (Saldaña, 2016).

*Theme Generation:* Relationships among codes were analyzed to develop higher-level themes and subthemes, following the process of "data reduction – data display – conclusion drawing" (Miles & Huberman, 1994).

*Software*-Supoorted Analysis: Tools like code matrices, thematic maps, and frequency analyses in MAXQDA helped visualize and interpret themes (Kuckartz & Rädiker, 2019).

*Relabiality and Validity:* Researcher memos were maintained throughout the process. Themes were supported with direct quotes for validity. For reliability, coding consistency was ensured, and conceptual coherence was preserved (Lincoln & Guba, 1985).

As a result of this multi-layered analysis process, a thematic structure explaining the workplace loneliness of mathematics teachers was created and the findings were interpreted in a holistic manner in line with this structure.

**2.7. Validity and Relabiality**

*2.7.1. Validity and reliability of quantitative data*

In this study, the "Loneliness in the Workplace Scale" developed by Wright et al. (2006) and adapted into Turkish by Dogan et al. (2009) was used. The reliability of the scale was reassessed, and Cronbach's Alpha coefficients were calculated as $a$ = .879 for the Emotional Deprivation sub-dimension, $a$ = .878 for the Social Companionship sub-dimension, and $a$ = .872 for the overall scale.

*2.7.2. Validity and reliability of qualitative data*

The research process was thoroughly documented, and data were stored to ensure the possibility of reanalysis (Miles & Huberman, 1994). The interview form was revised based on expert opinions, a pilot study was planned, and triangulation was ensured using semi-structured interviews supported by a web-based survey (Lincoln & Guba, 1985). In accordance with the recommendations of Lincoln and Guba (1985), convenience and maximum variation sampling methods were used to enhance the transferability of the findings to similar contexts.

**2.8. Ethics**

Before the data collection process began, official permission was obtained from the Ministry of National Education to conduct the study in all middle schools located in the Maltepe district of Istanbul. Prior to administering the data collection instruments, participants were informed about the purpose, scope, and voluntary nature of the research. A written informed consent form was provided, and participants' written consent was obtained. The data collected from participants have been anonymized in accordance with confidentiality principles and are stored in a secure environment accessible only to the researchers. In this context, the participants in the research were referred to as P1, P2, P3, P4, and P5.

**2.9. Limitations**

The research is limited to middle school mathematics teachers working in a specific region. Therefore, the findings cannot be generalized across different branches, education levels or geographic regions. Since qualitative data are based on interviews with a limited number of

participants, the findings are intended for in-depth understanding rather than generalizability. Participants' statements are based on their personal experiences and are contextual.

## 3. Findings

### 3.1. Quantitative Findings

The statistical results concerning the emotional deprivation and social companionship sub-dimensions, as well as the total scale score of middle school mathematics teachers, are presented in Table 3.

Table 3
*Descriptive Statistics of Middle School Mathematics Teachers' Scores on the Loneliness in the Workplace Scale*

| *Dimension* | *Min.* | *Max.* | *N* | *M* | *SD* |
|---|---|---|---|---|---|
| Emotional Deprivation | 7 | 30 | 145 | 12.1 | 4.73 |
| Social Companionship | 6 | 22 | 143 | 11.4 | 4.30 |
| Total Scale Score | 13 | 52 | 143 | 23.4 | 7.25 |

As seen in Table 3, the mean score for "Emotional Deprivation" sub-dimension is 12.1, which indicates a low level of emotional deprivation among teachers when considering the possible score range of 9 to 45. Similarly, the mean score for "Social Companionship" sub-dimension is 11.4, suggesting that teachers experience a low level of loneliness in this dimension, given the score range of 6 to 30. In contrast, the mean score for the total scale is 23.4, which falls closer to the middle of the total scale range (13 to 65), indicating a moderate level of perceived workplace loneliness. These findings suggest that teachers generally experience low to moderate levels of workplace loneliness.

In this study, the workplace loneliness levels of participants were examined in relation to the gender, education, duration of service, age group, marital status and school type variables. The analysis was conducted across three dimensions: "Emotional Deprivation," "Social Companionship," and the "Total Scale Score".

#### *3.1.1. Gender variable*

To determine the suitability of parametric tests, assumptions of normality and homogeneity of variances were tested. According to the results of Levene's test, the assumption of homogeneity of variances was met for all variables ($p > .05$). Regarding the distribution of the data, it was found that the "Emotional Deprivation" sub-dimension did not meet the assumption of normality; therefore, the Mann-Whitney U test was applied for this variable. For the other two variables—"Social Companionship" and the "Total Scale Score"—the assumption of normal distribution was satisfied, and independent samples *t*-tests were employed. The findings revealed that there were no statistically significant differences in workplace loneliness levels based on gender. According to the results of the Mann-Whitney U test, there was no significant difference between male and female teachers in terms of "emotional deprivation" scores ($U = 1842$, $p = .582$). Similarly, the independent samples *t*-test indicated no significant difference in "social companionship" scores between male and female participants ($t = 0.027$, $p = .978$). The analysis of the total scale scores also revealed no significant difference in perceived workplace loneliness based on gender ($t = -0.421$, $p = .674$). The statistical results related to these findings are presented in Table 4.

In conclusion, there is no statistically significant difference between male and female teachers in terms of both emotional and social loneliness scores ($p > .05$). Therefore, it can be inferred that workplace loneliness levels among teachers do not significantly vary according to gender.

Table 4
*Comparison of Loneliness in the Workplace Scale Scores by Gender*

| | *Descriptives* | | *Mann-Whitney U* | | *Student's t* | | |
|---|---|---|---|---|---|---|---|
| *Dimension and gender* | *n* | *M* | *Statistic* | *p* | *Statistic* | *df* | *p* |
| Emotional Deprivation | | | | | | | |
| Female | 109 | 12.0 | 1842 | 0.582 | | | |
| Male | 36 | 12.5 | | | | | |
| Social Companionship | | | | | | | |
| Female | 107 | 11.4 | | | 0.0271 | 141 | .978 |
| Male | 36 | 11.4 | | | | | |
| Total Scale Score | | | | | −0.4210 | 141 | .674 |
| Female | 107 | 23.3 | | | | | |
| Male | 36 | 23.9 | | | | | |

*Note*. $H_a$ $\mu_{Female} \neq \mu_{Male}$

*3.1.2. Education level variable*

To ensure group balance, participants who selected "Doctorate" and "Master's" education levels were combined under the category "Graduate." When comparing teachers' levels of workplace loneliness by educational attainment, the distribution was found to be approximately normal for the total scale and the sub-dimension of social companionship. However, the emotional deprivation sub-dimension did not meet the normality assumption, as skewness and kurtosis values exceeded the ±1.96 threshold. Levene's test indicated that the assumption of homogeneity of variances was met for both the social companionship sub-dimension and the total scale ($p > .05$). Accordingly, independent samples *t*-tests and, where necessary, the Mann-Whitney U test was employed. The analysis results revealed no statistically significant differences in emotional deprivation ($U = 1709$, $p = .937$), social companionship ($t(141) = 0.524$, $p = .601$), and workplace loneliness ($t(141) = 0.408$, $p = .684$) scores based on educational attainment. The statistical results related to these findings are presented in Table 5.

Table 5
*Comparison of Loneliness in the Workplace Scale Scores by Education Level*

| | *Descriptives* | | *Mann-Whitney U* | | *Student's t* | | |
|---|---|---|---|---|---|---|---|
| *Dimension and education level* | *n* | *M* | *Statistic* | *p* | *Statistic* | *df* | *p* |
| Emotional Deprivation | | | | | | | |
| Undergraduate | 115 | 12.1 | 1709 | .937 | | | |
| Graduate | 30 | 11.9 | | | | | |
| Social Companionship | | | | | | | |
| Undergraduate | 113 | 11.5 | | | 0.524 | 141 | .601 |
| Graduate | 30 | 11.1 | | | | | |
| Total Scale Score | | | | | −0.408 | 141 | .684 |
| Undergraduate | 113 | 23.6 | | | | | |
| Graduate | 30 | 23.0 | | | | | |

*Note*. $H_a$ $\mu_{Undergraduate} \neq \mu$Graduate

These findings suggest that teachers with undergraduate and postgraduate degrees' experience similar levels of workplace loneliness, indicating that educational level does not have a determining effect on perceptions of workplace loneliness among teachers.

*3.1.3. Duration of service variable*

The assumptions of normality were not met for emotional deprivation and workplace loneliness variables in some groups, as indicated by skewness and kurtosis values exceeding the ±1.96 range. Therefore, the non-parametric Kruskal-Wallis test was applied for these variables, and no significant differences were found among experience groups ($p > .05$). For the social

companionship variable, normality and homogeneity of variances were confirmed, and a one-way ANOVA was conducted. The ANOVA results indicated no significant difference in social companionship levels across experience groups ($F(2,140) = 0.774$, $p = .463$). The statistical results related to these findings are presented in Table 6.

Table 6
*Comparison of Loneliness in the Workplace Scale Scores by Duration of Service*

| | *Descriptives* | | *Kruskal-Wallis* | | | *One-Way ANOVA (Fisher's)* | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Dimension and duration of service (Year)* | *n* | *M* | $\chi^2$ | *df* | *p* | *F* | *df1* | *df2* | *p* |
| Emotional Deprivation | | | | | | | | | |
| 0-13 | 66 | 11.3 | 4.716 | 2 | .095 | | | | |
| 14-25 | 59 | 12.5 | | | | | | | |
| 26-40 | 20 | 13.6 | | | | | | | |
| Social Companionship | | | | | | | | | |
| 0-13 | 66 | 11.9 | | | | 0.774 | 2 | 140 | .463 |
| 14-25 | 58 | 11.2 | | | | | | | |
| 26-40 | 19 | 10.6 | | | | | | | |
| Total Scale Score | | | | | | | | | |
| 0-13 | 66 | 23.1 | 0.673 | 2 | .714 | | | | |
| 14-25 | 58 | 23.8 | | | | | | | |
| 26-40 | 19 | 23.5 | | | | | | | |

Overall, the findings suggest that teachers' levels of workplace loneliness do not significantly differ according to their years of teaching experience, implying that professional seniority may not be a determining factor in perceived loneliness.

*3.1.4. Age groups variable*

Levene's test results confirmed the homogeneity of variances ($p > .05$). The analysis examined whether there were significant differences in the sub-dimensions of emotional deprivation, social companionship, and workplace loneliness based on age. As the assumption of normality was not met for the "Workplace Loneliness" sub-dimension, the non-parametric Kruskal-Wallis test was employed, which revealed no statistically significant difference among age groups ($p = .057$). In contrast, one-way ANOVA was conducted for the "Emotional Deprivation" and "Social Companionship" sub-dimensions, as the data were normally distributed. ANOVA results showed a significant difference among age groups for the "Social Companionship" sub-dimension ($p = .037$), whereas no significant difference was found for "Emotional Deprivation" ($p = .116$). The statistical results related to these findings are presented in Table 7 and Post-hoc Test results are shown in Table 8.

Post-hoc analyses indicated that teachers aged 36–44 experienced significantly higher levels of loneliness in the social companionship dimension compared to those aged 45 and above (mean difference = 2.265, $p = .034$). This finding suggests that social companionship may improve or the sense of loneliness may decrease with age. No significant differences were observed among the other age groups. Overall, age appears to influence certain dimensions of workplace loneliness, possibly due to enhanced social support mechanisms or shifts in individuals' perspectives on workplace social interactions over time.

*3.1.5. Martial status*

Due to group imbalance, individuals who selected "widowed" and "divorced" as their marital status were recoded as "single." The analysis examined emotional deprivation, social companionship, and overall loneliness scores based on marital status. Descriptive statistics, normality, homogeneity of variances, and significance tests were assessed. The assumption of

Table 7
*Comparison of Loneliness in the Workplace Scale Scores by Age Groups*

| | *Descriptives* | | *Kruskal-Wallis* | | | *One-Way ANOVA (Fisher's)* | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Dimension and age group* | *n* | *M* | $\chi^2$ | *df* | *p* | *F* | *df1* | *df2* | *p* |
| Emotional Deprivation | | | | | | | | | |
| 23-35 | 51 | 11.1 | | | | 2.19 | 2 | 141 | .116 |
| 36-44 | 54 | 12.9 | | | | | | | |
| 45+ | 39 | 12.4 | | | | | | | |
| Social Companionship | | | | | | | | | |
| 23-35 | 51 | 11.1 | | | | 3.39 | 2 | 139 | .037 |
| 36-44 | 54 | 12.5 | | | | | | | |
| 45+ | 37 | 10.2 | | | | | | | |
| Total Scale Score | | | | | | | | | |
| 0-13 | 66 | 23.1 | 5.73 | 2 | .057 | | | | |
| 14-25 | 58 | 23.8 | | | | | | | |
| 26-40 | 19 | 23.5 | | | | | | | |

Table 8
*Results of Tukey Post-Hoc Test for Social Companionship According to Age Groups*

| *Tukey Post-Hoc Test – Social Companionship* | | | | |
|---|---|---|---|---|
| | | *23-35* | *36-44* | *45+* |
| 23-35 | Mean difference | — | −1.40 | 0.862 |
| | *p*-value | — | 0.207 | 0.611 |
| 36-44 | Mean difference | | — | 2.265* |
| | *p*-value | | — | 0.034 |
| 45 + | Mean difference | | | — |
| | *p*-value | | | — |

*Note.* * $p < .05$

normality was met, as skewness and kurtosis values fell within the acceptable ±1.96 range. Levene's test confirmed the homogeneity of variances, supporting the validity of the independent samples *t*-test. The results revealed that marital status had a statistically significant effect on workplace loneliness. Specifically, independent samples *t*-tests indicated significant differences in emotional deprivation ($p$ = .033), social companionship ($p$ = .021), and workplace loneliness ($p$ = .014) based on marital status. The statistical results related to these findings are presented in Table 9.

Table 9
*Comparison of Loneliness in the Workplace Scale Scores by Marital Status*

| | *Descriptives* | | *Student's t* | | |
|---|---|---|---|---|---|
| *Dimension and marital status* | *n* | *M* | *Statistic* | *df* | *p* |
| Emotional Deprivation | | | | | |
| Single | 40 | 13.5 | 2.16 | 142 | .033 |
| Married | 104 | 11.6 | | | |
| Social Companionship | | | | | |
| Single | 39 | 12.7 | 2.34 | 140 | .021 |
| Married | 103 | 10.9 | | | |
| Total Scale Score | | | | | |
| Single | 39 | 25.8 | 2.48 | 140 | .684 |
| Married | 103 | 22.5 | | | |

*Note.* $H_a$ $\mu_{Single} \neq \mu_{Married}$

*3.1.6. School type variable*

Considering the assumption of normality, the results of the independent samples *t*-test revealed that teachers' workplace loneliness levels significantly differed by school type in certain variables. According to Levene's test results, the assumption of homogeneity of variances was violated for the "Emotional Deprivation" ($p$ = .003) and "Workplace Loneliness" ($p$ = .010) variables; thus, Welch's *t*-test was employed for these two variables. For the "Social Companionship" variable, the equality of variances was met, and therefore the standard Student's *t*-test was used. The results of Welch's *t*-test for the emotional deprivation sub-dimension indicated that teachers working in private schools ($M$ = 10.7) reported significantly lower levels of emotional deprivation compared to their counterparts in public schools ($M$ = 12.3) ($p$ = .028). This finding suggests that private school teachers perceive themselves as less emotionally isolated or deprived, implying a more favorable emotional support environment in these institutions. Similarly, the results of the *t*-test for the social companionship sub-dimension revealed a statistically significant difference ($p$ = .038). Private school teachers scored higher ($M$ = 12.8) than public school teachers ($M$ =10.9) on this sub-dimension. However, given that higher scores on this scale reflect increased levels of loneliness in terms of social relationships, this result suggests that private school teachers may experience greater social isolation in the workplace. In contrast, no statistically significant difference was found between groups in the total scale scores ($p$ = .752). The mean score for public school teachers was 23.1, whereas for private school teachers it was 23.5. This result indicates that overall levels of perceived workplace loneliness are comparable across different school types. The statistical results related to these findings are presented in Table 10.

Table 10
*Comparison of Loneliness in the Workplace Scale Scores by School Types*

| | *Descriptives* | | *Welch's t* | | | *Student's t* | | |
|---|---|---|---|---|---|---|---|---|
| *Dimension and school type* | *n* | *M* | *Statistic* | *df* | *p* | *Statistic* | *df* | *p* |
| Emotional Deprivation | | | | | | | | |
| Public | 115 | 12.3 | 2.238 | 69.7 | .028 | | | |
| Private | 28 | 10.7 | | | | | | |
| Social Companionship | | | | | | | | |
| Public | 113 | 10.9 | | | | −2.098 | 139 | .038 |
| Private | 28 | 12.8 | | | | | | |
| Total Scale Score | | | | | | | | |
| Public | 113 | 23.1 | −0.318 | 57.2 | .752 | | | |
| Private | 28 | 23.5 | | | | | | |

*Note.* $H_a$ $\mu_{Public} \neq \mu_{Private}$

In conclusion, the emotional and social experiences of teachers differ to some extent depending on the type of school in which they are employed. Specifically, private school teachers appear to be in a more favorable position in terms of emotional deprivation. However, their higher levels of social companionship-related loneliness may indicate a lack of fulfilling interpersonal relationships within the school environment.

**3.2. Quantitative Findings**

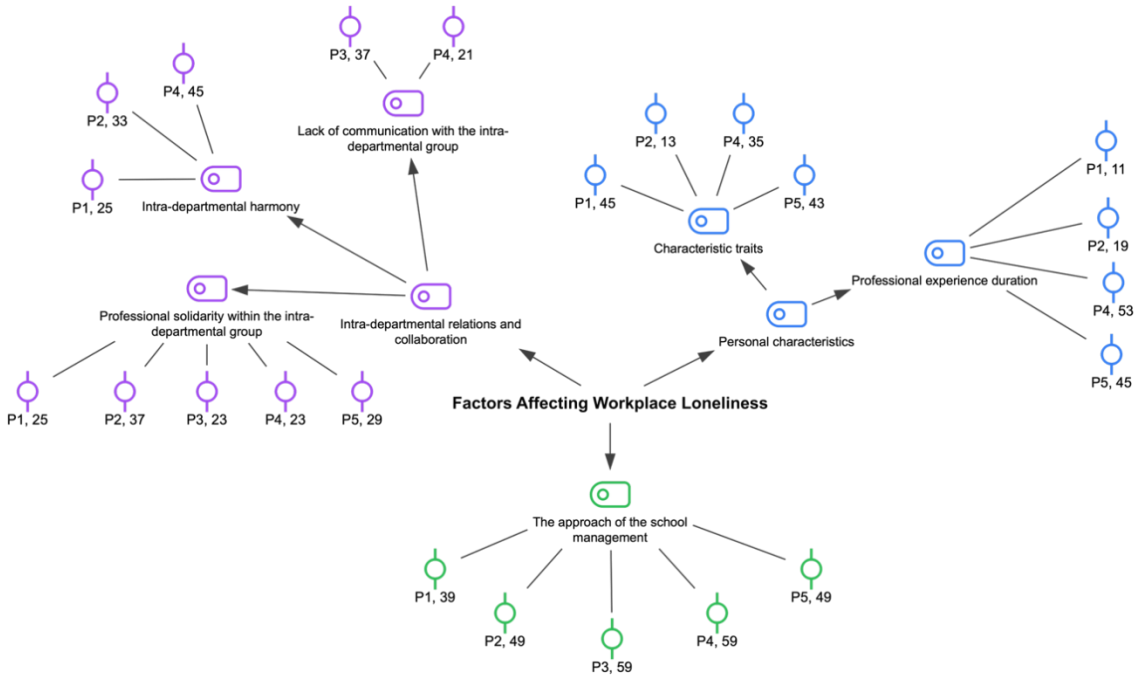
As a result of the analysis of the qualitative data obtained from the research, qualitative findings were grouped under three themes: "Factors Affecting Workplace Loneliness", "The Impact of Workplace Loneliness on Job Performance" and "Recommendations for Reducing Workplace Loneliness".

*3.2.1. Theme 1: Factors affecting workplace loneliness*

In the study, findings related to the factors influencing workplace loneliness were obtained through questions posed to participants regarding whether they experience professional loneliness

at school, their relationships with fellow department teachers, opportunities for collaboration, and communication processes with school administration. Within this theme, the categories and codes concerning the factors affecting workplace loneliness are presented in Figure 1.

Figure 1
*Categories, Codes and Participant Information Related to the Theme "Factors Affecting Workplace Loneliness"*




As shown in Figure 1, the factors affecting workplace loneliness according to the participants are grouped into "Personal qualities," "Intra-departmental relations and collaborations," and "The approach of the school management."

Two codes were identified under the "Personal qualities" category: "Characteristic traits" and "Professional experience duration.".

**Characteristic Traits.** The majority of participants (P1, P2, P4, P5) indicated that the experience of workplace loneliness is influenced by personal characteristics. P1 expressed that their emotional structure and high need for socialization directly affect their sense of security and job performance:

> It may not be the case for everyone, but if you are someone with an emotional nature who places great importance on socialization, it can happen. I am such a person. I don't feel very happy in a place where I don't feel safe, and my unhappiness affects my job performance, I believe. (P1)

Similarly, P4 stated that sociability and communication skills are determining factors in this process, while P5 indicated that they sometimes experience loneliness as a conscious choice to maintain distance. P2 emphasized that the feeling of loneliness can be person-specific and that not everyone may feel the same way, explaining their comfort at school as follows:

> Well, I have worked at different schools, but the reasons may be somewhat personal. It may also be related to myself. I don't know at all if everyone feels this way. But because I feel comfortable here, I go everywhere, I can go anywhere, I can access everything. Everything is at my fingertips, from my transportation card for the elevator to the keys to the rooms on the floors—I have them all, so I feel like this place is my home. There's something like that. (P2)

**Professional Experience Duration.** Participants with at least 11 years of experience (P1, P2, P4, P5) expressed that as they gained professional competence, their need for collaboration with others decreased. P2, with 19 years of experience, stated that in the early years of their career, they needed support with tasks such as writing notebooks or preparing written materials, but currently

experience no problems related to teaching. P4, with 23 years of experience, expressed this transformation by comparing different periods of their career with the following words:

> If you asked the 20-year-old me, I would say that I would definitely collaborate—because I didn't know the job. But if you ask the 38-year-old me now, I would say I wouldn't collaborate with anyone. (P4)

P5 emphasized that inexperienced teachers definitely experience the challenge of loneliness and that this negatively affects lesson productivity.

*Cross-Validation of Quantitative and Qualitative Data.* The increasing trend in emotional deprivation levels (11.3→12.5→13.6) associated with increasing years of service in the quantitative data shows consistency with the qualitative findings. Experienced participants P2 (19 years, 23-35 age, male, married) and P4 (14-25 years, 36-44 age, male, married) indicated that their need for collaboration decreased as they gained professional competence. P4's statement that while he preferred to collaborate in his 20s, at age 38 he would no longer collaborate with anyone, concretizes this transformation. P2's lack of problems related to teaching demonstrates the increase in professional autonomy.

Despite being single and in the 36-44 age group in the quantitative data, P1 reported low loneliness levels. This can be explained by P1's high need for sociability and emotional nature, which he emphasized under the characteristic traits subcode. P1's statement "...if you are someone with an emotional nature who places great importance on socialization, it can happen" shows that individual differences can counterbalance demographic risk factors. Similarly, P5 (26-40 years, 45+ age, male, single, private school) characterized loneliness as a conscious choice to maintain distance and reported high loneliness levels.

According to the participants, one of the factors influencing workplace loneliness at school is “Intra-departmental relations and collaborations.”. Three codes were derived under the category of “Intra-departmental Relations and Collaborations”: “Intra-departmental harmony,” “Professional solidarity within the intra-departmental group,” and “Lack of communication with the intra-departmental group.”

**Intra-Departmental Harmony.** The majority of participants (P1, P2, P4) indicated that the social relationships they established with department members affected their loneliness experiences. P1 expressed that they get together with department members outside of school as well: "Sometimes we get along well with each other in the department. I mean, when we meet outside of school, for example, if someone has a baby, we go visit. We also go as a department." P4 exemplified the cohesion within the department as follows: “Our intra-departmental group is a harmonious one. For example, twice a year, we go together to a lakeside house outside the city that belongs to one of our colleagues.”.

P2, stated that interaction within the department mostly takes place in the form of conversation.

**Professional Solidarity within the Intra-Departmental Group.** All participants emphasized that they collaborate with department members on professional matters and that this situation supports them. P1 expressed that they exchange ideas and benefit from each other's experiences: "Mathematics is rarely discussed there, of course, but within the school we frequently exchange ideas. Things like 'teach this this way,' or 'I taught it like this'—I benefit from their experiences." P2 stated that they divide the work during the exam preparation process:

> Since we prepare the exams together, we discuss things like 'up to which topic should we go? Are you behind or ahead? If you're behind, let's prepare the exam according to you.' This month you prepare the exam, next time I'll prepare it, things like that. (P2)

P3 emphasized that collaborating with an experienced founding teacher in their first year prevented them from feeling alone:

> Because it's my first year and she's very experienced, we sit down a lot, talk, and try to do things collaboratively. I don't feel alone. This may be due to both having this relationship and the fact that

> the person I have this relationship with is perhaps one of the founders of the private school in the private sector. (P3)

P5 stated that lesson planning and exam topics are discussed in department meetings.

**Lack of Communication with the Intra-Departmental Group.** Some participants (P3, P4) expressed that they could not establish sufficient communication with department members. P3 stated that they wanted to collaborate with a part-time department member but could not communicate:

> Now, one of my department members works part-time, so they just come in and out for classes. But I had a problem during one period... But we couldn't communicate much about this. Because they were very busy at school. Sometimes they weren't even present in the environments where I was. We didn't even have many normal conversations outside of work. (P3)

P4 expressed the lack of communication within the department as follows: "We've never had such conversations—no one really comes to ask me anything, and to be honest, I don't go to ask anyone either."

*Cross-Validation of Quantitative and Qualitative Data:* The highest social companionship deficiency experienced by the 36-44 age group in the quantitative data ($M$ = 12.5) shows consistency with the statements of participants in this age group in the qualitative findings. P4 (36-44 age, male, married, public school, moderate loneliness), despite stating that there are harmonious social relationships within the department, expressed experiencing a lack of communication on professional matters: "We've never had such conversations—no one really comes to ask me anything, and to be honest, I don't go to ask anyone either." This situation demonstrates that the 36-44 age group may experience a lack of professional solidarity even if they participate in social activities.

The 45+ age group having the lowest social companionship deficiency ($M$ = 10.2) partially contradicts P5 (45+ age, male, single, private school, high loneliness), who is in this group and stated that intra-departmental meetings are held regularly despite being demographically in a high-risk group. This situation indicates that P5's high loneliness level may stem from other factors (being single, gender-based workload) rather than relationships within the department.

P1 (36-44 age, female, single, public school, low loneliness) and P3 (23-35 age, female, single, private school, moderate loneliness) emphasized cohesion within the department and professional solidarity. P3's not feeling alone due to collaborating with an experienced colleague reveals that professional solidarity reduces the experience of loneliness. P1's meeting with department members outside of school may explain reporting low loneliness despite being single.

**The Approach of the School Management.** Participants emphasized that the attitudes and behaviors of school management were determining factors in feeling comfortable. P1 stated that they could communicate comfortably with school management: "I mean, I feel comfortable because there's no prejudice or coldness, no such attitudes. I haven't encountered anything like that when I talk. I can say things comfortably when I need to." P2 shared that while satisfied with the current school management, they had experiences at different schools where they couldn't even meet with the principal: "We are quite comfortable with our school management... But this is not the case everywhere. I've worked at several different schools, and sometimes you can't even see the principal... sometimes you can't even make a request."

P3 expressed wanting more interaction with the founding principal but being satisfied with their current principal:

> I would have liked them to greet us when they're at school, to chat with us when appropriate—this could have perhaps increased my sense of belonging too. But that's their choice. I can't say anything about that. But my own principal, I'm satisfied with my principal. I don't have any problems with them. (P3)

P5 emphasized the importance of school management prioritizing teacher happiness: "School management will think first about the happiness of their teacher colleagues. They think about their

comfort, trying to improve physical conditions. But this is important: mental health and happiness come first."

P4 expressed in detail that different administrators have different management styles and that this affects the school climate:

> Let me put it this way: we work with many administrators, and each administrator's style and method is somewhat different, of course. Some administrators try to treat everyone equally, but while treating everyone equally, they overlook the sense of justice. ... That's my opinion. Our current school administration treats everyone equally. This year they started to act a bit more fairly. But I don't think this sense of equality is the right feeling. ... We were very good with our previous principal. I think those were the times when the school was most successful. Our previous principal ... was a teacher-centered principal. ... I didn't want to leave school. For example, the bell would ring, everyone would go home, when work was done I would stay at school. (P4)

*Cross-Validation of Quantitative and Qualitative Data:* In the quantitative data, teachers working in public schools having higher emotional deprivation levels (12.3 > 10.7) but lower social companionship deficiency (10.9 < 12.8) compared to private schools is explained through different dimensions in the qualitative findings. P3, working at a private school, stated that they could not establish sufficient interaction with the founding principal but were satisfied with their direct principal. P4, working at a public school, compared experiences working with different principals and emphasized wanting to stay at school during the period when working with a teacher-centered principal. P2's experiences of not being able to meet with principals at different schools reveal that management approaches vary across schools. P1 and P5's emphasis on being able to communicate comfortably with management and management prioritizing teacher happiness demonstrates that positive management approaches can reduce the experience of loneliness.

P1 (public school, single, low loneliness) and P5 (private school, single, high loneliness) emphasizing their ability to communicate comfortably with management and management prioritizing teacher happiness demonstrates that positive management approaches can reduce the experience of loneliness. However, P5's high loneliness level reveals that the school management factor alone is not sufficient and must be evaluated together with other factors (being single, gender-based workload).

*3.2.2. Theme 2: The impact of workplace loneliness on job performance*

The findings related to the impact of workplace loneliness on job performance were obtained through questions directed at participants regarding whether they interact with colleagues outside of departmental meetings, opportunities for collaboration with departmental teachers, their perceptions of loneliness in the school environment, and the possible effects of this feeling on their professional performance. The codes generated for the theme "The Impact of Workplace Loneliness on Job Performance" are presented in Figure 2.

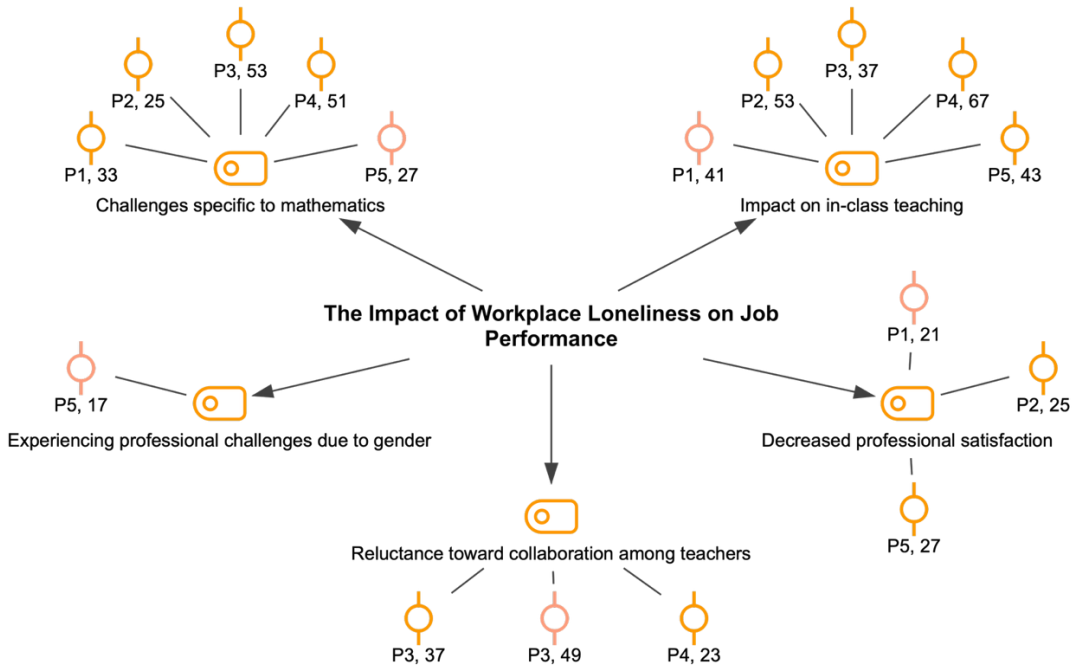
As shown in Figure 2, five codes were derived under the theme "The Impact of Workplace Loneliness on Job Performance": "Challenges specific to mathematics," "Reluctance toward collaboration among teachers," "Experiencing professional challenges due to gender," "Decreased professional satisfaction," and "Impact on in-class teaching."

**Challenges Specific to Mathematics.** All participants stated that the challenges they experience due to the nature of mathematics class affect their performance. P1 expressed experiencing difficulties due to curriculum intensity and insufficient class hours. P2 stated that students have difficulty understanding due to the difficulty of the subject and its sequential structure:

> Perhaps because of the difficulty of the subject, you explain it like this. It's not understood, you explain and it's still not understood. It's a difficult subject to understand. Because it's a sequential subject, if a student misses even one class, they can fall behind. (P2)

Figure 2

*Codes and Participant Information Related to the Theme "The Impact of Workplace Loneliness on Job Performance"*




P3 emphasized struggling to keep up with the new curriculum despite working at a private school and being ahead. P4 expressed the mismatch between students' deficiencies in basic mathematics skills and curriculum expectations as follows: "It talks about discovering pi in the circumference of a circle and such. In the 6th grade curriculum of the Ministry of Education, the student doesn't even know how to borrow in subtraction." P5 stated that mathematics class requires more effort compared to other subjects:

> When a student takes an exam, the most difficult question is usually from mathematics... It's harder for students to understand. You probably exert two or three times more effort than teachers of other subjects. And in the end, the results are definitely lower compared to other subjects. You take on both the fatigue and the failure. That's the nature of our branch—it's just how it is in our field. (P5)

**Reluctance Toward Collaboration Among Teachers.** Two participants (P3, P4) expressed the difficulties they experienced regarding collaboration with colleagues. P3 stated being willing to collaborate but not receiving reciprocation: "I was willing to collaborate in order to make sense of it, but since I didn't receive such an approach from them, it didn't happen anyway." They also mentioned being unable to communicate with a part-time department member: "But we couldn't communicate much about this. Because they were very busy at school. Sometimes they weren't even present in the environments where I was. We didn't even have many normal conversations outside of work." P4 emphasized that ego issues among mathematics teachers prevent collaboration:

> Ultimately, the person has a style. They've found an example related to instruction. This example might be working very well—I think we should benefit from it. We can put our egos aside. But mathematics teachers generally have this thing too. I mean, there's this 'I know best' attitude, but there's no such need, no such situation. (P4)

**Experiencing Professional Challenges due to Gender.** P5, the only participant who evaluated the effects of workplace loneliness on professional performance in the context of gender, expressed that being the only male teacher in the department caused an increase in the workload assigned to him as follows:

> There are six or seven math teachers, and I'm the only man among them. Female teachers often take maternity leave or get married... and for various reasons, the extra workload falls on you as a male teacher. I face the challenges of being the only male teacher. (P5)

**Decreased Professional Satisfaction.** The majority of participants (P1, P2, P5) stated that the experience of loneliness decreased their professional satisfaction. P1 expressed that the decrease in professional satisfaction increased concerns about the future: "Since my professional satisfaction has significantly decreased… I sometimes feel like things are going downhill. Is it always going to be like this? It's a situation that's closely related to a lack of satisfaction."

P2 stated that the difficulties experienced due to the sequential structure of the subject created distress.

**Impact on In-Class Teaching.** All participants emphasized that the feeling of loneliness directly affected their classroom performance. P1 stated that their tolerance toward students decreased when unhappy:

> If I felt lonely, I would be unhappy. And when I'm unhappy, I think my tolerance for students decreases, and so does my motivation in class. Honestly, this reflects on the students as well, and it ends up being a bit unfair to them. (P1)

P2 expressed that personal problems negatively affected teaching:

> For example, you couldn't pick up your child from school. My neighbor will pick them up, who will pick them up, how will they pick them up? When these things are spinning in my head, it's not possible to teach comfortably. (P2)

P3 stated that lack of collaboration reduced lesson productivity. P4 expressed in detail being irritable toward students when feeling lonely, but teaching more effectively when feeling good:

> When I feel lonely, I become incredibly irritable. When I enter the class, if a student drops their pencil on the floor, I can yell and shout at them. But right now, for example, in these months, I feel good about myself. Now when I enter the class, they say 'to the last drop of sweat'—that's how I teach, for example. I mean, I put forth the best, the greatest effort I can for the child to understand. (P4)

P5 emphasized that the feeling of loneliness affects the teacher's happiness and consequently their approach to students:

> Let me put it this way: no matter what field a person is in, including teaching and other professions, they cannot be happy in a place where they feel lonely. When they're not happy, they can't work with enthusiasm. For example, love lies at the core of our profession. Toward the child. If you don't have love, you cannot succeed at that job. (P5)

*Cross-Validation of Quantitative and Qualitative Data:* In the quantitative data, single teachers experiencing higher loneliness in both emotional deprivation (13.5 > 11.6) and social companionship (12.7 > 10.9) dimensions shows consistency with the qualitative findings. Among single participants, P1 (36-44 age, female, public school), P3 (23-35 age, female, private school), and P5 (45+ age, male, private school) expressed that loneliness negatively affects job performance in different dimensions. P1's decreased professional satisfaction and reduced tolerance toward students, P3's experience of lack of collaboration, and P5's experience of gender-based workload excess reveal the different challenges faced by single teachers. Teachers working in public schools having higher emotional deprivation levels (12.3 > 10.7) corresponds with P1, P2, and P4 (public school) emphasizing the difficulties they experience regarding curriculum intensity, student level, and classroom management. The 36-44 age group having the highest loneliness score ($M$ = 25.4) shows consistency with P1 and P4, who are in this age group, expressing the effects of loneliness on job performance in detail.

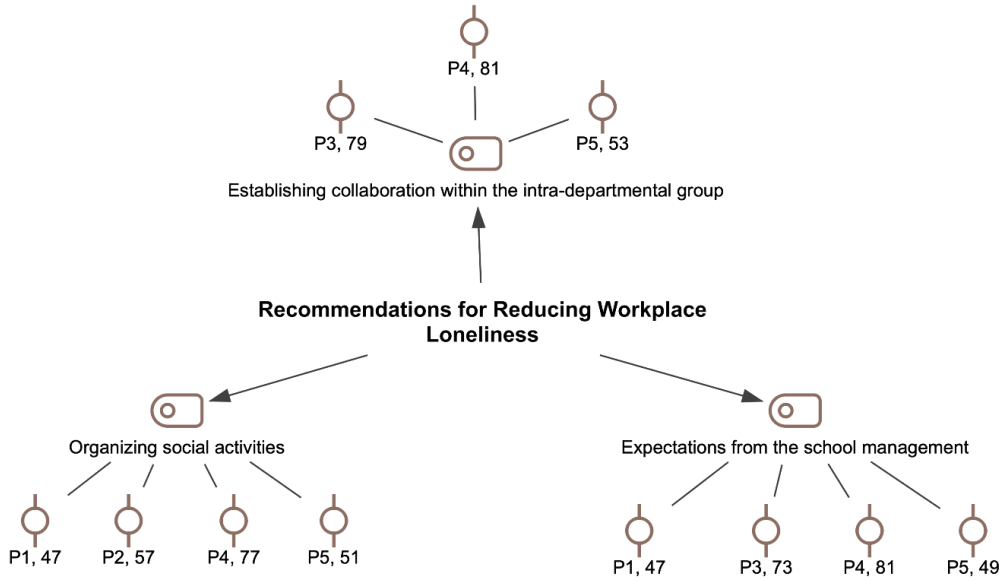
*3.2.3. Theme 3: Recommendations for reducing workplace loneliness*

The findings related to this theme were obtained through questions directed to the participants regarding what can be done to cope with workplace loneliness, as well as their expectations from

the school management and their colleagues in this context. Additionally, participants were asked whether they felt the need for a stronger environment of communication and solidarity among mathematics teachers, and how such an environment could be established. The codes related to the theme "Recommendations for Reducing Workplace Loneliness" are presented in Figure 3.

Figure 3

*Codes and Participant Information Related to the Theme "Recommendations for Reducing Workplace Loneliness"*




As shown in Figure 3, three codes were identified under the theme "Recommendations for Reducing Workplace Loneliness": "Establishing collaboration within the intra-departmental group," "Organizing social activities," and "Expectations from the school management."

**Establishing Collaboration within the Intra-Departmental Group**. Many participants (P3, P4, P5) emphasized that collaboration within the department should be structured systematically and regularly. P3 expressed the importance of planned and regular meetings as follows:

> There should be systematic and regular meetings arranged in advance—like meeting twice a month, on a specific date, at a specific time, in a specific room, with a clear agenda. Everyone should come prepared, knowing what will be discussed and what actions will be taken. (P3)

P4 stated that a catalyst is needed to initiate collaboration:

> For example, there's the TUBITAK project. I'm not doing it. There are colleagues who do it. But nobody among us stands up and says, 'Hey, friends, let's do a project together.' We don't have such energy. Someone needs to act as a catalyst for this. Action needs to be taken here. Everyone has potential, but nobody takes action. Sometimes a high-energy mathematics teacher gets assigned to the school and can initiate action. Sometimes the administration can do this. (P4)

P5 emphasized the positive reflections of getting ideas from colleagues.

**Organizing Social Activities.** The majority of participants (P1, P2, P4, P5) suggested organizing activities to strengthen social bonds among teachers. P1 recommended that school management organize activities that encourage social connection. P2 gave examples of activities they had done in the past:

> If it were me, I could organize collective activities related to teachers, for example. We did them in the past—excursions, picnics, barbecues, Teachers' Day meals that all teachers could attend, fast-breaking meals—you know, where everyone could bond and get along. (P2)

P4 stated that social activities would reduce loneliness: "We don't want to be lonely. There should be social activities, maybe competitions—events organized among teachers." P5 emphasized the importance of conversations in sincere settings: "There are friend conversations

where people participate from the heart, eat and drink, and relax. Small talk happens there. That's a thousand times more beneficial. People say what's in their hearts, they speak comfortably."

**Expectations from the School Management.** A large portion of participants (P1, P3, P4, P5) expressed expecting school management to take an active role in reducing loneliness. P1 suggested assigning responsibilities to department heads: "Maybe responsibilities could be assigned to department heads so that they initiate collaboration within their subject groups. This could help promote solidarity among colleagues." P3 stated that systematic and regular management would increase motivation: "Everything should be very systematic, orderly, and disciplined. Because even the lack of this can cause low motivation in places." P4 emphasized management providing support in this matter. P5 expressed that school management should first think about teacher happiness as follows:

> First, just as I must give love to my students when I enter the classroom—before mathematics, I must make them happy first, then teach—school management will also think first about the happiness of their teacher colleagues. They think about their comfort, trying to improve physical conditions. But this is important: mental health and happiness come first. School management occasionally organizes meals. I don't know. They bring teacher colleagues together and help them bond. (P5)

*Cross-Validation of Quantitative and Qualitative Data:* Participants' suggestions show consistency with previously identified quantitative findings. The 36-44 age group experiencing the highest social companionship deficiency ($M$ = 12.5) corresponds with P4's (36-44 age, male, married, public school) emphasis on the need for a catalyst for collaboration within the department and the importance of social activities. Single teachers experiencing higher loneliness (emotional deprivation $M$ = 13.5, social companionship $M$ = 12.7) explains the suggestions for social activities and management support from P1 (single, female, public school), P3 (single, female, private school), and P5 (single, male, private school). Higher emotional deprivation in public schools ($M$ = 12.3) and higher social companionship deficiency in private schools ($M$=12.8) makes it meaningful that participants working in both school types (P1, P2, P4 public; P3, P5 private) offer different but complementary suggestions. While P3's suggestion for systematic meetings and P5's suggestion for sincere conversation environments aim to address social companionship deficiency in private schools, P2 and P4's suggestions for collective activities can be evaluated as strategies aimed at reducing emotional deprivation in public schools.

## 4. Discussion and Conclusion

The primary aim of this study is to examine middle school mathematics teachers' workplace loneliness experiences within the framework of Wright's (2005) two-dimensional model and to illuminate the multilayered nature of this experience by evaluating quantitative and qualitative data through cross-validation. The results indicate that teachers generally report low levels of loneliness in the dimensions of emotional deprivation and social companionship, but total scale scores approach moderate levels. This situation suggests that although teachers do not experience workplace loneliness intensely, they may have a perception of loneliness that varies in the low-to-moderate range. This pattern is largely consistent with results in the literature (Kaya & Erdogan, 2020; Ugurlu & Kaplan, 2021). Wright's (2005) two-dimensional model (emotional deprivation and social companionship deficiency) is thought to provide a meaningful distinction in the local context as well. The results indicate that these two dimensions operate relatively independently and are associated with different demographic variables.

### 4.1. Demographic Variables and Workplace Loneliness Experience

In the context of demographic variables, the absence of a significant difference according to gender supports the interpretation that workplace loneliness experience may be sensitive to institutional, social, and professional factors rather than gender (Kaya & Erdogan, 2020; Wright, 2005). However, the fact that the gender variable does not create a significant differentiation at the general level in the quantitative data indicates that contextual and structural gender dynamics that

emerge in the qualitative findings remain invisible. It was observed that being of the minority gender in the intra-departmental group leads to excessive workload, and this situation increases the feeling of loneliness. This situation corresponds with Bryan et al.'s (2025) description of "disconnection from colleagues, organization, and society" and demonstrates that loneliness is not limited only to individual relationships but is also influenced by broader social structures. Consequently, the loneliness-performance relationship is not a simple and linear process but is complexly shaped by subject-specific factors, gender dynamics, and individual loneliness levels. The lack of significant effect of education level also indicates that the bachelor's/graduate distinction does not alone determine loneliness perception, and that social environment and organizational climate may be more influential (Peplau & Perlman, 1982).

Although no significant difference was found in terms of years of service, qualitative data suggest that as experience increases, some teachers may consciously narrow their social networks along with professional autonomy. In interviews, experienced teachers expressed that they needed collaboration more in the early years of their careers, but this need decreased as they gained professional competence. One participant concretized this transformation by stating that while they preferred to collaborate in their twenties, in their thirties they would no longer collaborate with anyone. While Professional Learning Communities Theory posits that collaboration supports teacher well-being at every career stage, this research demonstrates that as experienced teachers' need for collaboration decreases, their social bonds may also weaken (DuFour et al., 2007; Hord, 1997). This situation indicates that professional development may not be viewed as a linear process and that different social needs may emerge at different career stages. It suggests that as teachers' individual expertise develops, their forms of participation in PLCs may also transform. Therefore, for the establishment of a sustainable professional learning culture, it is important that PLCs be structured in a way that integrates experienced teachers' accumulated knowledge into collective learning processes rather than excluding this knowledge.

Regarding the age variable, the higher loneliness observed in the social companionship deficiency dimension in the middle-age group (36–44) may be related to the narrowing of social relationships and work-life balance difficulties in middle age. Qualitative data also indicate that social interactions relatively decrease in this age group. In the literature, this pattern is addressed as a possible reflection of the midlife stress peak (Carr & Pudrovska, 2022; Lachman, 2004). From a life cycle perspective, difficulties in maintaining work-life balance may increase the tendency toward social isolation; moreover, increasing workload and family responsibilities may also feed this tendency (Carr & Pudrovska, 2022; McPherson et al., 2006; Shin et al., 2023).

In the context of marital status, married teachers having lower loneliness scores compared to their single counterparts raises the possibility that family-based social support systems may play a protective role (Holt-Lunstad et al., 2010). Findings that married individuals generally report higher life satisfaction and better mental health indicators (Erden et al., 2023; Stack & Eshleman, 1998) and explanations that the emotional/social support provided by marriage can alleviate workplace loneliness (Mishra et al., 2024) appear consistent with this picture.

The reverse pattern observed across school types — higher emotional deprivation in public schools and higher social companionship deficit in private schools — suggests that a teacher may feel emotionally isolated even while participating in social activities, or may maintain close friendships yet still feel excluded from broader school networks (Lam & Lau, 2012; Wright, 2005). The relatively higher level of emotional deprivation in public schools may indicate that social support mechanisms and administrator–teacher relationships in these contexts are more limited compared to private schools (Alkhyeli & Ewijk, 2018; Leiter & Maslach, 2009). Interviews indicate that some teachers perceive limited opportunities for communication and mutual consultation on professional matters despite having harmonious social relationships within the intra-departmental group. This picture suggests that inclusion in social networks does not always mean emotional attachment, while also appearing consistent with Wright's prediction that the two dimensions are distinct. Additionally, the results can be associated with the supportive conditions and shared

values characteristics of PLCs (Boone, 2010; Hord, 1997; Webb et al., 2009). An effective PLC structure draws attention to the importance of a trust-based and participation-based school climate where teachers can feel a sense of belonging both emotionally and socially (DuFour et al., 2007). Therefore, the different forms of teacher loneliness observed in both school types can be evaluated as a potential indicator of PLCs not being operated effectively. Indeed, in a strong PLC structure, managerial support, trust-based relationships, and a sense of common purpose have the potential to reduce teachers' loneliness experiences by strengthening their emotional and social bonds (Boone, 2010; Hord, 1997; Newmann, 1996; Stoll et al., 2006; Vescio et al., 2008; Webb et al., 2009).

### 4.2. The Role of Organizational and Social Context

As part of the third research question, the factors shaping middle school mathematics teachers' perceptions of workplace loneliness were examined through in-depth interviews with the teachers. The research findings reveal three primary factors shaping teachers' perceptions of workplace loneliness: personal qualities, intra-departmental relations and collaboration, and the approach of the school management. Teachers with low levels of loneliness reported forming strong relationships in their professional and social environments, noting that regular idea-sharing and interactions outside school helped reduce their sense of loneliness. Those experiencing moderate levels of loneliness emphasized that their perceptions were reinforced by the school administration's attitude and the quality of relationships with colleagues, particularly pointing out that limited collaboration contributed to this perception. The teacher with a high level of loneliness attributed their experience to groupings, lack of communication, and gender-based imbalances within the school context. The participants' emphasis on the lack of collaboration among colleagues and limited social interaction is consistent with the findings of Schleifer et al. (2017) on teacher isolation, and also aligns with international research from countries such as Australia (Lewis, 1999) and South Korea (Yuh & Choi, 2017), which associate teachers' sense of loneliness with insufficient opportunities for sharing professional experiences, the absence of meaningful professional relationships, and limited social support. Additionally, the results of Stănescu and Romascanu (2024), which suggest that reduced social support increases emotional deprivation and thereby reinforces perceptions of loneliness, support the participants' statements. In addition, it is suggested that employees working in a collaborative climate—where colleagues help one another, provide emotional communication, interpersonal and team support—tend to feel better in the workplace and experience reduced levels of loneliness (Du et al., 2022; Guo, 2020). Furthermore, participants' feelings of exclusion at the levels of school management and broader society directly correspond to the themes of "disconnection from colleagues, organization, and society" as defined by Bryan et al. (2025), highlighting that teachers' experiences of workplace loneliness are multidimensional and systemic in nature.

Regarding the role of organizational and social context, the notion that teachers' perceptions of being valued by the school can influence their loneliness experiences also finds support in this study (Eisenberger et al., 1986). Qualitative results indicate that when there is meaningful and accessible communication with management, the perception of loneliness can weaken. The relatively high emotional deprivation in public schools can be interpreted consistently with results suggesting that lack of administrative support may be associated with feelings of not belonging (Skaalvik & Skaalvik, 2018). Narratives about how management changes in the same school can affect perceived support suggest that organizational support may be not only a structural but also a relational phenomenon (Collie et al., 2015b; Haw, 2023; Lee et al., 2020). However, it is also observed that in some cases loneliness levels do not remain low even when the perception of management support is high; this situation suggests the possibility that organizational support alone may not be sufficient under all conditions and that other factors (e.g., marital status, workload, intra-departmental group dynamics) may come into play (Tian et al., 2023). Additionally, it is understood that the structural features of PLCs that promote horizontal collegial

collaboration and collective learning opportunities may also play a determining role in this process (Haw et al., 2023).

The role of collaborative culture and shared values in reducing teacher loneliness has emerged as a multidimensional and complex dynamic in this research. Qualitative results show that teachers frequently resort to collaborative practices such as regular idea exchange, joint exam preparation, and similar activities. This situation corresponds with the "shared individual practice" dimension of PLCs (Hord, 1997; Newmann, 1996). However, the results also demonstrate that the formal existence of PLC structures alone is not sufficient. In interviews, it was expressed that regular participation in intra-departmental group meetings does not always create deep professional solidarity; interactions often remain superficial. Participants' emphasis on limited collaboration with colleagues and lack of social interaction is also consistent with international research (Lewis, 1999; Schleifer et al., 2017).

These results reveal, as emphasized by Stoll et al. (2006) and Vangrieken et al. (2017), that for PLCs to be effective, they need not only structural but also cultural depth. Teachers' statements regarding the lack of systematic and regular meetings, clear agendas, and prepared participation indicate that the "supportive conditions (physical)" dimension defined by Hord (1997) is weak. Similarly, concerns about the content of meetings and the quality of dialogues show that the "collective learning and application" and "supportive conditions (human)" dimensions have also not been sufficiently developed (Boone, 2010).

Overall, the findings indicate that PLCs in Türkiye have not yet been systematically institutionalized and have not fully realized their potential in reducing teacher loneliness. Therefore, PLCs need to be restructured not merely as formal meeting structures, but as social communities based on authentic collective learning, shared leadership, and psychological safety (Darling-Hammond et al., 2017; Vangrieken et al., 2017).

As part of the fourth research question, the study investigated how middle school mathematics teachers perceive the impact of workplace loneliness on job performance. Participants' evaluations regarding the relationship between workplace loneliness and job performance were shaped by themes such as challenges specific to the mathematics subject, reluctance toward collaboration, gender-based professional difficulties, decreased professional satisfaction, and impacts on in-class teaching. All participants emphasized the negative effects of loneliness on job performance; however, the intensity of this impact varied according to their levels of perceived loneliness.

Teachers experiencing low levels of loneliness expressed that loneliness can lead to unhappiness, loss of motivation, and impatience toward students, which can weaken fundamental teaching skills such as empathy and patience. Those experiencing moderate levels of loneliness emphasized effects such as decreased motivation and disruption of the teaching process, and also noted that there are differences according to levels of social support. The teacher experiencing high levels of loneliness stated that classroom performance is directly affected, that they become more irritable toward students when feeling lonely, but teach more effectively when feeling good. These results demonstrate that the effect on teaching performance differentiates depending on the intensity of loneliness. As loneliness increases, a marked decrease is observed in teachers' professional satisfaction, motivation, and classroom interactions; conversely, it is understood that increasing social support, collegial interaction, and administrative responsiveness are fundamental elements that can mitigate these negative effects.

The weakening of pedagogical qualities such as patience and empathy emphasized in interviews demonstrates that loneliness can lead to emotional exhaustion. When evaluated in the context of PLCs, the absence of collective learning and shared practice opportunities limits the social support resources that teachers can use to cope with professional difficulties and may increase emotional exhaustion (Borko & Potari, 2019; Vescio et al., 2008). PLC structures where teachers can systematically share instructional difficulties with colleagues and develop reflective dialogue both reduce loneliness and provide social resources that support teaching performance (Darling-Hammond et al., 2017; Newmann, 1996). This situation is consistent with the strong

relationships between loneliness, job satisfaction, and burnout reported in Bryan et al.'s (2023) meta-analysis.

In the context of challenges specific to mathematics, teachers stated that factors such as curriculum intensity, low student achievement, and the sequential structure of the subject exacerbate the experience of loneliness. This finding indicates that the structural stressors faced by mathematics teachers have been previously emphasized in the literature (Jian et al., 2022; Meng & Liu, 2008; Milkowski, 2019). Indeed, mathematics teachers face a series of discipline-specific challenges; these include mathematics being perceived as inherently difficult, students showing lower achievement compared to other subjects, and implicit accountability pressures placed on teachers (Hodgen & Askew, 2007). Additionally, mathematics anxiety is prevalent among students and parents, increasing teachers' responsibilities for sustaining motivation, communicating effectively with parents, and ensuring psychological safety in the learning environment (Ashcraft & Krause, 2007; Dowker et al., 2016; Ramirez et al., 2018).

The mismatch between curriculum expectations and student readiness, and mathematics requiring more effort compared to other subjects, demonstrates that subject-specific challenges may strengthen the loneliness-performance relationship. Such discipline-specific challenges emphasize the importance of the "collective learning and application" dimension of Professional Learning Communities; structured collaboration opportunities where teachers can systematically discuss curriculum adaptation strategies, student misconceptions, and instructional difficulties with colleagues can enable these challenges to transform from individual burdens into collective problem-solving processes (Stoll et al., 2006; Vangrieken et al., 2017). Such professional interaction networks not only reduce loneliness but also enrich pedagogical knowledge, enhance the quality of instructional practices, and strengthen the sense of collective efficacy (Goddard et al., 2015; Horn & Little, 2010). This structure, which is particularly important for mathematics teachers, has the potential to transform individual isolation into professional solidarity by facilitating strategy sharing in teaching complex concepts, joint analysis of student thinking, and coordination of curriculum adaptations (Harvey & Teledahl, 2022; McKie, 2024).

As part of the fifth research question, the study explored middle school mathematics teachers' suggestions for coping with workplace loneliness. The findings indicate that participants' strategies for coping with workplace loneliness vary according to their levels of perceived loneliness. Participants with low levels of loneliness suggested interventions focused on enhancing professional collaboration and social interaction. These suggestions align with the "collective learning and application" and "shared individual practice" characteristics of PLCs and emphasize the necessity of structured opportunities for peer interaction and collaborative inquiry (Hord, 1997; Vescio et al., 2008). In contrast, those with moderate levels of loneliness concentrated more on the attitudes of school leadership, proposing that fostering a culture of collegial solidarity—through teacher excursions and shared social activities—could serve as effective means to mitigate feelings of loneliness. This emphasis on leadership role reflects the "supportive and shared leadership" characteristic of PLCs; administrators must actively create conditions for teacher collaboration and community building (Boone, 2010; Darling-Hammond et al., 2017). The participant who experienced a high level of workplace loneliness proposed more systemic solutions, emphasizing that school leadership should prioritize teacher well-being, improve physical conditions, and create social environments based on voluntary participation. These systemic recommendations emphasize the importance of the "supportive conditions" (both physical and human) characteristic that is essential for effective PLCs; dedicated time and space for collaboration, along with psychological safety and inclusive participation, form the foundation of these conditions (Hord, 1997; Vangrieken et al., 2017; Webb et al., 2009).

These results directly correspond with the fundamental assumption of Organizational Support Theory (Eisenberger et al., 1986): employees' perception of being valued by the organization strengthens their sense of belonging and commitment. Within this framework, the obtained results can be evaluated as a strategic approach aimed at reducing the negative relationship between

Perceived Organizational Support and workplace loneliness (Tian et al., 2023). Additionally, teachers' recommendations including both vertical support (administrator leadership) and horizontal support (collegial collaboration) demonstrate that effective strategies for combating loneliness require a holistic integration of Organizational Support Theory with the Professional Learning Communities approach (Antinluoma et al., 2021; Stoll et al., 2006).

Within the scope of the sixth research question, it was determined that teachers' personal experiences show strong consistency with quantitative results overall. Statistical information regarding school type, marital status, age group, and years of service largely corresponds with the experiences participants expressed in interview data. This consistency demonstrates that the mixed-methods approach is effective in understanding the complex nature of teacher loneliness and reveals the validity of Wright's (2005) two-dimensional model in the Turkish educational context. Similarly, there are studies emphasizing that quantitative and qualitative results support each other in mixed-methods studies conducted with teachers and that this integration is critical in understanding the multidimensional nature of loneliness (Bryan et al., 2023; Ugurlu & Kaplan, 2021).

On the other hand, qualitative interviews illuminated teachers' individual experiences in depth beyond the quantitative data. For example, although no statistically significant difference was found in the gender variable, one participant's statement that being of the minority gender in the intra-departmental group creates excessive workload and feelings of exclusion demonstrated that gender dynamics can be effective at the micro level and contextually. This result supports Bryan et al.'s (2025) emphasis that teacher loneliness is not limited only to interpersonal relationships but is also influenced by broader social structures and organizational dynamics. Such micro-level exclusion experiences emphasize the importance of the "supportive conditions" (human) dimension of PLCs—where each member's "voice is heard" and their contributions are valued (Boone, 2010; Hord, 1997). Similarly, while no general difference was observed according to years of service, interviews revealed that as experienced teachers gain professional autonomy, their need for collaboration decreases and they may consciously narrow their social networks.

These results indicate the presence of nuances that are not visible in quantitative analyses but can be revealed through qualitative inquiry. They demonstrate that teachers' experiences of loneliness are shaped not only by demographic factors but also by personal preferences, stages of professional development, and contextual dynamics. In particular, the quality of in-school collaboration structures (Professional Learning Communities) and administrative support mechanisms (Organizational Support) emerge as moderating factors influencing the relationship between demographic characteristics and loneliness (Stoll et al., 2006; Vangrieken et al., 2017). Therefore, the mixed-methods approach has allowed for the identification of both general patterns and the underlying individual and contextual factors that explain them.

## 5. Implications and Recommendations

For practical implications, it may be beneficial for school administrations to develop systematic support mechanisms that prioritize teacher happiness and mental health; strengthening regular and meaningful communication with teachers could contribute to reducing perceptions of loneliness. Targeted support programs, flexible practices, and social support systems can be planned particularly for single teachers and those in the middle-age group. Institutionalizing collaboration processes within intra-departmental groups; establishing a culture of regular, agenda-driven, and prepared meetings; strengthening the facilitating role of intra-departmental group leaders; and management support functioning as a catalyst can help transform superficial interactions into deep professional solidarity. Voluntary, sincere, and inclusive activities aimed at strengthening social bonds may provide benefits especially for single and middle-aged teachers; it is thought that subject-based support groups, psychosocial support, and professional development opportunities aimed at coping with mathematics-specific difficulties could be beneficial. In cases where there is gender imbalance in intra-departmental groups, careful arrangements aimed at

ensuring fairness in workload distribution and reducing the risk of exclusion may also be considered.

The results of this study reveal that workplace loneliness negatively affects teachers' professional performance and psychological well-being. In this context, future research is recommended to focus on the development of school-based psychosocial intervention programs aimed at strengthening communication, social connectedness, and emotional support among teachers. The study also indicates that school leadership plays a significant role in shaping teachers' perceptions of loneliness. Accordingly, the development and experimental evaluation of training modules for school administrators focusing on empathy, leadership, and social support skills may contribute significantly to reducing teachers' feelings of loneliness. Considering the prevalence of workplace loneliness among teachers, the design and pilot implementation of in-school support centers that offer social and professional assistance may be a valuable step, and their effectiveness should be evaluated through empirical research.

According to the results, teachers working in private school experience higher levels of loneliness in the dimension of "social companionship," whereas public school teachers report more intense feelings of "emotional deprivation." This highlights the need for comparative research exploring the structure and functioning of social support systems across different school types. Moreover, the study shows that mathematics teachers' perceptions of workplace loneliness are largely shaped by school leadership attitudes, relationships with colleagues, and the overall level of communication. Future research should therefore investigate in greater depth how leadership styles, school climate, and administrative practices influence teacher loneliness. It was also emphasized that mathematics teachers experience loneliness due to specific professional challenges. Thus, comparative studies examining stress and loneliness across different subject areas can contribute to the diversification of teacher support strategies. Finally, the study found that workplace loneliness has a negative impact on the teaching process. As loneliness may affect student achievement through decreased teacher motivation and classroom interaction, further longitudinal and experimental studies are needed to clarify the causal relationships involved.

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## References

Adamson, B., & Axmith, M. (2003). The CEO disconnect: Finding consistency between personal values and the demands of leadership. *Ivey Business Journal*, *68*(4), 1-6. https://doi.org/10.1504/IJMIE.2018.088369

Akkaya, M., & Duy, B. (2024). Wellness and psychological flexibility as predictors of loneliness in university students during COVID-19 pandemic. *Cukurova University Faculty of Education Journal*, *53*(2), 755-785. https://doi.org/10.14812/cuefd.1357651

Alkhyeli, H. E., & Ewijk, A. V. (2018). Prioritisation of factors influencing teachers' job satisfaction in the UAE. *International Journal of Management in Education*, *12*(1), 1-24. https://doi.org/10.1504/IJMIE.2018.088369

Antinluoma, M., Ilomäki, L., & Toom, A. (2021). Practices of professional learning communities. *Frontiers in Education*, *6,* 617613. https://doi.org/10.3389/feduc.2021.617613

Aselage, J., & Eisenberger, R. (2003). Perceived organizational support and psychological contracts: A theoretical integration. *Journal of Organizational Behavior*, *24*(5), 491-509. https://doi.org/10.1002/job.211

Ashcraft, M. H., & Krause, J. A. (2007). Working memory, math performance, and math anxiety. *Psychonomic Bulletin & Review*, *14*(2), 243-248. https://doi.org/10.3758/BF03194059

Baumeister, RF and Leary, MR (1995). The need to belong - desire for ınterpersonal attachments as a fundamental human-motivation. *Psychological Bulletin, 117*(3), 497-529. https://doi.org/10.1037/0033-2909.117.3.497

Boone, S. C. (2010). *Professional learning communities' impact: A case study investigating teachers' perceptions and professional learning satisfaction at one urban middle school* (Publication no. 3419559) [Doctoral dissertation, Walden University]. ProQuest Dissertations and Theses Global.

Borko, H., & Potari, D. (2024). *Teachers of mathematics working and learning in collaborative groups: The 25th ICMI study*. Springer. https://doi.org/10.1007/978-3-031-56488-8

Bryan, B. T., Andrews, G., Thompson, K. N., Qualter, P., Matthews, T., & Arseneault, L. (2023). Loneliness in the workplace: A mixed-method systematic review and meta-analysis. *Occupational Medicine*, *73*(9), 557-567. https://doi.org/10.1093/occmed/kqad138

Bryan, B. T., Triantafillopoulou, E., Parsons, V., Arseneault, L., & Matthews, T. (2025). Conceptualising workplace loneliness: A qualitative investigation with UK workers. *Social Psychiatry and Psychiatric Epidemiology*, *60*(1), 1-13. https://doi.org/10.1007/s00127-025-02925-0

Bryman, A. (2006). Integrating quantitative and qualitative research: How is it done? *Qualitative Research*, *6*(1), 97-113. https://doi.org/10.1177/1468794106058877

Buchanan, J. (2012). Sustainability education and teacher education: Finding a natural habitat?. *Australian Journal of Environmental Education*, *28*(2), 108-124. https://doi.org/10.1017/aee.2013.4

Campbell, C., Lieberman, A., & Yashkina, A. (2013). *The teacher learning and leadership program: research project*. Ontario OTFFEO.

Carr, D., & Pudrovska, T. (2022). Midlife and mental health. In H. S. Friedman (Ed.), *Encyclopedia of mental health* (pp. 133-136). Elsevier. https://doi.org/10.1016/B978-0-12-397045-9.00109-9

Chauraya, M., & Brodie, K. (2017). Learning in professional learning communities: Shifts in mathematics teachers' practices. *African Journal of Research in Mathematics, Science and Technology Education*, *21*(3), 223-233. https://doi.org/10.1080/0035919X.2017.1350531

Collie, R. J., Shapka, J. D., Perry, N. E., & Martin, A. J. (2015a). Teacher well-being: Exploring its components and a practice-oriented scale. *Journal of Psychoeducational Assessment*, *33*(8), 744-756. https://doi.org/10.1177/0734282915587990

Collie, R. J., Shapka, J. D., Perry, N. E., & Martin, A. J. (2015b). Teachers' beliefs about social-emotional learning: Identifying teacher profiles and their relations with job stress and satisfaction. *Learning and Instruction*, *39*, 148-157. https://doi.org/10.1016/j.learninstruc.2015.06.002

Creswell, J. W. (2013). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Pearson.

Creswell, J. W., & Clark, V. L. P. (2007). *Designing and conducting mixed methods research*. Sage.

Darling-Hammond, L. (2017). Teacher education around the world: What can we learn from international practice?. *European Journal of Teacher Education*, *40*(3), 291-309. https://doi.org/10.1080/02619768.2017.1315399

Datnow, A. (2011). Collaboration and contrived collegiality: Revisiting Hargreaves in the age of accountability. *Journal of Educational Change*, *12*(2), 147-158. https://doi.org/10.1007/s10833-011-9154-1

Day, C. (2013). The new lives of teachers. In M. A. Flores, A. A. Carvalho, F. I. Ferreira, & M. T. Vilaça (Eds.), *Back to the future: Legacies, continuities and changes in educational policy, practice and research* (pp. 57-77). Sense Publishers.

Dogan, T., Cetin, B., & Sungur, M. Z. (2009). Reliability and validity of the Turkish version of loneliness at work scale. *Anatolian Journal of Psychiatry, 10*(6), 271-277.

Dor-Haim, P. (2021). Expressions of loneliness: Different perspectives of loneliness among school deputy principals. *Educational Management Administration & Leadership*, *51*(5), 1181-1199. https://doi.org/10.1177/17411432211021425

Dor-Haim, P., & Oplatka, I. (2021). Feelings of loneliness among school principals: Experiences, causes and coping strategies. *Leadership and Policy in Schools*, *20*(2), 261-276. https://doi.org/10.1080/15700763.2019.1668423

Dowker, A., Sarkar, A., & Looi, C. Y. (2016). Mathematics anxiety: What have we learned in 60 years?. *Frontiers in Psychology*, *7*, 508. https://doi.org/10.3389/fpsyg.2016.00508

Du, S., Ma, Y., & Lee, J. Y. (2022). Workplace loneliness and the need to belong in the era of COVID-19. *Sustainability*, *14*(8), 4788. https://doi.org/10.3390/su14084788

DuFour, R., DuFour, R., Eaker, R., & Many, T. (2007). *Learning by doing: A handbook forprofessional learning communities at work*. Solution Tree.

DuFour, R., Eaker, R., & DuFour, R. (2006). *On common ground: The power of professionallearning communities*. Solution Tree.

Edmondson, A. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly*, *44*(2), 350-383. https://doi.org/10.2307/2666999

Edmondson, A. C., & Lei, Z. (2014). Psychological safety: the history, renaissance, and future of an ınterpersonal construct. *Annual Review of Organizational Psychology and Organizational Behavior*, *1*(1), 23-43. https://doi.org/10.1146/annurev-orgpsych-031413-091305

Einav, M., Confino, D., Geva, N., & Margalit, M. (2024). Teachers' burnout—The role of social support, gratitude, hope, entitlement and loneliness. *International Journal of Applied Positive Psychology*, *9*(2), 827-849. https://doi.org/10.1007/s41042-024-00154-5

Eisenberger, R., Huntington, R., Hutchison, S., & Sowa, D. (1986). Perceived organizational support. *Journal of Applied Psychology*, *71*(3), 500-507. https://doi.org/10.1037/0021-9010.71.3.500

Emerson, E., Fortune, N., Llewellyn, G., & Stancliffe, R. (2021). Loneliness, social support, social isolation and wellbeing among working age adults with and without disability: Cross-sectional study. *Disability and Health Journal*, *14*(1), 100965. https://doi.org/10.1016/j.dhjo.2020.100965

Erden, A., Erden, H., & Aytaç, T. (2023). Teachers' well-being levels by gender and marital status: A meta-analysis study. *Asian Journal of Instruction*, *11*(1), 38-60. https://doi.org/10.47215/aji.1304646

Firoz, M., & Chaudhary, R. (2022). The impact of workplace loneliness on employee outcomes: What role does psychological capital play? *Personnel Review*, *51*(4), 1221-1247. https://doi.org/10.1108/PR-03-2020-0200

Glesne, C. (2011). *Becoming qualitative researchers: An introduction*. Pearson Education.

Goddard, R., Goddard, Y., Sook Kim, E., & Miller, R. (2015). A theoretical and empirical analysis of the roles of instructional leadership, teacher collaboration, and collective efficacy beliefs in support of student learning. *American Journal of Education*, *121*(4), 501-530. https://doi.org/10.1086/681925

Guo, L. (2020). The effect of workplace loneliness on silence behavior. *Psychology*, *11*(3), 467-479. https://doi.org/10.4236/psych.2020.113032

Harvey, F., & Teledahl, A. (2022). Characteristics of professional learning communities in mathematics: a systematic review. *Mathematics Teacher Education and Development*, *24*(1), 72-95.

Haw, J. Y., Nalipay, M. J. N., & King, R. B. (2024). Perceived relatedness-support matters most for teacher well-being: A self-determination theory perspective. *Teachers and Teaching*, *30*(6), 745-761. https://doi.org/10.1080/13540602.2023.2263736

Higinio, G. G., Silvia, F., & Víctor, R. (2025). A cross-sectional study of teacher's motivational profiles during COVID-19 lockdown: relationship with teaching satisfaction, loneliness and affects. *BMC Psychology*, *13*(1), 1-10. https://doi.org/10.1186/s40359-025-03261-3

Hodgen, J., & Askew, M. (2007). Emotion, identity and teacher learning: Becoming a primary mathematics teacher. *Oxford Review of Education*, *33*(4), 469-487. https://doi.org/10.1080/03054980701451090

Hofman, J. (2023). Classroom management and teacher emotions in secondary mathematics teaching: a qualitative video-based single case study. *Education Inquiry*, *14*(3), 389-405. https://doi.org/10.1080/20004508.2022.2028441

Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: A meta-analytic review. *PLOS Medicine*, *7*(7), e1000316. https://doi.org/10.1371/journal.pmed.1000316

Hord, S. M. (1997). *Professional learning communities: Communities of continuous inquiry and improvement*. Southwest Education Development Laboratory.

Hord, S. M., & Sommers, W. A. (2008). *Leading professional learning communities: Voicesfrom research and practice*. Corwin Press.

Horn, I. S., & Little, J. W. (2010). Attending to problems of practice: Routines and resources for professional learning in teachers' workplace interactions. *American Educational Research Journal*, *47*(1), 181-217. https://doi.org/10.3102/0002831209345158

Jaworski, B. (2006). Theory and practice in mathematics teaching development: Critical inquiry as a mode of learning in teaching. *Journal of Mathematics Teacher Education*, *9*(2), 187-211. https://doi.org/10.1007/s10857-005-1223-z

Jaworski, B., Chapman, O., Clark-Wilson, A., Cusi, A., Esteley, C., Goos, M., Isoda, M., Joubert, M., & Robutti, O. (2017). Mathematics teachers working and learning through collaboration. In G. Kaiser (Ed.), *Proceedings of the 13th International Congress on Mathematical Education: ICME-13* (pp. 261-276). Springer. https://doi.org/10.1007/978-3-319-62597-3_17

Jian, X., Wijaya, T. T., & Yu, Q. (2022). Key factors affecting mathematics teachers' well-being and stress levels: An extended engagement theory. *International Journal of Environmental Research and Public Health*, *20*(1), 548. https://doi.org/10.3390/ijerph20010548

Johnson, R. K., Harrold, M. L., Cochran, D. J., Brannan, D., & Bleistein, T. (2014). An examination of the first years: Novice ESOL teachers' experiences with loneliness and stress. *Pure Insights*, *3*(1), 8.

Kachchhap, S. L., & Horo, W. (2021). Factors ınfluencing school teachers' sense of belonging: an empirical evidence. *International Journal of Instruction*, *14*(4), 775-790. https://doi.org/10.29333/iji.2021.14444a

Kariou, A., Koutsimani, P., Montgomery, A., & Lainidi, O. (2021). Emotional labor and burnout among teachers: A systematic review. *International Journal of Environmental Research and Public Health*, *18*(23), 12760. https://doi.org/10.3390/ijerph182312760

Kaya, K., & Erdogan, Ç. H. (2020). Investigation of loneliness levels of physical education teachers. *African Educational Research Journal*, *8*(2), 239-243. https://doi.org/10.30918/AERJ.82.20.060

Kline, R. B. (2023). *Principles and practice of structural equation modeling*. Guilford Publications.

Kuckartz, U., & Rädiker, S. (2019). *Analyzing qualitative data with MAXQDA*. Springer. https://doi.org/10.1007/978-3-030-15671-8

Lachman, M. E. (2004). Development in midlife. *Annual Review of Psychology*, *55*(1), 305-331. https://doi.org/10.1146/annurev.psych.55.090902.141521

Lam, L. W., & Lau, D. C. (2012). Feeling lonely at work: Investigating the consequences of unsatisfactory workplace relationships. *The International Journal of Human Resource Management*, *23*(20), 4265-4282. https://doi.org/10.1080/09585192.2012.665070

Lee, A. N., Nie, Y., & Bai, B. (2020). Perceived principal's learning support and its relationships with psychological needs satisfaction, organisational commitment and change-oriented work behaviour: A Self-Determination Theory's perspective. *Teaching and Teacher Education*, *93*, 1-11. https://doi.org/10.1016/j.tate.2020.103076

Leiter, M. P., & Maslach, C. (2009). Nurse turnover: The mediating role of burnout. *Journal of Nursing Management*, *17*(3), 331-339. https://doi.org/10.1111/j.1365-2834.2009.01004.x

Lewis, R. (1999). Teachers coping with the stress of classroom discipline. *Social Psychology of Education*, *3*(3), 155-171. https://doi.org/10.1023/A:1009627827937

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage.

Lincoln, Y. S., Lynham, S. A., & Guba, E. G. (2011). Paradigmatic controversies, contradictions, and emerging confluences, revisited. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage handbook of qualitative research* (4th ed., pp. 97-128). Sage.

Lortie, D. C. (1986). Teacher status in Dade County: A case of structural strain?. *The Phi Delta Kappan*, *67*(8), 568-575.

Mallery, P., & George, D. (2003). *SPSS for Windows step by step: A simple guide and reference*. Allyn & Bacon.

McKie, K. (2024). Collaboration counts: sustained success in professional learning communities. canadian journal of science, *Mathematics and Technology Education*, *24*(3), 380-399. https://doi.org/10.1007/s42330-025-00367-z

McPherson, M., Smith-Lovin, L., & Brashears, M. E. (2006). Social isolation in America: Changes in core discussion networks over two decades. *American Sociological Review*, *71*(3), 353-375. https://doi.org/10.1177/000312240607100301

Meng, L., & Liu, S. (2008). Mathematics teacher stress in Chinese secondary schools. *The Journal of Educational Enquiry*, *8*(1), 73-96.

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*. Jossey-Bass.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Sage.
Milkowski, M. (2019). *Understanding teachers' stress and its impact on students' achievement: A comparative study of Polish and American secondary mathematics teachers' perceptions* (Publication no. 27736036) [Doctoral dissertation, Saint Joseph's University]. ProQuest Dissertations and Theses Global.
Mishra, R., Alsabatin, H., Upamanyu, S., Masih, J., Hannoon, A., Badawi, S., Reyad, S., & Jamjoom, Y. (2024). Exploring the ımpact of marital status and workplace environment on mental health among employees in service-based ındustries. *AgBioForum, 26*(3), 83-94.
Mullen, C. A., & Hutinger, J. L. (2008). The principal's role in fostering collaborative learning communities through faculty study group development. *Theory into Practice*, *47*(4), 276-285. https://doi.org/10.1080/00405840802329136
Newmann, F. M. (1996). *Authentic achievement: Restructuring schools for intellectual quality*. Jossy-Bass.
OECD. (2009). *Creating effective teaching and learning environments: First results from TALIS*. https://doi.org/10.1787/9789264068780-en.
Patton, M. Q. (2002). *Qualitative research and evaluation methods*. Sage.
Peng, J., Chen, Y., Xia, Y., & Ran, Y. (2017). Workplace loneliness, leader-member exchange and creativity: The cross-level moderating role of leader compassion. *Personality and Individual Differences*, *104*, 510-515. https://doi.org/10.1016/j.paid.2016.09.020
Peplau, L. A., & Perlman, D. (1982). *Loneliness: A sourcebook of current theory, research and therapy*. Wiley.
Polizzi, S. J., Zhu, Y., Reid, J. W., Ofem, B., Salisbury, S., Beeth, M., Roehrig, G., Mohr-Schroeder, M., Sheppard, K., & Rushton, G. T. (2021). Science and mathematics teacher communities of practice: social influences on discipline-based identity and self-efficacy beliefs. *International Journal of STEM Education*, *8*(1), 30. https://doi.org/10.1186/s40594-021-00275-2
Pressley, T., Ha, C., & Learn, E. (2021). Teacher stress and anxiety during COVID-19: An empirical study. *School Psychology*, *36*(5), 367-376. https://doi.org/10.1037/spq0000468
Ramirez, G., Hooper, S. Y., Kersting, N. B., Ferguson, R., & Yeager, D. (2018). Teacher math anxiety relates to adolescent students' math achievement. *AERA Open*, *4*(1), 1-13. https://doi.org/10.1177/2332858418756052
Rhoades, L., & Eisenberger, R. (2002). Perceived organizational support: A review of the literature. *Journal of Applied Psychology*, *87*(4), 698-714. https://doi.org/10.1037/0021-9010.87.4.698
Ronfeldt, M., Farmer, S. O., McQueen, K., & Grissom, J. A. (2015). Teacher collaboration in instructional teams and student achievement. *American Educational Research Journal*, *52*(3), 475-514. https://doi.org/10.3102/0002831215585562
Rook, K. S. (1984). Research on social support, loneliness, and social isolation: Toward an integration. *Review of Personality and Social Psychology*, *5*, 239-264.
Saldaña, J. (2016). *The coding manual for qualitative researchers*. Sage.
Schleicher, A. (2016). *Teaching excellence through professional learning and policy reform: lessons from around the world*. OECD. http://dx.doi.org/10.1787/9789264252059-en
Schleifer, D., Rinehart, C., & Yanisch, T. (2017). *Teacher collaboration in perspective: A guide to research*. Public Agenda.
Shin, S., Mercer, S., Babic, S., Sulis, G., Mairitsch, A., King, J., & Jin, J. (2023). Riding the happiness curve: the wellbeing of mid-career phase language teachers. *The Language Learning Journal, 51*(2), 195-207. https://doi.org/10.1080/09571736.2021.1979632
Sîrbu, A. A., & Dumbravă, A. C. (2019). Loneliness at work and job performance: The role of burnout and extraversion. *Psihologia Resurselor Umane*, *17*(1), 7-18. http://dx.doi.org/10.24837/pru.2019.1.491
Skaalvik, E. M., & Skaalvik, S. (2018). Job demands and job resources as predictors of teacher motivation and well-being. *Social Psychology of Education*, *21*(5), 1251-1275. https://doi.org/10.1007/s11218-018-9464-8
Stack, S., & Eshleman, J. R. (1998). Marital status and happiness: A 17-nation study. *Journal of Marriage and the Family*, *60*(2), 527-536. https://doi.org/10.2307/3538667
Stănescu, D. F., & Romascanu, M. C. (2024). The impact of perceived social support on workplace loneliness. The mediation role of work alienation. *Management Dynamics in the Knowledge Economy*, *12*(2), 133-144. https://doi.org/10.2478/mdke-2024-0009
Stoll, L., Bolam, R., McMahon, A., Wallace, M., & Thomas, S. (2006). Professional learning communities: A review of the literature. *Journal of Educational Change*, *7*(4), 221-258. https://doi.org/10.1007/s10833-006-0001-8
Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics*. Pearson.

Tabak, I., & Argon, T. (2018). The teacher opinions on emotional labour and loneliness in the workplace. *İnönü University Journal of the Faculty of Education*, *19*(3), 1-13. https://doi.org/10.17679/inuefd.351583

Taylor, L., Zhou, W., Boyle, L., Funk, S., & De Neve, J-E. (2024). *Wellbeing for schoolteachers* (Report No. 2). International Baccalaureate Organization.

Tian, G., Liu, T., & Yang, R. (2023). Workplace loneliness mediates the relationship between perceived organizational support and job performance: Differing by extraversion. *Frontiers in Psychology*, *14*, 1-11. https://doi.org/10.3389/fpsyg.2023.1058513

Ugurlu, C. T., & Kaplan, İ. (2021). Teachers' views regarding loneliness in professional life: A mixed methods study. *Gazi Journal of Educational Sciences, 7*(1), 1-19. https://dx.doi.org/110.30855/gjes.2021.07.01.001

Vangrieken, K., Dochy, F., Raes, E., & Kyndt, E. (2015). Teacher collaboration: A systematic review. *Educational Research Review*, *15*, 17-40. https://doi.org/10.1016/j.edurev.2015.04.002

Vangrieken, K., Meredith, C., Packer, T., & Kyndt, E. (2017). Teacher communities as a context for professional development: A systematic review. *Teaching and Teacher Education*, *61*, 47-59. https://doi.org/10.1016/j.tate.2016.10.001

Vescio, V., Ross, D., & Adams, A. (2008). A review of research on the impact of professional learning communities on teaching practice and student learning. *Teaching and Teacher Education*, *24*(1), 80-91.

Wax, A., Deutsch, C., Lindner, C., Lindner, S. J., & Hopmeyer, A. (2022). Workplace loneliness: The benefits and detriments of working from home. *Frontiers in Public Health*, *10*, 903975. https://doi.org/10.3389/fpubh.2022.903975

Webb, R., Vulliamy, G., Sarja, A., Hämäläinen, S., & Poikonen, P. L. (2009). Professional learning communities and teacher well-being? A comparative analysis of primary schools in England and Finland. *Oxford Review of Education, 35*(3), 405-422. https://doi.org/10.1080/03054980902935008

Weiss, R. S. (1973). *Loneliness: The experience of emotional and social isolation*. MIT Press.

Wright, S. L. (2005). Organizational climate, social support and loneliness in the workplace. *The Journal of Psychology*, *139*(5), 467-480. https://doi.org/10.1016/S1746-9791(05)01106-5

Wright, S. L., Burt, C. D. B., & Strongman, K. T. (2006). Loneliness in the workplace: Construct definition and scale development. *New Zealand Journal of Psychology*, *35*(2), 59-68.

Yuh, J., & Choi, S. (2017). Sources of social support, job satisfaction, and quality of life among childcare teachers. *The Social Science Journal*, *54*(4), 450-457. https://doi.org/10.1016/j.soscij.2017.08.002

**Appendix 1.** Normality Distribution Analysis Results of the Scores from the Loneliness in the Workplace Scale

| *Dimension and variable* | *Skewness (SE)* | *Kurtosis (SE)* | *Normality Distribution* | |
|---|---|---|---|---|
| Emotional Deprivation | | | | |
| Gender | | | | |
| Female | 1.224 (0.231) | 2.009 (0.459) | Non-normal | Non-normal |
| Male | 0.852 (0.393) | 1.015 (0.768) | Normal | |
| Education Level | | | | |
| Undergraduate | 1.212 (0.226) | 2.015 (0.447) | Non-normal | Non-normal |
| Graduate | 0.612 (0.427) | −0.803 (0.833) | Normal | |
| Duration of Service | | | | |
| 0-13 | 1.705 (0.295) | 3.847 (0.582) | Non-normal | Non-normal |
| 14-25 | 0.715 (0.311) | 0.588 (0.613) | Normal | |
| 26-40 | 0.837 (0.512) | 1.894 (0.992) | Normal | |
| Age Group | | | | |
| 23-35 | 1.011 (0.333) | 0.437 (0.656) | Normal | Normal |
| 36-44 | 1.199 (0.325) | 1.760 (0.639) | Normal | |
| 45+ | 0.844 (0.378) | 1.576 (0.741) | Normal | |
| Marital Status | | | | |
| Single | 1.383 (0.374) | 1.775 (0.733) | Normal | Normal |
| Married | 0.541 (0.237) | −0.749 (0.469) | Normal | |
| School Type | | | | |
| Public | 0.838 (0.226) | 1.775 (0.733) | Normal | Normal |
| Private | 0.291 (0.441) | −0.749 (0.469) | Normal | |
| Social Companionship | | | | |
| Gender | | | | |
| Female | 0.569 (0.234) | −0.758 (0.463) | Normal | Normal |
| Male | 0.392 (0.393) | −0.588 (0.768) | Normal | |
| Education Level | | | | |
| Undergraduate | 0.552 (0.227) | −0.767 (0.451) | Normal | Normal |
| Graduate | 0.356 (0.427) | −0.724 (0.833) | Normal | |
| Duration of Service | | | | |
| 0-13 | 0.463 (0.295) | −0.885 (0.582) | Normal | Normal |
| 14-25 | 0.491 (0.314) | −0.765 (0.618) | Normal | |
| 26-40 | 0.675 (0.524) | −0.416 (1.014) | Normal | |
| Age Group | | | | |
| 23-35 | 0.681 (0.333) | −0.278 (0.656) | Normal | Normal |
| 36-44 | 0.202 (0.325) | −1.127 (0.639) | Normal | |
| 45+ | 0.792 (0.388) | −0.145 (0.759) | Normal | |
| Marital Status | | | | |
| Single | 0.400 (0.378) | −0.545 (0.741) | Normal | Normal |
| Married | 0.609 (0.238) | −0.778 (0.472) | Normal | |
| School Type | | | | |
| Public | 0.519 (0.227) | −0.786 (0.451) | Normal | Normal |
| Private | 0.472 (0.441) | −0.956 (0.858) | Normal | |
| Total Scale Score | | | | |
| Gender | 0.827 (0.234) | 1.769 (0.463) | Normal | Normal |
| Female | 0.492 (0.393) | 0.515 (0.768) | Normal | |
| Male | | | | |
| Education Level | 0.848 (0.227) | 1.401 (0.451) | Normal | Normal |
| Undergraduate | −0.304 (0.427) | −0.950 (0.833) | Normal | |
| Graduate | | | | |
| Duration of Service | 1.104 (0.295) | 2.313 (0.582) | Non-Normal | Non-Normal |
| 0-13 | 0.489 (0.314) | 0.445 (0.618) | Normal | |
| 14-25 | −0.597 (0.524) | −0.941 (1.014) | Normal | |
| 26-40 | | | | |
| Age Group | | | | |
| 23-35 | 0.718 (0.333) | 0.474 (0.656) | Normal | Non-Normal |
| 36-44 | 0.931 (0.325) | 2.101 (0.639) | Non-Normal | |
| 45+ | 0.004 (0.388) | −0.992 (0.759) | Normal | |
| Marital Status | | | | |
| Single | 1.139 (0.378) | 1.501 (0.741) | Normal | Normal |
| Married | 0.058 (0.238) | −0.988 (0.472) | Normal | |
| School Type | | | | |
| Public | 0.441 (0.227) | 0.088 (0.451) | Normal | Normal |
| Private | 0.693 (0.441) | 0.792 (0.858) | Normal | |