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Comparing the Effectiveness of Collaborative Teaching Method with Brain-Based Teaching Method on Students' Social Competence

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ABSTRACT

Objective: The aim of the present study was to compare the effectiveness of collaborative teaching method with brain-based teaching method on students' social competence.

Methods: The statistical population consisted of students studying in the academic year 2021-2022 in the middle school level of District 2, Tehran. Then, a total of 36 students were purposefully selected and randomly assigned to three groups: collaborative teaching method group (12 students), brain-based teaching method group (12 students), and control group (12 students). In the experimental groups, collaborative teaching method and brain-based teaching method were implemented in ten 50-minute sessions. These two groups underwent training using these methods, while the control group did not receive any form of training or intervention. The data were collected using the Flener's Social Competence Questionnaire (1990). Data analysis was conducted using analysis of covariance (ANCOVA).

Results: The results indicated that both collaborative teaching method and brain-based teaching method were effective on social competence. Individuals who received training using the collaborative teaching method achieved higher scores in social competence after the intervention compared to those who received training using the brain-based teaching method, demonstrating the greater efficacy of the collaborative teaching method over the brain-based teaching method.

Conclusions: Educational practitioners and policymakers can use these insights to make informed decisions about teaching strategies that best serve the holistic development of students, ultimately contributing to their overall well-being and success in academic and social domains.

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Introduction

Educators and peers play significant roles in shaping the organizational and socio-emotional dynamics within the classroom environment (Hamre et al., 2013). Classroom organization pertains to the framework established by the teacher, encompassing the structural elements of the learning space. Conversely, the social-emotional climate characterizes the interpersonal ambiance cultivated by student interactions within the group (Boor-Klip et al., 2016). These facets of the classroom climate are believed to exert an influence on students' social competence. Teachers contribute to this structure by employing effective classroom management strategies. In a well-managed classroom, routines follow predictable patterns, rules and expectations are clearly defined, and social interactions among students, including collaborative work and play, are skillfully overseen (Márquez et al., 2006). Within general education settings, highly structured classrooms have been observed to promote socially adept behaviors among students (Jennings & Greenberg, 2009). Given that students' social competence significantly influences their interactions with both teachers and peers, it is reasonable to surmise that it also plays a role in shaping their overall perceptions of the classroom. Although the explicit exploration of links between self-reported social competence and classroom climate is limited, some indications suggest that pupils' classroom perceptions may vary depending on factors such as gender, ethnic background, and behavioral challenges (Poulou et al., 2022; Skura & Świderska, 2022).

For instance, students' behavioral issues can impact their experiences of peer interactions within school settings. Those who report higher levels of behavioral challenges often describe their peers as more disruptive and view the school environment as less safe (Cregenzán-Royo et al., 2022). Consequently, students with lower social competence may perceive the classroom as less positive,

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characterized by fewer constructive interactions with peers, when compared to their socially more adept counterparts. In essence, social competence emerges as a critical determinant of high-quality interpersonal relationships and is likely to influence students' perceptions of the classroom's organization and atmosphere.

Collaborative learning, as defined by Lin and Lin (2015), entails students jointly pursuing a shared learning objective within a group structure where they bear mutual responsibility for each other's learning outcomes. It is important to distinguish between "cooperative learning" and "collaborative learning." Cooperative learning initially divides a learning task into subtasks that individual partners can independently address. In contrast, collaborative learning involves collectively tackling a problem through asynchronous and interactive means, placing emphasis on discussions during task participation and acknowledging the essential role of student-to-student communication in cognitive adjustment (Curtis & Lawson, 2001). Verdejo et al. (2003) underscored collaborative learning founded on dialogue. Gokhale (1995) underscores that active idea exchange within a group not only enhances student engagement but also fosters critical thinking. Research demonstrates that compared to individual learning, collaborative learning offers students an avenue for in-depth discussion and promotes higher-order thinking. It also aids in longer-lasting information retention.

Drawing from the observations of Tuckman and Jensen (1977), collaborative learning unfolds through several stages of interpersonal development within a group. These stages encompass: (1) Formation, characterized by a transitional phase when group members are unfamiliar with each other; (2) Conflict, a period of adjustment and acclimation as members adapt and reconcile; (3) Cohesion, where, with the proper management of conflicts, a shared balance and consensus are

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gradually established, enhancing group cohesion; and (4) Execution, when team members shift their focus toward task completion and goal achievement, relying increasingly on one another, leading to more productive role assignments.

In collaborative learning environments, students tend to outperform their peers who study independently, irrespective of their initial learning levels (O'Donnell & Hmelo-Silver, 2013). Communication among students during collaborative learning is considered beneficial (Laal & Laal, 2012). Existing research demonstrates that collaborative learning is an efficacious approach to learning improvement (Slavin, 2013) and bolsters student satisfaction with the overall learning process (Tarhan et al., 2013).

Another teaching method is brain-based teaching method. Brain-based teaching (BBT) is an educational approach rooted in neuroscience findings, offering a 21st-century perspective on effective instruction. This method is viewed as a remedy for shortcomings in other teaching approaches (Jensen, 2008). It revolves around a student-centered philosophy, transforming the teacher's role into that of a facilitator. By emphasizing student engagement, BBT fosters active participation in the teaching-learning process (Handayani & Corebima, 2017). Notably, BBT shares fundamental principles with constructivism, encompassing meaningful learning, individual learning differences, multiple learning representations, personal and environmental learning factors, and effective learning components (Kahveci & Ay, 2008).

BBT capitalizes on understanding how the brain is inherently predisposed to learning. Degen (2014) regard the brain as a biologically programmed organ fundamentally designed for learning. The objective of any teaching-learning process is to induce a relatively permanent change in behavior. Therefore, employing an approach that aligns with how the brain processes information

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can effectively address the diverse characteristics and needs of learners. BBT method integrates the principles of brain-based theory into the classroom setting. Varghese and Pandya (2016) define brain-based learning as a holistic instructional approach that leverages current neuroscience research to comprehend how humans truly learn. Neuroscience, on the other hand, is the scientific exploration of brain structure and function (Arun & Singaravelu, 2018). Sani et al. (2019) view brain-based learning as a student-focused, instructor-supported methodology that capitalizes on students' cognitive strengths while emphasizing significant learning. Jensen (2008) characterizes brain-based learning as a cognitive framework for the learning process, providing a foundation of principles and knowledge that informs decision-making about learning . El-Maksoud and Abd El-Fattah (2016) suggests that while BBT was not originally conceived as a teaching method, its principles can effectively mitigate the limitations of other teaching approaches.

In the field of education, there is a growing need to identify and implement effective teaching methods that not only enhance students' academic achievements but also nurture their social competence. Two prominent teaching methods, collaborative teaching and brain-based teaching, have gained attention for their potential to impact students' social skills. Collaborative teaching encourages peer interaction, cooperative problem-solving, and group learning, while brain-based teaching aligns with principles derived from neuroscience to create engaging and interactive learning environments. However, there remains a significant gap in understanding which of these methods is more effective in fostering social competence among students. Given the crucial role of social competence in students' overall development and future success, it is imperative to investigate and compare the outcomes of these two teaching methods. This research seeks to address the following question: to what extent do collaborative teaching and brain-based teaching

methods influence students' social competence? By investigating these questions, this study aims to provide valuable insights into the comparative effectiveness of collaborative teaching and brain-based teaching methods in promoting social competence among students, contributing to the ongoing dialogue on innovative and student-centered teaching approaches.

Materials and Methods

The study was conducted during the academic year 2021-2022, focusing on middle school students in District 2, Tehran. This population was chosen as the target for assessing the effectiveness of collaborative teaching and brain-based teaching methods on students' social competence. A total of 36 students were purposefully selected and randomly assigned to three distinct groups:

1. Collaborative Teaching Method Group comprising 12 students.
2. Brain-Based Teaching Method Group also consisting of 12 students.
3. Control Group including 12 students.

The experimental groups, namely the Collaborative Teaching Method Group and the Brain-Based Teaching Method Group, underwent a structured intervention. This intervention spanned ten sessions, each lasting 50 minutes, during which the respective teaching methods were diligently applied.

1. Collaborative Teaching Method Group: This group of students received instruction utilizing the collaborative teaching method. This approach emphasizes peer interaction, cooperative learning, and group problem-solving. The students engaged in collaborative activities designed to enhance their social competence.

2. Brain-Based Teaching Method Group: Students in this group experienced the brain-based teaching method. This method integrates principles derived from neuroscience research into the

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teaching process. It aims to create an engaging and interactive learning environment, which is expected to influence their social competence positively.

3. Control Group: The control group, in contrast, did not receive any form of specialized training or intervention related to collaborative or brain-based teaching methods. Their experiences served as a baseline for comparison.

Instrument

To evaluate the impact of the interventions, data were collected using the Flener's Social Competence Questionnaire (1990). The Social Adequacy Questionnaire comprises 47 items and is rooted in the four-dimensional model developed by Flannery et al. in 1990. This questionnaire assesses social competence across four dimensions: behavioral skills, emotional skills, cognitive skills, and motivational skills. Respondents rate these dimensions using a seven-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). To ensure the questionnaire's content validity, it underwent expert evaluation by psychologists and psychiatrists. The internal consistency of the questionnaire items was verified with a Cronbach's alpha coefficient of 0.88, indicating a high level of reliability. Additionally, the test-retest reliability coefficient was assessed using a sample of 30 students, yielding a value of 0.89, indicating that the questionnaire's results are consistent over time. The construct validity of the questionnaire, as determined through factor analysis, demonstrated a coefficient of 0.826, affirming the questionnaire's ability to measure the intended dimensions of social competence.

Data analysis

The collected data were subjected to rigorous analysis using analysis of covariance (ANCOVA). This statistical method was employed to assess the effects of the teaching methods on students'

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social competence while controlling for potential confounding factors. ANCOVA allows for the comparison of means among different groups, considering pre-existing differences among participants. By employing this methodology, the study aimed to determine the relative effectiveness of collaborative teaching and brain-based teaching methods on enhancing students' social competence and provide valuable insights for educational practice and research.

Ethical Considerations: The ethical considerations were central to the planning, execution, and reporting of this research. They were consistently upheld to protect the rights, well-being, and dignity of all participants while advancing the understanding of educational practices and student development.

Results

In Table 1, the normality of the data results was provided.

Table 1. Kolmogorov-Smirnov test results for normal distribution assumption

Variable	Group	Statistic	p
Social competence	Experimental 1	0.15	.32
	Experimental 2	0.35	0.29
	Control	0.39	0.27

Table 1 displays the outcomes of the Kolmogorov-Smirnov test used to assess the normality of data distribution. The results within Table 1 suggest that the significance level for social competence exceeds 0.05. Consequently, the Kolmogorov-Smirnov statistic for this variable does not reach significance at the 0.05 level of error, signifying a normal distribution for this variable. This adherence to the normal distribution assumption permits the application of univariate covariance analysis. The mean scores for social competence in the experimental and control groups is provided in table 2.

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Table 2. Correlation coefficients matrix of research variables

Variable	Group	Mean	SD
Social competence	Collaborative Teaching	152.58	5.57
	BBT	138.24	4.31
	Control	119.33	4.78

Table 3. ANCOVA test result

Source	Variable	SS	DF	MS	F	p	Eta
Group	Social competence	14.88	2	7.44	7.11	0.001	0.56

Table 3 presented the results of a univariate covariance analysis of post-test scores for social competence. The table shows that there is a significant difference between the experimental and control groups. The post hoc Tuckey test results indicate a significant difference between the experimental and control groups, and there is significant difference between the two experimental groups which demonstrating the greater efficacy of the collaborative teaching method over the brain-based teaching method.

Discussion

The aim of the current research was to comparing the effectiveness of collaborative teaching method with brain-based teaching method on students' social competence. The results indicated that both collaborative teaching method and brain-based teaching method were effective on social competence. Individuals who received training using the collaborative teaching method achieved higher scores in social competence after the intervention compared to those who received training using the brain-based teaching method, demonstrating the greater efficacy of the collaborative teaching method over the brain-based teaching method.

One noteworthy finding of this research is the effectiveness of the collaborative teaching method in enhancing students' social competence. The results indicate that students who underwent

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training using the collaborative teaching method demonstrated notable improvements in their social competence. This outcome is in line with prior research highlighting the advantages of collaborative learning in promoting interpersonal skills, teamwork, and effective communication (Laal & Laal, 2012; Slavin, 2013). Collaborative teaching, by encouraging peer interaction, group problem-solving, and cooperative learning, fosters an environment in which students can actively engage with their peers. This not only enhances their academic learning but also contributes to the development of critical social competencies. The higher scores achieved by students in the collaborative teaching group affirm its positive impact on students' social skills.

While the results indicate that the brain-based teaching method was effective in enhancing students' social competence, it is notable that the gains achieved in this group were comparatively lower than in the collaborative teaching group. Brain-based teaching, informed by principles derived from neuroscience, aims to create engaging and interactive learning environments. It encourages students to explore and understand how their brains function, promoting a deeper level of learning and potentially impacting their social competence. Although the results show that the brain-based teaching method had a positive effect, the relatively lower scores suggest that it may not be as effective as the collaborative teaching method in this particular context (Sani et al., 2019; Varghese & Pandya, 2016).

The comparative analysis of the two teaching methods is a crucial contribution of this study. The findings indicate that the collaborative teaching method outperformed the brain-based teaching method in terms of enhancing students' social competence. This suggests that, for the specific goal of nurturing social skills in students, the collaborative approach may be more efficacious. The interactive and peer-centered nature of collaborative teaching likely plays a significant role in this

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superior outcome. It facilitates the development of critical social competencies, including effective communication, cooperation, and conflict resolution.

Implications for Educational Practice

These findings have important implications for educational practice. Educators and instructional designers may consider the benefits of incorporating collaborative teaching methods into their curricula to enhance students' social competence. However, it is important to acknowledge that the efficacy of teaching methods can vary depending on the specific learning objectives and the characteristics of the student population. Therefore, a balanced and context-specific approach to teaching and learning should be adopted.

Limitations and Future Research

It is important to recognize that this study is not without limitations. The research was conducted in a specific context and with a relatively small sample size. Future research should aim to replicate these findings across diverse educational settings and with larger and more diverse student populations. Additionally, a longitudinal approach could provide insights into the long-term impact of these teaching methods on social competence.

In conclusion, this research underscores the significance of teaching methods in shaping students' social competence. The collaborative teaching method emerged as the more effective approach in this study, highlighting its potential to significantly impact students' interpersonal skills and teamwork. However, the context and specific learning objectives must be considered when selecting the most appropriate teaching method, as different approaches may yield varying results based on the goals of the educational program.

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Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by ethics committee of university.

Author contributions

ET, FJ and NN contributed to the study conception and design, material preparation, data collection and analysis. The author contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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