

The role of ChatGPT readiness in shaping language teachers' language teaching innovation and meeting accountability: A bisymmetric approach

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ABSTRACT

There are some dichotomies surrounding ChatGPT's application and impact on education as a central part of artificial intelligence (AI) integration. Problems concerning negative preconceptions and the limited usage of this form of AI have been reported, as some teachers perceive it as a competitor. This is due to insufficient readiness for its integration and a lack of understanding of how it can facilitate teaching innovation. Due to this, the researchers applied a bisymmetric approach, where necessity conditional analysis (NCA) as a symmetrical approach employs necessity logic to identify the must-have factors required for language teachers' passing accountability, while PLS-SEM as an asymmetrical approach follows additive sufficiency logic to identify the should-have factors that contribute to helping them to pass their accountability. Applying this approach would generate more results from different perspectives in ChatGPT readiness and language teaching innovation with it. In this line, the researchers randomly explored 124 Iranian in-service language teachers ChatGPT readiness and their teaching innovation in helping them pass the external and internal language teaching competencies. The result of the PLS-SEM showed that the more the language teachers were ready to practically use ChatGPT alongside, aware of its opportunities and challenges in English language teaching (ELT), the more they could generate more language teaching methods and approaches with it, apply them to their language teaching procedures, and share them with their colleagues. Moreover, their generational language teaching methods with ChatGPT mediated the correlation between ChatGPT readiness and meeting internal accountability. Additionally, the NCA showed that the generation of language teaching methods with ChatGPT and their implementation through it were among the necessary factors that help language teachers meet both internal and external accountability by teaching language with ChatGPT. Based on these findings, the researchers recommended that stakeholders shift their focus from AI programming to AI teaching, especially for ELT.

1. Introduction

Artificial intelligence (AI) has gained prominence in a variety of human sectors, such as industry, business, and marketing. In addition to gaining popularity, these technologies have sparked a wave of innovation that has the potential to transform the education sector, particularly computer-assisted language learning (CALL) and ELT. According to Abuhassna (2024), AI provides personalized, customized learning assistance that can be tailored to each student's needs and learning style, thereby meeting the demands of a variety of learning speeds and preferences. Artificial intelligence is currently centered around chatbots, which are computer programs that converse with users in natural language and respond accordingly. A famous chatbot named ChatGPT is part of OpenAI's Generative Pre-Trained Transformer (GPT) family and

is highly regarded among users. Using large language models (LLMs) constructed from extensive web corpus data to generate context-appropriate texts that recognize language varieties, genres, and cultural distinctions (Abuhassna, 2024), which make it an effective CALL tool and facilitate its integration into language instruction and learning processes; however, it is being hailed as an educational tool that supports or even replaces teachers' work by monitoring learners' progress, evaluating their performance, and providing self-directed learning (Wang et al., 2023). In reality, however, intelligent educational tools are seldom used consistently, stemming from a lack of practice (Nguyen et al., 2022), AIs' quality and individuals' preferences, and ethical issues (Ray, 2023).

The predominant techno-centric approach in the educational field might be at the root of the problem at the macro level, which emphasizes

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the role of ChatGPT by educational stakeholders while ignoring the agency of the teacher, who can decide whether or not, what, when, and how to implement AI (Luckin et al., 2022; Rahimi, 2023a). In spite of the fact that many teachers are aware of the potential benefits of AI-enhanced education, they may not be prepared to take advantage of these tools at the micro level (Luckin et al., 2022; Vidgor, 2023; Wang et al., 2023). This is especially true in the case of English language teaching, since AI, ChatGPT, and Information and Communications Technologies (ICT) have changed teaching with technology into solving problems with it (Rahimi, 2023b), and for this sake, language teachers need to be ready. However, recent studies have reported that teachers have a high level of attitude toward ChatGPT (Kasneci et al., 2023; Nguyen, 2023). Still, it is not guaranteed that they are ready to apply it to their language class, particularly in practical aspects. Indeed, their ChatGPT readiness for implementation should be at an advanced level, since a high level of attitude and satisfaction will not guarantee its success. The study by Mohamed (2023) found that if language teachers were provided with professional development and exposure to relevant readiness, they were highly likely to use ChatGPT for language learning. Conversely, Kasneci et al. (2023) reported that university instructors were somewhat hesitant to incorporate artificial intelligence in their teaching due to a lack of readiness and ethical concerns. According to Gallindo-Dominguez et al. (2023), among 445 primary teachers, only 25% of them implemented AI and ChatGPT into their classrooms despite overall positive perceptions of integrating it into teaching, which stemmed from a lack of readiness and knowledge to effectively use it to engage learners in activities that were designed by ChatGPT. In light of this, ChatGPT readiness for implementation should, therefore, be advanced since a high level of satisfaction and attitude will not ensure that ICT or AI will be implemented successfully; instead, teachers are reluctant to implement ChatGPT in schools due to a lack of its readiness.

There is also concern and a perceived threat by some teachers that ChatGPT might replace their role in schools. This might lead them to believe that they may lose their jobs or even their power in their classrooms as a result of its integration (Wang et al., 2023). One of the main problems might be that teachers are unaware of the potential uses of ChatGPT to support innovative teaching methods in their classes, owing to a lack of understanding of both its theoretical and practical components.

Additionally, evidence regarding the influence of ChatGPT readiness on teachers' work is limited, and it is necessary to show that teachers' readiness is among the necessary conditions to shape their innovativeness in language teaching, particularly during this era when insatiable appetites for achievement are fostered by both governments and educational systems, pushing teachers to deliver high-quality and high-equity instruction (Sorat & Mohamadi Zenouzagh, 2022; Vidgor, 2023; Wang et al., 2023). Despite this, such achievements are based on the deepest layer of teachers, meaning readiness and innovativeness, to reach such accountabilities. This has yet to be covered, and it is thus recommended by recent studies to address accountabilities in the educational technology era (Sorat & Mohamadi Zenouzagh, 2022; Veronica Santelices & Wilson, 2022; Vidgor, 2023), particularly in CALL. There is even less understanding of how ChatGPT readiness affects teachers' innovativeness in language teaching, which might also mediate their accountabilities. In light of these gaps, the current study will explore the role of language teachers' ChatGPT readiness in shaping their innovativeness and accountabilities in language teaching. Researchers have therefore developed the following research questions to answer in this study.

RQ1: What are the factorial structures of the English language teachers' ChatGPT readiness, teaching innovativeness, and teaching accountabilities in the Iranian EFL context?

RQ2: To what extent can English language teachers' ChatGPT readiness shape their language teaching innovativeness with ChatGPT in the Iranian EFL context?

RQ3: To what extent can English language teachers' teaching innovativeness with ChatGPT shape their language teaching accountabilities in the Iranian EFL context?

RQ4: To what extent can English language teachers' teaching innovativeness mediate the relationship between their ChatGPT readiness and teaching accountabilities in the Iranian EFL context?

RQ5: What are the necessary conditions to meet language teachers' internal and external accountabilities through the combination of their ChatGPT readiness and language teaching innovativeness in the Iranian EFL context?

2. Literature review

2.1. ChatGPT readiness

Researchers have defined readiness in different ways based on the context of their studies. As a clarification, Parasuraman and his colleagues (2022) conceptualized readiness as the tendency of individuals to use technology to accomplish specific goals. Ayanwale et al. (2022) operationalized the concept as the degree to which a teacher feels confident in applying the target AI. A variety of multidimensional aspects of it have been validated and discovered in recent literature pertaining to artificial intelligence in various fields of study such as business, medicine, and well as Science, technology, engineering, and mathematics (STEM; Karaca et al., 2021; Wang et al., 2023). These multidimensional aspects, however, have remained unclear in English language teaching, or CALL, leading researchers to apply them in the current study to advance this field. Accordingly, they operationalized the following components.

- **Cognition:** Language teachers' cognitive readiness, including knowledge about the function of ChatGPT and its importance in language teaching.
- **Ability:** Language teachers' skills in using and adapting ChatGPT according to their language teaching procedure.
- **Vision:** Language teachers' awareness of opportunities and challenges of ChatGPT in language teaching.
- **Ethics:** Language teachers' awareness of legal norms and ethical regulations while using ChatGPT in language teaching.

2.2. Teachers' accountability

Teachers' accountability refers to their responsibility to ensure that teaching is of the highest quality and that the students achieve the goals they should achieve. Rosenblatt (2017) suggested that accountability has two dimensions: an internal one referring to teachers' self-regulation based on ethical guidelines, focusing on acquiring and mastering professional knowledge and ethics; and an external one, which is created by stakeholders, administrators, or pedagogical experts and enables teachers to achieve specific academic goals to respond to formal requirements and demands (e.g., having six students in the top ten percentile for university entrance exams). Due to the fact that teachers use ChatGPT to facilitate teaching procedures as well as to meet both internal and external accountability, understanding the role of ChatGPT readiness in passing such criteria is crucial both pedagogically and practically. For this sake, the researchers applied them as mediator variables in this study.

2.3. Innovativeness

The term innovativeness refers to introducing new ideas, concepts, or methods (Stevenson, 2010), and self-innovation is understood as the process of developing, adopting, or implementing an innovation on one's own (Yuan & Woodman, 2010). Like teachers' accountability and readiness, innovativeness is also cited as having multidimensional factors (Vidgor, 2023; Çoklar & Özbek, 2017). According to De Jong and

Den Hartog (2010), teachers' innovations include four subcomponents: exploration, generation, championing, and implementation. In the present study, exploration refers to the way in which language teachers think about novel ideas to use ChatGPT in their language class; generation means the perception of the capability to formulate a novel idea in language teaching through ChatGPT; championing is the ability to communicate novel ideas to other language teachers and leadership; and implementations is language teachers' perceptions of implementing those ideas in a practical manner in language teaching through ChatGPT. Alongside facilitating the teaching process with ChatGPT, teachers also strive to be innovative in their language classes by applying ChatGPT. This has not been explored yet. For this reason, language teachers' innovativeness is selected as an outcome variable in this study.

2.4. Hypotheses development

Educators who wish to integrate chatbots into their teaching processes must begin by understanding their basic technical functions (Guggemos & Seufert, 2021; Seufert et al., 2021). As a matter of fact, effective AI-based instruction requires technical knowledge to apply it in teaching procedures (Galindo-Domínguez et al., 2023, pp. 1–16). Effective ICT and AI instruction requires technical cognition to apply it to technical implications (Rahimi, 2023b), and technical cognition is regarded as a good indicator of understanding the pedagogical potential of relevant technology (Koehler & Mishra, 2009; Rahimi, 2023b; Schmid et al., 2020). It has also been found that teachers familiar with a particular technology will be aware of its pedagogical advantages (Sahin et al., 2013). A study conducted by Huang et al. (2022) found that teachers who have a high level of knowledge and proficiency regarding chatbots can design their activities for pedagogical purposes, such as providing feedback to students. In a similar manner, teachers may utilize AI-based tools for field-specific purposes as they become more familiar with the technology. Additionally, Wang et al. (2023) found that teachers' understanding of the functional aspects of ChatGPT contributed to their satisfaction with their jobs. A more important question is whether this cognitive readiness will allow them to be innovative language teachers, given the impact it has already had on their attitudes or their job satisfaction. This gap was addressed by developing the following hypotheses.

- H1a: Language teachers' cognition readiness will shape their exploration.
- H1b: Language teachers' cognition readiness will shape their generation.
- H1c: Language teachers' cognition readiness will shape their championing.
- H1d: Language teachers' cognition readiness will shape their implementations.

In the current study, teachers' cognition readiness is a notional concept, whereas their ability is functional. According to recent surveys, by the time AI becomes more complex and their applications much more sophisticated, teachers must be able to simultaneously know how to use them (knowledge-oriented) and how to apply them (action-oriented; Rahimi, 2023b). Said et al.'s (2023) findings suggested that AI knowledge may not only contribute to the successful integration of AI into education. Instead, it may also result in the blindness of individuals, meaning they overestimate its risks. Furthermore, Al Darayseh (2023) noted that teachers' AI readiness depends on their perceptions of its use and ability to incorporate it into their teaching practices. This was supported by recent studies reporting that teachers' ChatGPT readiness, especially the practical aspects of it, helped them to manage the intense experience of being a new teacher, develop lessons and classroom activities, and decline the fear of using it in front of students (Barrot, 2023; Elstad & Eriksen, 2024; Moorhouse, 2024); however, its role in shaping

language teachers' innovativeness and meeting accountabilities has yet to be addressed in the fields of CALL and ELT. This gap and previous findings led the researchers to develop the following hypotheses.

- H2a: Language teachers' ability readiness will shape their exploration.
- H2b: Language teachers' ability readiness will shape their generation.
- H2c: Language teachers' ability readiness will shape their championing.
- H2d: Language teachers' ability readiness will shape their implementations.

Research suggests that educators' attitudes, perceptions, and awareness of both the positive and negative aspects of ChatGPT are critical to successfully integrating it (Farrokhnia et al., 2023; Galindo-Domínguez et al., 2023, pp. 1–16). This awareness should occur prior to embedding the target ICT or AI, since the more they are aware of positive and negative effects, the less they encounter perceived personal behavior during implementation (Fleckenstein et al., 2024; Rahimi, 2023b). In addition, teachers would be able to avoid chaos, bias, and discrimination in their teaching process by being aware of the opportunities and threats associated with ChatGPT (Farrokhnia et al., 2023; Galindo-Domínguez et al., 2023, pp. 1–16), which would result in increased usage and better quality (Kasneci et al., 2023). Additionally, by familiarizing themselves with ChatGPT's weaknesses, threats, and positive aspects, such as understanding the accuracy of the responses they receive, the risks associated with data pollution, knowledge plagiarism, and ethical and safety concerns, it helped them to have a successful teaching procedure (Cooper, 2023; Javaid et al., 2023; Mamo et al., 2024). As of yet, its role in developing the innovativeness of language teachers in teaching language with ChatGPT remains to be explored. To shed more light on the role of this in the literature concerning language teaching, the researchers will develop the following hypotheses to explore its role in shaping teachers' innovativeness.

- H3a: Language teachers' visions readiness will shape their exploration.
- H3b: Language teachers' visions readiness will shape their generation.
- H3c: Language teachers' visions readiness will shape their championing.
- H3d: Language teachers' visions readiness will shape their implementations.

There are many ethical considerations beyond the privacy and bias associated with AI-enhanced educational environments, according to Akgun and Greenhow (2021). The United Nations Educational, Scientific, and Cultural Organization (UNESCO, 2019) has reported six challenges that must be overcome to significantly integrate artificial intelligence into education worldwide, including developing comprehensive public policies, embedding artificial intelligence in education with a view to inclusion and equity, encouraging learners to use AI ethically, designing AI-based educational rubrics, generating data systems that are inclusive and reliable, ensuring the significance of AI in academic research, and ensuring ethical and transparent data collection.

Adams et al. (2023) conducted a content analysis of the "soft documents," revealing 16 ethical concerns reported by the Institute for Ethical AI in Education (2021), the UNESCO (2019, 2021) and the World Economic Forum (2019) all presented their concerns in addition to UNESCO's previous report (2019). According to these organizations, ethical design, pedagogical appropriateness, and teachers' empowerment in designing their courses were among the factors relating to ethical concerns in teaching with AI, particularly ChatGPT. Due to the fact that teachers are the true gatekeepers and learners may look up to them as role models, they should follow ethics in the use of ChatGPT.

Thus, they are required to develop a thorough understanding of legal and ethical issues, which teachers are expected to show to their learners as they might learn it implicitly (Rahimi, 2023a; Rahimi & Mosalli, 2024; Wu et al., 2022). This may also be relevant to their innovation in teaching with ChatGPT. Thus, the following hypotheses were developed by the researchers to figure out this gap.

- H4a: Language teachers' Ethical readiness will shape their exploration.
- H4b: Language teachers' Ethical readiness will shape their generation.
- H4c: Language teachers' Ethical readiness will shape their championing.
- H4d: Language teachers' Ethical readiness will shape their implementations.

The results of previous studies indicated that teachers' innovativeness is directly correlated with their approach to teaching (Suharyati, 2017), work motivation (Çoklar & Özbek, 2017), and attitudes toward integrating technology (Yilmaz & Bayraktar, 2014). Additionally, Vidergor (2023) reported that teachers' innovativeness significantly contributed to their success in passing accountabilities during the previous period of emergency remote teaching; while Lee and Jung (2021) emphasized that teachers' adoption of technology and their innovation were context-specific, meaning that teachers have different thinking, novelties, and perceptions in various settings. To examine this in ChatGPT language teaching, the researchers examined its direct role in how teachers' ChatGPT innovativeness can help them meet their accountabilities. This led to the following hypotheses being developed by the researchers.

- H5: Language teachers' innovative exploration will lead them to pass external (H5a) and internal (H5b) accountability.
- H6: Language teachers' innovative generation will lead them to pass external (H6a) and internal (H6b) accountability.
- H7: Language teachers' innovative championing will lead them to pass external (H7a) and internal (H7b) accountability.
- H8: Language teachers' innovative implementation will lead them to pass external (H8a) and internal (H8b) accountability.

To obtain a deeper understanding of the role of teachers' ChatGPT innovativeness in meeting accountabilities, the researchers investigated whether it served as a mediator or moderator between teachers' ChatGPT readiness and their achievement of accountabilities. As highlighted by recent scholars, exploring the mediation role of the variables can provide greater insight into the research regarding successful or unsuccessful intervention components, program improvement, delayed program effects, unraveling processing changes, and developing theory as well (MacKinnon, 2011; Sarstedt et al., 2020). Consequently, the researchers decided to explore the mediation roles of teachers' teaching innovativeness between their ChatGPT readiness, and teaching accountability. Therefore, we propose the following hypotheses.

- H9: Language teachers' innovative exploration will mediate the relationship between their cognition (H9a), ability (H9b), vision (H9c), ethical readiness (H9d) and external accountability.
- H10: Language teachers' innovative exploration will mediate the relationship between their cognition (H10a), ability (H10b), vision (H10c), ethical readiness (H10d) and internal accountability.
- H11: Language teachers' innovative generation will mediate the relationship between their cognition (H11a), ability (H11b), vision (H11c), ethical readiness (H11d) and external accountability.
- H12: Language teachers' innovative generation will mediate the relationship between their cognition (H12a), ability (H12b), vision (H12c), ethical readiness (H12d) and internal accountability.

- H13: Language teachers' innovative championing will mediate the relationship between their cognition (H13a), ability (H13b), vision (H13c), ethical readiness (H13d) and external accountability.
- H14: Language teachers' innovative championing will mediate the relationship between their cognition (H14a), ability (H14b), vision (H14c), ethical readiness (H14d) and internal accountability.
- H15: Language teachers' innovative implementations will mediate the relationship between their cognition (H15a), ability (H15b), vision (H15c), ethical readiness (H15d) and external accountability.
- H16: Language teachers' innovative implementations will mediate the relationship between their cognition (H16a), ability (H16b), vision (H16c), ethical readiness (H16d) and internal accountability.

3. Methodology

3.1. Study context, and participants

The data for the study was collected from 124 Iranian in-service EFL teachers majoring in English Language Teaching (ELT) and passing their post-graduate levels at the University of Mohaghegh Ardabili and Hashemi Nejad Farhangian University, as well as one private university, the Islamic Azad University of Mashhad. The researchers asked the heads of the English departments for their permission to distribute study questionnaire link to their students. In order to assure that a representative sample would be generalizable, the researchers used simple probability sampling to ensure that each participant had an equal chance of participating in the study. Therefore, the link to the online questionnaire was shared with the heads of the language departments, and a detailed explanation of the purpose of the study is provided in the questionnaire link. An informed consent is provided by the researcher in the instrument description, and the researcher assures them that their personal information will remain anonymous. In this line of research ethic, and data privacy, the researcher did not collect any personal information about the participants, such as their names and surnames. Instead, they collected information about their demographic characteristics. Accordingly, there were 63 females and 61 males in the study population. In terms of age, the most common group was 23–27 years old (79.8%). Among the participants, 102 (82.3%) were master's students, and 22 (17.7%) were Ph.D. candidates. A total of 90 respondents (72.6%) had taught English with ICTs for three to four years, followed by 25 respondents between one and two (20.2), and the remainder had more than three years of experience. Teachers with more than four years of experience comprised the majority of the participants (40.3%), followed by those with one to three years (20.6%) and those with more than seven years (33.1%). A summary of the participant's demographic

Table 1
Participants' demographic information.

		N	%
Gender	Male	61	49.2
	Female	63	50.8
Age	23–27	99	79.8
	27<	25	20.2
Teaching experience	1–4	33	20.6
	5–7	50	40.3
	7<	41	33.1
	1–2	25	20.2
Teaching language with ICT	3–4	90	72.6
	5<	9	7.3
Academic degree	M.A	102	82.3
	PhD	22	17.7

information can be found in Table 1.

3.2. Instrument

The study instrument is attached as an appendix, along with its normality distribution. The scales of each instrument ranged from 1 (strongly disagree) to 7 (strongly agree), and the distribution of the data was normal, as it ranged between -1 and 1 .

3.3. Data analysis

We applied bisymmetric analysis in order to gain a more comprehensive understanding of our findings. We employed structural equation modeling (SEM) with partial least squares (PLS) for the symmetrical part of the study. During the first phase, this approach may be appropriate as it can analyze the data with a limited number of participants (Hair et al., 2021). In addition, it is ideal for theory development due to its predictive characteristics since it uses ordinary least squares (OLS) to minimize error terms and maximize the coefficient of determination (Ringle et al., 2012). Moreover, it processes both reflective and formative indicators simultaneously while being a superior approach to estimating models based on mediation and conditional processes (Sarstedt et al., 2020). It is also noteworthy that the PLS-SEM applies an additive sufficiency logic to identify those factors that should be included in a model to predict the target outcome (Hauff et al., 2024).

As for the asymmetrical part of the study, we applied NCA. NCA is a technique developed by Dul (2016) that estimates the identification of necessary conditions in data sets. As opposed to SEM approaches, and other data analysis techniques such as regression, correlations *t*-test, Analysis of variance (ANOVA), or Multivariate analysis of variance (MANOVA) focusing on the average impact of each variable on the other (Rasoolimanesh et al., 2021), while asymmetrical approaches identify the various combinations of independent variables that are responsible for generating outcomes (Richter et al., 2020) which generate a result from another perspective. As opposed to PLS-SEM, which follows fuzzy logic and predicts the target outcome based on the should-have factors, NCA uses the necessary logic and explores the target outcome in consideration of the must-have factors that must be present to achieve the target outcome (Dul, 2016). The incorporation of both approaches is likely to allow us to gain a deeper and more nuanced understanding of how variables are causally related to each other and to predict outcomes more accurately from both perspectives, which have been recommended by statistical figureheads (Hauff et al., 2024; Richter et al., 2022), and cannot be done by qualitative, or mixed-method design, particularly exploring the necessary conditions to predict the target outcome. Accordingly, the PLS (4.0) analysis was utilized for both phases to analyze the study data.

4. Results

4.1. Symmetrical analysis

4.1.1. Measurement phase

The researchers calculated the validity and reliability of the latent variables during the PLS-SEM measurement phase. Reliability was determined by Cronbach's alpha and composite reliability. The survey's validity was also evaluated through convergent and discriminant validity. A reliability cutoff value of 0.7 and a validity cutoff value of 0.5 were recommended by Hair et al. (2021). Table 2 shows that all latent variables exceeded the reliability and validity cut-offs.

To ensure discriminant validity, Fornell and Larcker's (1981) criteria were applied. All AVE roots must be higher than those of other constructs, and they must also be greater than 0. Table 3 shows that all variables were discriminately valid. As a result, the first research question has been addressed, and language teachers' ChatGPT readiness, teaching innovativeness, and teaching accountability have been

Table 2

The reliability and validity of the constructs.

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
AB	0.895	0.898	0.934	0.826
CH	0.830	0.832	0.898	0.747
CO	0.899	0.939	0.936	0.829
ET	0.709	0.811	0.840	0.648
EX	0.768	0.773	0.868	0.688
EXT	0.845	0.866	0.909	0.772
GE	0.818	0.818	0.892	0.733
IMP	0.769	0.768	0.867	0.684
INT	0.829	0.833	0.898	0.746
VI	0.854	0.862	0.912	0.775

validated in the Iranian context as part of the research. We must note, however, that the validity of the questionnaire can be compromised by some factors, such as speeding bias, which occurs when participants quickly respond to the study instrument; social desirability bias, which is the desire of respondents to answer a survey question in a manner they perceive as moral or socially acceptable; or dissent bias, which occurs when respondents answer negative survey questions.

4.2. Structural model

As a first step in the structural model, multicollinearity was measured by the variance inflation factor (VIF); consequently, there is no problem of collinearity between the independent variables of the model since all of them were below 5 (Hair et al., 2021). As the second metric, the researchers examined study hypotheses based on their path coefficients, *t*-values, and *p*-values. In this regard they applied 5000 bootstrap sample analysis, to find out what teachers' ChatGPT readiness factors predicted their language teaching innovativeness. According to structural modeling results, teachers' cognition readiness predicted their implementation H1d ($\beta = 0.184$), the ability readiness predicted their generation H2b ($\beta = 0.187$), championing H2c ($\beta = 0.231$), and implementation H2d ($\beta = 0.207$), respectively. Furthermore, their vision readiness significantly predicted their exploration H3a ($\beta = 0.439$), generation H3b ($\beta = 0.272$), championing H3c ($\beta = 0.334$), and implementation H3d ($\beta = 0.296$), and as a last factor of ChatGPT readiness, their ethical readiness significantly predicted their exploration H4a ($\beta = 0.201$), generation H4b ($\beta = 0.345$), championing H4c ($\beta = 0.226$), and implementation H4d ($\beta = 0.314$), in this way, the second research question was answered.

Moreover, among the teachers' teaching innovativeness, only generation predicted their internal accountability H6b ($\beta = 0.746$) and implementation predicted their external accountability H7a ($\beta = 0.308$), while the rest failed to predict the study hypotheses because their *t*-value was below 1.96, or their *p*-value exceeded 0.05. These findings address the third research question. Table 4 summarizes the result of bootstrap analysis.

Moreover, the direct bootstrap analysis with high confidence intervals (97.5% CI) showed that teachers' external accountability is predicted by ability readiness (AB > EXT; CI [0.077, 0.272]), ethical readiness (ET > EXT; CI [0.124, 0.342]), and vision readiness (VI > EXT; CI [0.154, 0.378]). At the same time, their internal accountability is only shaped by ethical readiness (ET > INT; CI [0.020, 0.253]). Table 5 displays the bootstrap direct analysis.

Furthermore, to explore the mediation role of teachers' innovativeness between their ChatGPT readiness and accountabilities, the researchers applied mediation analysis. Accordingly, the result showed that generation significantly mediated the correlation between teachers' Ethical readiness (ET- > GE- > INT; CI [0.110, 0.440]) and vision readiness (VI- > GE- > INT; CI [0.082, 0.349]), with internal accountability, as well as vision readiness with external accountability (VI- > GE- > EXT; CI [0.004, 0.142]). Likewise, championing also mediated

Table 3

Result of the discriminant validity.

	AB	CH	CO	ET	EX	EXT	GE	IMP	INT	VI
AB	0.909									
CH	0.392	0.864								
CO	0.328	0.219	0.910							
ET	0.480	0.474	0.360	0.805						
EX	0.323	0.445	0.218	0.460	0.830					
EXT	0.517	0.567	0.402	0.593	0.456	0.878				
GE	0.419	0.510	0.308	0.572	0.450	0.548	0.856			
IMP	0.467	0.539	0.427	0.604	0.496	0.576	0.791	0.827		
INT	0.025	0.111	0.155	0.098	0.136	0.106	0.474	0.261	0.864	
VI	0.165	0.465	0.209	0.420	0.549	0.398	0.462	0.500	0.161	0.881

Table 4

Result of the bootstrap.

	Path	β	Sample mean (M)	VIF	t-value	P-values
H1a	CO- > EX	0.004	0.008	1.99	0.052	0.959
H1b	CO- > GE	0.066	0.066	1.99	0.917	0.359
H1c	CO- > CH	-0.008	-0.005	1.99	0.093	0.926
H1d	CO- > IMP	0.184	0.185	1.99	2.517	0.012
H2a	AB- > EX	0.153	0.155	1.35	1.920	0.055
H2b	AB- > GE	0.187	0.188	1.35	2.802	0.005
H2c	AB- > CH	0.231	0.233	1.35	2.691	0.007
H2d	AB- > IMP	0.207	0.209	1.35	2.993	0.003
H3a	VI- > EX	0.439	0.437	1.22	5.691	0.000
H3b	VI- > GE	0.272	0.271	1.22	4.011	0.000
H3c	VI- > CH	0.334	0.335	1.22	3.634	0.000
H3d	VI- > IMP	0.296	0.296	1.22	4.145	0.000
H4a	ET- > EX	0.201	0.203	1.60	2.293	0.022
H4b	ET- > GE	0.345	0.347	1.60	3.734	0.000
H4c	ET- > CH	0.226	0.229	1.60	2.129	0.033
H4d	ET- > IMP	0.314	0.314	1.60	3.889	0.000
H5a	EX- > EXT	0.141	0.138	1.42	1.635	0.102
H5b	EX- > INT	-0.019	-0.023	1.42	0.193	0.847
H6a	GE- > EXT	0.155	0.158	2.75	1.372	0.170
H6b	GE- > INT	0.746	0.751	2.75	4.916	0.000
H7a	CH- > EXT	0.308	0.313	1.52	2.388	0.017
H7b	CH- > INT	-0.124	-0.128	1.52	1.524	0.127
H8a	IMP- > EXT	0.218	0.214	2.97	1.679	0.093
H8b	IMP- > INT	-0.253	-0.252	2.97	1.533	0.125

Table 5

The bootstrap direct analysis.

	β	2.5%	97.5%	t-value	P-values
AB- > EXT	0.167	0.077	0.272	3.391	0.001
AB- > INT	0.056	-0.037	0.142	1.237	0.229
CO- > EXT	0.048	-0.056	0.153	0.910	0.514
CO- > INT	0.003	-0.081	0.107	0.071	0.955
ET- > EXT	0.220	0.124	0.342	3.951	0.000
ET- > INT	0.146	0.020	0.253	2.476	0.002
VI- > EXT	0.271	0.154	0.378	4.768	0.000
VI- > INT	0.079	-0.027	0.190	1.449	0.127

between teachers' vision, and their external accountability (VI- > CH- > EXT; CI [0.193; 2.362]). Accordingly, the last research question, which highlighted the mediation role of language teachers' teaching innovativeness between their ChatGPT readiness and their accountability, was answered, and its results are shown in Table 6.

The coefficient of determination (R^2) is applied by researchers to evaluate the predictive power of the model. According to Hair et al. (2021), the model is weak, moderate, and strong at 0.19, 0.37, and 0.677. We obtained sufficient coefficients of determination for CH (0.35), EX (0.38), EXT (0.44), GE (0.42), IMP (0.51), and INT (0.27). To estimate the accuracy of the adjusted model, Stone-Geisser's (Q^2) value was used. Table 8 shows that the model is accurate in prediction as Q^2 exceeds 0 (Hair et al., 2021).

The model fit indices were evaluated simultaneously using two metrics, Standardized Root Mean Square Residuals (SRMR, Henseler et al., 2016), and Goodness of Fit (GOF, Tenenhaus et al., 2004). Hair et al. (2014) set the cut-offs for GOF to 0.1, 0.25, and 0.36, respectively, as small, medium, and strong. SRMR is considered good if its value is 0.08, according to Hair et al. (2021) which was the case in our study. Table 7 and Fig. 1 present the structural model and relative values.

4.3. Asymmetrical analysis

Unlike symmetrical approaches, asymmetrical approaches rely on normality. A normal distribution was calculated for the scores of the latent variables. Appendix 2 shows latent variable scores were distributed normally between -1 and 1.

Researchers used a ceiling-envelope-free disposal hull (CE-FDH) to report NCA results since it is 100% accurate, unlike a ceiling regression-free disposal hull (CR-FDH), which is less accurate per definition than a ceiling regression-free disposal hull (Richter et al., 2020). Cognition, vision readiness, and implementation innovativeness are among the necessary conditions for internal accountability based on CE-FDH results that have p-values below 0.05. Moreover, the necessity effect size of all of them was medium, following Dull's (2016) report that the d value $0 < d < 0.1$ can be considered a small effect, $0.1 \leq d < 0.3$ as a medium effect, $0.3 \leq d < 0.5$ as a large effect, and $d \geq 0.5$ as a very large effect. Table 8, and Figs. 2–5 display the NCA charts for each variable.

In addition, the bottleneck identified seven conditions to facilitate language teachers' internal accountability through integrating ChatGPT readiness and innovativeness. For clarification, in order to achieve a 70% level of internal accountability, seven conditions need to be in place. For this sake, ability readiness and vision readiness should be no less than 24% and 32%, as well as implementation and generation innovativeness should be no less than 31% and 51%. Table 9 shows the following conditions.

Based on the CE-FDH, championing, cognition, and vision were not among the necessary conditions and contributed to teachers passing their external accountability through as they were not significant, while the reminder factors were significant and had a moderate effect on it. Table 10 and Figs. 6–10 show the NCA result for external accountability.

The bottleneck revealed ten conditions that language teachers must fulfill to pass internal accountability by integrating ChatGPT readiness and language teaching innovation. For clarification to achieve a 70% level of external accountability, five conditions must be met. It requires ability and readiness to be at least 11% and 32%, and exploration, implementation, and generation of innovativeness to be at least 15%, 27%, and 31%. To meet the 80% level of external accountability, all the factors should be presented simultaneously, where teachers' ChatGPT readiness, including their ability, cognition, vision, and ethical readiness, should be at least 95%, 7%, 8%, and 34%, respectively. Moreover, their innovativeness, comprising generation, exploration, implementation, and championing, should be at least 42%, 15%, 31%, and 73%, respectively. Table 11 shows the following conditions.

Table 6
Result of the mediation analysis.

Hypotheses	Paths	β	2.5%	97.5%	t-value	P-value
H9a	CO- > EX- > EXT	0.001	-0.023	0.031	0.044	0.965
H9b	AB- > EX- > EXT	0.022	-0.006	0.067	1.120	0.263
H9c	VI- > EX- > EXT	0.062	-0.015	0.132	1.669	0.095
H9d	ET- > EX- > EXT	0.028	-0.005	0.087	1.174	0.240
H10a	CO- > EX- > INT	0.000	-0.012	0.022	0.010	0.992
H10b	AB- > EX- > INT	-0.003	-0.045	0.028	0.162	0.871
H10c	VI- > EX- > INT	-0.008	-0.092	0.078	0.191	0.848
H10d	ET- > EX- > INT	-0.004	-0.054	0.034	0.174	0.862
H11a	CO- > GE- > EXT	0.010	-0.018	0.046	0.660	0.509
H11b	AB- > GE- > EXT	0.029	-0.013	0.082	1.204	0.229
H11c	VI- > GE- > EXT	0.042	-0.015	0.119	1.235	0.217
H11d	ET- > GE- > EXT	0.053	-0.019	0.166	1.127	0.260
H12a	CO- > GE- > INT	0.049	-0.052	0.175	0.858	0.391
H12b	AB- > GE- > INT	0.139	0.036	0.263	2.390	0.017
H12c	VI- > GE- > INT	0.203	0.082	0.349	2.963	0.003
H12d	ET- > GE- > INT	0.257	0.110	0.440	3.088	0.002
H13a	CO- > CH- > EXT	-0.003	-0.064	0.058	0.086	0.932
H13b	AB- > CH- > EXT	0.071	0.008	0.181	1.561	0.119
H13c	VI- > CH- > EXT	0.103	0.024	0.193	2.362	0.018
H13d	ET- > CH- > EXT	0.070	0.001	0.203	1.309	0.191
H14a	CO- > CH- > INT	0.001	-0.029	0.029	0.077	0.938
H14b	AB- > CH- > INT	-0.029	-0.082	0.008	1.272	0.203
H14c	VI- > CH- > INT	-0.042	-0.107	0.010	1.396	0.163
H14d	ET- > CH- > INT	-0.028	-0.099	0.007	1.046	0.296
H15a	CO- > IMP- > EXT	0.040	-0.004	0.122	1.222	0.222
H15b	AB- > IMP- > EXT	0.045	-0.005	0.120	1.373	0.170
H15c	VI- > IMP- > EXT	0.065	-0.010	0.155	1.531	0.126
H15d	ET- > IMP- > EXT	0.069	-0.010	0.169	1.494	0.135
H16a	CO- > IMP- > INT	-0.046	-0.117	0.017	1.383	0.167
H16b	AB- > IMP- > INT	-0.052	-0.146	0.014	1.283	0.199
H16c	VI- > IMP- > INT	-0.075	-0.180	0.024	1.446	0.148
H16d	ET- > IMP- > INT	-0.080	-0.216	0.022	1.311	0.190

Asymmetric and symmetric results led to several scenarios for internal and external accountability. Regarding internal accountability, some variables, such as ability readiness and exploration, as well as championing, were neither necessary nor further levels of them led teachers to pass internal accountability. Moreover, some variables, such as vision readability and cognition, were necessary for teachers to pass internal accountability while using ChatGPT. It was not escalated to a

Table 7
The model predictive power, accuracy, and fit indices.

Variables	Q^2	R^2
CH	0.239	0.351
EX	0.244	0.383
EXT	0.330	0.449
GE	0.298	0.421
IMP	0.333	0.513
INT	0.181	0.272
SRMR = 0.064		
$GOF = \sqrt{\text{Communalities} \times R^2} = \sqrt{0.862 \times 0.398} = 0.585$		

Table 8
The NCA result of Internal accountability.

	d value	95.0%	Permutation p value
Ability	0.198	0.218	0.096
Championing	0.222	0.234	0.084
Cognition	0.239	0.203	0.009
Ethics	0.089	0.158	0.434
Generation	0.281	0.178	0.000
Implementations	0.255	0.182	0.000
Vision	0.209	0.131	0.000

subsequent level, however.

Accordingly, the first part of the fourth research question was addressed by the researchers, showing the necessary factors that enabled them to meet their internal accountability, which shows in [Table 12](#).

Three scenarios were identified for external accountability. To begin with, some variables, such as cognition and vision readiness, weren't necessary or helpful to teachers in passing external accountability assessments. The leveling up of some variables, such as ability readiness and ethical considerations, also increased teachers' chances of passing external readability. In addition, some variables, such as exploration and generation, were necessary to lead teachers to pass their external accountability, but extending it to a higher level did not result in any improvement. Consequently, the second part of the fourth research question was addressed by the researchers, revealing the factors necessary to enable language teachers to meet their external accountability. [Table 13](#) provides detailed information regarding external accountability scenarios.

5. Discussion

5.1. The factorial structure of ChatGPT readiness, language teaching innovativeness, and accountability

In the first phase of the symmetrical data analysis, referred to as the formative phase, the factorial structure of three instruments—ChatGPT readiness, teachers' innovativeness, and accountabilities—was validated in the Iranian EFL context. Besides the recent surveys validating AI readiness within the medical environment (Karaca et al., 2022) and marketing (Shaikh et al., 2023), we also validated ChatGPT readiness within the context of English language teaching. The innovativeness and accountability of teachers had already been validated during emergency remote education in Israel (Vidergor, 2023) and in Turkish online education (Ucus & Acar, 2018), and we extended their validation to the Iranian EFL context and AI.

5.2. Language teachers' ChatGPT readiness, and their innovativeness

As a result of the formative model, unexpectedly, we found that language teachers' cognition readiness was only predictive of implementation ($\beta = 0.184$) and unrelated to other innovativeness constructs. It follows that language teachers are more likely to be able to implement their language teaching novelties through ChatGPT in their classrooms if

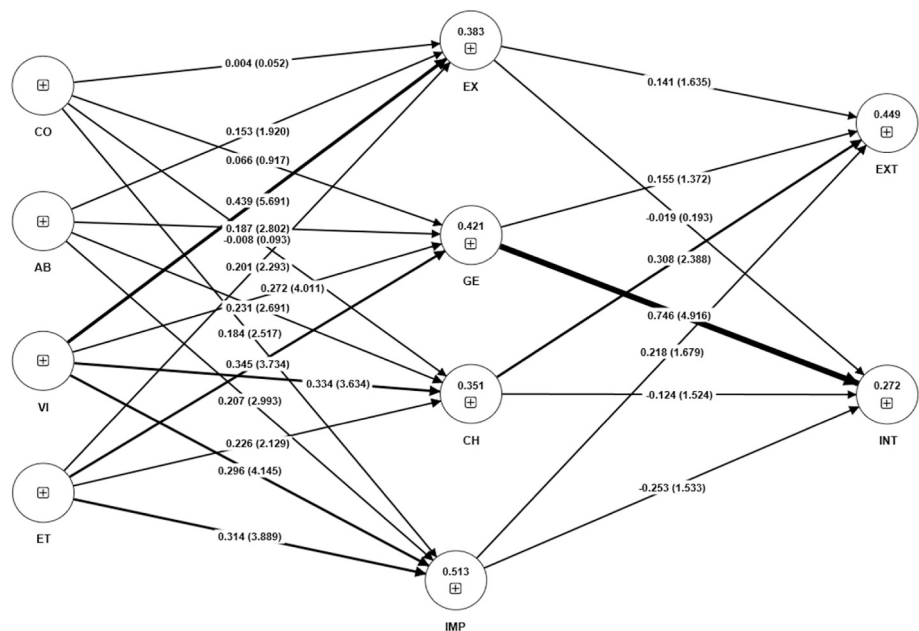


Fig. 1. Study model with relative value.

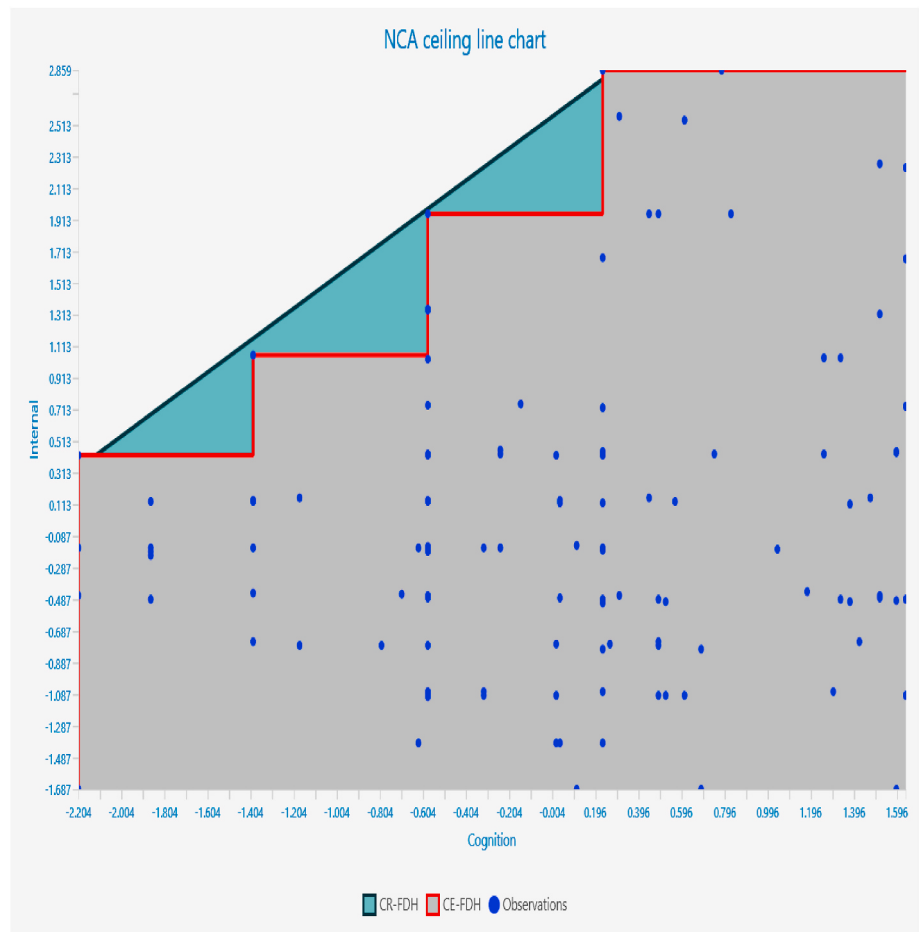


Fig. 2. The NCA of Cognition.

they have a higher level of cognition readiness and notional knowledge about its functioning. Teachers' confidence may be related to this, as described by [Ayanwale et al. \(2022\)](#). In their study, teachers' confidence

was a predictor of whether they accepted it as a tool for integrating AI into school procedures because, when they are cognitively ready for the application, they are more likely to be confident in their ability to

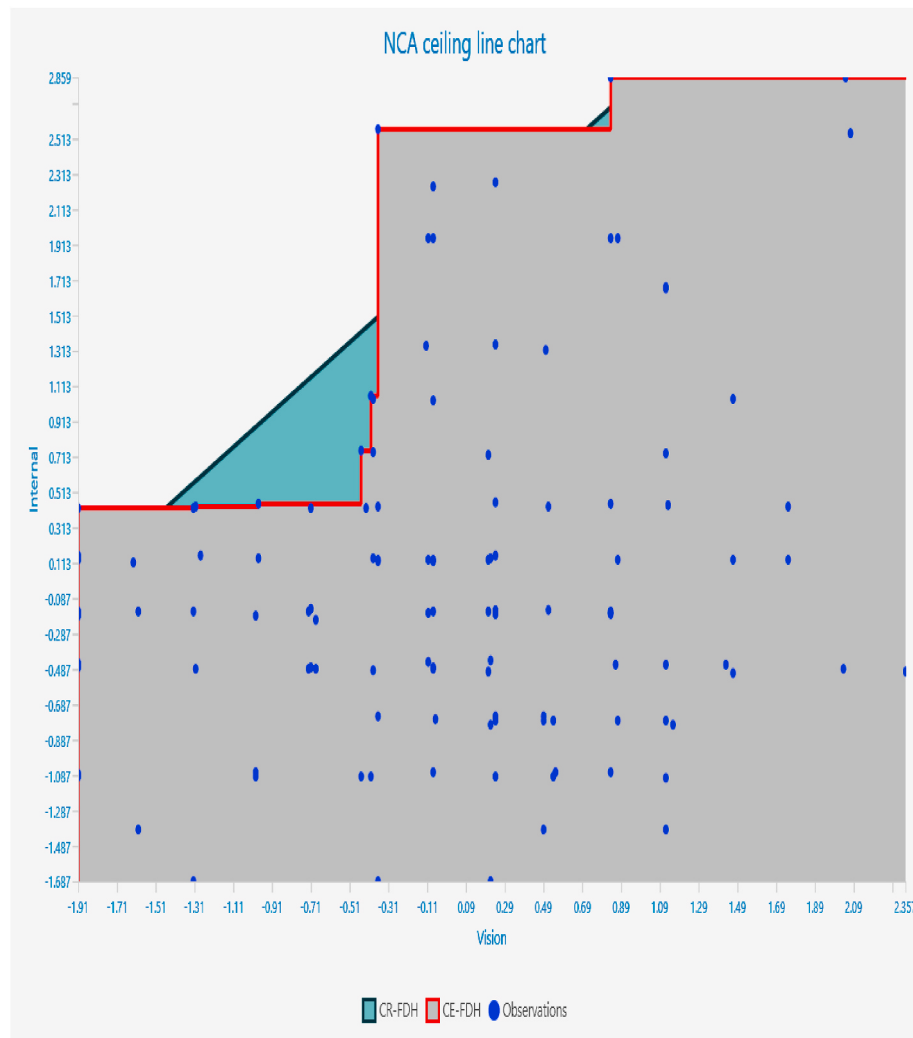


Fig. 3. The NCA of vision.

implement it as well. This also coincides with Russell's (2021) observations that teachers with limited knowledge of AI in education may make insensitive decisions about whether and how AI will influence education, either overstating or understating its significance. Furthermore, the results support previous findings, which concluded that technical cognition in target ICT is an effective indicator of the potential pedagogical value of it (Koehler & Mishra, 2009; Rahimi, 2023b; Schmid et al., 2020). A further benefit of this finding is that it provides more insight into the literature since prior studies have already shown how teachers' satisfaction (Huang et al., 2022) and attitudes (Wang et al., 2023) contributed to their decision to implement ChatGPT into their classrooms, and we have now taken another step forward by demonstrating that teachers' ChatGPT conceptual knowledge readiness was the predictor of the implementation of their teaching novelties through ChatGPT, which

As mentioned earlier, ability is the functional side of ChatGPT readiness. Unlike the notional side of teachers' readiness, the functional side significantly predicted all innovativeness factors except exploration. In particular, it had a higher shared variance with teachers' championing. Therefore, having had a high level of practical and functional readiness to work with ChatGPT, language teachers were able to generate and formulate novel ideas, share them with their coworkers, and put them into practice through it. Due to their ability and comprehensive functional knowledge, they might be able to seek out assistance concerning when, where, and how to generate ideas,

formulate informed pedagogical strategies, and improve their teaching practice by using ChatGPT to apply this innovativeness (Nazaretsky et al., 2022; Wang et al., 2023). This finding might address the issue of "blindness of individuals," which was raised by Said et al. (2023). Having a greater amount of notional knowledge might overestimate subjective feelings due to the fact that notional knowledge is not sufficient to ensure the successful implementation of AI in education. We found that ChatGPT's practical readiness was significantly more important than its theoretical readiness, which was unexpected. Since the practical readiness of chat GPT can not only simultaneously increase a teacher's practical, but it also increases a teacher's theoretical knowledge about it as they can achieve both through trial and error.

Another important aspect of teachers' ChatGPT readiness is their vision, which was already predicted in all of their innovativeness components. This means that the more they are aware of the positive and negative aspects of ChatGPT, the higher their level of development of novel ideas, sharing them with their co-workers, and implementing them so as to apply those ideas in their language teaching practice. Kasneci et al.'s (2023) observation supports this finding, as they reported that teachers who perceive intense threats from ChatGPT are less likely to engage in innovative activities, including risk-taking and experimenting with uncertainty associated with AI-assisted pedagogy. In recent years, studies have shown that being aware of the benefits and threats of ChatGPT can prevent chaos, bias, and discrimination (Farrokhnia et al., 2023) and reduce the difficulty of applying ChatGPT to

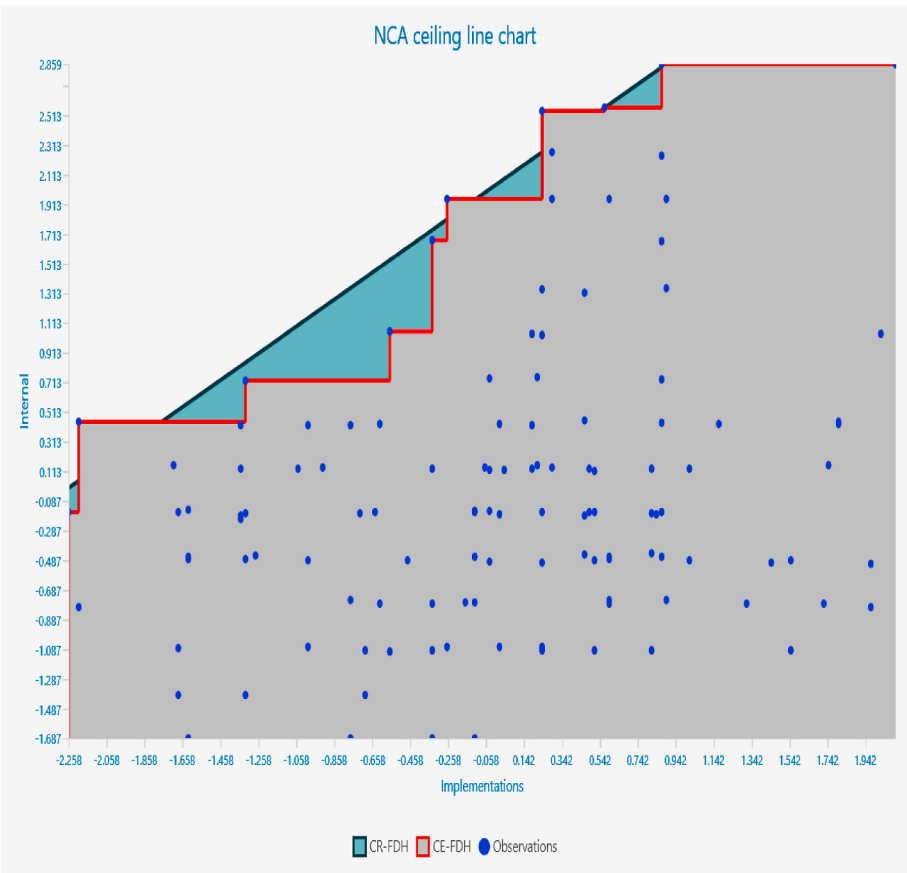


Fig. 4. The NCA of *Implementation*.

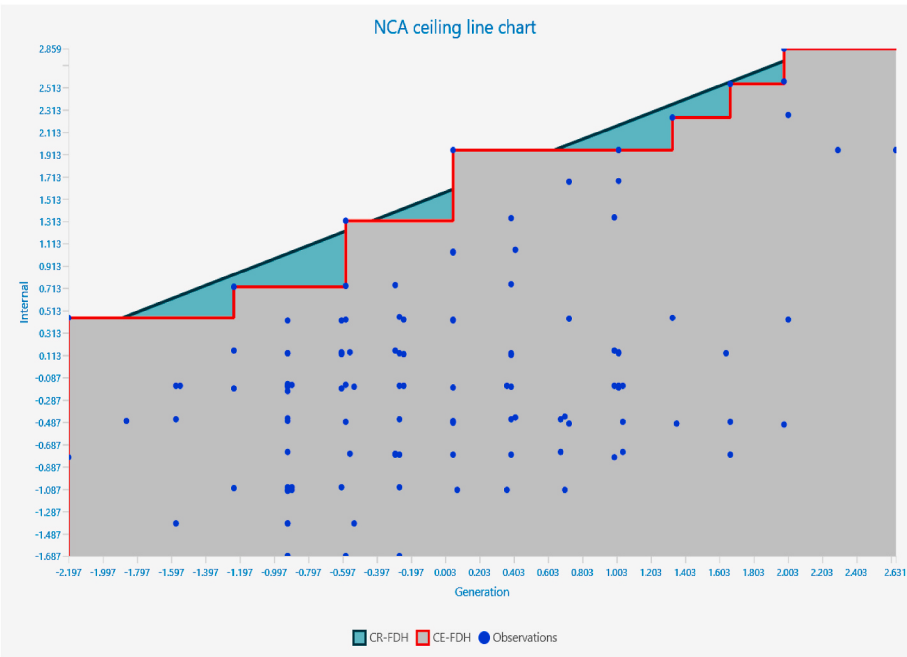


Fig. 5. The NCA of *Generation*.

teaching practices (Cooper, 2023; Javaid et al., 2023; Luckin et al., 2022; Mamo et al., 2024). Nevertheless, the current finding suggests that it also shapes language teachers’ innovativeness in language teaching.

Similar to vision readiness and ability, ethical readiness also pre-

dicted language teachers’ exploration ($\beta = 0.201$), generation ($\beta = 0.345$), championing ($\beta = 0.226$), and implementations ($\beta = 0.314$). Therefore, the more in-depth knowledge they possess about legal norms and ethical regulations prior to using ChatGPT, the more likely they will

Table 9

The bottleneck of the internal accountability.

	Internal	Ability	Championing	Cognition	Ethics	Generation	Implementations	Vision
0.000%	-1.687	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10.000%	-1.233	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20.000%	-0.778	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30.000%	-0.323	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40.000%	0.131	0.000	0.000	0.000	3.226	0.000	0.806	0.000
50.000%	0.586	2.419	8.065	7.258	5.645	5.645	12.903	25.000
60.000%	1.040	2.419	8.065	7.258	5.645	35.484	29.032	27.419
70.000%	1.495	24.194	20.968	18.548	5.645	51.613	31.452	32.258
80.000%	1.950	38.710	41.129	51.613	5.645	88.710	53.226	32.258
90.000%	2.404	38.710	41.129	51.613	5.645	91.935	53.226	32.258
100.000%	2.859	38.710	41.129	51.613	21.774	93.548	79.032	73.387

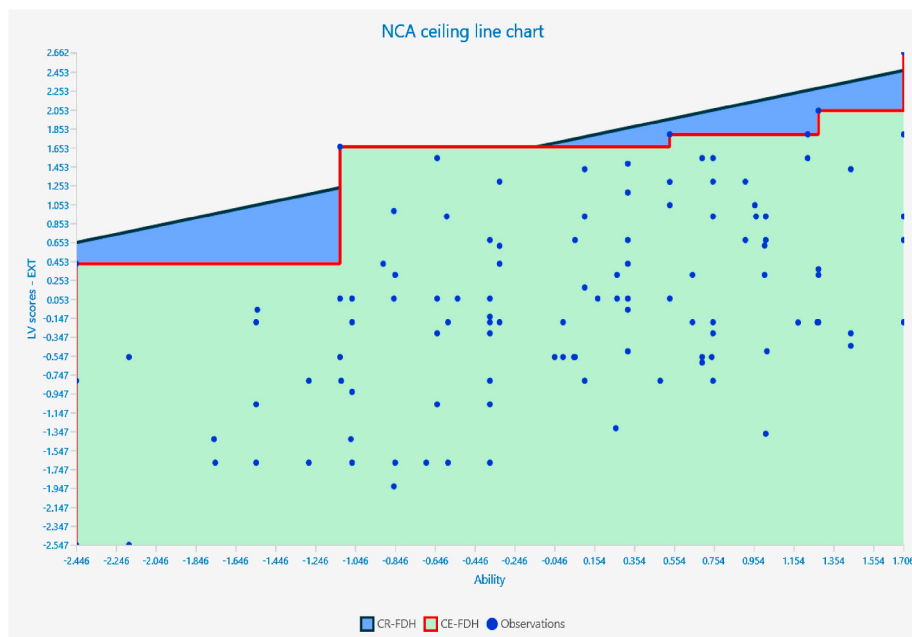
Table 10

The NCA result of external accountability.

Variables	d value	95.0%	Permutation p value
Ability	0.256	0.205	0.001
Championing	0.182	0.213	0.190
Cognition	0.184	0.196	0.083
Ethics	0.209	0.167	0.002
Exploration	0.235	0.179	0.001
Generation	0.207	0.178	0.008
Implementations	0.232	0.185	0.000
Vision	0.122	0.143	0.151

be to come up with innovative ideas for language teaching. Additionally, it culminated in coworkers sharing these ethics with each other and adhering to them while using ChatGPT to apply those novelties in the language class. In addition, this study highlights that ethical readiness plays a significant role before applying ChatGPT to teaching procedures and empowering teachers to design their courses through AI, which may provide a solution to recent concerns addressed by UNESCO (2019; 2021), IEAIED (2021), and the [World Economic Forum \(2019\)](#). It is important to note that, if ethical readiness serves as a prerequisite for generating novelty and implementing it through AI by teachers, they may also serve as role models for their students. This is in line with [Rahimi's \(2023a\)](#) finding that teachers who follow ethical norms while using ICT and AI explicitly teach these morals to their students.

With regard to the role of language teachers' ChatGPT innovativeness in helping them to pass their accountabilities, the result of the PLS-SEM showed that exploration innovation did not contribute to shaping teachers' accountabilities. However, the NCA analysis showed that it was only among the necessary conditions for teachers to pass their external accountabilities. Accordingly, innovative exploration was necessary for language teachers to reach their external accountabilities. However, a higher level of it could not increase their chance of passing it. The cause of this result may lie at both the macro and micro levels. In light of the development of AI and ICT, stakeholders, pedagogical experts, and executive managers have been urged by several organizations, such as Assessment and Teaching of Twenty-First Century Skills (ATC21S), the Organization for Economic Co-operation and Development (OECD), the European Union (EU), the Computer Science Teachers Association (CSTA), the International Society for Technology in Education (ISTE), and the International Association for the Evaluation of Educational Achievement (IEA), to update their metrics in education and develop learners' new skills and competences. These include 21st-century digital competence, 21st-century digital skills, and computational thinking skills through ICT, as well as AI ([Guggemos, 2021](#); [Rahimi, 2023a](#); [Rahimi & Mosalli, 2024](#); [Wu et al., 2022](#)). For that reason, language teaching stakeholders are starting to align with metamodernism ([Kilicoglu & Kilicoglu, 2019](#)), thus altering the way languages are taught with ICT or AI, namely taking a step towards problem-solving approaches to language teaching ([Rahimi, 2023a](#)) on

**Fig. 6.** The NCA of ability readiness for external accountability.

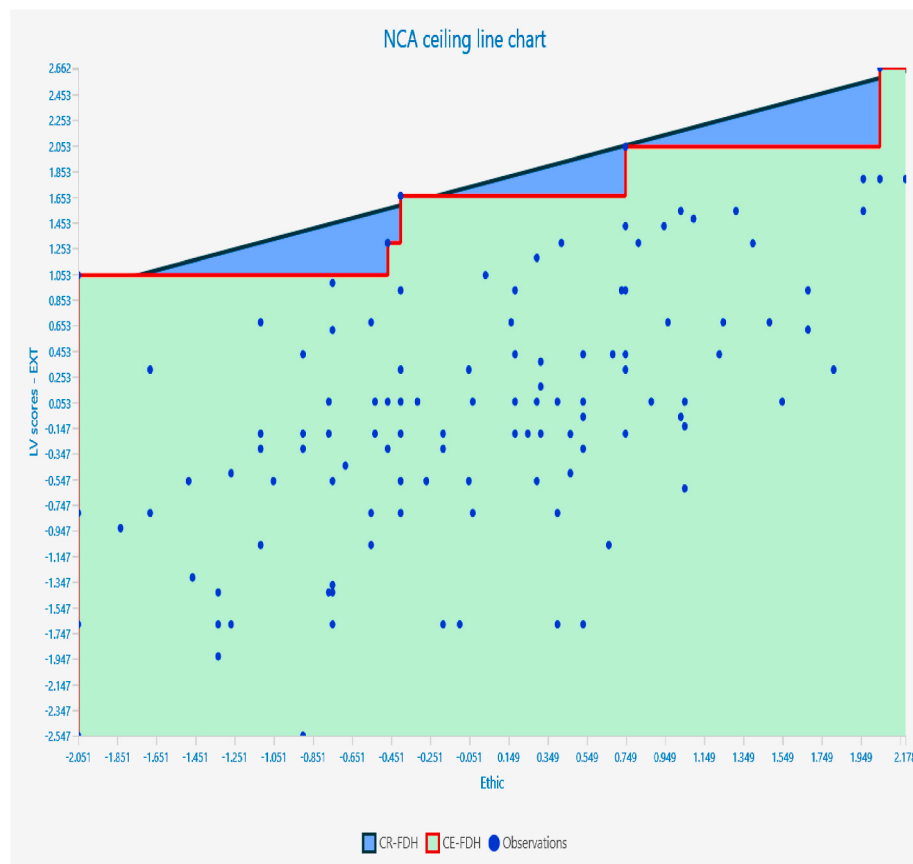


Fig. 7. The NCA of ethical readiness for external accountability.

the micro level. Accordingly, language teachers should at least investigate and generate novel ideas in their classrooms through artificial intelligence to fulfill such criteria, which are merely related to external criteria.

Moreover, generation only predicted external accountability ($\beta = 155$). However, it was among the necessary conditions for both internal and external accountabilities governed by the NCA. In addition, their implementation could neither predict external nor internal accountability, yet it is among the necessary factors for teachers to pass such metrics. This indicates that teachers had a good level of perception in generating ideas for language teaching using ChatGPT, but when implementing their innovations through ChatGPT, they failed to do so. Political concerns and infrastructure constraints may cause this issue as some AI-based tools, particularly ChatGPT, do not support Iranian telephone numbers. The economic sanctions prevented some of these AI tools from being available in the study context (Rahimi & Atefi Boroujeni, 2022). To overcome this constraint, teachers often utilized virtual private networks (VPNs) in order to be able to use such tools.

Moreover, the teachers' championing innovativeness of ChatGPT only predicted their external accountability ($\beta = 0.308$) and failed to predict the external one. However, the NCA analysis showed that it was not among the necessary conditions to lead teachers to pass their accountabilities. Thus, sharing and communicating novel ideas about teaching language with ChatGPT with co-workers and leaders was unnecessary to assist teachers in meeting their external and internal accountability. It is possible, however, that a further level, particularly the external accountability, would increase their chances of passing them. A number of recent studies have demonstrated the crucial role played by network bandwidth and connections between teachers in their work context to escalate their teaching with technology (Rahimi, 2023b; Rahimi & Mosalli, 2024; Wu et al., 2022). With this finding, the literature now includes their role in shaping their teaching innovativeness via

ChatGPT and passing stakeholders' external metrics through it.

Before discussing the mediator role of teachers' innovativeness between their ChatGPT readiness and accountabilities, the researchers outline the direct relationship between teachers' ChatGPT readiness and their responsibilities. Thus, the direct bootstrap analysis determined that ability readiness predicted teachers' external accountability but not their internal accountability. The asymmetrical results of the study also support this conclusion, as ability readiness is one of the necessary conditions to facilitate teachers passing the metrics developed by stakeholders, and a higher level of it increases their chances of passing such metrics. Furthermore, teachers' ethical readiness directly contributed to their ability to meet their internal and external accountability requirements. Moreover, ethical readiness is only necessary for teachers to pass external accountability, just as ability readiness is not necessary for internal accountability. It is also noteworthy that vision readiness only predicted teachers' external readiness. However, unlike previous findings of direct bootstrapping analyses, it was among the necessary conditions for teachers to pass their internal accountability, although a further level of it would not have increased their chances, as illustrated by the NCA.

Based on indirect bootstrap analysis, teachers' generation and championing positively mediated the correlation between their ChatGPT readiness and accountabilities. The mediator variables flipped some correlations as well. As a clarification, ability readiness significantly contributed to teachers meeting their external accountability in direct bootstrap analysis, while mediators reversed this significant direction to a non-significant one in indirect bootstrap analysis. A similar effect was also observed by generation between internal accountability and vision readiness, since in direct bootstrapping analysis, both factors did not show a correlation. Consequently, Simpson's paradox (Pavlidis & Perlman, 2009) occurred. More importantly, suppression is also seen between the paths AB- > GE- > INT and ET- > GE- > INT, where the

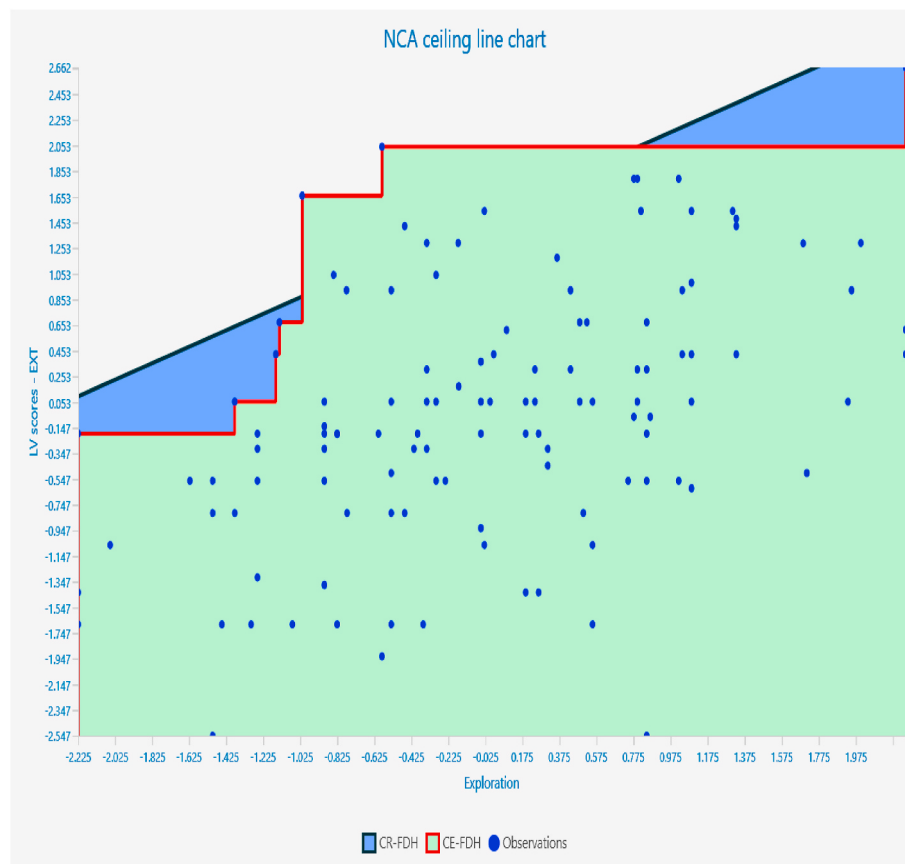


Fig. 8. The NCA of exploration for external accountability.

mediator significantly increases the path coefficient compared with the direct analysis between $AB- > INT$ and $ET- > INT$. Similarly, complementary mediation (Hair et al., 2021) is also observed in $VI- > CH- > EXT$ since both direct and indirect analyses were positive and significant. Consequently, generation and championing served as mediator variables because they explained the process without affecting its direction (MacKinnon, 2011).

Furthermore, full mediation is also observed by GE in $VI- > GE- > INT$, as the indirect effect was observed in the study while there was a lack of any direct effect between $VI- > INT$. However, generation, exploration, championing, and implementation acted as “direct-only non-mediators” (Hair et al., 2021) in $(AB > EX > EXT; VI > EX > EXT)$, $(AB- > GE > EXT)$, $(ET > GE > EXT)$, $(AB > CH > EXT)$, and $(AB > IMP > EXT)$, meaning that the direct effect was significant while the indirect effect not, accordingly generation, exploration, championing, and implementation served as moderators rather than mediators because they shifted the direction of and strength between variables (MacKinnon, 2011).

6. Concluding remarks

6.1. Theoretical contribution

It is important to emphasize that the study results contribute to the existing literature in CALL, teacher education, educational technology, and applied linguistics. First of all, this is one of the first studies in the field of CALL to investigate the role of language teachers' ChatGPT readiness in shaping their innovativeness as well as their accountability in language teaching. Furthermore, the role of language teachers' innovativeness as both predictors and mediators in passing on their internal and external accountabilities was covered by the study in CALL, educational technology, and applied linguistics. As a further addition,

this study contributed to a better understanding of how ChatGPT readiness shapes teachers' innovativeness in language teaching, since recent studies have explored the factors that contribute to educators' readiness for AI in the classroom (Ayanwale et al., 2022). The study also shifted the view from teachers' attitudes or motivation toward ChatGPT (Mohamed, 2023; Nguyen, 2023) to their innovativeness and accountabilities. Additionally, the research addressed previous studies that recommended exploring the role of ICT and AI in helping teachers meet their accountabilities in educational technologies (Sorat & Mohamadi Zenouzagh, 2022; Vidergor, 2023). Furthermore, the study addressed several concerns that ATC21S, OECD, EU, CSTA, ISTE, and IEA raised regarding AI readiness and ethical concerns while using ChatGPT in both education and society. Also, this study was among the first to use NCA, which moved the focus from integrating quantitative and qualitative data to generating accurate results by incorporating both asymmetrical and symmetrical prediction approaches. Additionally, through multi-level analysis, the study developed a new conceptual model in the field by incorporating various aspects of teachers' ChatGPT readiness, language teaching innovativeness, and accountabilities.

6.2. Practical contribution

The study findings can be used to contribute to the practical application of micro, meso, and macro layers. The first step is for teachers, particularly those with negative perceptions of ChatGPT due to their concern that it will replace their role in the future; to overcome such concerns and reluctance concerning teaching language with ChatGPT. It is possible to accomplish this goal if language teachers acquire a conceptual understanding of its functional aspects in language teaching, if they have assistance in generating novel ideas in language teaching, and if they are allowed to apply those ideas in language class through it. By that time, their visionary readiness would also increase, and they would

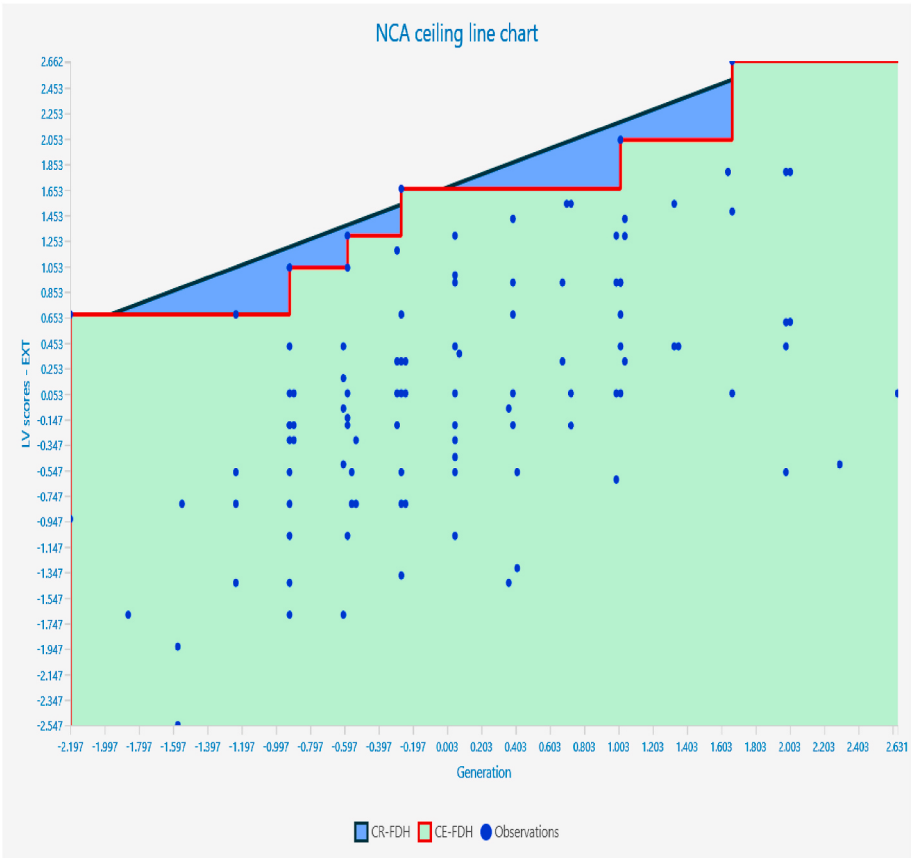


Fig. 9. The NCA of generation for external accountability.

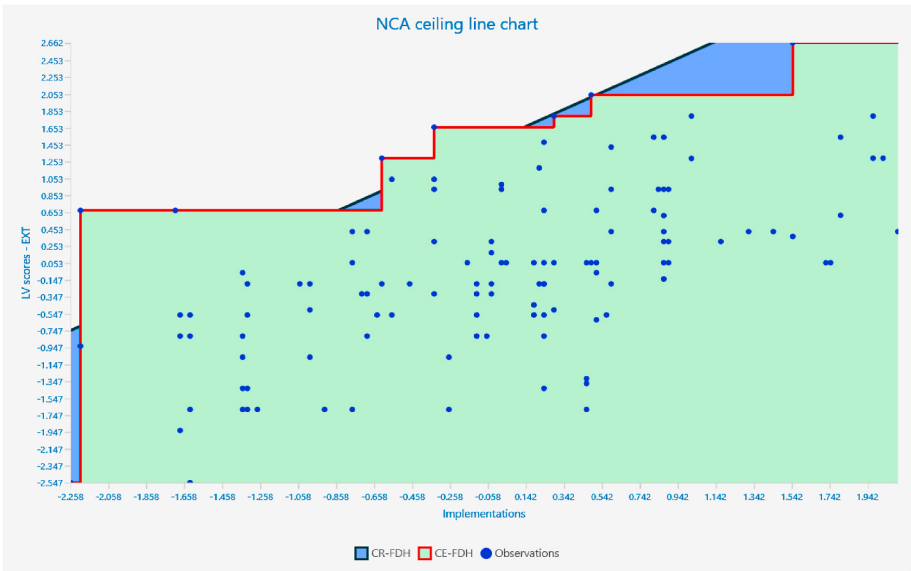


Fig. 10. The NCA of implementation for external accountability.

be familiar with the challenges and opportunities of ChatGPT in English language teaching. This, in turn, would enable them to generate and apply their innovative approaches to language teaching. Some teachers should also change the way they implement ChatGPT, since very often they merely apply it for assigning students' homework (Nguyen, 2023). Instead, they should think about and find out how innovative language methods could be applied to it, as generation was among the necessary factors to pass both accountabilities and a superior mediator variable.

Moreover, language teachers should attend several workshops, and AI teacher training programs. Additionally, they should attend several workshops as well as AI teacher training programs; however, they should not rely heavily on these teacher training programs to ensure that they are the real ChatGPT users, as they must experiment with ChatGPT within and outside of the language classroom, using trial and error in order to become self-ready ChatGPT teachers who can take advantage of it to design several language teaching approaches, methods, and tasks

Table 11

The bottleneck of the external accountability.

	External	Ability	Championing	Cognition	Ethics	Exploration	Generation	Implementations	Vision
0.000%	−2.547	0.000	0.000	0.000	0.000	0.000	0.000	0.806	0.000
10.000%	−2.026	0.000	0.000	0.000	0.000	0.000	0.000	0.806	0.000
20.000%	−1.505	0.000	0.000	0.000	0.000	0.000	0.000	0.806	0.000
30.000%	−0.984	0.000	0.000	0.000	0.000	0.000	0.000	0.806	0.000
40.000%	−0.464	0.000	0.000	0.000	0.000	0.000	0.000	0.806	0.000
50.000%	0.057	0.000	0.000	0.000	0.000	7.258	0.000	0.806	0.000
60.000%	0.578	11.290	0.000	7.258	0.000	13.710	0.000	0.806	0.000
70.000%	1.099	11.290	0.000	7.258	32.258	15.323	31.452	27.419	0.000
80.000%	1.620	11.290	73.387	7.258	34.677	15.323	42.742	31.452	8.871
90.000%	2.141	95.968	93.548	95.968	97.581	97.581	91.129	91.935	96.774
100.000%	2.662	95.968	93.548	95.968	97.581	97.581	91.129	91.935	96.774

Table 12

Relevant scenarios for internal accountability.

Variable	Symmetric phase	Asymmetric phase	Conclusion
Cognition	Not significant	Necessary	A certain level of cognition readiness was necessary to lead teachers to pass their internal accountability. However, a further level of it did not increase it.
Ability	Not significant	Not Necessary	Not significant.
Vision	Not Significant	Necessary	A certain level of vision awareness was necessary to lead teachers to pass their internal accountability. However, a further level of it did not increase it.
Ethics	Significant	Not Necessary	A certain level of ethical awareness was not necessary to lead teachers to pass their internal accountability. However, a further level of it elevated it.
Exploration	Not significant	Not Necessary	Not significant.
Generation	Not significant	Necessary	A certain degree of generation was required to lead teachers to pass their internal accountability. However, a further level of it did not increase it.
Championing	Not significant	Not necessary	Not significant.
Implementation	Not significant	Necessary	A certain degree of implementation was required to lead teachers to pass their internal accountability. However, a further level of it did not increase it.

Table 13

Relevant scenarios for external accountability.

Variable	Symmetric phase	Asymmetric phase	Conclusion
Cognition	Not significant	Not Necessary	Cognition readiness was not necessary to lead teachers to pass their external accountability, and a higher level did not provide an increase.
Ability	Significant	Necessary	To maintain their external accountability, teachers need to have a certain level of ability awareness, and an increased level of awareness will further enhance it.
Vision	Not Significant	Not Necessary	Not significant.
Ethics	Significant	Necessary	There was a certain level of ethical awareness necessary for teachers to pass their external accountability, and a further level elevated it.
Exploration	Not significant	Necessary	A certain degree of exploration was required for teachers to pass their external accountability. It did not, however, increase at a higher level.
Generation	Not significant	Necessary	A certain degree of generation was necessary to lead teachers to pass their external accountability. Further levels, however, did not increase it.
Championing	Not significant	Not Necessary	Not significant.
Implementation	Not significant	Necessary	A certain degree of implementation was required to lead teachers to pass their external accountability. Nevertheless, a further level did not increase it.

that are tailored to their context so that they may meet both external and internal accountabilities.

In addition, their colleagues should be made aware of ChatGPT's benefits and drawbacks when it comes to teaching languages. The possibility of teaching languages with ChatGPT is possible if language teachers utilize their experience teaching languages with ChatGPT and share their teaching strategies, methods, and designs with others. Besides sharing ChatGPT's features and language teaching methods with it, language teachers should also share their experiences about how they used it in the most ethical way in their language class, since ethical readiness is among the necessary factors for language teachers to meet both internal and external accountability.

The next implications are for pedagogical experts, curriculum developers, policy makers and executive managers, as follows:

Presently, AI-enhanced education focuses more on programming than cultivating the skill of using it or preparing teachers to use it most effectively and innovatively, particularly for artificial intelligence language teaching. To accomplish this, they should conduct workshops in which ChatGPT programmers and experienced language teachers train language teachers in terms of knowledge, skills, and vision, as well as ethics, on how they can generate and apply novelty to English language teaching through ChatGPT. As part of their teacher training courses, they should encourage them to have internal accountability, which also covers their external accountability. As teachers become more ready and innovative, ChatGPT will no longer be perceived as a competitor but rather as a facilitator.

Stakeholders should not simply develop some metrics for language teachers and leave it to them to meet or pass such accountability. The

mere development of some metrics and letting teachers alone pass them is indeed unethical, unstandardized, and illogical because some teachers may not be ready to utilize artificial intelligence, some of them may not know how to develop novel ideas and implement them through artificial intelligence, and some may not be able to easily access artificial intelligence (such as in the current study context). Instead, they should develop external accountability based on teachers' artificial intelligence readiness and their teaching context (the availability of AI in their environment) to apply their novelties through AI, as implementation is among the necessary conditions to pass accountabilities.

It is important that executive managers and school heads conduct regular meetings for language teachers to share their experiences, challenges, ethical behaviors and opportunities in artificial intelligence language teaching that lead them to meet their responsibilities, since championing significantly led them to pass their external accountability.

The policymakers, particularly in the study context, should make a change in their own rules and update them based on learners' and teachers' current needs and ICT and AI developments. They can accomplish this by removing their restriction against focusing on only national sites and applications, which causes teachers to use VPNs, particularly when trying to use ChatGPT. It may also be beneficial for schools and language institutes to have a rule that allows them to use AI freely (without VPN) in their language classes. This also enables language teachers to avoid purchasing VPN services and instead seek other means of connecting with ChatGPT. There is a possibility to achieve this goal if the language institute and policymakers are willing to negotiate on this issue. This restriction should also be considered by language institutes when developing some external accountability for language teachers.

In order to achieve a balance between language teachers' readiness and innovativeness, we need to provide and develop conditions that will support teachers in becoming both AI-ready users and innovative teachers while meeting their accountability requirements simultaneously. It will be possible if teachers, stakeholders, and pedagogical experts meet the conditions outlined in the asymmetrical phase of the study. These conditions need teachers to want to set aside their AI reluctance, and stakeholders as well as policymakers need to dedicate more budget and provide conditions and standard criteria. Last but not least, this study develops a new conceptual framework that allows scholars to validate, extend, or test it in other disciplines, languages, or non-language teaching contexts.

6.3. Limitation of the study

During the present study, we explored the influence of EFL teachers' ChatGPT readiness on their innovativeness in teaching languages with ChatGPT and how they can help them to pass their accountabilities. The role of their innovativeness between their ChatGPT readiness and their accountabilities, as well as the necessary conditions to enable teachers to fulfill their accountabilities when teaching with artificial intelligence, were addressed. Now, the authors would like to point out some limitations that may be helpful in future research in this area. Due to the fact that the research was conducted at three universities, national and

international testing of the research model and study instruments at high schools, or any other levels would be beneficial as they differ based on the study context. A further limitation is that the researcher did not take into account the impact that a teacher's demographic characteristics might have on his or her ChatGPT readiness, language teaching innovativeness, and ability to meet accountability, so we suggested to validate the study instruments in other research contexts and extending the current conceptual model by integrating teachers' demographic information. We also recommended that the study model be replicated with a larger sample size and other sampling methods, as we did with a small sample size and random sampling methods. A mixed methodology could also be adopted in future research, providing the possibility of exploring some of the findings qualitatively through log file data, observation, or longitudinal studies. Despite this, the current study focuses solely on the level of ChatGPT readiness, innovativeness, and accountability among teachers. Considering that students play a crucial role in ICT readiness, innovativeness, and accountability, it would be crucial to test the model with them.

Declarations

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Data availability statement

The datasets used and/or analyzed during the current study are available from the.

Declaration of generative AI in scientific writing

The authors in the current study did not use any kinds of artificial intelligence in any parts, and sections of the article.

CRediT authorship contribution statement

Amir Reza Rahimi: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Ana Sevilla-Pavón:** Writing – review & editing, Validation, Supervision, Project administration, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix 1

The study questionnaire, and its descriptive statistics.

Latent variables	Source	Item	Mean	Standard deviation	Excess kurtosis	Skewness
AB1	Adapted from Karaca et al. (2021)	I can use the information provided by ChatGPT in combination with my language teaching procedure	4.944	1.643	−0.297	−0.560

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(continued)

Latent variables	Source	Item	Mean	Standard deviation	Excess kurtosis	Skewness
AB2	Adapted from De Jong and Den Hartog (2010)	I can use ChatGPT effectively and efficiently in English language teaching	4.218	1.511	−0.641	−0.050
AB3		I can access, evaluate, use, share and create new language teaching activities, or methods with ChatGPT	4.524	1.643	−0.713	−0.242
CO1		I know the different characteristics of ChatGPT for the sake of English language teaching.	3.734	1.357	−0.346	−0.034
CO2		My knowledge of ChatGPT allows me to integrate it into every aspect of the English language teaching.	3.726	1.340	−0.768	0.108
CO3		Based on my knowledge of the ChatGPT, I can plan my language teaching procedure	3.694	1.363	−0.583	−0.125
VI1		I can explain the limitations of ChatGPT for English language teaching	3.935	1.148	−0.729	0.031
VI2		I can explain the strengths and weaknesses of ChatGPT for English language teaching	4.089	1.283	−0.616	−0.098
VI3		I can foresee the opportunities and threats that ChatGPT can be create for language teaching	4.250	1.287	−0.639	−0.088
ET1		I can use the information provided by ChatGPT in my English language class accordance with legal and ethical norms	3.790	1.166	−0.418	0.511
ET2		I can act in accordance with ethical principles while using ChatGPT in my English language class	4.282	1.299	−0.725	0.220
ET3		I can follow the legal regulations regarding the use of ChatGPT in my English language class	4.363	1.352	−0.514	0.226
EX1		I usually use ChatGPT to explore new activities, tasks, and language teaching approaches with it	4.161	1.461	−0.943	0.218
EX2		I usually use ChatGPT to explore new ideas in my language teaching class	4.129	1.257	0.008	0.049
EX3		I usually use ChatGPT to explore new language teaching approach with it	4.847	1.607	−0.380	−0.503
GE1		The ChatGPT is an excellent tool for assisting us in developing and designing new activities, tasks, and approaches to teaching English with it.	3.782	1.241	−0.292	0.218
GE2		Using ChatGPT to develop novel ideas for teaching English is a great idea	3.831	1.203	−0.508	0.304
GE3		Through ChatGPT, I enjoy incorporating new teaching methods and activities into my language classroom	4.218	1.188	−0.648	0.327
CH1		I attempted to convince stakeholders and the head of the school to support the use of ChatGPT in our school	4.073	1.165	0.130	−0.205
CH2		I generally share the innovative ideas and activities offered by ChatGPT on how to teach English to foreign language learners	4.226	1.170	0.112	0.008
CH3		I usually share my innovative language teaching methods with ChatGPT with other English language teachers	4.355	1.079	−0.115	0.070
IMP1		The ideas and language teaching activities provided by ChatGPT are applicable in my English language class	3.742	1.269	−0.406	0.235
IMP2		ChatGPT provides novel ideas and language tasks that I integrated them into my English language class.	3.831	1.401	−0.191	0.324
IMP3		ChatGPT provided me with a variety of new ideas and language exercises that I used in my English language class	3.685	1.253	−0.768	−0.280
EXT1	Adapted from Rosenblatt (2016)	I get credit for my innovative teaching methods	3.790	1.309	−0.065	0.221
EXT2		I am usually evaluated by the school to see whether my language learners improve their grades	3.976	1.292	−0.532	0.023
EXT3		I will be accountable for my language learners' achievements	4.008	1.317	−0.498	0.092
INT1		I am responsible for teaching language with ChatGPT in the best possible way	3.758	1.247	0.047	0.723
INT2		I am responsible for using new professional knowledge/methods, and tools in my language class	3.855	1.287	−0.100	0.459
INT3		I develop my language teaching professionally to teach the best possible instruction to my language learners	3.952	1.282	−0.114	0.603

Appendix 2

The descriptive statistics of latent variable scores.

Variable	Mean	Median	Observed min	Observed max	Standard deviation	Excess kurtosis	Skewness
Vision	0.000	−0.074	−1.910	2.357	1.000	−0.361	−0.141
Ethics	0.000	−0.035	−2.051	2.178	1.000	−0.507	0.072
Internal	0.000	−0.161	−1.687	2.859	1.000	0.653	0.902
Generation	0.000	−0.241	−2.197	2.631	1.000	−0.277	0.402
Implementations	0.000	0.183	−2.258	2.100	1.000	−0.461	−0.150
Cognition	0.000	0.070	−2.204	1.636	1.000	−0.475	−0.200
Ability	0.000	0.106	−2.446	1.706	1.000	−0.397	−0.408
Championing	0.000	0.111	−2.930	2.829	1.000	0.565	−0.071
Extrinsic	0.000	−0.031	−2.225	2.244	1.000	−0.384	0.050

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