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Predicting Critical Thinking Tendencies of University EFL teachers through Problem-solving Skills: differences in gender and teaching experience

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Abstract

Critical thinking is one of the main functions of education and it is considered as learners' use of prior knowledge to make judgments and solve problems. This study aimed, firstly, to examine the relationship between university EFL teachers' critical thinking tendencies and their problem-solving skills, and secondly, to explore the prediction of university EFL teachers' critical thinking tendencies by problem-solving skills, gender, and teaching experience. The study was designed in a correlational survey method. In total, 70 university EFL teachers (35 males and 35 females), from Azad and Payame Noor universities located in Isfahan and Ilam provinces teaching undergraduate students majoring in English, participated in this research. Data were collected via the California Critical Thinking Disposition Inventory and the Problem-Solving Inventory. The collected data were analyzed using descriptive statistics, the Pearson Product-Moment Correlation Coefficient, and stepwise regression analysis. The relationship between critical thinking tendencies and problem-solving skills was investigated through the Pearson Product Moments Correlation Coefficient, and stepwise regression analysis was run to determine whether university EFL teachers' problem-solving skills, gender, and teaching experience can significantly predict their critical thinking tendencies. The findings indicated that there was a positive, moderate, and significant relationship between university EFL teachers' problem-solving skills and their critical thinking tendencies, while there was no significant difference according to gender. In terms of teaching experience, the correlation coefficient for novice teachers showed a weak, positive, and non-significant relationship, yet the correlation coefficient for experienced teachers indicated a moderate, positive, and significant relationship. This study has both theoretical and practical implications for EFL teachers, practitioners, learners, and policymakers.

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Introduction

Critical thinking (CT) is considered one of the most crucial and essential elements of achievement. However, it seems that the concept has also become a confusing term among educators. "At one level, we all know what critical thinking means – it means good thinking, almost the opposite of illogical, irrational thinking. However, when we test our understanding further, we run into questions" (Facione, 2011, 2). For example, is CT the same as creative thinking? Is it identical to higher-order thinking skills (HOTS)? Does it concentrate on the content? Does it focus on the mental process which is used? Does it have specific or general applications?

There is no differentiation in educational contexts of how important CT is for students from various careers or academic majors (Kabeel & Eisa, 2016; Rincker, 2014). However, considering that a new language learner is frequently exposed to different ideas and a new culture, its significance in ELT classrooms cannot be ignored. Due to its identity as the lingua franca, learning or teaching English may be different from learning or teaching other languages (Külekçi & Kumlu, 2015). The global position of this language brings people from different cultures together and broadens their horizons. Our thoughts and speech are influenced by our culture; that is why critical thinking is needed in language classes to gain diverse perspectives and understand different cultures (Alagözlü & Süzer, 2010). According to Alagözlü and Süzer, social structure is a significant determinant of students' ability to learn CT skills.

Critical thought is a significant issue that is of great importance in education, and these days, many educators are interested in encouraging and developing critical thinking in their classes. In reality, creating a learning environment that expedites the development of CT skills can be considered a fundamental objective of the educational program globally. Norris (1985) believed that CT is the learners' capability in using their prior knowledge, assessing their thoughts, and modifying their behavior because of thinking critically. Critical thinking, as Scriven and Paul (2004) described, is a process of evaluation, synthesis, analysis, conceptualization, and implementation of information. Children are not born with the capability to think critically. It is a learned skill that must be instructed by knowledgeable and trained teachers (Patel, 2013). Thus, instructors should know the importance of critical thinking abilities and the strategies of training them and attempt to identify different class areas as the appropriate place to teach and emphasize these skills (Schafersman, 1991).

> To better prepare our students for the challenges they will face, teachers should explicitly teach critical thinking strategies, equipping young people with twenty-first-century skills (Hove, 2011, 7).

Critical thinking studies have mainly focused on critical thinking tendency (CTT) and skills (Geçit & Akarsu, 2017). Whereas CTT is an individual's motivation for thinking critically, critical thinking skill is based on the individual's reasoning and decision-making skills to solve a problem (Genç, 2008). On the other hand, critical thinking skills have been identified with problem-solving abilities (Tümkaya et al., 2009) since critical thinking skills involve the processes of identifying and understanding the problem, deciding to solve, and solving the

problem for an individual to deal with the difficulties encountered. Thus, it can be asserted that both concepts are associated with each other and that it is impossible to completely distinguish these two notions.

According to D' Zurilla et al. (2002) and Kneeland (2001), a problem is a behavioral and cognitive process that occurs in daily life in specific circumstances, and the individual himself or herself manages the solution. Furthermore, a problem is defined as a condition where learners are eager to solve the difficulty, do not know how to achieve the solution, yet might solve it with skills and knowledge they possess (Olkun & Toluk, 2004). Problem-solving is a multi-step process that requires many mental operations to get from one situation to the next (Mayer, 1983). Individuals use their background knowledge, abilities, and expertise to solve an unfamiliar problem during the problem-solving process (Krulik & Rudnick, 1987). The individual needs to have problem-solving skills to attain their goals in life (Chaudhry & Rasool, 2012). Due to evolving professional standards, modern demands, and improvements in learning theories and education, problem-solving is a fundamental skill needed for learners. Problem-solving is essential for a learner's success in the community and academic life (Agran et al., 2002). As a result, teachers should have problem-solving skills to direct their students through the teaching-learning process and improve their problem-solving skills. For instance, in research conducted by Sandoval et al. (2018), a teacher development effort was made to change teacher thinking and learning. The student's outcomes were observed as a consequence. It was suggested that teacher thinking and learning had a great influence in stimulating learners' thinking processes.

Problem-solving skills and critical thinking have a lot in common. Critical thinking, like problem-solving, is a thinking mechanism that involves cognitive processes such as reasoning, assessing, and evaluating. Critical thinking is an intellectual ability that is important in both one's educational and social life (Akin et al., 2015). According to Akin et al. (2015), critical thinking is a method in which learners use their prior experience to perceive an obstacle and make appropriate decisions. Thus, it can be inferred that a person employs critical thinking throughout problem-solving activities, and the problem-solving process enhances the use of critical thinking. Problem solving can be described as determining what to do when you do not know what to do (Altun, 2015). There are different definitions of CT; however, most of the descriptions contain common elements such as problem-solving and making decisions (Halpern, 1998). Individuals' critical thinking abilities will help them suggest the best solutions to their problems (Birgili, 2015). Problem-solving has the potential to promote one's critical thinking abilities (Buku et al., 2016). Critical thinking needs to employ strategies and skills to foster the desired outcomes and to overcome the problems faced (Zulmaulida et al., 2018). To be effective, individuals need to develop their critical thinking skills, which will help them evaluate complex situations quickly, produce efficient solutions, and make sound decisions (Zare & Biria, 2018). As a result, problem-solving skills play a crucial role in developing critical thinking.

In recent times, scholars from diverse fields, specifically education and memory development, have exhibited a notable interest in exploring the relationship between problem-solving skills and critical thinking propensities (Friedel et al., 2008; Kim & Choi, 2014;

Memduhoğlu & Keleş, 2016; Tümkaya et al., 2009). As of yet, there has been no exploration of the possible correlation between the critical thinking tendencies of teachers and their problem-solving abilities with respect to their teaching experience and gender. Thus, the present study aimed to investigate the potential correlation between critical thinking tendencies and problem-solving skills among male and female EFL teachers. Therefore, it will be novel to simultaneously investigte the relationships between such variables in connection with several other vaeiables such as gender and teaching experience. Moreover, the current study is novel in terms of research design, research context, research variables and research participants. To accomplish this goal, the study posed the following three research questions:

RQ1: Is there any significant relationship between problem-solving skills and critical thinking tendencies of university EFL teachers?

RQ2: Are there any significant differences between male and female university EFL teachers' problem-solving skills and their critical thinking tendencies?

RQ3: Are there any significant differences between novice and experienced university EFL teachers' problem-solving skills and their critical thinking tendencies?

Literature Review

Theoretical Background of the Study

Critical thinking is a complicated notion with distinct characteristics derived from the various branches of knowledge that have spent time and effort debating its definition. CT was described by Paul and Elder (2007) of the Foundation for Critical Thinking as "the practice of examining and assessing thinking to improve it" because the quality of our thinking determines the quality of our lives (p.4). Consequently, innovation in thinking must be nurtured in a systematic manner. As a result, critical thinking is self-disciplined, self-governed, and self-regulated. Facione (2011) acknowledged that the development of thought is critical to our life quality. He also stated that although being informed and exercising sound judgment does not guarantee satisfaction or financial success, it does increase one's chances of achieving these objectives. He highlighted that critical thinking deficiencies lead to patient deaths, work loss, inadequate law enforcement, war injuries, misjudgments, cardiovascular disease, poor academic performance, and other issues. Thus, critical thinking is defined as a self-regulatory judgment that leads to reflection, interpretation, assessment, reasoning, and also a description of the empirical, logical, analytical, and situational factors that led to that judgment. CT is crucial as a research tool. As a result, CT is an effective tool in one's personal and public life, as well as a revolutionary power in education.

According to Facione (2011), "CT is a ubiquitous and self-correcting human trait, though it is not linked with improved thinking" (p. 26). Critical thinking has been presented in three ways in Latin America: political and cultural reflections, methodological and educational reflections, and reflections on teaching, promoting, and evaluating critical thinking in education. First, it is political and cultural in nature as its primary goal is to reinterpret upcoming occurrences in Latin America, such as economic, social, religious, governmental, and technological conflicts to formulate new strategies. Second, because of Freire's (2005) universal inspiration, it is methodological and educational. He proposed education as a

democratic praxis based on a humanistic and transformative pedagogy aimed at liberating people from injustice and oppression. Finally, it is a review on how to incorporate and integrate CT into the educational system. Tamayo (2014), one of the leading authors of Latin America on CT and its components, considered CT as a domain-specific skill that could be acquired in education across all realms of knowledge, and through inter-and cross-disciplinary scientific studies. Nevertheless, he believed it is more important to take an inclusive and interdisciplinary approach to CT so that it would become a conceptual and empirical tool, an analytical resource, and a strategy for collective and individual liberation that is permeated by learning processes and information growth.

Several authors have provided different definitions of problem-solving. Problem-solving, according to Chi and Glaser (1985), is one of the most intelligent human behaviors since it necessitates complex thinking skills. Critical thinking improves effective learning in educational settings (Uzuntiryaki-Kondakçı & Çapa-Aydın, 2013), and it is described as students applying prior knowledge to solve problems and make decisions (Linn, 2000). In other words, critical thinking is a mechanism in which a student uses previous information to interpret an issue and make appropriate decisions about it (Akin et al., 2015). As a result, it can be inferred that critical thinking is used during the problem-solving process and that problem-solving practices improve critical thinking. Actually, some scholars (Friedel et al., 2008; Kim & Choi, 2014; Memduhoğlu & Keleş, 2016; Tümkaya et al., 2009) have concluded that problem-solving skills are linked to critical thinking.

Since problem-solving is a way of thinking critically, it can be stated that critical thinking is essential in all aspects of life, particularly for professionals (Karakoc, 2016). In the learning process, critical thinking is a crucial technique (Llyod & Bahr, 2010). To improve the desired results and overcome the challenges they face, critical thinking requires the use of skills and techniques (Zulmaulida et al., 2018). Students' critical thinking abilities will help them come up with the best solutions to their problems (Birgili, 2015). Students' critical thinking skills assess the information they receive and how they apply it, but they need more practice to improve (Snyder & Synder, 2008).

Empirical Background of the Study

The relationship between pre-service teachers' critical-thinking tendencies and their problem-solving skills was examined by Memduhoğlu and Keleş (2016). A relational screening model was used in the research. Pre-service teachers studying in the Education Faculty at the Yüzüncü Yıl University of Turkey, during the 2013-2014 academic year comprised the study population. In this study, 656 students from different educational fields were included in the survey. For sampling, the stratified sampling technique was employed. Gender, field, grade, and academic performance were personal variables for these pre-service teachers. The data were collected using Facione et al.'s (1998) "California Critical Thinking Tendency Inventory," Heppner and Petersen's (1982) "Problem Solving Inventory," and a personal information form. Descriptive statistics, parametric analyses, and correlation analyses were used to analyze the data collected. The critical thinking tendency and problem-solving skills of pre-service teachers were found to have a near moderate-level and positive correlation in this research.

Ocak and Eğmir (2016) studied the relationships between critical thinking tendencies and problem-solving skills in pre-service teachers. The second aim of the study was to determine whether problem-solving skills differed significantly depending on critical thinking tendency level, as well as the compound impact of critical thinking tendency level with gender, department, and grade level. The sample contained 224 pre-service teachers at Afyon Kocatepe University. The California Critical Thinking Disposition Inventory, developed by Facione et al. (1998) and translated into Turkish by Kökdemir (2003), and the Problem Solving Inventory, developed by Heppner and Petersen (1982) and adapted into Turkish by Şahin et al. (1993), were used to collect data. According to the results, there was a significant and positive relationship between critical thinking tendencies and problem-solving skills among pre-service teachers. Problem-solving skills and their sub-dimensions varied significantly depending on the critical thinking tendency level of pre-service teachers (low, moderate, high). Furthermore, when the compound effect of critical thinking tendency level with gender, department, and grade level was examined, no significant differences in problem-solving skills were found.

Pre-service teachers' critical thinking dispositions, problem-solving skills, and self-efficacy beliefs were investigated by Cansoy and Türkolu (2017). A total of 519 pre-service teachers from Afyon Kocatepe University took part in the study during the 2016-2017 academic year. The data were gathered using the Critical Thinking Disposition, Problem Solving Inventory, and Teacher Self-Efficacy Scale. To analyze the data, the researchers used the arithmetic mean, Pearson Product-Moment Correlation Coefficient, and Multiple Linear Regression Analysis. The study found that pre-service teachers had a low critical thinking disposition, moderate problem-solving skills, and adequate perceptions of teacher self-efficacy. However, all dimensions of teacher self-efficacy showed strong positive associations with critical thinking dispositions and problem-solving skills. Additionally, critical thinking dispositions and problem-solving skills were both positive and significant predictors of all sub-dimensions of teacher self-efficacy beliefs.

Schooner et al. (2017) carried out research on the perspectives of Swedish compulsory school technology teachers on problem-solving and critical thinking as curriculum elements and skills discussed in the classroom. In-depth qualitative interviews were conducted with twenty-one teachers. The research findings revealed that the interviewed teachers had three distinct approaches to teaching about technology in a critical thinking and problem-solving mode: (1) the design approach, (2) the systems approach, and (3) the values approach. Even though these skills are not explicitly mentioned in the current Swedish technology curriculum, teachers claim they integrated critical thinking and problem-solving in various settings within the subject of technology. Teachers often associate and incorporate problem-solving and critical thinking with subject material in technology. Teachers use a variety of approaches depending on the material they are teaching, mainly when teaching about complex technology, but there was a tendency to overlook critical thinking abilities when dealing with design and problem-solving skills when dealing with values.

Irwanto et al. (2018) explored the differences between Critical Thinking Skills (CTS) and Problem Solving Skills (PSS) among pre-service elementary teachers who used the Process-Oriented Guided-Inquiry Learning (POGIL) and traditional lecture methods in their teaching.

They also examined the strength of the connection between CTSs and PSSs. Cluster random sampling was used to select both groups. During the academic year 2017-2018, this study was conducted at Universitas Muhammadiyah Ponorogo in Indonesia, with 48 participants. At a significance level of 0.05, the data were analyzed using the Mann-Whitney U-test and Spearman's rho correlation. The findings revealed that: 1) there was a significant difference in CTS and PSS between experimental and control groups in favor of experimental group students, and 2) all dependent variables had a strong positive and significant correlation. As a result, lecturers should use POGIL to help students develop their higher-order thinking skills.

The relationship between reflective thinking skills perceptions and problem-solving skills perceptions that should be present in Turkish teaching was explored by Karakoç and Demir (2020). The research included 106 Turkish teachers from eight districts in Kars Province. The Reflective Thinking Tendency Scale (YANDE) and the Problem Solving Inventory (PSI) were used in this research. The findings were analyzed using descriptive and inferential statistical methods. According to the results, there were moderate relationships between the total and sub-dimensions of Turkish teachers' perceptions of reflective thinking skills and their perceptions of problem-solving skills. The results revealed that the reflective thinking scale sub-dimensions of "continuous and purposeful thinking", "open-mindedness," "questioner and successful teaching," "teaching accountability and scientificity," "predictive and sincerity", and "professional perspective" did not significantly predict the sub-dimension of problem-solving. The researcher sub-dimension of the reflective thinking scale, on the other hand, was found to be an important predictor of problem-solving total scores. The relationships between Turkish teachers' perceptions of total and sub-dimensions of reflective thinking skills and total and sub-dimensions of problem-solving skills were moderate.

Method

For this study, a quantitative research design with a descriptive-analytical method was selected. This study aimed to determine the existence and the degree of relationship between two or more variables rather than creating cause-and-effect relationships (Karasar, 2013). As the purpose of the current study was to determine the relationship between problem-solving skills and critical thinking tendencies, a correlational design was selected. Detailed information on participants, instruments, data collection procedures and data analysis is provided in the following sections.

Participants

The participants in this study were 70 university EFL teachers teaching undergraduate students majoring in English. During the academic year of 2022-2023, 70 university EFL teachers (35 males and 35 females) from the English departments of Azad and Payame Noor universities in Isfahan and Ilam provinces were invited to participate in the study. Purposive sampling was used to determine the sample. All participants were actively involved in teaching undergraduate programs. Doctoral degrees in English Language Teaching, English Translation, or English Literature were all held by them. Their ages ranged from 35 to 50. They had 3 to 10 years of teaching experience. The gender and teaching experiences of university EFL teachers were also taken into account. Four branches of Islamic Azad universities, including Najafabad, Shahreza,

Khorasgan, and Ilam, and two branches of Payame Noor universities in Isfahan and Ilam provinces, were surveyed for EFL teachers.

Instruments

For data collection, three instruments were used in this study. The information about them is presented below:

Participant Information Form

Researchers created this form to collect data on participants' socio-demographic characteristics such as age, gender, grade level, and field of study.

California Critical Thinking Disposition Inventory (CCTDI)

It was originally developed by Facione and Facione (1998) to measure teacher candidates' critical thinking tendencies and to examine their attitudes toward the significance of critical thinking, as well as its place and value in language teaching. The affective and attitudinal dimensions of critical thinkers are discussed using a six-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). Analyticity, open-mindedness, inquisitiveness, self-confidence, truth-seeking, systematicity, and cognitive maturity are the seven subscales of the original form of the inventory, which has 75 items. Overall test reliability was 0.90 (Cronbach's alpha) with subscale scores ranging from 0.71 to 0.80. The instrument and its subscales have consistently been shown to be accurate in studies using the CCTDI (Facione & Facione, 1996).

Problem Solving Inventory

This scale was developed by Heppner and Petersen (1982). It consists of 35 items and six sub-dimensions that are impulsive style, reflective style, problem-solving confidence, avoidant style, monitoring, and planfulness. PSI employs a six-point Likert scale, ranging from 1 (strongly agree) to 6 (strongly disagree). The internal consistency of the PSI has been found to be acceptable across a range of populations and cultures (e.g., Heppner & Wang, 2003). The overall Cronbach Alpha reliability coefficient was 0.88, and the sub-dimension reliability coefficients were 0.78, 0.76, 0.64, 0.74, 0.69, and 0.59, respectively. These values illustrate that the scale is a reliable and valid measurement instrument.

Data Collection Procedures

During the 2022-2023 academic year, data were collected from university EFL teachers teaching undergraduate students majoring in English. About 70 university EFL teachers from Azad and Payame Noor universities of Isfahan and Ilam provinces were invited to participate in the study. Four branches of Islamic Azad universities, including Najafabad, Shahreza, Khorasgan, and Ilam, and two branches of Payame Noor universities in Isfahan and Ilam provinces, were surveyed for EFL teachers. First, the deans of education faculties were formally consulted. Purposive sampling was used to select the participants. The gender and teaching experience of the participants were taken into consideration. Then, data were obtained using two inventories. The instruments were piloted prior to the analysis to ensure their reliability for the purpose of the study. Google forms were used to create the online surveys, which were then sent to the participants' email addresses. The researcher provided general information and instructions for scale use, and all scales were given to the teachers

simultaneously. Respondents' anonymity was maintained, and they were told to fill out the questionnaires by choosing one of the options. The data collection process lasted approximately four weeks. Finally, statistical programs such as bivariate correlation, independent samples t-test, and two-way ANOVA based on normality test were used to evaluate the inventories. The descriptive analysis of the closed items of the questionnaires was done through the SPSS (Statistical Package for Social Sciences) 20.0 software. The significance of the data was tested on the basis of 0.05 level.

Data Analysis

This study utilized a correlational design to analyze university EFL teachers' responses to two scales. The Pearson Product-Moment Correlation Coefficient (r) was used to investigate the relationship between university EFL teachers' critical thinking tendencies and their problem-solving skills. In addition, stepwise regression analysis was run to determine if problem-solving skills, gender, and teaching experience of university EFL teachers explain their critical thinking tendencies. There were two phases for the data analysis. In the first phase, descriptive statistics were used to identify each participant's demographic responses. The second phase of analysis was completed to determine whether there was a significant difference in the responses based upon gender and teaching experience. Participants were asked to rate how much they agreed or disagreed with statements in the surveys. A six-point Likert scale was used to record responses, ranging from "strongly disagree" to "strongly agree." The assumptions of stepwise regression analysis, such as multivariate normality and linearity, as well as multi-collinearity, were tested prior to the analysis. The data were analyzed using the SPSS version 20.0 software program. Sub-dimension scores were determined in the analysis depending on the purpose of the study, and binary comparisons of t-test for independent samples were used to see whether there was a significant difference between groups. In this research, the level of significance was set at 0.05.

Results

Based on the objectives of the study, the following research hypotheses had to be tested:

H01: There is no significant relationship between problem-solving skills and critical thinking tendencies of university EFL teachers.

H02: There are no significant differences between male and female university EFL teachers' problem-solving skills and their critical thinking tendencies.

H03: There are no significant differences between novice and experienced university EFL teachers' problem-solving skills and their critical thinking tendencies.

Testing the Research Hypotheses

To test the first null hypothesis of the study and to see whether there was a significant relationship between problem-solving skills and critical thinking tendencies of university EFL teachers, Pearson correlation was employed; the results of this analysis are presented in Table 1:

Table 1. *Relationship Between Problem-solving Skills and Critical Thinking Tendencies*

		Problem-solving Skills	Critical Thinking Tendencies
Problem-solving Skills	Pearson Correlation	1	.43**
	Sig. (2-tailed)		.000
	N	70	70
Critical Thinking Tendencies	Pearson Correlation	.43**	1
	Sig. (2-tailed)	.000	
	N	70	70

** shows a significant relationship at p < .01

It could be found in Table 1 that the critical thinking scores of the teachers were positively correlated with their problem-solving skills (r = .43) and that this moderate, positive correlation was statistically significant at both .05 and .01 levels of significance (p < .01). The first null hypothesis of the study, hence, was rejected, and it was inferred that there was a positive, moderate, and significant relationship between university EFL teachers' problem-solving skills and their critical thinking tendencies, as is also shown in the scatterplot in Figure 1:

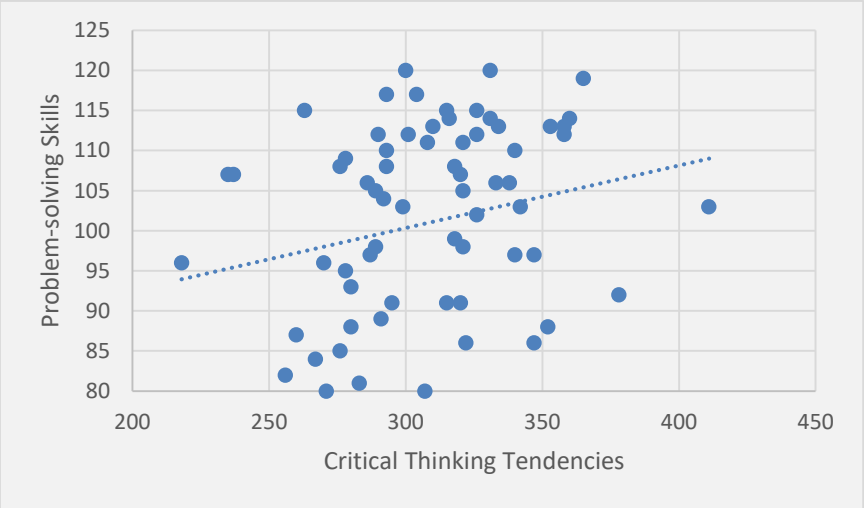

Figure 1. *Relationship Between Problem-solving Skills and Critical Thinking Tendencies*

To test the second and the third hypotheses of the present study and to examine the relationship between problem-solving skills and critical thinking tendencies of university EFL teachers with respect to the variables of gender and teaching experience, Pearson correlation was run for male, female, novice, and experienced teachers; then, Fisher's z was calculated to find out about the significance/non-significance of the differences between the correlation coefficients. The results of these analyses are presented in the following two tables:

Table 2. *Relationship Between Problem-solving Skills and Critical Thinking Tendencies Regarding Gender*

		Critical Thinking (Males)	Critical Thinking (Females)	Fisher's *z*	Sig.
Problem-solving Skills	Pearson Correlation	.35	.55**	-.96	.16
	Sig. (2-tailed)	.07	.000		
	N	27	40		

** shows a significant relationship at p < .01

It is shown in Table 2 that although the correlation coefficient for the relationship between critical thinking tendencies and problem-solving skills was positive and moderate for males (r = .35), but positive and strong for females (r = .55), and although the relationship is non-significant for males, but significant for females, the difference between the coefficients for males and females was still not of statistical significance (p > .05). These two relationships are displayed in the scatterplots in Figure 2:

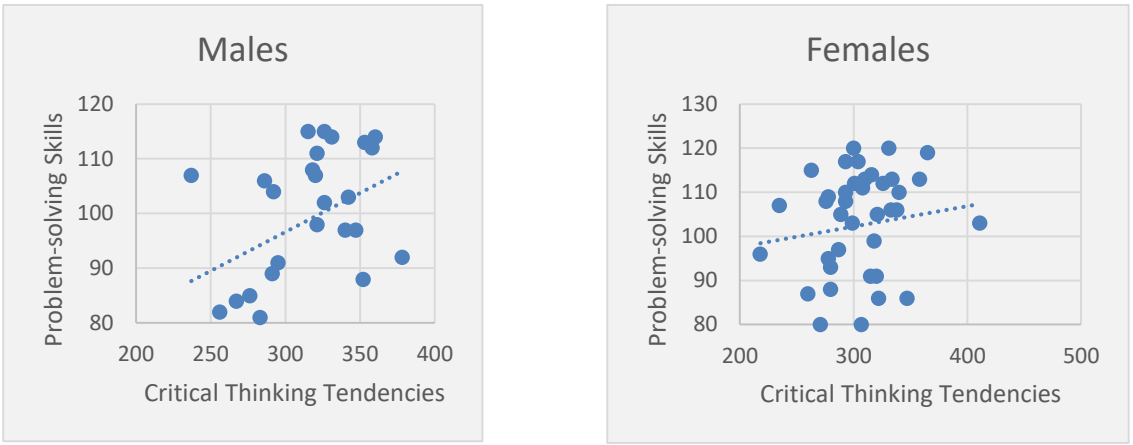

Figure 2. *Relationship Between Problem-solving Skills and Critical Thinking Tendencies of Male and Female Teachers*

The results obtained for novice and experienced teachers are provided in Table 3:

Table 3. *Relationship Between Problem-solving Skills and Critical Thinking Tendencies Regarding Teaching Experience*

		Critical Thinking (Novice)	Critical Thinking (Experienced)	Fisher's *z*	Sig.
Problem-solving Skills	Pearson Correlation	.35	.54**	-.92	.17
	Sig. (2-tailed)	.06	.000		
	N	28	40		

** shows a significant relationship at p < .01

As for the relationship between problem-solving skills and critical thinking tendencies of university EFL teachers, the correlation coefficient for novice teachers (r = .35) indicated a positive, moderate, and non-significant relationship, but the one for experienced teachers (r = .54) showed a strong, positive, and significant relationship. However, the p value for the Fisher's z formula demonstrated no significant difference between the two coefficients. All this boils down to the acceptance of the second and the third hypotheses of the study.

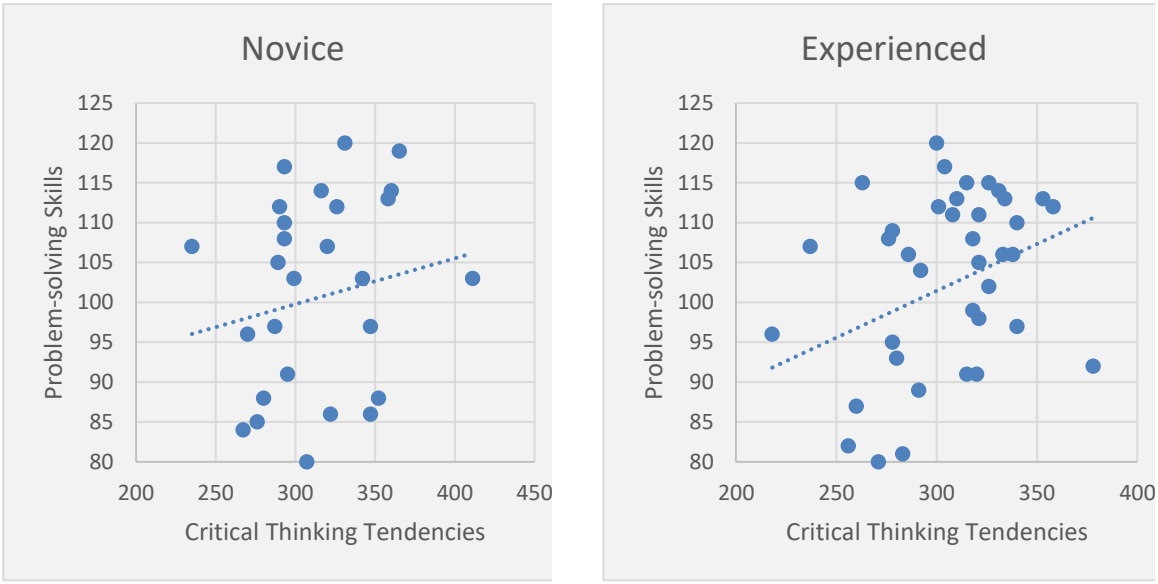

Figure 3. *Relationship Between Problem-solving Skills and Critical Thinking Tendencies of Novice and Experienced Teachers*

Predictive Power of Problem-solving Skills, Gender, and Teaching Experience

To investigate the predictive power of problem-solving skills, gender and teaching experience in accounting for critical thinking tendencies of university EFL teachers, multiple regression was conducted. This statistical test shows whether different independent variables (e.g., problem-solving skills, gender, teaching experience) can account for changes in a dependent variable (e.g., critical thinking tendencies). The results of multiple regression analysis are presented in Tables 4 and 5:

Table 4. *Model Summary for Multiple Regression*

Model	*R*	*R* Square	Adjusted *R* Square	*Std.* Error of the Estimate
1	.46	.21	.17	32.00

In Table 4, the value given under the R Square column shows how much of the variance in critical thinking is explained by problem-solving skills. The value given here is .21, which means that problem-solving skills explained 21% of the variance in the critical thinking scores of the teachers. To examine the statistical significance of this result, Table 5 should be consulted.

Table 5. *Statistical Significance of the Multiple Regression Results*

Model [a]		Sum of Squares	*df*	Mean Square	*F*	Sig.
1	Regression	18143.366	3	6047.789	5.905	.001[b]
	Residual	67599.220	66	1024.231		
	Total	85742.586	69			

a. Dependent Variable: Critical Thinking Tendencies

b. Predictors: (Constant), Problem-solving Skills

In Table 5, the p value under the Sig. column equaled .001, which was smaller than the significance level ($p < .05$), indicating that the model reached statistical significance. In other

words, problem-solving skills could significantly predict the critical thinking tendencies of the teachers. The results of multiple regression for gender and teaching experience are presented in Tables 6 and 7.

Table 6. *Model Summary for Multiple Regression*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	.51	.26	.20	31.53

Table 6 illustrates an R Square value of .26, which shows 26% of the variance in critical thinking is explained by problem-solving skills, gender, and teaching experience. To examine the statistical significance of this result, Table 7 should be checked.

Table 7. *Statistical Significance of the Multiple Regression Results*

	Model [a]	Sum of Squares	*df*	Mean Square	*F*	Sig.
2	Regression	21095.799	5	4219.160	4.242	.002[b]
	Residual	59676.202	60	994.603		
	Total	80772.001	65			

a. Dependent Variable: Critical Thinking Tendencies

b. Predictors: (Constant), Problem-solving Skills, Gender, Teaching Experience

The Sig. value in Table 7 equaled .002, which was smaller than the significance level ($p < .05$). This means that the model reached statistical significance. To put it differently, problem-solving skills, gender, and teaching experience could significantly predict critical thinking of teachers.

Discussion

The present study was an attempt to find out the relationship between critical thinking tendencies of university EFL teachers and their problem-solving skills. The potential roles of gender and teaching experience in this regard were also examined. According to the results of this study, the variable of problem-solving skills has a positive effect on critical thinking tendencies in university EFL teachers. The Pearson correlation detected a significant relationship between university EFL teachers' problem-solving skills and critical thinking tendencies scores for both the novice and experienced teachers with high levels of problem-solving skills associated with high levels of critical thinking tendencies. Additionally, a weak positive relationship between university EFL teachers' problem-solving skills and critical thinking tendencies scores was yielded for both the males and females with high levels of problem-solving skills associated with high levels of critical thinking tendencies. This result shows consistency with the findings of similar studies (Memduhoğlu & Keleş, 2016; Ocak & Eğmir, 2016; Cansoy & Türkolu, 2017; Schooner et al., 2017; Irwanto et al., 2018) in which it was found that there was a near moderate-level and positive correlation between pre-service teachers' critical thinking tendencies and their problem-solving skills. Upon an in-depth review of the existing literature on problem-solving skills, it can be said that problem-solving skills are one of the facilitating skills of critical thinking.

Providing a theoretical framework that links critical thinking and problem-solving skills is the theoretical contribution of the study. When university EFL instructors are capable of managing their cognitive processes and improving problem-solving skills in educational issues,

they will be able enough to think critically while facing complex issues. The results of this study show that problem-solving skills act as specific skills that are used to attain higher-level thinking skills such as critical thinking. Students need to plan their learning, reflect on the learning process when it occurs, monitor, understand, and evaluate learning after completing a task. Through teaching problem-solving skills, students can define the ways they learn better. To put it simply, students who are familiar with general thinking and problem-solving strategies are more likely to use them when faced with various classroom challenges (Schneider & Pressley, 1998; Weinstein & Mayer, 1986). Similarly, by definition, students who lack expertise in many areas of various learning and thinking strategies, need to learn about them to be able to apply common strategies to new and challenging tasks. When an instructor discovers this situation, he may use additional techniques that have been found to help learners think and solve the problem. This study is important to teachers as it provides insights into the teacher's thinking and perception of critical thinking in the classroom. The results of this study contribute to the notion that a higher level of knowledge monitoring is provided by presenting multiple opportunities for cognitive practice and problem-solving. Regarding practical implications, it is recommended to conduct and compare experimental studies on different samples in diverse age groups in order to determine cause-and-effect relationships and cognitive abilities. A similar method can also be used for other data sources (observation, interview, etc.) or a different population.

Conclusion

Critical thinking is important and must be promoted through native language courses and in a foreign language teaching environment. This prepares learners and teachers to think critically and creatively to learn and teach a foreign language. Since active involvement of the students in the class is essential for promoting their critical thinking (Bedir, 2013), the educational system needs teachers who are critical thinkers and problem-solvers. Furthermore, teacher-provided materials in language classes can be developed to allow students to critically analyze, integrate, and interpret what they are learning. Teachers should use appropriate materials and methodologies to identify areas of instruction that may provide critical thinking and problem-solving skills. Following Bedir (2013), students can improve their critical thinking if teachers employ proper instructional methods and curriculum materials. Thus, teacher training programs should also be supported to raise awareness of critical thinking in EFL teachers through teacher training (Şeker & Kömür, 2008). As a result, there is a need for further training for teachers who want to incorporate critical thinking strategies into their instruction and improve their students' critical thinking abilities. Student performance is indeed related to the teacher's ability to put critical thinking into practice. Therefore, it is very crucial to train teachers to teach these techniques as part of their methodology. Trained teachers can promote and model thinking behavior in the educational process to improve learners' skills (Shangarffam & Maminpour, 2011). Last but not least, creating a common curriculum for these courses is needed.

The present study, like any other study, bears a number of limitations. First of all, this study is small in scope, only 70 university EFL teachers from Azad and Payame Noor universities located in Isfahan and Ilam provinces teaching undergraduate students majoring in English

were included. Consequently, this study is limited to these two branches and provinces, and the generalization of the results should be undertaken carefully. The second limitation is related to instruments for collecting data. Some of these instruments are inaccessible in our context. Finally, the current study did not investigate the effect of all influential variables on critical thinking tendencies of university EFL teachers. Moreover, longitudinal studies can be carried out to observe the effect of problem-solving skills on critical thinking tendencies. Although the research participants were only university EFL teachers teaching undergraduate students majoring in English, it is possible to investigate the generalizability of the results by conducting similar studies in different samples such as students studying in different fields, adults, and teachers teaching other fields of study. It is therefore recommended that new research be conducted among individuals and groups at different levels of society.

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