

Self-efficacy, motivation and quality of life in distance education: A network approach.

OSVALDO TADEU DA SILVA JUNIOR¹, EVANDRO MORAIS PEIXOTO², THIAGO JOSÉ LEONARDI³,
MÁRCIO PEREIRA DA SILVA⁴, MILTON VIEIRA DO PRADO JÚNIOR⁵, RUBENS VENDITTI JUNIOR⁶
^{1,4,5,6}Physical Education, São Paulo State University (UNESP), BRAZIL
²Physical Education, University of São Francisco (USF), BRAZIL
³Physical Education, State University of Campinas (UNICAMP), BRAZIL

Published online: June 30, 2026

Accepted for publication: June 15, 2026

DOI:10.7752/jpes.2026.06114

Abstract

Background. Distance education has rapidly become consolidated in Brazil, as indicated by educational management authorities. This growth is driven by considerable changes in educational policy, advances in educational technologies, and increasing expectations regarding student engagement. Within this context, teachers face new challenges, making it essential to investigate the dimensions of self-efficacy, motivation, and quality of life, which are key factors for understanding professional performance and teachers' health. **Methods.** A network approach was applied, to analyze node centrality indicators, precision, and stability, in order to explore the relationships among aspects of self-efficacy, motivation, and quality of life. The sample comprised 168 Physical Education teachers in higher education, of both sexes, aged 26-50 years, with varying professional experience, working in distance education programs across different regions of São Paulo State, Brazil. **Results.** The analyses revealed strong direct connections (edges) between motivation and quality of life dimensions. The shortest path linking these constructs involved the lack of peer support as a limiting factor for teachers' willingness to face challenges or seize opportunities, as well as adequate energy levels for daily activities. It was also observed that the availability of information in teachers' daily routines showed the highest centrality indices, indicating that this variable is the most likely to rapidly influence all other nodes in the network. **Conclusion.** The results underscore the importance of institutional and peer support, daily energy levels, and information availability as central elements in the psychosocial interrelations of educators working in Distance Education. These findings provide valuable evidence for institutional policies and management practices aimed at promoting teacher well-being and performance in this educational context.

Key Words: Teacher Well-Being, Higher Education Faculty, Occupational Health Psychology, Social Support Networks.

Introduction

Distance Education (DE) has expanded substantially over the last two decades, supported by regulatory reforms and technological advances that have transformed higher education in Brazil and worldwide. Recent educational policies have increased the flexibility of DE implementation, contributing to significant growth in student enrollment and consolidating DE as a central component of contemporary higher education (Brasil, 2025).

This reconfiguration of higher education has directly impacted pedagogical practices and the dynamics of teaching work, demanding new competencies and redefinition of the role of teachers (Raimkulova et al., 2024). The advancement of educational technologies and the growing expectations surrounding student engagement intensify the challenges faced by teachers in the DE context (Prananto et al., 2025). International evidence indicates that the rapid expansion of online teaching during and after the COVID-19 pandemic led to many higher-education instructors having to adapt their pedagogical practices to digital environments, often despite limited prior experience and training (Bond et al., 2021; Cabero-Almenara et al., 2023).

The growing presence of digital technologies in higher education has increased the need for teachers to acquire and refine the competencies required to design, deliver, and manage learning experiences in online environments (Cabero-Almenara et al., 2023). Recent research has sought to understand this phenomenon by addressing topics such as teaching competence (Menescardi et al., 2021), pedagogical practices (Raimkulova et al., 2024), self-efficacy (Blonder et al., 2022), motivation (Van Dijk et al., 2025), and the impact of these factors on teachers' quality of life (Weißenfels et al., 2022). Within this context, investigations into self-efficacy, motivation, and quality of life emerge as central, fundamental dimensions for understanding performance and well-being among DE instructors (Matos et al., 2022; Weißenfels et al., 2022). The literature indicates that psychological factors, such as belief in one's own ability and motivational engagement directly influence teaching effectiveness and instructional quality (Matos et al., 2022).

Teacher self-efficacy refers to the educator's belief in their capacity to plan, organize, and implement effective instructional practices. This belief is associated with higher levels of engagement, satisfaction, and adaptability to challenging contexts (Tschannen-Moran & Hoy, 2001). However, in DE environments, traditional sources of self-efficacy, such as direct contact with students and peer observation, are mediated by technology and require greater autonomy, which may affect teachers' perceived efficacy (Yang & Du, 2024).

In higher education, self-efficacy influences how teachers plan their lessons, address challenges, interact with students, and commit to their institutions. Teachers with high self-efficacy exhibit greater resilience, autonomy in selecting teaching strategies, and stronger commitment to student learning (Shu, 2022).

At the same time, motivation constitutes an essential factor in sustaining engagement and the quality of teaching work. The social-cognitive theory of motivation emphasizes the reciprocal influence of personal, behavioral, and environmental factors on human behavior (Bandura, 1986). Accordingly, motivated teachers show greater involvement in pedagogical practice, adopt innovative approaches, and face adversity with enhanced resilience (Van Dijk et al., 2025). However, studies indicate that in DE contexts, motivation may be undermined by factors such as social isolation, reduced student interaction, and excessive workload (Telyani et al., 2021).

The reorganization of teaching work in DE, marked by intensified workloads, lack of institutional support, and technical or communicative challenges, can negatively affect teachers' quality of life (Mosquera, Albuquerque, & Picoto, 2022). The subjective effects of these conditions include anxiety, discomfort, and concern, which directly impact the mental and emotional health of instructors.

Quality of Life (QoL), understood as a multidimensional construct encompassing physical, psychological, social, and environmental aspects (WHOQOL Group, 1998), has been proven to be a relevant indicator in DE research. Although the modality offers temporal flexibility, it also presents challenges related to precarious working conditions and difficulty maintaining boundaries between professional and personal life (Sobral et al., 2024).

Evidence from the literature shows that teachers' mental health in DE settings is directly linked to three factors: organizational support for the effective use of new technologies, the adequacy of these technologies to work objectives (technological level), and peer support within the professional environment (interpersonal level). These elements are essential for promoting teacher well-being in the face of remote-teaching challenges (Wang & Li, 2019).

Given this panorama, it is evident that understanding the interrelationships among self-efficacy, motivation, and quality of life is essential. This understanding could inform institutional policies for professional development, helping to prevent occupational illness and promote well-being in contemporary educational contexts.

Although the literature demonstrates the independent relevance of self-efficacy, motivation, and quality of life for teaching performance, these constructs are rarely investigated as an integrated system. According to Social Cognitive Theory, human functioning results from reciprocal interactions among personal, behavioral, and environmental factors (Bandura, 1986). In this perspective, teachers' beliefs about their own capabilities may influence motivation, professional engagement, and perceptions of well-being, while contextual factors, such as institutional support, technological resources, and working conditions, could simultaneously affect all three dimensions. Therefore, understanding these constructs in isolation may overlook important mechanisms underlying teacher adaptation and effectiveness in Distance Education.

Recent studies have highlighted the importance of self-efficacy for teacher resilience and instructional quality (Blonder et al., 2022), the role of motivation in sustaining engagement and professional development (Van Dijk et al., 2025), and the influence of working conditions on teachers' quality of life and mental health (Sobral et al., 2024). However, most previous investigations examined these constructs separately using traditional statistical approaches, and consequently, little is known about how self-efficacy, motivation, and quality of life interact simultaneously, particularly among higher-education Physical Education instructors working in Distance Education. Understanding these interrelationships is important because teacher well-being and professional effectiveness depend on multiple interconnected psychological and contextual factors.

To address this limitation, network analysis has emerged as a promising methodological approach because it allows the investigation of complex systems composed of mutually interacting variables rather than assuming linear relationships among latent constructs (Robinaugh et al., 2020). By identifying central nodes and the strongest connections within a network, this method may reveal strategic targets for interventions aimed at improving teacher well-being and professional performance.

Therefore, the present study aimed to analyze the network relationships among self-efficacy, motivation, and quality of life in higher-education Physical Education instructors working in Distance Education. Using a cross-sectional design and network analysis techniques, this study sought to identify the most central elements within the network and the strongest associations among variables that may influence teachers' professional functioning and well-being.

Material & methods

Study type

This empirical study adopts an associative methodological strategy, aimed at investigating the interrelationships among the components of motivation, self-efficacy, and quality of life. The associative approach is suitable for diverse research contexts, depending on the intended objectives, and in this case, it was applied to examine the connections among the variables involved.

Procedure

The study was approved by the Research Ethics Committee of Centro Universitário Católico Salesiano Auxilium [CAAE: 61006822.4.0000.5379]. Participants were guaranteed anonymity and data confidentiality, as well as the right to withdraw from the study at any time, in accordance with Resolution No. 466/2012 of the Brazilian National Health Council.

Data were collected via an electronic form hosted on Google Forms. In the first section, participants were informed about the procedures and objectives of the research, and in the second section they were presented with the Informed Consent Form, which they were required to agree to before proceeding. The average response time for completing the questionnaire was 18 minutes.

Participants

The sample consisted of 168 university professors working in Distance Education (DE), of both sexes (52.9% female and 47.1% male), aged between 26 and 50 years. The participants were from various regions of Brazil: Southeast (23.8%), Midwest (11.3%), Central-East (26.1%), and Northwest (38.6%). Regarding teaching experience, 38.6% had 0–2 years, 17.8% had 2–4 years, and 43.4% had more than 4 years of experience.

Instruments

Assessment of Motivation Levels

To assess the teachers' motivation levels, the Teaching Motivation Scale (EMD) developed by Davoglio and Santos (2017) was used. This instrument, validated in Brazil, is applicable to the population of Brazilian university professors. It was developed based on the premises of Social Cognitive Theory, which conceptualizes self-determined motivation as an intrinsic process influenced by sociocontextual factors related to the basic psychological needs of autonomy, competence, and relatedness.

The scale consists of 24 items that assess five dimensions: performance (items 6, 8, 12, 16, 17, 18, 19), development (1, 9, 10, 11, 14, 15, 24), teaching practice (13, 21, 22, 2), continuing education (4, 5, 7), and institutional integration (2, 3, 20). Items were rated on a five-point Likert scale, ranging from 1 ("not applicable at all") to 5 ("fully applicable").

Teacher Self-Efficacy Scale

To identify, describe, and analyze the self-efficacy beliefs of higher education teachers, the Teacher Self-Efficacy Scale (Polydoro et al., 2004) was applied. This instrument was translated into Portuguese and adapted to the Brazilian context and teaching reality, initially focusing on the specific context of Physical Education teachers. In this version, several modifications were made to wording and terminology to avoid ambiguity and to ensure better comprehension of the items within the Brazilian educational context.

The scale comprises 24 items with responses on a six-point scale. It is divided into two factors (subscales), Factor 1 – Intentionality of Teaching Action, which includes items 2, 4, 6, 9, 10, 11, 12, 14, 15, 17, 18, 19, 20, and 23, assessing instructional strategies and student engagement; and Factor 2 – Classroom Management, which includes items 1, 3, 5, 7, 8, 13, 16, 21, 22, and 24, reflecting teachers' perceived ability to handle multiple aspects of classroom dynamics.

Quality of Life Questionnaire (WHOQOL-BREF)

The WHOQOL-BREF questionnaire was used to evaluate teachers' quality of life. This abbreviated version of the WHOQOL-100 consists of 26 questions, of which the first two assess overall quality of life (general life satisfaction and health), while the remaining 24 questions evaluate four domains: Physical (physical pain, treatment, energy, mobility, sleep, daily activities, and work capacity); Psychological (enjoyment of life, meaning in life, concentration, body image, self-satisfaction, and negative feelings); Social relationships (personal relationships, sexual life, and social support from friends); and Environment (safety, healthy surroundings, financial resources, available information, leisure activities, housing, access to health services, and transportation).

Scoring follows a five-point Likert scale, where higher scores indicate better quality of life. Scores between 1.0 and 2.9 indicate a need for improvement; 3.0 to 3.9 suggest regular quality of life; 4.0 to 4.9 represent good quality of life; and 5.0 indicates very good quality of life (Fleck et al., 2000).

Data Analysis

The analysis was conducted in two distinct stages. In the first stage, the statistical model was estimated from the obtained data through a weighted network of the observed variables. In the second stage, the structure of the weighted network was analyzed using graph theory metrics for local inference (Newman, 2018).

To estimate the Gaussian Graphical Model, the High-Dimensional Undirected Graph Estimation (Huge) technique (Zhao et al., 2012) was applied. The Extended Bayesian Information Criterion (EBIC) with a hyperparameter of 0.5 was used to select the optimal model. The selected model was visualized as a network

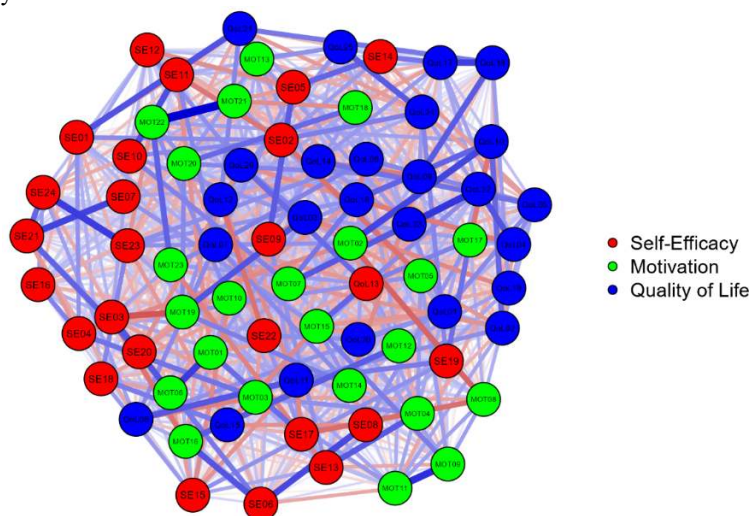
structure (Epskamp et al., 2018), in which the nodes represent questionnaire items and the edges (connecting lines) represent associations between items. Four graph theory indicators were considered to evaluate the estimated model: Betweenness, measures how efficiently a node acts as a bridge between others; Closeness, evaluates the speed with which information can spread from a specific node to all others; and Strength, indicates the degree of connectivity of a node relative to the rest of the network (Opsahl et al., 2010).

The stability indices of edges and centrality were estimated using a nonparametric bootstrap and case-dropping approach with 1,000 samples (Epskamp et al., 2018). All analyses were performed using JASP version 19.03.0.

Results

As illustrated below in Figure 1, the network is predominantly composed of positive connections (edges), with several strong links between the nodes. These connections occur both within clusters and across the different domains investigated in this study, indicating strong internal cohesion among certain self-efficacy, motivation, and quality-of-life nodes, as well as interlinkages among nodes across these domains that form the overall network structure.

Fig. 1 Represents the network of items related to Self-Efficacy (SE), Motivation (MOT), and Quality of Life (QoL) for the analyzed sample. Network structure ($n = 168$) showing the 24 Self-Efficacy items (red), 23 Motivation items (green), and 26 Quality-of-Life items (blue). Green edges represent positive associations and red edges negative associations. The thickness and density of the edges between nodes demonstrate the strength of their connectivity.



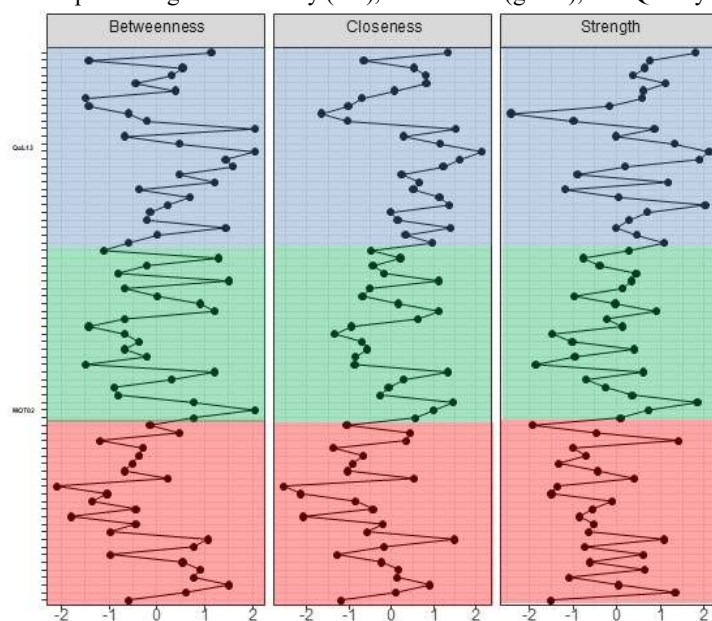
Considering an analysis focused on the relationships among self-efficacy variables, the nodes representing teachers' perceptions SE23 ("How well can you plan alternative strategies in your class?") and SE24 ("How well can you provide appropriate challenges for highly capable students?") showed the strongest connection between pairs ($r = 0.40$). Next in connectivity strength were SE07 ("How well can you respond to difficult questions posed by your students?") and SE21 ("How well can you respond to a challenging student?"), followed by SE06 ("To what extent can you make students believe they can perform well in activities?") and SE08 ("How well can you establish routines to keep class activities running smoothly?"), both with $r = 0.36$. Additionally, SE01 ("How much can you do to deal with the most difficult students?") and SE11 ("To what extent can you create good questions for your students?") exhibited a connection strength of $r = 0.34$, followed by SE05 ("To what extent can you make your expectations clear regarding students' behavior?") and SE14 ("How much can you do to improve the understanding of a struggling student?") with $r = 0.30$.

Regarding teacher motivation, strong connections were observed between MOT21 ("I feel free to negotiate participation in different teaching activities") and MOT22 ("Cooperative spaces among teachers promoted by the institution are a source of pleasure for me") ($r = 0.49$), MOT09 ("I always critically evaluate my teaching actions") and MOT11 ("In my practice, I try to help students understand that making mistakes is part of the learning process") ($r = 0.41$), and between MOT01 ("I feel less capable when I have to deal with new content") and MOT06 ("Sometimes I avoid doing things of interest to me out of fear of feeling embarrassed") ($r = 0.40$). Within the quality-of-life domain, the strongest associations were found between QoL22 ("How satisfied are you with the support you receive from your friends?") and QoL23 ("How satisfied are you with the conditions of the place where you live?") ($r = 0.39$), and between QoL17 ("How satisfied are you with your ability to perform your daily activities?") and QoL18 ("How satisfied are you with your capacity for work?") ($r = 0.38$). Finally, QoL24 ("How satisfied are you with your access to health services?") and QoL25 ("How satisfied are you with your means of transportation?") were also strongly connected ($r = 0.31$).

When examining the interconnection among all assessed domains, the nodes showing the strongest associations were QoL10 (“Do you have enough energy for your daily life?”) and MOT02 (“The lack of peer support limits my willingness to face challenges or take advantage of teaching opportunities”) ($r = 0.36$). Additional relevant connections included SE06 (“To what extent can you make students believe they can perform well in activities?”) and MOT16 (“I value having flexible activities and work schedules”) ($r = 0.33$), as well as SE03 (“To what extent can you control disruptive behaviors in class?”) and MOT16, and SE13 (“To what extent can you ensure that students follow classroom rules?”) and MOT04 (“I find it difficult to work cooperatively within the teaching environment”) all with $r = 0.32$. The accuracy of edge weight estimates was assessed using a non-parametric bootstrap with 95% confidence intervals (Appendix 1). The results indicated that most intervals were narrow and that the mean estimated edge weights were close to those in the original sample. This demonstrates that the network exhibits good precision in edge estimates and high overall accuracy.

Figure 2 presents the standardized estimated values of centrality indicators *strength*, *closeness*, and *betweenness* for self-efficacy, motivation, and quality-of-life variables among DE instructors. The centrality analysis identified QoL13 as the node with the greatest strength within the network, followed closely by QoL12 and QoL05. The quality-of-life factors QoL13 and QoL16, together with the motivation factor MOT02, showed the highest degree of interconnectivity within the network. Specifically, node QoL13 displayed high values for *strength* (2.10), *closeness* (2.12), and *betweenness* (2.03), indicating its central role in the network and its strong relationships with other nodes. Among all indicators, quality of life exhibited the highest *closeness* value (2.12), suggesting shorter paths to all other nodes and reflecting its substantial centrality. Edge precision was visually evaluated through inspection of the confidence intervals obtained via non-parametric bootstrapping with 1,000 resamples (95% CI). Narrower confidence intervals indicate more precise edge estimates (see Appendix 1).

Fig. II Centrality indices (betweenness, closeness, and strength) presented as standardized z-scores. Items are organized by color bands representing Self-Efficacy (red), Motivation (green), and Quality of Life (blue).



Regarding network stability, the case-dropping bootstrap technique was applied to assess node weight stability. Mean correlations between node weights in the full sample and in samples with randomly removed cases were calculated, along with 95% confidence intervals. The mean correlations did not show any marked decline as sample size decreased, indicating satisfactory stability of node weights (see Appendix 2).

Discussion

The aim of the present study was to explore the network relationships among self-efficacy, motivation, and quality of life in higher education Physical Education professors working in Distance Education (DE). Overall, the network exhibited low sparsity, with a predominance of positive connections among the nodes. The network analysis revealed a strong interconnection between the components of quality of life and motivation, particularly between “The lack of peer support as a limiting factor in the willingness to face challenges or seize opportunities in teaching practice” (MOT02) and “Having sufficient energy for daily life” (QoL10). The centrality measures indicated that item QoL13 (“How available is the information that teachers need to perform their daily activities?”), related to quality of life, had the greatest impact in the network, showing high values for strength, closeness, and betweenness. Therefore, the current study contributes to the literature by presenting new evidence on this topic.

Initially, the study examined the interconnections among self-efficacy, motivation, and quality of life domains. Network analysis has recently emerged as an innovative approach in psychological and educational research, particularly due to its ability to explore the relationships among different psychological constructs (Epskamp et al., 2018). Unlike conventional linear models, this method investigates how elements of a system connect and interact, offering integrated understanding of the variables involved (Costantini et al., 2015). By identifying central elements and strategic connections, network analysis enables the identification of factors that sustain teaching performance and teacher well-being in DE environments.

The interconnection found between quality of life and motivation factors in this study reinforces the importance of organizational interventions that provide technical and social support in the workplace, especially within the DE context. Recent evidence shows that this type of institutional support has a positive impact on teachers' mental health, promoting greater security, well-being, and adaptive capacity in response to new teaching demands (Kita et al., 2022). Universities that offer comprehensive support, including social assistance, guidance from information technology teams on software and equipment use, and technical support such as device provision and instructional manuals, contribute significantly to teachers' well-being. Satisfaction with this type of support can reduce difficulties in using digital technologies and, consequently, improve teachers' mental health (Wang & Li, 2019).

Conversely, the lack of familiarity with educational technologies and the stress resulting from their use without adequate institutional support are detrimental factors that negatively affect teachers' mental health (Kita et al., 2022). Moreover, interpersonal relationships are one of the fundamental pillars of basic psychological needs (Ryan & Deci, 1985), and the absence of peer support can weaken this dimension, undermining intrinsic motivation and reducing teacher engagement.

In the context of DE, flexibility and autonomy are often cited as advantages. However, the absence of face-to-face interactions can intensify feelings of isolation, making peer support even more crucial for maintaining teachers' motivation and quality of life (Casacchia et al., 2021).

Second, the study analyzed the centrality indices of *strength*, *betweenness*, and *closeness*. Higher values of these indices indicate that a node occupies a more central position within the network. Node strength corresponds to the sum of the weights of all connections associated with it. Betweenness centrality represents the number of times a node lies on the shortest path between two other nodes. Finally, closeness centrality refers to the average distance of the shortest paths between a specific node and all others in the network (Opsahl et al., 2010).

The network analysis revealed that the item related to the availability of information in teachers' daily work (QoL13) presented the highest centrality values, suggesting that it has the greatest likelihood of influencing all other nodes across the network domains. This finding underscores the importance of social and informational support, that is, access to clear and timely information for teachers' performance and well-being in DE. Recent studies support this perspective, showing that the lack of institutional support and scarcity of clear information significantly contribute to increased stress and burnout among teachers (Wang & Li, 2019).

In general, studies on quality of life in teachers, particularly in basic education, suggest that social support and self-efficacy are two major predictors of quality of work life. Teachers who perceive greater social support and have stronger beliefs in their ability to cope with challenges (self-efficacy) report higher levels of satisfaction and well-being in the workplace (Matos et al., 2022). This phenomenon is also observed in the context of university-level distance education, where satisfaction with institutional support services for online teaching is associated with better mental health outcomes (Wang & Li, 2019).

The quality of academic work in higher education is closely linked to the teachers' access to clear and accurate information that can guide their daily pedagogical practices. The absence or inadequacy of institutional support, particularly technical and pedagogical support, can lead to feelings of unpreparedness when facing academic demands. This factor not only compromises professional performance but may also negatively impact teachers' health.

In this context, self-efficacy, understood as the belief in one's own ability to organize and execute the actions necessary to manage specific situations, emerges as a key determinant of university teachers' well-being. Empirical evidence shows that teachers with higher self-efficacy levels report better quality of life and are less vulnerable to burnout, particularly emotional exhaustion and demotivation (Matos et al., 2022). This occurs because these teachers tend to adopt more effective coping strategies, demonstrate greater resilience in the face of adversity, and perceive a stronger sense of control over their actions and outcomes.

The findings of the current study contribute to a more integrated understanding of the relationships among self-efficacy, motivation, and quality of work life among university professors. Based on the results, it is evident that overcoming challenges perceived by teachers, such as the lack of peer support, high level of effort required in daily tasks, and scarcity of information necessary for effective performance in DE requires an institutional environment capable of addressing organizational, technological, and interpersonal demands. In this sense, institutional support, through ongoing technical training, instructional resources, facilitated access to technology, and the promotion of peer collaboration, is essential for fostering both teaching performance and well-being in the face of the current challenges of Distance Education.

Conclusions

The findings of this study offer significant contributions to the literature by presenting new evidence on university professors working in Distance Education, using network analysis to explore, from a holistic perspective, the complex relationships among self-efficacy, motivation, and quality of life.

The network analysis revealed strong interconnections between quality of life and motivation components, particularly between “The lack of peer support as a limiting factor in the willingness to face challenges or seize opportunities in teaching practice (MOT02)” and “Having sufficient energy for daily life (QoL10).” The centrality measures suggested that QoL13 (“How available is the information teachers need to perform their daily activities?”), a quality-of-life item, had the greatest impact within the network, exhibiting high strength, closeness, and betweenness values.

These findings provide practical contributions for enhancing the performance and well-being of Distance Education teachers, by offering critical insights for the development of institutional policies aimed at supporting teacher professional development within the contemporary educational context.

The current study presents several limitations that should be considered in future research. Given the possible influence of regional differences and institutional type (public or private) on teachers’ perceptions of the investigated variables, generalizations should be made with caution. The network analysis conducted was based on cross-sectional data, which limits the formulation of causal inferences compared to longitudinal data. A cross-sectional network can generate hypotheses regarding prediction, directionality, or causality among nodes, but these relationships should be further examined through time-series data (Epskamp, Borsboom, & Fried, 2018). Additionally, the participants are employed in institutions with varying levels of quality according to the Ministry of Education’s performance indicators. Finally, other variables, such as age, years of experience, and workload, were not included in the study, which may have influenced the network results and should be incorporated into future research.

Future studies should adopt longitudinal designs to examine temporal and causal changes in the relationships among self-efficacy, motivation, and quality of work life in distance education. Comparative analyses between distance and face-to-face teaching could clarify how different environments affect teachers’ well-being and performance. Cross-cultural samples would enhance result generalization and reveal contextual influences on the adaptation to digital education.

Qualitative or mixed-methods approaches could further explore teachers’ subjective experiences, particularly regarding institutional support, peer collaboration, and emotional factors. Given the centrality of “information availability” and “peer support,” future research should also test intervention models that improve communication and collaboration, assessing their effects on teacher motivation, self-efficacy, and well-being.

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

During the preparation of this manuscript, the authors used the AI-based tool ChatGPT (OpenAI) exclusively for language refinement, including wording suggestions and clarity improvement. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

Conflicts of interest - authors do not have conflicts of interest

Funding

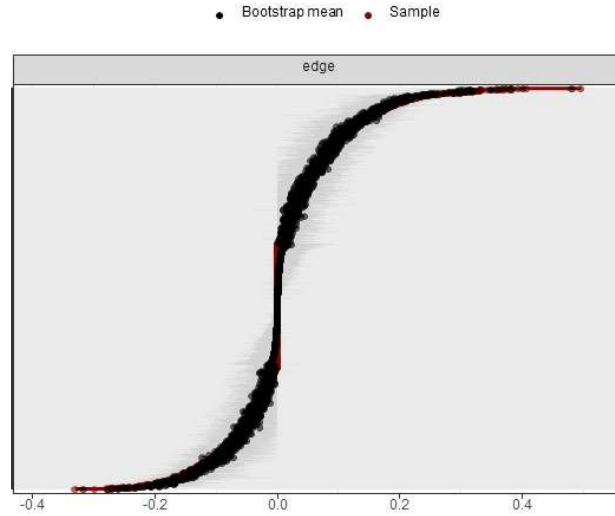
This study was carried out with the support of the Coordination for the Improvement of Higher Education Personnel – Brazil (CAPES) – Funding Code 001.

References

- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.
- Brazil. (2025, May 19). Decree No. 12,456 of May 19, 2025: Regulates the provision of distance education by higher education institutions in undergraduate programs and amends Decree No. 9,235 of December 15, 2017. Official Gazette of the Federative Republic of Brazil, Section 1. https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2025/decreto/d12456.htm
- Blonder, R., Rap, S., & Sakhnini, S. (2022). What can be learned from lecturers’ knowledge and self-efficacy for online teaching during the COVID-19 pandemic to promote online teaching in higher education. *PLOS ONE*, 17(10), e0275459. <https://doi.org/10.1371/journal.pone.0275459>
- Cabero-Almenara, J., Gutiérrez-Castillo, J. J., Barroso-Osuna, J., Palacios-Rodríguez, A., & Llorente-Cejudo, C. (2023). Digital teaching competence according to the DigCompEdu framework: Comparative study in different Latin American universities. *Journal of New Approaches in Educational Research*, 12(2), 276–291. <https://doi.org/10.7821/naer.2023.7.1452>
- Casacchia, M., Cifone, M. G., Giusti, L., Fabiani, L., Gatto, R., Lancia, L., Cinque, B., Petrucci, C., Giannoni, M., Ippoliti, R., & Roncone, R. (2021). Distance education during COVID-19: An Italian survey on university teachers’ perspectives and their emotional conditions. *BMC Medical Education*, 21(1), 335.

- Costantini, G., Epskamp, S., Borsboom, D., Perugini, M., Möttus, R., Waldorp, L. J., & Cramer, A. O. J. (2015). State of the aRt personality research: A tutorial on network analysis of personality data in R. *Journal of Research in Personality*, 54, 13–29.
- Davoglio, T. R., & Santos, B. S. dos. (2017). *Teacher motivation scale: Development and validation* [in Portuguese]. *Educar em Revista*, 33(65), 201–218.
- Epskamp, S., Borsboom, D., & Fried, E. I. (2018). Estimating psychological networks and their accuracy: A tutorial paper. *Behavior Research Methods*, 50(1), 195–212.
- Fleck, M. P. A., Louzada, S., Xavier, M., Chachamovich, E., Vieira, G., Santos, L., & Pinzon, V. (2000). *Application of the Portuguese version of the WHOQOL-BREF quality of life assessment instrument* [in Portuguese]. *Revista de Saúde Pública*, 34(2), 178–183.
- Kita, Y., Yasuda, S., & Gherghel, C. (2022). Online education and the mental health of faculty during the COVID-19 pandemic in Japan. *Scientific Reports*, 12(1), 20985. <https://doi.org/10.1080/0309877X.2021.1888072>
- Matos, M. da M., Sharp, J. G., & Iaochite, R. T. (2022). Self-efficacy beliefs as a predictor of quality of life and burnout among university lecturers. *Frontiers in Education*, 7, 914067.
- Menescardi, C., Suárez-Guerrero, C., & Lizandra, J. (2021). Training Physical Education Teachers in the Use of Technological Applications. *Apunts. Educación Física y Deportes*, 144, 33–43.
- Mosquera, P., Albuquerque, P. C., & Picoto, W. N. (2022). *Is online teaching challenging faculty well-being?* *Administrative Sciences*, 12(4), 164.
- Newman, M. E. J. (2018). *Networks* (2nd ed.). Oxford University Press.
- Opsahl, T., Agneessens, F., & Skvoretz, J. (2010). Node centrality in weighted networks: Generalizing degree and shortest paths. *Social Networks*, 32(3), 245–251.
- Polydoro, S. A. J., Azzi, R. G., Vieira, D. A., & Silva, M. C. (2004). *Teacher self-efficacy scale in physical education*. In C. Machado, L. S. Almeida, & M. Gonçalves (Eds.), *Psychological assessment: Forms and contexts* [in Portuguese]. (Vol. 1, pp. 330–337). Psiquilíbrios Edições.
- Prananto, K., Suriansyah, A., Mahrani, M., & Misbah, M. (2025). Perceived teacher support and student engagement among higher education students: A systematic literature review. *BMC Psychology*, 13(1), 112.
- Raimkulova, A., Kenzhebaeva, A., Abisheva, K., & Toktarbayeva, S. (2024). Pedagogical conditions of applying distance learning technologies in the system of higher professional education. *E-Learning and Digital Media*
- Robinaugh, D. J., Hoekstra, R. H. A., Toner, E. R., & Borsboom, D. (2020). The network approach to psychopathology: A review of the literature 2008–2018 and an agenda for future research. *Psychological Medicine*, 50(3), 353–366. <https://doi.org/10.1017/S0033291719003404>
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68–78.
- Shu, K. (2022). Teachers’ commitment and self-efficacy as predictors of work engagement and well-being. *Frontiers in Psychology*, 13, 872396.
- Sobral, F., Carvalho, V. S., Lopes, S., Chambel, M. J., & Giniger, S. (2024). Blurred boundaries: Exploring the influence of work-life and life-work conflicts on university teachers’ health, work results, and willingness to teleworking. *Frontiers in Education*, 9, 1344690.
- Telyani, A. E., Farmanesh, P., & Zargar, P. (2021). The impact of COVID-19 instigated changes on loneliness of teachers and motivation–engagement of students: A psychological analysis of the education sector. *Frontiers in Psychology*, 12, 749600.
- Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education*, 17(7), 783–805.
- Van Dijk, D., Baggen, Y., & Palavouzi, G. (2025). Unfolding educational innovation processes and teacher motivation in universities: A multiple-case study. *International Journal for Academic Development*.
- Wang, X., & Li, B. (2019). Technostress among teachers in higher education: An investigation from multidimensional person-environment misfit. *Frontiers in Psychology*, 10, 1791.
- Weißenfels, M., Klopp, E., & Perels, F. (2022). Changes in teacher burnout and self-efficacy during the COVID-19 pandemic: Interrelations and e-learning variables related to change. *Frontiers in Education*, 6, 736992.
- World Health Organization Quality of Life Group. (1998). Development of the World Health Organization WHOQOL-BREF quality of life assessment. *Psychological Medicine*, 28(3), 551–558. <https://doi.org/10.1017/S0033291798006667>
- Yang, X., & Du, J. (2024). The effect of teacher self-efficacy, online pedagogical and content knowledge, and emotion regulation on teacher digital burnout: A mediation model. *BMC Psychology*, 12(1), 415.
- Zhao, T., Liu, H., Roeder, K., Lafferty, J., & Wasserman, L. (2012). The huge package for high-dimensional undirected graph estimation in R. *Journal of Machine Learning Research*, 13, 1059–1062.

Appendix 1



Appendix 2

