Research article

Iranian and Turkish EFL instructors' Critical Openness, Reflective Skepticism, Innovative Thinking and Accountability: A comparative study

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ABSTRACT

The increasing interest in Turkish educational programs has led to the increasing interest in educational migration among the younger Iranian generations. Instructors, as the executive part of educational programs, can also play a key role in satisfying students' expectations and educational goals. The aim of this study was to identify and compare the Critical Openness (CO), Reflective Skepticism (RS), innovative thinking (IT), external accountability (EA), and internal accountability (IA) for the Iranian and Turkish English as Foreign Language (EFL) instructors through an online survey with Critical Thinking Theory and the 21st century skill consideration lens. To this end, a convenient sample of Iranian (N = 286) and Turkish (N = 281) EFL instructors were invited to take part in the online survey voluntarily. The scales consisted of the Likert scales of Rosenblatt (2017) [1], Semerci (2007) [2], and Sosu (2013) [3], because the conceptual frameworks were also taken from these studies. In the analysis stage, MANOVA was conducted to compare the results of the online survey between Iranian and Turkish EFL instructors in terms of their level of CO, RS, IT, EA, and IA. The analysis of the collected data uncovered that Turkish EFL instructors got higher scores in CO, RS, EA, and IA than Iranian EFL instructors while Iranian EFL instructors received higher scores in the employment of IT. The implications of the results would suggest collaborations between educational policymakers and teacher training course designers.

1. Introduction

Every society needs a strong educational system to cope with difficulties arising in diverse fields. The educational system encompasses many different elements, including instructors, students, policymakers etc. Among those, instructors seem to be more prominent, since they are present in different aspects of educational systems such as teaching and notifying improvements. Considering the crucial role of instructors in someone's success, the accountability of instructors has been investigated by different researchers [4–6]. Accountability can be related to the improvement for learners that can be reached through following "academic standards" [7,8]. An accountable instructor attempts to satisfy learners' needs in an effective way [9]. One of the main characteristics of accountable teachers might be their regard for the "individual attributes of students". The importance of such a feature can be explained by the link assumed between motivation, goals, and individual attributes [10,11].

Instructors' innovative thinking is another issue related. Plsek [12] identified that "[i]nnovative thinking is sometimes needed to generate ideas for improvement" (p.438). Therefore, it can be concluded that innovative thinking seems inevitable when it comes to teaching context [4,13–15]. According to Harrison and Horne [16], innovative thinking can be relevant to the concepts of flexible and divergent thinking such as the ability to modify one's way of thinking in response to unexpected occasions. Another important and relevant concept to innovative thinking is "strategic planning" referring to focusing on unplanned situations and trying to take the best-adapted actions or reactions [16].

When it comes to identifying and examining the effectiveness of instructors' educational performance, it seems critical to check 21st century skills such as 4Cs (critical thinking, creativity, collaboration, and communication) [17]. Moreover, the literature would suggest the importance of variables such as creativity and Innovative Thinking (IT) [18], Critical Openness (CO) and critical thinking [19]. These variables are similar and interchangeable to some extent. The current study used a minimalistic approach to selecting the psychological variables which encompass both 21st century skills and the sub-skills of the 21st century skills, such as critical thinking, which involves Interpretation, Analysis, Evaluation, Inference, Explanation, and Self-Regulation [20]. The links between the sub-skills of critical thinking and other relevant psychological variables were also checked. For instance, Reflective Skepticism (RS) seems to be embedded in the sub-skills of critical thinking. Moreover, a critical thinker is responsive and accountable for his/her thought and subsequent actions. In sum, the mentioned process of reflection in the literature has contributed to the selection of Critical Openness (CO), Reflective Skepticism (RS), innovative thinking (IT), external accountability (EA), and internal accountability (IA) as the main focus of this research. The elaborations of each of these concepts and their possible interactions have been discussed in this study. Considering the conjunctions of CO, RS, IT, EA, and IA with critical thinking that have been discussed in this study; the present research follows the Theory of Critical Thinking in education. Based on this theory, teachers play a fundamental role in promoting higher-order thinking skills such as critical thinking and other relevant cognitive abilities such as CO, RS, IT, EA, and IA [21].

Despite many attempts on the part of the Iranian educational system, there still seem Iranian students who might not be satisfied with the educational programs [22]. The increasing interest in educational migration motivated the comparisons and contrasts between the Iranian and Turkish instructors, who seem to be the first ones encountering students' expectations. This online survey attempted to check the possible differences between English as Foreign Language (EFL) instructors in Iran and Turkey to shed light on hidden parts of the increasing interests of educational migrations from Iran to Turkey. Identifying the possible differences can illuminate how the Iranian educational system needs to be improved. The implication of the findings can be beneficial for future international collaborations on the educational fields.

A long-established cultural and academic tie between the two countries of Iran and Turkey was one of the chief motivations for this comparative study. Every year, many Iranian and Turkish people travel to Turkey and Iran to seek their cultural and academic purposes [23,24]. Turkey can be seen as an opportunity for Iranian academic since this country provides different educational opportunities for those who seek higher steps in education and science [25]. One of the most common educational interactions between Iran and Turkey might be Iranian prospective EFL teachers who use international educational system in Turkey to get international certifications for teaching EFL through international methods [26]. It is worth reminding that Iran-Turkey links have been expanded in diverse aspects such as energy [27], politics and religion [28], and economic [29]. This brotherhood collaboration has provoked teaching and learning in new and similar countries [30]. In fact, this research aims to examine and explore more mutual educational collaboration between the two countries. Another issue that was also influenced by the old relationship between the two countries and the possible differences in educational outcomes (e.g., students and instructors' academic performances) seem to be high quality of Turkish educational system [31–33]. In addition, there still seem Iranian students who might not be satisfied with the educational programs [34]. Further, the increasing interest in educational migration motivated the comparisons and contrasts between the Iranian and Turkish instructors [24, 35]. This online survey attempted to check the possible differences between EFL instructors in Iran and Turkey to shed light on hidden parts of the increasing interests of educational migrations from Iran to Turkey. The reason for selecting EFL teachers was that EFL teachers can be teachers for those who major in English and for those whose major is not English thus RFL teachers can play a crucial role in training national and international workforces. Identifying the possible differences can illuminate how the Iranian educational system needs to be improved. The implication of the findings can be beneficial for future international collaborations on the educational fields. By specifying the needs of EFL instructors in these two countries, future EFL practitioners and researchers would plan and act effectively for future educational collaborations. The aim of this study was to examine and compare CO, RS, IT, EA, and IA for the Iranian and Turkish EFL instructors as the main source of English language learning for the EFL learners. This comparative study might be the first research for examining 21st century skills in EFL teacher education between two countries of Iran and Turkey.

1.1. Theoretical definitions

In the following sections, theoretical interpretations of the variables of the present study have been presented regarding the Critical Thinking Theory and the 21st century skills. It worth reminding that, the links of 21st century skills and higher-order thinking skills have been verified by prior studies [36,37]. Critical Thinking Theory simply explains how individual perceive, evaluate, analyze a new concept (in learning), and then how the new concept might be entered to modify and use the present conceptualized cognitive system in a more efficient way [38].

1.1.1. Critical Openness (CO)

CO might be one of those variables that have been less attended by the experts in the research domain, because there seem very few studies addressing CO in research [39]. Based on the definition proposed by Van Laar, van Deursen, van Dijk, and de Haan (40), CO, as the name represents, refers to the concept of being open and flexible to unknown and new entities, attitudes and notions. In other

words, an individual welcoming new experience can have a good level of CO. Possibly, one of the reasons for paucity of attention to CO in research, might be the abundant of terminologies referring to the concepts with very few differences. For instance, a process of educational problem-solving can involve diverse forms of reasoning skills such as critical thinking, adaptation, and reasoning [41]. CO can be seen as a combination of critical thinking (disposition) and open-mindedness which are related to the 21st century skills [42].

1.1.2. Reflective Skepticism (RS)

RS means to think and explore about the recently met ideas and learning and using past experiences [40]. There are many studies that uncover the links of RS and critical thinking as one of the main skills of the 21st century skills [43–45]. Orhan (46) who studied critical thinking disposition in Turkish setting, reported that CO and RS were both present in the model of critical thinking disposition. Hence, this justification can lead us to first, the high level of similarity among 21st century skill of critical thinking with RS and CO. Second, this justification can confirm the excess of terminologies that could contribute to the paucity of studies on CO, RS and other similar concepts. This variable that seems to have similarities with Reflective thinking has been studied by Turkish experts in recent decades [47].

1.1.3. Innovative thinking (IT)

IT has been presented in the studies of 21st century skills and higher-order thinking skills [42–48]. In addition, there are studies that used IT, innovation, creativity and creative thinking interchangeably [49–51]. Regardless of the variety of terminologies, IT refers to the cognitive ability of understanding the problem and solving that problem in a novel way [52]. There are also studies that verify the links of IT and critical thinking skills [53,54].

1.1.4. Accountability

Accountability has been defined as taking responsibility [55]. One of the interesting points of this variable is that accountability and critical thinking have been noted to be very fundamental for the 21st century life and success [56]. In other words, for success in the 21st century in terms of educational or vocational (and also in personal life), individuals need to be equipped with accountability and critical thinking skills [57]. One of the key factors for realizing accountability has been noted as the categorization of accountability into external and internal accountability i.e. (EA) and (IA) respectively. The beneficial role of this classification has been noted as the ease of assessing accountability in teaching and learning settings for confirming final success [58].

1.2. Theoretical framework

As it was stated earlier, this study attempted to 1) clarify the possible conjunction of the variables of CO, RS, IT, EA, and IA, and 2) to examine if the noted variables might be in the same range for the two countries with long-established relations.

The literature of studies on instructors is full of diverse correlational and comparative studies that focused on diverse and overlapping variables. Previous studies did not consider if the overlapping psychological variables and 21st century skills could cover each other. This economic and minimalistic approach to the studies on instructors can be very beneficial for outlining the key characteristics of instructors in general and EFL instructors in particular. Moreover, this approach can satisfy the research requirements of the 21st century and also imply the subsequent decisions and practices in EFL education. The main intention for examining the conjunctions of CO, RS, IT, EA, and IA was to verify how these variables can stand in one line to show they can also be considered as the sub-skills of the main umbrella terms in the 21st century skills. Another motive was the link of CO, RS, IT, EA, and IA with critical thinking skill and disposition which have been to be very determinative in successful lives [59]. Insufficient literature in searching such highly intertwined variables had also a crucial role in focusing on these variables and their relations. It is expected that encouraging higher-order thinking skills in the 21st century could advance thinking skills such as critical thinking at macro level and improving relevant
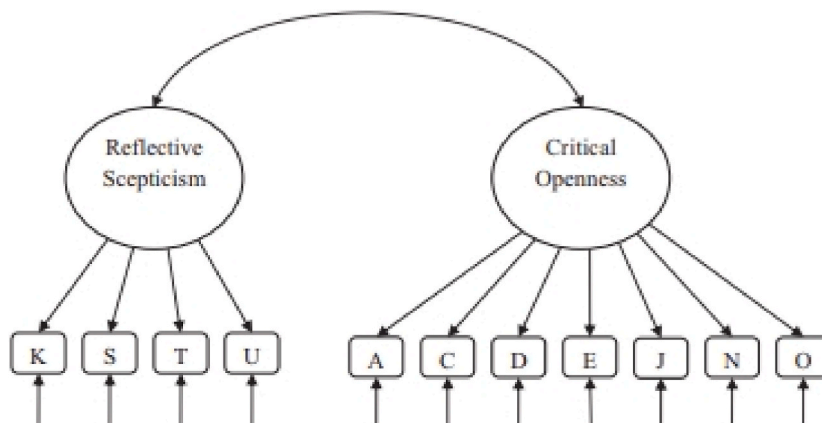

Fig. 1. Hypothesized two-factor CFA model for the Critical Thinking Disposition Scale Sosu [3].

sub-skills such as CO, RS, IT, EA, and IA, at micro level.

1.3. Conceptual framework

The main conceptual frameworks of this research were taken from a) Sosu [3] for CO and RS, b) Rosenblatt [1] for the variables of EA and IA and c) Semerci [2] for IT. Fig. 1 illustrates the relationship between RS and, CO.

To elaborate on the relationship between EA and IA, Rosenblatt [1] described that EA and IA are two different and complementary concepts and hence, they should be estimated independently. To explain about the ideas on IT, Semerci [2] refers to the creative thinking term that encompasses reflectiveness on the part of instructors.

No similar research was found to examine possible conjunctions of CO, RS, IT, EA, and IA to the best of our knowledge. Moreover, there was no research work to check comparisons and contrasts between the two countries which have tight links. To tailor future joint and collaborative teacher-training courses, the present study aimed to address the following specific objectives:

a. To determine whether there is significant difference among Iranian and Turkish EFL instructors in terms of Critical Openness (CO).
b. To determine whether there is significant difference among Iranian and Turkish EFL instructors in terms of Reflective Skepticism (RS).
c. To determine whether there is significant difference among Iranian and Turkish EFL instructors in terms of innovative thinking (IT).
d. To determine whether there is significant difference among Iranian and Turkish EFL instructors in terms of external accountability (EA).
e. To determine whether there is significant difference among Iranian and Turkish EFL instructors in terms of internal accountability (IA).

1.4. Literature review

There are considerable studies in the literature on EFL instructors' effective psychological characteristics for improving teaching achievements in both Iran and Turkey [60–64].

Research carried out by Khany and Tazik [62] checked the possible link between sub-categories of psychological empowerment (meaning, competence, self-determination, and impact), sub-categories of faculty trust (trust in principal, trust in colleagues, and trust in students and parents), and sub-categories of job satisfaction (intrinsic and extrinsic) for 217 EFL secondary school teachers. The results uncovered a correlation between psychological empowerment and job satisfaction. And trust was reported to be associated with job satisfaction. Therefore, their study uncovered that job satisfaction could influence psychological empowerment and faculty trust. Since, job satisfaction needs to be provoked by different inner and outer variables [65–67], instructors' psychological characteristics need to be explored thoroughly. In comparative research between Iranian and British instructors, Greenier, Derakhshan, and Fathi [68] studied the strength of the link between psychological well-being (PWB) and work engagement. They reported that the relationship between these two variables was stronger for the British instructors.

Arikan [69] checked the attitudes of both prospective and in-service instructors in Turkey to seek the characteristics of effective instructors. He concluded that based on the posed ideas, update teacher-training courses and curricula play the most important role in teaching effectively. Karakoyun and Lindberg [70] conducted a comparative survey in Turkey and Sweden to investigate pre-service instructors' attitudes toward the 21st century skills required for effective teaching. They reported that instructors in Turkey assumed that 21st century skills were connected to factors such as technology and information literacy. In addition, Swedish instructors reported 21st century skills pertaining to technology, distance learning, and communication. Since their participants were only 197 individuals, the generalizability of their findings should be attended to. In sum, regardless of the location of the studies for finding crucial characteristics of influential teaching, overlapping variables and recent teaching trends of the 21st century seem to play a key role. These issues seem not to be addressed enough. In addition, comparative research for Iranian and Turkish instructors was missing in the literature.

1.4.1. The relationship between innovative thinking, critical thinking and accountability

Innovative thinking, which constitutes the DNA of creative thinking, can be defined as establishing a relationship between objects or ideas that have not been linked before [71,72]. However, it has been stated that individuals can become innovative if they find solutions to the problems they encounter in their lives or when they establish new relationships in the depths of their perception [73]. According to Ülger [74], innovative thinking is extraordinary thinking that produces unique and innovative products; versatile, unpredictable in addition that it is open to development and innovation. Yaman and Yalçın [75] also stated that innovative thinking is a dynamic process like critical thinking. Considering the definitions and explanations in the literature, critical thinking can be considered as a research and inquiry-based thinking skill [12], while innovative thinking can be expressed as putting something new and different. From this point of view, innovative thinking is thinking that includes critical thinking. The difference between innovative thinking and critical thinking is that innovative thinking results in an original product, while critical thinking does not result in an original product [76]. As for the relationships between innovative thinking, critical thinking, and accountability, it can be said that instructors with a sense of high level of accountability can be assumed to be in charge of the outcomes of the teaching activities for their learners [4]. Instructors with high internal accountability are inclined to be innovative and critical in their educational enterprises as the important benchmark for assessing their achievement constitutes their consciousness. It can be also deduced that instructors who appreciate external accountability instead of internal accountability tend to carry out their tasks as prescribed by law or regulations.

On the other hand, instructors who appreciate internal accountability are inclined to perform more than predetermined roles by authorities and take risks in their teaching in order to help their students to achieve more [4].

1.4.2. The relationship between creativity (open-mindedness/innovative thinking), critical thinking and accountability

Creativity has been recognized as a dynamic process that can be learned and is encompassed by almost everyone [77]. Although different definitions exist for the concept of creativity, the notion of originality is the common core of the definitions [78–80]. In addition to originality, the definition of creativity has possessed the notion of effectiveness. Hence, creativity has been elaborated as a multifaceted concept that covers subcategories of appropriateness, usefulness, and practicality [79]. Research scholars also utilized other terms which were conceptually the same as creativity such as open-mindedness [81], and innovative thinking [82]. In the same vein, Newton and Newton [83], in their book on *Creativity in* 21st-*century education* commented that creativity contains a process of problem-solving in a new way.

Considering the relationship between creativity and CT [84,85], some scholars such as Birgili [84] and Eggers et al. [85], employed CT as a tool to invest on creativity developments. Birgili [84] studied CT and creativity development in the task of problem-solving and emphasized that problem-based learning (PBL) can provide a suitable condition for developing CT and creativity for the students and teachers.

The conjunction of CT and creativity has also been considered by different researchers [86]. Ülger [87] measured the correlation between CT and creativity for different majors. He found that although there was a remarkable relationship between CT and creativity for all of the participants regardless of their major, the interplay between CT and creativity was a more powerful correlation for the students in the majors of Visual Arts Education and Religion & Ethics Education. This correlation was not very strong for the participants majoring in Mathematics and Preschool Education. Ülger [87] concluded that those participants whose major included non-routine problem-solving processes tend to represent a more remarkable relationship between CT and creativity. At the empirical level, Turner and Wattanakul [88] studied the effect of explicit instructions on CT and creativity developments for 75 sophomores and demonstrated that the training course was effective for CT and creativity promotions. They also verified that this model of instruction can also be operationalized in higher levels of education.

In a study conducted in Iran, Rahdar, Pourghaz, and Marziyeh [89] sought the possible effect of teaching philosophy on children's Critical Openness (CO) and reported that the treatment could contribute to participants' CO. They also checked the effect of teaching philosophy on children's Reflective Skepticism (RS). According to the finding reported by them, the children in the experimental group outperformed the control group in the RS assessment and therefore, the treatment could improve participants' RS. In a more recent study, Orakcı and Rüzgar [90] concentrated on the interplay between "Reflective Thinking" and "Individual Innovativeness", and account for reflective thinking as the processes of thoughts that can influence individual innovativeness. Moreover, reflective thinking and individual innovativeness have been shown to be correlated with each other. Interestingly, it has been apparent that student teachers, who have higher levels of attitudes toward the teaching profession, tend to reveal a stronger relationship between reflective thinking and individual innovativeness [90].

Considering the scope of current work, the components of Critical Openness (CO), Reflective Skepticism (RS), innovative thinking (IT), external accountability (EA), and internal accountability (IA) has been selected to be explored as the related variables to CT as a whole. This study was an extension of the study conducted by Orakci, Dilekli, and Erdağ [4], that aimed to concentrate on CT as a new and untouched variable in the line of research. Therefore, this study could become significant as to the best knowledge of the researchers no prior study had focused on the collection of accountability, innovative thinking and CT for EFL instructors. Probably the advantages of CT can be illuminated in the following quotation. According to Siegel [91], "critical thinker has a rich make-up of dispositions, habits of mind, values, character traits, and emotions constitutive of the critical attitudes" (p.26).

2. Method

In this online survey, correlational research model, which determines the existence and degree of change between two or more variables, was used. The correlational research model was preferred since the CO, RS, IT, EA and IA variables were tried to be evaluated in terms of each other and various variables.

The ethical forms of the study were approved by the human research ethics committee of the corresponding author's university. The year and protocol number of the document is 2023/03-01.

2.1. Procedure

The aim of this online survey was to identify CO, RS, IT, EA, and IA for the Iranian and Turkish EFL instructors. The main motivation behind this study was the old relationship between the two countries and the possible differences in educational outcomes (e.g., students and instructors' academic performances). To this end, MANOVA was conducted to compare Iranian and Turkish EFL instructors in terms of their level of CO, RS, IT, EA, and IA. The electronic survey adopted a comparative perspective for comparing EFL teachers in Iran and Turkey in terms of CO, RS, IT, EA, and IA. The data collection was started simultaneously in Iran and Turkey by the relevant researchers. In the electronic survey, Google forms were used as the main platform for the data collection. The data was collected by sharing an electronic link to the scales in virtual communities of EFL teachers in Iran and Turkey. The main virtual communities which were used had been established in Telegram, WhatsApp, and e-mail contacts. Moreover, the scales were sent through convenience sampling. The scales were in English language for both groups. The data collection was carried out between September 2020 and August 2021. After the data collection, the data were analyzed using descriptive statistics. In addition, a one-way

multivariate analysis of variance was run to examine the effect of Iranian and Turkish EFL instructors on CO, RS, IT, EA, and IA. To verify the rigor of the findings, the results were coded and analyzed by two experts.

2.2. Research contexts

This online survey was used to cover a sample through which the real picture of the population would be presented. In addition, considering the tight historical connections between Iranian and Turkish societies and possible differences in educational fields, this study tried to check possible differences between Iranian and Turkish EFL instructors' critical features. Although many other important features can be identified by the EFL instructors, this study focused on the variables which were not addressed sufficiently in the literature. Hence, it was not applicable to compare and contrast these variables with prior studies in literature. The main contribution of this study might be opening new branches for the comparative studies and notifying EFL instructors' psychological features.

The reasons for choosing Iran and Turkey as the main research contexts can be explained by the successful Turkish education system, which has also attracted the attention of many Iranians for a better future [92]. The current trend which is observable in the young Iranian communities is to establish a successful future life via attending educational courses and programs which encourage global educational trends [93]. Another reason for the increasing interest in the Turkish educational system, courses and programs among the younger Iranian generation can be explained by the increasing interest in joining international collaborative societies [94]. The latter issue can be clarified by various attractive elements in Turkish schools, in particular such as interesting educational topics in books, employment of recent teaching trends, updated instructors, and diversity of choices for following during student hood and after graduation from the schools [95]. The increasing amount of migration among younger Iranians for educational purposes might be another justification for the above-mentioned issues.

To uncover other hidden parts of the educational migrations and interests in Turkish educational programs, it might also be useful to remind us of the conservative status of educational elements such as textbooks, teaching methods, teacher-training programs in Iran, as in some instances. In other words, Iranian authorities attempt to keep religious ideas in the educational system, courses, and programs [96,97], while the new generation seems to be interested in more globalized trends in education and, of course, in their future jobs. Thus, such a condition may encourage migration among younger generations [24].

2.3. Participants

The participants of the study were English Language instructors from both countries of Iran and Turkey. The participants were selected based on the convenience sampling. For the purpose of providing a comprehensive view of the population, the participants were asked to share the link of the scales in their social community so that the researchers were able to add participants from diverse cities and villages which were not accessible to them. The number of participants from Iran was 286, and the number of participants from Turkey was 281. Participants' ages were between 22 and 50 years old. Table 1 displays participants' demographic data.

As Table 1 illustrates, both groups had higher rate of participation on the parts of female instructors. Iranian EFL instructors had more participation from more experienced instructors than younger instructors. In addition, the Iranian group was more involved in teaching adult learners than the Turkish group. To add about participants' extracurricular studies, the individual with six or ten a month study were higher than those with one a year study. In both groups, participants who were teaching in Metropolis-City were higher than instructors in Village-Town. Participants' workplaces or school types were the school and grade of their current teaching

Table 1
Distribution of participants' characteristics.

Variables		Iran (n = 286) n (%)	Turkey (n = 281) n (%)
Gender	Male	123 (42.9)	102 (36.3)
	Female	163 (57.1)	179 (63.7)
Professional Seniority	1–5 year	45 (15.7)	67 (23.8)
	6–10 year	44 (15.3)	133 (47.3)
	11–15 year	57 (19.9)	38 (13.5)
	16–20 year	141 (49.1)	43 (15.3)
Workplace	University	135 (47.0)	44 (15.7)
	High school	74 (25.8)	82 (13.5)
	Secondary school	25 (8.7)	172 (61.2)
	Primary school	5 (1.7)	27 (9.6)
The frequency of extracurricular reading habits	Six or ten a month	78 (27.2)	70 (24.9)
	Two or five a month	32 (11.1)	88 (31.3)
	One a month	70 (24.4)	51 (18.1)
	Six or ten a year	21 (7.3)	19 (6.8)
	Two or five a year	32 (11.1)	9 (3.2)
	One a year	19 (6.6)	44 (15.7)
Place of residence	Metropolis-City	203 (70.7)	164 (58.4)
	District	42 (14.6)	59 (21)
	Village-Town	42 (14.6)	58 (20.6)

profession which were classified by the categories of university, high school, secondary school and primary school.

2.4. Data collection tools

a) External accountability scale: English instructors' external accountability dispositions were measured using six items with a 5-point Likert scale adapted from Rosenblatt's personal accountability scale [1]. This scale involves feelings of duty for teaching standards, student assessments, performance reporting, awards, and sanctions. "Cronbach's alpha reliability coefficient" for the present study was found 0.73. Moreover, the CFA fit indexes of the EA were as follows: $\chi2/df = 3.26$, RMSEA = 0.06, CFI = 0.96, GFI = 0.98, TLI = 0.90, IFI = 0.96, AGFI = 0.95, RMR = 0.03 and SRMR = 0.03, which pointed out perfect or acceptable, fit [98]. Two illustrative examples of items are as follows:

"In your work as a teacher, to what extent do you feel that it is your duty to …"

"Give yourself a report on the extent to which you reached your goals at work."

b) Internal accountability scale: instructors' internal accountability dispositions were measured using the seven items with a 5-point Likert scale adapted from Rosenblatt's personal accountability scale [1]. This scale involves feelings of duty regarding professional competence, professional development, and professional ethics. "Cronbach's alpha reliability coefficient" for the present study was found 0.86. The CFA fit indexes of the IA were as follows: $\chi2/df = 3.44$, RMSEA = 0.06, CFI = 0.98, GFI = 0.97, TLI = 0.96, IFI = 0.98, AGFI = 0.96, RMR = 0.01 and SRMR = 0.02, which pointed out perfect or acceptable fit [98]. Two illustrative examples of items are as follows:

"In your work as a teacher, to what extent do you feel that it is your duty to."

"Act by professional ethical principles at your work."

c) Innovative thinking scale: English instructors' innovative nature was measured using the six items with a 5-point Likert scale from the "Reflective Thinking Tendency Scale (RTTS)" developed by Semerci [2]. This scale involves teachers' tendencies regarding their problem-solving, the spirit of research, objective evaluations, and improvement of teaching. "Cronbach's alpha reliability coefficient" for the present study was found 0.75. The CFA fit indexes of the IT were as follows: $\chi2/df = 3.47$, RMSEA = 0.07, CFI = 0.97, GFI = 0.94, TLI = 0.93, IFI = 0.94, AGFI = 0.92, RMR = 0.01 and SRMR = 0.02, which pointed out perfect or acceptable fit [98]. Two illustrative examples of items are as follows:

"I cannot look at the events in the teaching-learning process from multiple perspectives."

"I make do with the activities in the book and do not create new ones."

d) Critical Openness scale: The "Critical Openness" subscale as five-point Likert-type responses (1 = strongly disagree, 5 = strongly agree) developed by Sosu [3] reflects the tendency to be actively open to new ideas, critical in evaluating these ideas and modifying ones thinking in light of convincing evidence. The coefficient of internal consistency for the total scale was high. "Cronbach's alpha reliability coefficient" for the present study was found 0.78. The CFA fit indexes of the CO were as follows: $\chi2/df = 3.52$, RMSEA = 0.08, CFI = 0.91, GFI = 0.93, TLI = 0.92, IFI = 0.96, AGFI = 0.91, RMR = 0.01 and SRMR = 0.02, which pointed out perfect or acceptable fit [98]. Two illustrative examples of items are as follows:

"I usually try to think about the bigger picture during a discussion."

"I often use new ideas to shape (modify) the way I do things."

e) Reflective Skepticism scale: The "Reflective Skepticism" subscale as five-point Likert-type responses (1 = strongly disagree, 5 = strongly agree) developed by Sosu [3] conveys the tendency to learn from one's past experiences and be questioning of evidence. The coefficient of internal consistency for the total scale was high. "Cronbach's alpha reliability coefficient" for the present study was found 0.80. The CFA fit indexes of the RS were as follows: $\chi2/df = 3.40$, RMSEA = 0.08, CFI = 0.97, GFI = 0.92, TLI = 0.90, IFI = 0.93, AGFI = 0.94, RMR = 0.01 and SRMR = 0.02, which pointed out perfect or acceptable fit [98]. Two illustrative examples of items are as follows:

"I often re-evaluate my experiences so that I can learn from them."

"I usually check the credibility of the source of information before making judgments."

2.5. Data collection and analysis

Firstly, a research approval was obtained from "Institutional Review Board for Research with Human Subjects" with the 347-research protocol code and the decision numbered 18 and dated January 07, 2020. To facilitate the accessibility to the potential participants, the scales were distributed electronically to the EFL instructors who were available for the authors and then in the subsequent stage, the instructors who were more collaborative with the project were asked to share the online scales with their colleagues in other locations. Thus, the scales were distributed in groups of instructors on different social networks and via email. The required guidelines in each section were explained at the beginning of each section. It is worth mentioning that the scales were

presented in English language for both groups. The triangulation of this research consisted of semi-structured interviews with 10 participants who were interested in the interview. The interview was carried out by the authors, in diverse venues depending on the participants' residency conditions. Face-to-face and electronic (via telephone) interviews were used for the purpose of this study. The questions of the interviews were the same as the items in the scales but some asking for clarification and exemplifications were added. The interviews were conducted with participants' L1.

The purpose of conducting this study was to discover whether there was any statistically significant difference between the Iranian and Turkish groups as the categorical independent variable. The Statistical analyses consist of a Multivariate Analysis of Covariance (MANOVA) to compare the Iranian and Turkish groups in terms of their level of CO, RS, IT, EA, and IA. All the statistics conducted in this study were carried out by applying SPSS 23 software. For the purpose of comparing the results, a procedure of statistical analysis was accomplished and the detailed explanation of this process is shown in tables and figures for the purpose of providing a clear-cut image of what has been obtained.

2.6. Normality test

In order to answer the research hypotheses, it was necessary to employ an association measure. In order to decide between parametric and non-parametric association measures, the assumption of normality was checked by computing the skewness and kurtosis ratios (i.e., skewness and kurtosis values divided by their standard error) from the table of normality test (Table 2). In Tables, (I) refers to the Iranian group while (T) refers to the Turkish group variables.

The values for asymmetry and kurtosis between −2 and +2 are considered acceptable in order to prove normal univariate distribution [99,100]. Hair et al. [100] and Bryne [101] argued that data is considered to be normal if skewness is between −2 and +2 and kurtosis is between −7 and +7. Accordingly, the normality assumption is assumed for grammar and motivational self-regulatory strategies.

3. Results

In order to find an answer to the research null hypothesis, a multivariate analysis of variance or MANOVA was carried out. A one-way between-groups multivariate analysis of variance was used to compare the differences between Iranian and Turkish instructors in terms of CO, RS, IT, EA, and IA [101]. Table 3 shows the descriptive statistics of the two groups for the comparison and contrasts.

An inspection of the mean scores (Table 3) indicated that Turkish instructors reported more frequent use of CO (M = 29.57, SD = 3.53) than did Iranian instructors (M = 28.4, SD = 4.51). Turkish instructors also tended to use RS (M = 17.36, SD = 2.6) more than Iranian instructors (M = 16.86, SD = 2.86). Further, Iranian instructors showed more frequent use of IT (M = 11.51, SD = 4.87) than did Turkish instructors (M = 10.4, SD = 5.69). Turkish instructors showed more interest to use EA (M = 24.11, SD = 4.25) more than Iranian instructors (M = 22.46, SD = 4.27). In addition, Turkish instructors also tended to use IA (M = 31.27, SD = 3.92) more than Iranian instructors (M = 30.67, SD = 4.53). Table 4 summarizes these findings and shows the effect size index (partial eta squared) for IA was 0.09 which is considered as the largest effect size index among various dependent variables They indicate that the instructors tend to utilize IA more often than other factors.

Table 5 shows that there was a statistically significant difference between Turkish instructors and Iranian instructors on the combined dependent variables: F (5, 56) = 6.56, p = 0.00; Wilks' Lambda = 0.945; partial eta squared = 0.055.

Table 6 illustrates the comparisons and contrasts for the CO, RS, IT, EA, and IA in details.

When the results of the dependent variables were considered separately, the only difference not to reach statistical significance, using a Bonferroni adjusted alpha level of 0.01 (because there were five analyses, the alpha level 0.05 was divided by 5), was IA: (p = 0.095, partial eta squared = 0.09).

Generally, it confirms the superiority of the Turkish instructors' using of CO, RS, EA, and IA over Iranian instructors. It presents that Turkish instructors used CO, RS, EA, and IA more than the Iranian group. It is represented graphically below in Figs. 2, 3, 5 and 6:

Figs. 4–6 also reveal the differences of the IT and EA for the Turkish and Iranian EFL instructors.

Table 2
Tests of normality (p ≤ 0.05).

	N	Minimum	Maximum	Mean	SD	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
CO–I	286	7.00	35.00	28.40	4.51	−1.15	0.14	2.68	0.28
RS-I	286	4.00	20.00	16.86	2.86	−1.12	0.14	1.69	0.28
IT-I	286	6.00	30.00	11.51	4.87	1.13	0.14	1.01	0.28
EA-I	286	7.00	30.00	22.46	4.27	−0.33	0.14	0.36	0.28
IA-I	286	8.00	35.00	30.6783	4.53	−1.80	0.14	4.84	0.28
CO-T	281	17.00	35.00	29.5730	3.53	−0.34	0.14	−0.33	0.29
RS-T	281	11.00	20.00	17.3630	2.60	−0.45	0.14	−1.08	0.29
IT-T	281	6.00	30.00	10.4021	5.69	1.95	0.14	3.81	0.29
EA-T	281	13.00	30.00	24.1103	4.25	−0.45	0.14	−0.62	0.29
IA-T	281	21.00	35.00	31.2740	3.92	−1.16	0.14	0.60	0.29
Valid N (listwise)	281								

Table 3

Descriptive statistics.

Instructors		Mean	SD	N
CO	I	28.40	4.51	286
	T	29.57	3.53	281
	Total	28.98	4.09	567
RS	I	16.86	2.86	286
	T	17.36	2.60	281
	Total	17.11	2.74	567
IT	I	11.51	4.87	286
	T	10.40	5.69	281
	Total	10.96	5.32	567
EA	I	22.46	4.27	286
	T	24.11	4.25	281
	Total	23.28	4.34	567
IA	I	30.67	4.53	286
	T	31.27	3.92	281
	Total	30.97	4.25	567

Table 4

Tests of between-subjects effects.

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	CO	191.99[a]	1	191.99	11.65	0.00	0.02
	RS	34.85[b]	1	34.85	4.65	0.03	0.00
	IT	176.32[c]	1	176.32	6.28	0.01	0.01
	EA	382.05[d]	1	382.05	20.96	0.00	0.03
	IA	50.297[e]	1	50.29	2.79	0.09	0.00
Intercept	CO	476514.74	1	476514.74	28918.79	0.00	0.98
	RS	166075.73	1	166075.73	22183.08	0.00	0.97
	IT	68101.27	1	68101.27	2425.90	0.00	0.81
	EA	307515.38	1	307515.38	16873.81	0.00	0.96
	IA	544007.34	1	544007.34	30180.17	0.00	0.98
Groups	CO	191.99	1	191.99	11.65	0.00	0.02
	RS	34.85	1	34.85	4.65	0.03	0.00
	IT	176.32	1	176.32	6.28	0.01	0.01
	EA	382.05	1	382.05	20.96	0.00	0.03
	IA	50.29	1	50.29	2.79	0.09	0.00
Error	CO	9309.89	565	16.47			
	RS	4229.92	565	7.48			
	IT	15860.97	565	28.07			
	EA	10296.79	565	18.22			
	IA	10184.30	565	18.02			
Total	CO	485885.00	567				
	RS	170311.00	567				
	IT	84205.00	567				
	EA	318027.00	567				
	IA	554192.00	567				
Corrected Total	CO	9501.88	566				
	RS	4264.77	566				
	IT	16037.29	566				
	EA	10678.85	566				
	IA	10234.60	566				

a. R Squared = 0.02 (Adjusted R Squared = 0.01)
b. R Squared = 0.00 (Adjusted R Squared = 0.00)
c. R Squared = 0.01 (Adjusted R Squared = 0.00)
d. R Squared = 0.03 (Adjusted R Squared = 0.03)
e. R Squared = 0.00 (Adjusted R Squared = 0.00)

The preceding graphs (Figs. 2–6) visually illustrate the Turkish and Iranian instructors' use of the mentioned variables. Further, it shows that Turkish instructors used the CO, RS, EA, and IA more than Iranian instructors. It also shows that Iranian instructors tend to use IT more than Turkish instructors.

4. Discussion

The present study examined for possible comparison and contrast between Iranian and Turkish EFL instructors in terms of CO, RS,

Table 5
Multivariate tests.[a].

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	0.99	11219.03[b]	5.00	561.00	0.00	0.99
	Wilks' Lambda	0.01	11219.03[b]	5.00	561.00	0.00	0.99
	Hotelling's Trace	99.99	11219.03[b]	5.00	561.00	0.00	0.99
	Roy's Largest Root	99.99	11219.03[b]	5.00	561.00	0.00	0.99
Groups	Pillai's Trace	0.05	6.56[b]	5.00	561.00	0.00	0.055
	Wilks' Lambda	0.94	6.56[b]	5.00	561.00	0.00	0.055
	Hotelling's Trace	0.05	6.56[b]	5.00	561.00	0.00	0.055
	Roy's Largest Root	0.05	6.56[b]	5.00	561.00	0.00	0.055

[a] Design: Intercept + Groups
[b] Exact statistic

Table 6
Pairwise comparisons.

Dependent Variable	(I) Groups	(J) Groups	Mean Difference (I-J)	SE	Sig.[b]	95% Confidence Interval for Difference[b]	
						Lower Bound	Upper Bound
CO	I	T	−1.16[a]	0.34	0.001	−1.83	−0.49
	T	I	1.16[a]	0.34	0.001	0.49	1.83
RS	I	T	−0.49[a]	0.23	0.031	−0.94	−0.04
	T	I	0.49[a]	0.23	0.031	0.044	0.94
IT	I	T	1.11[a]	0.44	0.012	0.24	1.98
	T	I	−1.11[a]	0.44	0.012	−1.98	−0.24
EA	I	T	−1.64[a]	0.35	0.000	−2.34	−0.93
	T	I	1.64[a]	0.35	0.000	0.93	2.34
IA	I	T	−0.59	0.35	0.095	−1.29	0.10
	T	I	0.59	0.35	0.095	−0.10	1.29

Based on estimated marginal means
[a] . The mean difference is significant at the .05 level.
[b] . Adjustment for multiple comparisons: Bonferroni.
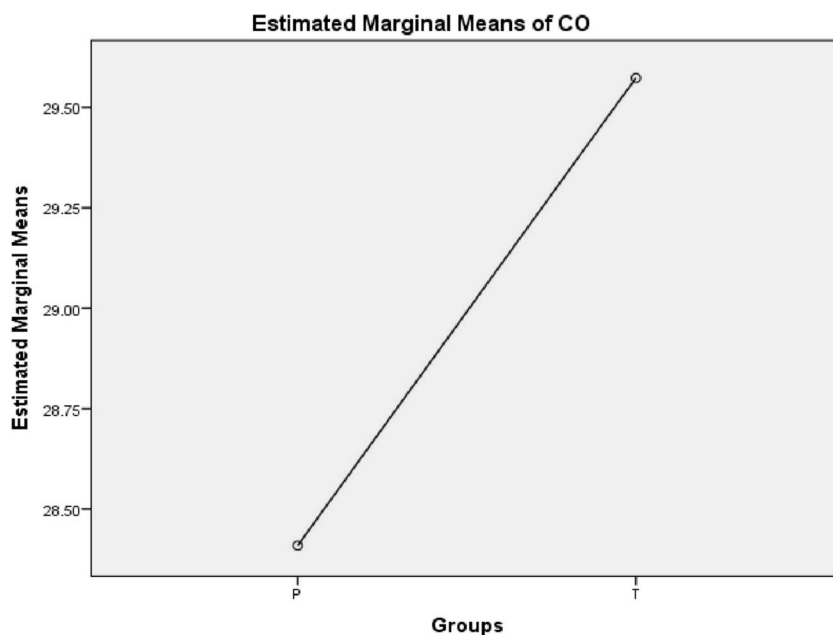
Fig. 2. Line graph of CO

IT, EA, and IA. The main motivation was to identify the possible differences between instructors. As it was noted earlier, instructors can play significant roles in satisfying both students' and authorities' educational expectations. The increasing number of migration among young generations in Iran might be a critical point to study different involved aspects in educational systems. To summarize explicitly,
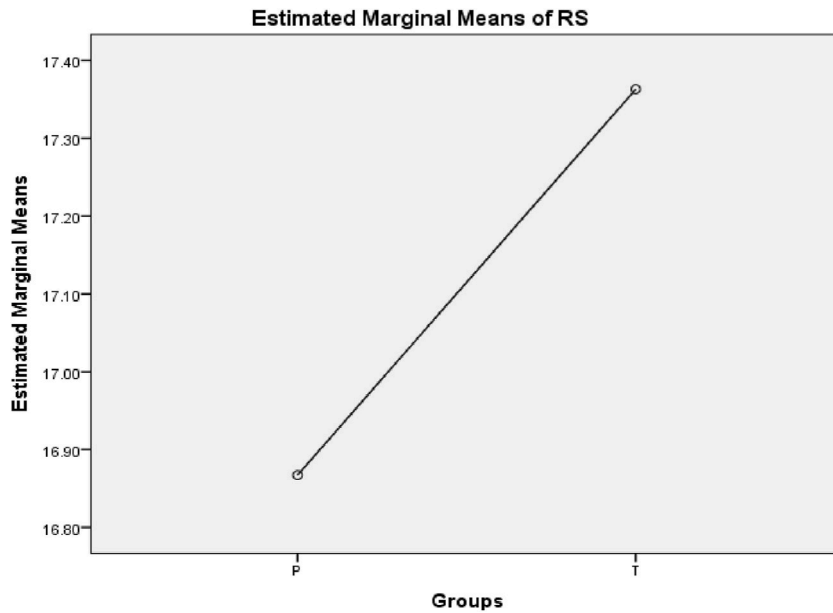
Estimated Marginal Means of RS

Fig. 3. Line graph of RS
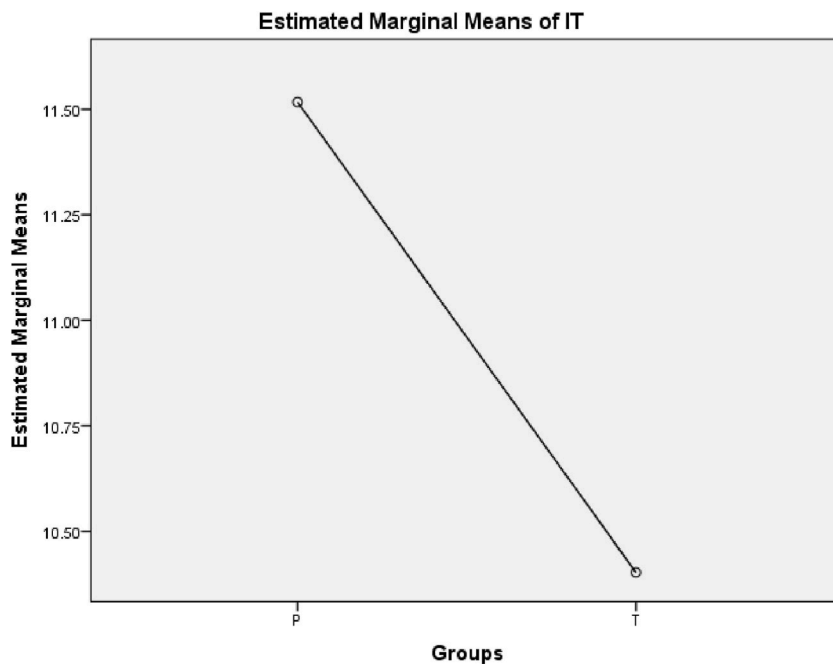
Estimated Marginal Means of IT

Fig. 4. Line graph of the it..

a. Turkish EFL instructors showed higher scores in CO than Iranian EFL instructors. b. Turkish EFL instructors showed higher scores in RS than Iranian EFL instructors. c. Iranian EFL instructors showed higher scores in IT than Turkish EFL instructors. d. Turkish EFL instructors showed higher scores in EA than Iranian EFL instructors. e. Turkish EFL instructors showed higher scores in IA than Iranian EFL instructors.

To elaborate on the details for implementing this online survey, the aim of the study and necessary information were presented in relevant sections in the online questionnaires. The scales were presented in English for both the Iranian and Turkish groups to avoid possible errors caused by translations. Based on the obtained results, Turkish EFL instructors tend to use the CO, RS, EA, and IA more than Iranian EFL instructors and Iranian EFL instructors showed to use IT more than Turkish EFL instructors. The differences between the two groups can express the subsequent differences between EFL instructors in Iran and Turkey in teaching practices. Further, the
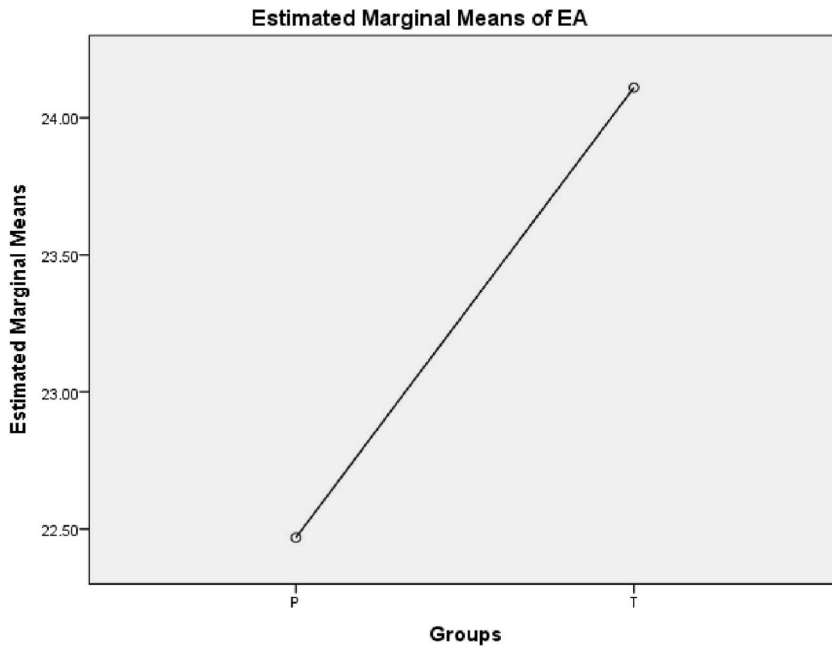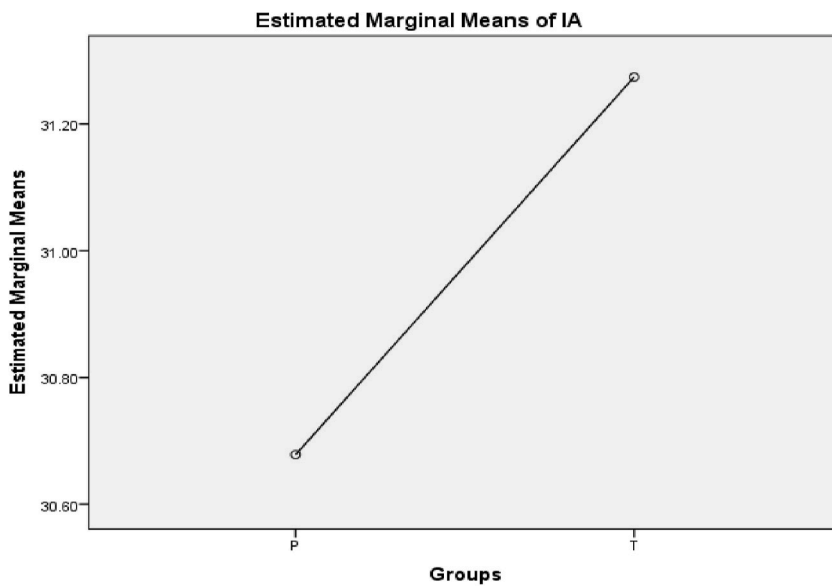
Fig. 5. Line graph of the EA

Fig. 6. Line graph of the IA

difference between the groups in terms of higher rate of teaching in younger learners for the participants in the Turkish group might be another reason for the higher levels of RS, EA, and IA. Because teaching demands instructors' 21st century characteristics [102]. In addition, Iranian participants were more experienced in teaching than Turkish participants; thus, there might be some kind of automatic teaching performance which might not be reported by the participants.

Based on the conceptual framework of this research, the rigor of the findings can also be confirmed. As explained earlier, CO and RS are linked, so that for Turkish participants both variables were at a high level. In the case of EA and IA, both variables were higher for the Turkish instructors. And considering the higher level of IT for the Iranian group, this variable was not linked to the other variables as it was stated before. Therefore, the findings of this research were in accordance with the conceptual frameworks of Sosu [3] for CO and RS, Rosenblatt [1] for the variables of EA and IA, and Semerci [2] for IT. The results obtained from triangulation i.e., semi-structured interviews with participants on the telephone and in person clarified that the participants provided their honest

responses to the scales.

One of the possible reasons for the noted differences might be due to the differences in educational rules for the instructors and educational policies for the operationalization. This means that considering Turkey as the European country, Turkish educational system seems to follow the most recent trend in the educational system which is also practiced in the European countries. In addition, considering the contrasts for prioritizing 21st century skills in Turkey and local values in Iran, the EFL instructors seem to follow the intended educational goals in their country. Another reason for obtaining these results might be lack of opportunity for Iranian EFL teachers for being trained by the recent educational trends in the 21st century. The limited number of EFL teachers who can travel for educational and academic goals to Turkey cannot promote the population of Iranian EFL teachers in CO, RS, EA, and IA. By reminding that the teacher educations in Iran did not encourage 21st century skills explicitly, updating the programs might be critical. As it was noted in the Introduction that this study concentrated on Theory of Critical Thinking in education as one of the important skills of this era, the results uncovered that the educational system that did not encourage 21st century skills and higher-order thinking skills explicitly, cannot equip teachers with required thinking skills and cannot expect future success.

Considering the few comparative research studies for the 21st century skills, accomplishing such studies can provide more tangible findings for emphasizing the importance of such higher order thinking skills. Another contribution of such works might be the possibilities for the educational reforms and predicting possible consequences. The findings of this study were also in line with the theoretical conjunctions of Rosenblatt [1], Semerci [2], and Sosu [3]. This study confirmed the link of accountability and educational variables posed by Adler-Kassner and Harrington [58]. In addition, this study could strength the links of CO, RS, IT, EA, and IA with the 21st century skills were [36,41,44,45,53,54].

In the field literature, there are many studies that found the positive and significant relationship between "critical" and "creative thinking" [87,103–105]. Akpur [106] revealed a positive and significant relationship among "critical", "reflective" and "creative thinking". Aşkın-Tekkol and Bozdemir [32], exploring teacher candidates' reflective thinking tendencies and their critical thinking skills, revealed a positive and moderate correlation between these variables. Evin-Gencel and Güzel [107] also found that the relationship between reflective thinking and critical thinking was positive and significant, which was confirmed by Semerci's research [2]. In addition, the theoretical framework that reflective thinking encourages critical thinking supports this relationship [1–3]. As Evin-Gencel and Güzel [107] emphasize, reflective and critical thinking affect each other, and they help learners to diagnose areas where they are sufficient or insufficient whereas increasing awareness during their learning processes.

Baki [108] found that "creative thinking tendencies" is a significant and a positive predictor of "reflective thinking". As it is understood clearly, it can be discussed that "critical", "reflective" and "creative thinking skills" are closely interrelated and the relationship between them is of great importance. In this regard, as Deringöl [109] points out, critical thinking is used during the awareness of a problem and learners tend to use "critical thinking" in company with other metacognitive thinking skills in order to realize learning process, which may reveal creative ideas. In addition, Çardak [110] emphasizes that "critical thinking" can endorse "reflective thinking" whereas a series of actions or steps taken in order to achieve "critical thinking" can be a consequence of "creative thinking" or "problem solving". Therefore, it can be inferred that they are closely related to each other.

As for the relationships between CO, RS, IT, EA, and IA, it can be said that instructors with sense of high level of accountability can be presumed to be responsible for the outcomes of the teaching activities for their learners [1–3]. Instructors with high internal accountability tend to be innovative and critical in their educational enterprises as the important benchmark for assessing their achievement constitutes their consciousness. It can be also deduced that instructors who appreciate external accountability instead of the internal accountability tend to carry out their tasks as prescribed by law or regulations. On the other hand, instructors who appreciate internal accountability are inclined to perform more than predetermined roles by authorities and take risks in their teaching in order to help their students to achieve more [4]. Considering the tight links of Iran and Turkey, it can be expected that international students (Iranian students) in Turkey can have a positive impact on academic advances, cooperation and targeting future educational goals for both countries and of course for other international steps in the world. To account for the findings, it should be noted that based on the descriptive data in Table 1, participants were different in terms of some of the teaching and professional variables that could contribute to the differences in terms of CO, RS, IT, EA, and IA. Finally, to address the findings from other perspectives, the findings can be affected by hidden variables such as different gender, professional seniority, school type, the frequency of extracurricular reading habits and place of residence, then there is a possibility that the results in this present study were affected by these covariates. In this way, the interpretations of the findings need to be carried out carefully. In other words, the participants in the Iranian group were mainly in-service teachers while the Turkish group were mainly pre-service teachers thus their available times, extracurricular reading habits and place of residence were different. In addition, participants' professional seniority and school type was also different. Since, it is very difficult to control such hidden variables and features in the studies on human being particularly when the study was conducted in two different countries the interpretation of the findings and homogeneity of the groups should be explained. As noted, before, it might not be applicable to find two exact groups but future studies can focus on just some of the above noted hidden variables to check if the same results could be obtained.

The analysis of the findings supports that following 21st century skills and critical thinking theory in teacher education programs for EFL teachers needs to be examined for possible remedies and international collaborations. The remedies in Iran (considering the obtained results) can be done via national educational system and training Iranian EFL instructors with the national teacher trainers who are training with the recent educational trends of 21st century skills and Critical Thinking Theory. Further, this movement can be accelerated and reinforced by cooperating with international teacher trainers particularly Turkish teacher trainers, as the old and near neighbor to Iran and Iranian culture. Other practical suggestion can be holding workshops, online courses and adding new educational materials for both pre- and in-service teachers in Iran which can be done with collaboration with international teacher trainers in Turkey.

4.1. Implications and limitations

One of the main contributions of these results might be providing an opportunity for further looks at the results of the educational systems and students' particularly educational and academic achievement. Therefore, the differences between instructors and their subsequent influence on students' educational (and future vocational) performances can illuminate the issues that may need to be addressed for educational reforms in each country.

To pinpoint some of the limitations of this study, it can be important to notify you about the limited number of items for estimating variables such as internal and external accountability. Thus, the results should be interpreted with caution. One of the limitations of this research was the lack of a longitudinal study, so future studies can address this aspect. This study also could not select homogeneous groups in terms of demographic data. Another limitation of this study was the approximately limited sample size which can be considered for further research. This limitation which was caused by Covid-19 pandemic condition contributed the long period of data collection. Following studies can select group with the same characteristics such as teaching experience and school type. In addition, future studies can explore the comparison and contrast between the EFL instructors' and EFL learners' ideas and explore if there might be some necessary moves in the educational settings for improving EFL teaching and learning. Future studies can seek the impact of educational ties between Iran and Turkey at different social levels (e.g., micro, macro etc.). Another missing point that can be addressed in future studies can be the possible role of Iran in Turkey educational system and vice versa. Inviting teacher trainers from countries such as Turkey in Iran can be a hot topic for both research and practice in teacher education programs. Updating teacher training programs and revising teacher education academically might be one of the contributions of this study. As it was noted before, one of the main implications of this research can be provoking and planning joint and collaborative teacher-training courses for EFL instructors for Iranian and Turkish instructors. Another implication of this line of research might be globalizing educational systems and collaborations. Moreover, this study could bring 21st century skills to the attention of the following studies and training courses. Finally, the revision of the educational systems might be another important implication of this research.

5. Conclusion

This study was comparative research to check CO, RS, EA, IA, and IT for Turkish and Iranian EFL instructors. The main contribution of this research was the identification of psychological characteristics of instructors regarding 21st century skills and examining EFL instructors who need special training for providing 21st century teachings. This research tried to select variables with regard to 21st century skills that were not addressed enough in the literature. The authors tied to access EFL instructors in distant locations via convenience sampling to avoid bias of findings for collecting data from one available location. This research tried to remind the strong links between Iran and Turkey and tap the comparative study for future and joint teacher-training courses.

Based on the findings, this research uncovered that Turkish EFL instructors tend to use CO, RS, EA, and IA more than Iranian EFL instructors. The results also suggested that Iranian EFL instructors seem to use IT more than Turkish EFL instructors. Such findings not only can clarify the different trends advocated in each country but can be used for tailoring future teacher training courses. Even in the broader scope, this research design can be used for as a pre-requisite of international teacher training courses. In addition, the results would identify possible risks, so that the findings can be taken into account in future steps in the field of education. Considering the current condition of Iran and obstacles for educational improvements, international collaborations with old friends such as Turkey can play a significant role in Iran [29].

Ethics declarations

All participants provided informed consent for the publication of their anonymized case details and images. The ethical forms of the study were approved by the human research ethics committee of the corresponding author's university. The year and protocol number of the document is 2023/03-01.

Data availability statement

Data will be made available on request.

CRediT authorship contribution statement

Şenol Orakcı: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Tahmineh Khalili:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

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

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e29097.

Annex

Scales used in this research:

External accountability sub-scale

(1 – Strongly disagree, 2 – Disagree, 3 – Neither agree or disagree, 4 – Agree, 5 – Strongly agree)
Items.
In your work as a teacher, to what extent do you feel that it is your duty to.

1. Give yourself a report on the extent to which you reached your goals at work
2. Give school management a report on the extent to which you reached your goals at work
3. Be evaluated by whether your students improve their grades
4. Be accountable for your students' achievements
5. Pay for the consequences when your work does not meet expectations
6. Get credit for the success of your classes

Internal accountability sub-scale

1. Act by your inner moral standards
2. Act by professional ethical principles at your work
3. Develop professionally in order to accomplish your work in the best way
4. Learn from the work of outstanding colleagues
5. Be responsible for teaching in the best possible way
6. Be ready to use results of studies on instruction and education
7. Be responsible for using professional knowledge in your work

Innovative Thinking Scale

(1 – Strongly disagree, 2 – Disagree, 3 – Neither agree or disagree, 4 – Agree, 5 – Strongly agree)
Items.

1. I help other teachers in teaching.
2. I make do with the activities in the book and do not create new ones.
3. While explaining the subject, I leave some points missing and let the students find them.
4. I cannot look at the events in the teaching-learning process from multiple perspectives.
5. I am not responsible for my students' individual needs.
6. I do not care about my students' educational activities.

Critical Thinking Disposition Scale

(1 – Strongly disagree, 2 – Disagree, 3 – Neither agree or disagree, 4 – Agree, 5 – Strongly agree)
Critical Openness sub-scale.

1. I usually try to think about the bigger picture during a discussion.
2. I often use new ideas to shape (modify) the way I do things.
3. I use more than one source to find out information for myself.
4. I am often on the lookout for new ideas.
5. I sometimes find a good argument that challenges some of my firmly held beliefs.
6. It's important to understand other people's viewpoint on an issue.
7. It is important to justify the choices I make.

Reflective Skepticism sub-scale

1. I often re-evaluate my experiences so that I can learn from them.
2. I usually check the credibility of the source of information before making judgements.
3. I usually think about the wider implications of a decision before taking action.
4. I often think about my actions to see whether I could improve them.

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