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EFL Teachers' Brain-Friendly Teaching: The Role of Fluid and Crystallized Intelligence

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Abstract

This study investigated the connection between Iranian EFL teachers' fluid and crystallized intelligence and their implementation of brain-friendly teaching methods. Brain-friendly teaching aims to create environments conducive to effective thinking, problem-solving, and well-adjusted behavior. The study involved 200 EFL teachers from language institutes in Iran, tests to measure participants' fluid and crystallized intelligence, as well as a brain-friendly teaching inventory. The results, analyzed through Spearman's rho correlation, indicated a significant correlation between teachers' intelligence and their use of brain-friendly teaching methods. These findings suggest potential implications for English teachers, educators, and language supervisors in enhancing teaching practices.

Keywords

Brain-friendly teaching, crystallized intelligence, EFL teachers, fluid intelligent

1 | Introduction

Human intelligence has been a subject of fascination and inquiry throughout history, dating back to the philosophical musings of thinkers like Plato and Aristotle. Over time, this interest has grown into a formal scientific discipline, with scholars like Kaufman (2013) highlighting its significance. Intelligence, broadly defined, encompasses the mental capacity for reasoning, problem-solving, and learning. As noted by Colom et al. (2022), this definition underscores the integration of various cognitive functions such as memory, perception, attention, language, and planning. Standardized tests are commonly used to measure intelligence, with scores predicting a range of social outcomes including educational attainment, job performance, and even health and longevity. These tests tap into fundamental aspects of human cognition, particularly reasoning, problem-solving, and learning abilities, which are essential for navigating complex situations (Colom et al., 2022). Cattell's division of intelligence into fluid and crystallized components provides a useful framework for understanding the

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multifaceted nature of intelligence. Fluid intelligence encompasses cognitive abilities that are not reliant on prior knowledge, such as logical reasoning and spatial skills, while crystallized intelligence comprises the knowledge accumulated over a person's lifetime, including vocabulary, academic knowledge, and practical skills (Cattell, 1943).

Brain-friendly teaching, as advocated by proponents like Caine and Caine (1991), emphasizes learning strategies that align with the principles of brain-based learning. This approach prioritizes meaningful learning experiences over rote memorization, recognizing that the brain learns best when information is presented in a logical and meaningful manner. Teachers who employ brain-friendly teaching methods structure lessons to incorporate novel stimuli and promote social interaction, enhancing students' engagement and retention of information (Kagan, 2014). Moreover, teachers' personalities play a significant role in their effectiveness as educators. Research by Chambers et al. (2001) and Etheridge (2010) suggests that personality differences among teachers can influence their communication style, classroom management techniques, and ability to meet the diverse needs of their students.

In the Iranian EFL context, where English language teaching is prevalent, there has been limited exploration of brain-friendly teaching methods despite their potential benefits for student learning. Given the importance of creating an optimal learning environment, further research into the intersection of intelligence, teaching practices, and brain-friendly methodologies could provide valuable insights for educators and educational policymakers.

2 | Literature Review

2.1 | Intelligence

Human intelligence is a defining characteristic of humanity, setting humans apart from other organisms and enabling them to achieve dominance and create complex civilizations (Putri et al., 2022). This intelligence is not static but can develop and evolve through interactions with the environment, including education (Putri et al., 2022). Education plays a crucial role in nurturing and balancing various facets of intelligence, such as linguistic, mathematical/logical, and problem-solving skills. For instance, individuals with strong mathematical/logical intelligence tend to excel in analytical thinking and problem-solving tasks, while those with advanced linguistic intelligence demonstrate proficiency in language comprehension and expression (Putri et al., 2022).

Teachers play a pivotal role in shaping the educational experiences of students, as their beliefs, assumptions, and knowledge inform their decision-making processes (Kazuyoshi & Tim, 1999). These factors influence the instructional strategies employed by teachers and, consequently, the learning opportunities available to students (Borg & Al-Busaidi, 2012). The diversity of intelligence among individuals underscores the importance of adapting teaching methodologies to cater to the unique strengths and needs of learners (Putri et al., 2022).

Research has delved into the relationship between intelligence and language learning, particularly focusing on crystallized and fluid intelligence. Crystallized intelligence refers to acquired knowledge and skills accumulated over time, while fluid intelligence pertains to the ability to reason and solve novel problems independently of prior learning (Maroufolzakerin & Faravani, 2020). Studies have found significant correlations between crystallized intelligence and vocabulary size and other language abilities among language learners, suggesting that the accumulation of knowledge plays a vital role in language acquisition (Baghaei & Tabatabaee-Yazdi, 2015; Nadri et al., 2019; Maroufolzakerin & Faravani, 2020; Mirsaeedghazi, 2021; Tabatabaee-Yazdi & Baghaei, 2018).

Moreover, investigations have explored the efficacy of integrating crystallized intelligence into language learning environments, particularly for students with cognitive disabilities (Lifshitz et al., 2018). Such approaches aim to enhance students' communicative competence by leveraging their existing knowledge and skills (Lifshitz et al., 2018). Additionally, sociodemographic factors, including gender, age, education, and socioeconomic status, have been found to influence general knowledge and intelligence levels (Buades-Sitjar et al., 2022).

Furthermore, research has examined the relationship between teachers' cognitive abilities, such as fluid intelligence, and their self-efficacy and burnout levels (Mousavi et al., 2022). Positive correlations have been observed between teachers'

self-efficacy and fluid intelligence, indicating that cognitive abilities may influence teachers' confidence in their instructional practices (Mousavi et al., 2022). Additionally, lower levels of burnout have been associated with higher levels of self-efficacy and fluid intelligence among teachers (Mousavi et al., 2022).

Overall, these findings highlight the intricate interplay between intelligence, education, and teaching practices, underscoring the importance of considering individual differences and cognitive abilities in educational contexts.

2.2 | Brain-Friendly Teaching

Brain-friendly teaching aligns with how the human brain naturally functions, aiming to create optimal learning environments where learners' brains can operate efficiently and effectively (Winarso & Karimah, 2017). It emphasizes the development of learners' mental, biological, and emotional faculties, fostering clear reasoning, focused behavior, and effective learning outcomes (Ghanbari et al., 2019). Brain-based teaching methods leverage insights from cognitive science to design learning materials and activities that align with the brain's natural processes and preferences (Winarso & Karimah, 2017).

Research has explored the effectiveness of brain-friendly teaching strategies in enhancing students' creative character and thinking abilities (Winarso & Karimah, 2017; Solihatin & Syahrial, 2019; Satria, 2015). While some studies have found positive correlations between brain-friendly teaching methods and student outcomes, others have emphasized the importance of factors such as cognitive load, repetition, questioning, visualization, feedback, and reflection in facilitating brain-friendly learning experiences (Ghanbari et al., 2019; Retone & Prudente, 2020). Integration of technology with brain-friendly teaching techniques has been shown to enhance conceptual understanding and learning gains among students (Retone & Prudente, 2020).

Furthermore, the principles of neuroscience have been systematically applied to language teaching through a "brain-friendly" approach, enhancing teaching effectiveness and improving learners' language acquisition outcomes. Constructing valid instruments to measure teachers' awareness of brain-friendly teaching has been a focus of recent research, leading to the development of inventories that effectively capture teachers' understanding and implementation of brain-friendly teaching practices (Sattari & Tabatabaee-Yazdi, 2022). Additionally, studies have demonstrated the efficacy of brain-friendly teaching methods in improving vocabulary retention compared to traditional teaching approaches (Bayer, 2022).

Overall, research in brain-friendly teaching underscores the importance of aligning instructional practices with the brain's natural processes to optimize learning outcomes and enhance students' cognitive development.

3 | Method

3.1 | Participants

The sample of this study was about 200 EFL teachers from both genders (Males = 64, Females = 136) in different age groups (*Mean* = 26, *SD* = 5.78). They were asked to fill out the questionnaires electronically using Google Form. They were from different cities, mostly Mashhad. Data collection started in April 2023 and lasted for three months.

3.2 | Instrument

To fulfill the purpose of the study, Tabatabaee-Yazdi (2017) verbal analogy test was used as a fluid intelligence which contains 41 multiple-choice questions. To assess teachers' crystallized intelligence, Baghaei's C-test (Tabatabaee-Yazdi et al., 2018) was used. Brain-Friendly Teaching Inventory (Sattari & Tabatabaee-Yazdi, 2022) was also used as the third instrument. The degree of reliability for the scales were investigated using the Cronbach alpha coefficient, and values of 0.72, 0.94, and 0.96 were obtained for the Fluid intelligence, Crystallized intelligence, and the brain-friendly teaching inventory, respectively.

4 | Results

To examine the strength and direction of the relationship between Iranian EFL teachers' fluid and crystallized intelligence and their attitudes toward brain-friendly teaching, Spearman's *rho* correlation was used (due to the nonnormal distribution of the data). The results (Table 1) showed that there was a moderate positive correlation between Iranian EFL teachers' fluid intelligence and their attitude toward brain-friendly teaching ($\rho = 0.37$, $p = 0.00$), and a small positive correlation between Iranian EFL teachers' crystallized intelligence and their attitude toward brain-friendly teaching ($\rho = 0.14$, $p = 0.04$).

Table 1

Spearman's rho Correlation between EFL Teachers' Fluid Intelligence, Crystallized Intelligence, and their Attitudes toward Brain-friendly Teaching

	Brain-Friendly Teaching
Fluid Intelligence	0.37**
Crystallized Intelligence	0.14*

Note. **Correlation is significant at the 0.01 level (two-tailed)
*Correlation is significant at the 0.05 level (two-tailed)

5 | Discussion

The study aimed to investigate the correlation between Iranian EFL teachers' fluid and crystallized intelligence and their attitudes toward brain-friendly teaching. Results indicated a significant relationship between teachers' fluid intelligence and their attitudes toward brain-friendly teaching, aligning with previous research findings (Ghanbari et al., 2019). This suggests that cognitive factors may influence teachers' receptiveness to brain-friendly teaching methods, which can be facilitated through strategies such as cognitive load considerations, repetition, questioning, visualization, feedback, and reflection (Ghanbari et al., 2019). Additionally, brain-based teaching methods have been shown to enhance memorization and vocabulary acquisition among learners (Bayer, 2022; Maroufolzakerin & Faravani, 2020).

Furthermore, the study found a significant relationship between teachers' crystallized intelligence and their attitudes toward brain-friendly teaching. This finding corroborates previous research highlighting the influential role of intelligence in teaching and learning processes (Sattari & Tabatabaee-Yazdi, 2022). Ackerman et al. (2000) suggest that crystallized intelligence is a stronger predictor than fluid intelligence across various knowledge domains, underscoring its importance in educational contexts.

Overall, the study underscores the significance of both fluid and crystallized intelligence in shaping teachers' attitudes toward brain-friendly teaching methods, highlighting the potential impact of cognitive factors on instructional practices and educational outcomes.

6 | Conclusion

The study found a significant and positive correlation between Iranian EFL teachers' fluid and crystallized intelligence and their implementation of brain-friendly teaching methods. This suggests that brain-friendly teaching, which engages students emotionally and encourages reflection, can serve as a conceptual framework for English language learning and teaching. This approach provides opportunities for students to reflect on their knowledge, work in groups, and engage in activities of their choice, ultimately fostering motivation and enhancing learning outcomes.

However, integrating brain-friendly teaching into EFL pedagogy can be challenging, as it requires motivated and energetic teachers with high levels of fluid and crystallized intelligence. Many Iranian English teachers may be reluctant to adopt brain-friendly teaching methods due to organizational issues such as low payment and poor work environments. To

address this, educational settings should provide support for teachers to develop their fluid and crystallized intelligence and increase their awareness of brain-friendly teaching strategies.

Researchers have suggested various strategies for enhancing EFL teachers' fluid and crystallized intelligence and promoting brain-friendly teaching, including peer observation, coaching, reflective teaching practices, and professional learning communities. Additionally, higher academic authorities should identify teachers lacking knowledge in these areas and provide training and support through seminars, workshops, and conferences. Creating a brain-friendly teaching environment in both public and private educational institutes can further encourage goal-oriented behaviors among teachers and improve educational outcomes.

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Conflict of Interest

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Data Availability Statements

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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