

# On the Correlation between Problem-solving Skills and Online Information-seeking Behavior of English for Specific Purposes Students

Farshad Parhamnia<sup>1\*</sup>, PhD;  Majid Farahian<sup>2</sup>, PhD

<sup>1</sup>Department of Knowledge and Information Science, Kermanshah Branch, Islamic Azad University, Kermanshah, Iran

<sup>2</sup>Department of ELT, Kermanshah Branch, Islamic Azad University, Kermanshah, Iran

## ABSTRACT

**Background:** Individuals' information-seeking behaviors differ, depending on whether they perceive themselves as effective problem-solvers or not. As such, the present study examined the relationship between problem solving skill and online information-seeking behavior of students of medical sciences in general and English for specific purposes (ESP) courses.

**Methods:** The present study is an applied research that adopted a survey method. The participants were 232 students of Kermanshah University of Medical Sciences and faculty of paramedical sciences, Islamic Azad University, Kermanshah branch. This research was conducted in 2019-2020 during the time of COVID-19. The sampling method in this study was available sampling. The researchers selected the students who used the Internet to meet their information needs in their ESP courses. A problem-solving questionnaire and a researcher-made scale were employed in the study to investigate the participants' information-seeking behavior. To determine the reliability of the Problem-solving questionnaire and online information-seeking behavior, we used Cronbach's alpha coefficient. The results of the test indicated that the reliability of the problem-solving questionnaire was 0.852, and that of the online information-seeking behavior questionnaire was 0.778, which is considered an acceptable level. Data were analyzed using descriptive statistics including frequency, percentage and mean and inferential statistics including Pearson correlation matrix and multiple regression using SPSS software version 22.

**Result:** The findings showed that there was a correlation between the scales of problem solving including, problem solving confidence ( $P < 0.001$ ), approach-avoidance style ( $P < 0.001$ ), and personal control ( $P < 0.001$ ) with and information-seeking behavior in general and ESP courses. In addition, the results of multiple regression analysis revealed that the variable of problem solving confidence ( $\beta = 0.275$ ,  $P < 0.05$ ) and personal control ( $\beta = -0.179$ ,  $P < 0.05$ ) could significantly explain information-seeking behavior of paramedical sciences students in general and ESP courses; however, the avoidance style had no contribution to this study ( $P > 0.05$ ).

**Conclusion:** Medical students' success in general and ESP courses need their proper online information seeking behavior which can result in improvement in their problem solving skill. The findings may provide deeper insights regarding the potential relationship between problem solving skill and online information-seeking behavior of students of medical sciences. More specifically, the role of computer-assisted language learning (CALL) in ESP courses is emphasized.

**Keywords:** Problem solving, Information-seeking behavior, General English, ESP courses

\*Corresponding author:

Farshad Parhamnia, PhD;  
Department of Knowledge and Information Science,  
Kermanshah Branch, Islamic Azad University, Kermanshah, Iran.

Email: fparhamnia@yahoo.com

Please cite this paper as:

Parhamnia F, Farahian M.  
On the Correlation between Problem-solving Skills and Online Information-seeking Behavior of English for Specific Purposes Students. *Interdiscip J Virtual Learn Med Sci.* 2023;14(1):31-46. doi:10.30476/IJVLMS.2023.96339.1175.

Received: 04-11-2022

Revised: 21-12-2022

Accepted: 24-02-2023

## Introduction

For many years, learning in schools was limited to the students' memorizing what they were told to, and learning was equated with remembering what was transmitted by teachers. Besides, little attention was paid to problem-solving skills in the learning process (1). Gradually, teaching through problem-solving received acclaim. A lot of scholars, e.g., Jonassen, Partridge, and Hughes have underlined the importance of problem solving and argued that "problem solving is generally regarded as the most important cognitive activity in everyday and professional contexts" (1). This indicates that "knowing how to solve problems is crucial in school contexts, as well as in real-life situations" (2). The term problem solving has been defined as "using existing knowledge and skills to address an unanswered question or troubling situation, while problem-based learning is an approach to instruction in which students acquire new knowledge and skills while working on a complex problem similar to those in the outside world." (3) This requires four steps: understanding and recognizing the problem, planning and finding solutions to solve the problem, applying a problem plan, and evaluating the steps of problem solving. By creating problem-solving conditions, students would be in real conditions to face problems, and through thinking deeply about those problems, they would try to examine them from different angles and finally innovatively solve them (4). This not only helps them to be more successful in understanding and conducting research at school and enhance the quality of their learning (5), but also enables them to prepare themselves to deal with real-life experiences (6). Problem solving empowers metacognition and more specifically helps with their regulation of cognition (7). Problem solving, as a learning process, makes individuals more efficient and helps them gain more self-confidence (8, 9). In the meantime, it enables one to "discover, create, or identify effective approaches to cope with challenging life events"(10).

Problem-solving ability consists of three

components (11). First is a sense of self-confidence or a sense of self-efficiency in dealing with problems. The second one is adjusting emotions when facing problems, and the third component is facing problems instead of avoiding them (12). People who take a problem-solving approach toward problems not only gain knowledge, but also improve their cognition (13). Studies have shown that students who use problem-solving approaches develop critical thinking (14-16), decision-making, and reasoning (17) in themselves in addition to using deep thinking (18). Therefore, problem solving can be one of the influential factors in an individual's behavior, especially his/her information-seeking behavior. Additionally, human beings need information for their growth and development, and in today's world, information is of critical importance (19). Perhaps, one can say that up-to-date and sufficient information is the cornerstone of any development. The search for information by individuals or their information-seeking behavior has also become particularly important; to put it in a nutshell, one of the prerequisites of success in any organization is having access to information. Therefore, it is necessary for higher education students to know how to obtain the information they need and what the appropriate ways of gaining information are (20).

The set of activities that individuals perform after identifying doubt in themselves to meet their information needs is called information-seeking behavior (21). This includes the objective of information seeking, search methods, search tools, and the factors affecting information seeking (22). In other words, information-seeking behavior refers to activities that a person performs to meet the information he/she needs and encompasses the individual's goals of information search, search methods, search tools, and the type of required information (22, 23). Marchionini (24) states that information-seeking behavior is a problem-oriented one because the starting point of information seeking is the individual's information needs which

ultimately lead to problem solving. Thus, information retrieval is a process beginning with the need for information and continues through gaining help from specific search solutions, and the required information is reviewed and inspected after extraction; finally, the retrieved information leads to problem solving (25). This can affect the students' academic success in different areas and can be an integral part of a student's behavior in all subjects, sciences, and skills. Like any other course, ESP courses are no exception to this rule (25).

In recent years, increasing attention has been given to the use of technology in education and various technological tools such as computers have found their place in education. Part of such a shift of attention has been due to the outbreak of COVID-19. Due to school closure caused by the COVID-19 epidemic, about 1.6 billion students experienced detrimental effects on their education (26). According to the United Nations (27) and the World Health Organization (28), governments had to take some significant precautions to stop the virus from spreading, such as social distancing and the closure of workplaces, public places, and schools. For stopping and slowing the spread of this contagious disease, Iranian schools and universities all switched to online instruction, as has been done in many other nations around the world. The shift towards e-learning called 'emergency e-learning' (29) has had a great impact on both teaching and learning process (30). Emergency e-learning, as defined by Murphy, is "the temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances". By using technological tools like CD players, computers, the Internet and software applications, a suitable learning environment has been provided for learners. Even the use of technology has improved the teaching practice and has enabled teachers to overcome the training challenges and at the same time update their knowledge (31). Meanwhile, Computer Assisted Language Learning (CALL) has enabled students to get

involve in an interactive learning environment and make use of applications like online dictionaries, and programs for learning grammar, vocabulary, and pronunciation. Using technology, foreign language students can engage in an interactive process of learning, practice four language skills, and get involved in online information seeking behavior (32). CALL is considered as "an approach to teaching and learning foreign language where the computer and computer-based resources such as the Internet are used to present, reinforce, and assess the materials to be learned" (33). On top of all advantages CALL can have for students, it can help them locate, evaluate, and use the information they need during the course of the study (34). Although such a process of online information search seems very simple, it entails highly complex cognitive and metacognitive strategies (35).

Due to the key role of English in the advancement of knowledge and education, there has been a growing demand for the development of ESP courses (36). Therefore, it is around three decades since general English and ESP have been on the agenda of the Ministry of Higher Education in Iran (37). In addition, three credit hours of General English course and at least two credit hours of ESP have been included in the curriculum. While studying for higher education courses, Iranian students need to take these courses. General courses improve the students' reading skills and at the same time prepare them for ESP courses. The main purpose of these courses, as (38) explained, is to enable students "to use English in academic and occupational settings". Like other university students, paramedical students need to learn a foreign language since apart from the fact that some of the sources required by the curriculum are in English, they may encounter patients from abroad in their future careers, attend scientific conferences abroad, or continue their studies at higher levels (39).

Based on the researchers' experience, it seems necessary for students to be familiar with different sources of information and the

appropriate ways of searching for information in general and ESP courses since there is an overreliance on textbooks (38-40) and “the most commonly used tools” are textbooks (41). Besides, ESP students can take advantage of many other sources of information, including the Internet, audio-visual materials, etc., that can help them with their foreign language learning process. In this regard, Farahian and Parhamnia (42) investigated the quality of ESP courses from ESP instructors’ point of view and explored the role of quality of education of ESP courses in the information-seeking behavior of the students. As they reported, the only resources ESP students used were coursebooks, and not enough attention is paid to their needs. Chen (43) studied the information searching strategy of EFL students from 11 universities. Based on the results, the participants used the strategies at an average level. In the same line, Johnston (1) explored the information literacy of EFL students at a higher education institute in the United Arab Emirates. The findings revealed that the students faced various challenges that influenced their experiences of information literacy. The findings of this research show that when EFL students read, understand, organize, and translate information, they employ various techniques. Regarding the relationship between problem-solving and information-seeking behavior (44), probed the relationship between Canadian public health professionals’ cognition of their problem-solving abilities and their information-seeking behaviors. Results showed a significant relationship between perceived problem-solving abilities and collaborative information-seeking behavior, but not individual information seeking. In the same vein (45), sought problem solving and self-efficacy skills in information seeking behavior among the postgraduate students who were writing their thesis. It was found that students who used problem solving skills have higher degrees of self-efficacy and a better performance regarding information-seeking behavior.

Overall, the ability to effectively search

and locate information in online sources is an essential skill for university students (46), and personal and cognitive factors are influential in information-seeking behavior; successful information-seeking behavior is contingent upon problem solving skills (47). In addition, it seems that the relationship between problem-solving and information-seeking behavior has not so far been studied, especially in students’ ESP courses. Accordingly, the present study sought to answer the following hypotheses:

1. There is a significant relationship between problem-solving skills and online information-seeking behavior of paramedical sciences students in ESP courses.
2. Problem-solving skills predict the online information-seeking behavior of paramedical sciences students in ESP courses.
3. The relationship between problem-solving and online information-seeking behavior is moderated by gender.

## Methods

This study is a survey in which the data was analyzed using descriptive statistics including frequency, percentage, mean and inferential statistics including Pearson correlation matrix and multiple regression using SPSS software version 22.

## Participants

The population of the study included 690 paramedical sciences students of Kermanshah University of Medical Sciences and Faculty of paramedical sciences, Islamic Azad University, Kermanshah branch who had either passed the ESP course or were studying the course in their universities. In order to determine the sample size, we used the correlation sample size formula ( $N = [(Z_{\alpha} + Z_{\beta})/C]^2 + 3$ ). Based on the correlation sample size formula ( $Z_{\alpha} = 1.96$ ,  $Z_{\beta} = 1.03$ ,  $\alpha = 0.05$ ,  $\beta = 0.15$ , and  $r = 0.20$ ) with 10% increase, 243 questionnaires were distributed. This study was conducted in 2019-2020, when all students participated in online courses due to the COVID-19 pandemic quarantine. The inclusion criterion for ESP students was being an ESP student or having passed the

course. Purposeful sampling was used in this study. This means that for more validity of the sampling method, the students that used the Internet to meet their information needs were selected. Thus, of all distributed questionnaires, 11 surveys were incomplete, so they were excluded from the study. Therefore, the data analysis was based on 232 returned questionnaires.

### *Data Collection Instruments*

The instruments for data collection consisted of two questionnaires: a researcher-made questionnaire on information-seeking behavior and a problem-solving questionnaire.

### *Problem-solving Questionnaire*

Heppner and Krauskopf consider problem-solving a series of behavioral, cognitive, and emotional responses formed to adapt to internal and external challenges (48). The problem solving questionnaire was developed by Heppner and Peterson (1982). The questionnaire consists of 35 items. There are 3 additional items in the scale that are used only to encourage answering and are not scored. A 6-point Likert scale (strongly disagree to strongly agree) was used in the questionnaire. The questionnaire has three subscales including “problem solving confidence” (11 items), “approach□avoidance style” (16 items), and “personal control” (5 items). The validity and reliability of the questionnaire have been assessed and approved by the scale developers. In the study of (49), the reliability of its subscales was reported to be 0.72 to 0.90. In the study (50), the reliability was reported as 0.85, 0.84, and 0.72 respectively for the subscales using Cronbach’s test. In another study (51), the authors note that the reliability is 0.70 to 0.80. Another research (52) found the reliability of subscales between 0.72 and 0.85 and the overall reliability of the scale was 0.90. Also, as research (53) indicated, the Cronbach’s alpha was 0.77. To prevent bias in answering, for 15 items negative statements are used which are scored in reverse. In the current research, considering that each of the variables was different in terms of the number

of items, the sum of the scores of the items of each variable was not used, but the average of the items was employed. In terms of scoring, each item was assigned a minimum of one and a maximum of five. Therefore, the theoretical average was considered 3 in this study.

### *Online Information-seeking Behavior Questionnaire*

The researcher-made information-seeking behavior questionnaire examines how people behave when searching for information in ESP courses. The scale was developed by the researchers based on the related literature (54-57) and consists of 15 items using a five-point Likert scale (strongly disagree to strongly agree). As to the content validity, the scale was given to four experts and after they passed judgments, some items in the questionnaire were revised. Cronbach’s alpha was used to check the reliability of the scale. Cronbach’s alpha coefficient also showed that the reliability of the online information-seeking behavior questionnaire was 0.778, that is an acceptable level.

### *Validity and Reliability of the Instruments*

1. Face validity: Since the questionnaire of problem-solving has been used by many researchers at home and abroad, it was given to five faculty members of the English language teaching field (3 people) and the library and information science field (2 people). The faculty members were asked to find any problem in the questionnaire, including the degree of appropriateness or lack of appropriateness of the questions with the components, ambiguity in phrases and sentences, and the existence of inadequacy in the meanings of the words. Their opinions were applied in the form of minor changes in the problem-solving questionnaire and general changes in the information behavior questionnaire. After face validity, the questionnaire was given to experts to calculate the content validity ratio (CVR) and content validity index (CVI); they were asked to answer each of the questions as “*necessary*”, “*not necessary but useful*”

and “not necessary”. Based on the Lawshe’s Table, scores higher than 0.99 were accepted (CVR>0.99). Then, CVI was evaluated based on Waltz and Basel’s content validity index. For this purpose, the experts were asked to answer each of the 32 items of the problem-solving questionnaire and 15 items of the information-seeking behavior questionnaire based on a four-point Likert scale (relevance, simplicity, and clarity (for example: “irrelevant”, “somewhat relevant”, “related”, and “completely related”). For this purpose, the CVI score was calculated by the sum of the agreeable points for each item that earned rank 3 and 4 (the highest score) on the total number of experts. Therefore, the acceptance of the items based on the CVI score was higher than 0.79. (CVI>0.79).

2. Construct validity: The questionnaire (problem-solving) was examined to estimate the construct validity using the exploratory factor analysis (EFA), scree plot, and convergent validity; average variance extracted (AVE) was used.

First, Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was performed. The results of this test showed that the sampling adequacy criterion of KMO was 0.880, which indicates the appropriateness of the data volume for the main components. Also, the result of Bartlett’s test of Sphericity was statistically significant ( $\chi^2=12214.516$ , and  $P<001$ ). It can be concluded that the covariance between the items designed to measure the main constructs of the research is sufficient to extract at least one factor.

The next step is to determine the contribution of each factor in explaining the total variance of all questions. The results are

shown in Table 1.

As shown in Table 1, the first factor with a specific value of 41.850, could alone explain 13.392% of the total variance of the problem-solving scale. The second factor with a specific value equal to 22.950 could alone explain 7.344% of the total variance. The third factor with a specific value equal to 11.295 could alone explain 3.16% of the total variance of the problem-solving questionnaire. In total, three factors with eigenvalues higher than one have been able to explain 76.094% of the variance of the 32 items related to the problem solving scale. Figure 1 shows a view of the scree plot.

The scree plot test is one of the most common graphic methods for selecting the appropriate number of factors from the eigenvalues. In other words, according to Table 1, the results of the scree plot diagram, the total explained variance, are the same. The presence of a steep slope between the factors can be an additional basis for selecting the final factors. In Figure 1, three factors are greater than one, and at this point, a relative decrease and fall can be observed in the curve line. The next step is to perform the EFA (Varimax rotation) and AVE which are shown in Table 2.

In factor analysis, we used Varimax rotated correlation matrix to identify the correlation matrix between the items and factors and categorize each item in each factor. Table 2 shows the correlation matrix between the items and factors extracted with an eigenvalue higher than (1) after rotation, whose correlation value between the items and factors fluctuated between -1 and +1. Also, the values shown in each factor, the numbers in the Table, indicate that they can form a relationship factor with each other.

**Table 1:** Total variance explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	13.392	41.850	41.850	13.392	41.850	41.850	11.668	36.462	36.462
2	7.344	22.950	64.799	7.344	22.950	64.799	9.064	28.326	64.788
3	3.614	11.295	76.094	3.614	11.295	76.094	3.618	11.305	76.094
4	0.993	3.104	79.197						
5	0.949	2.965	82.162						

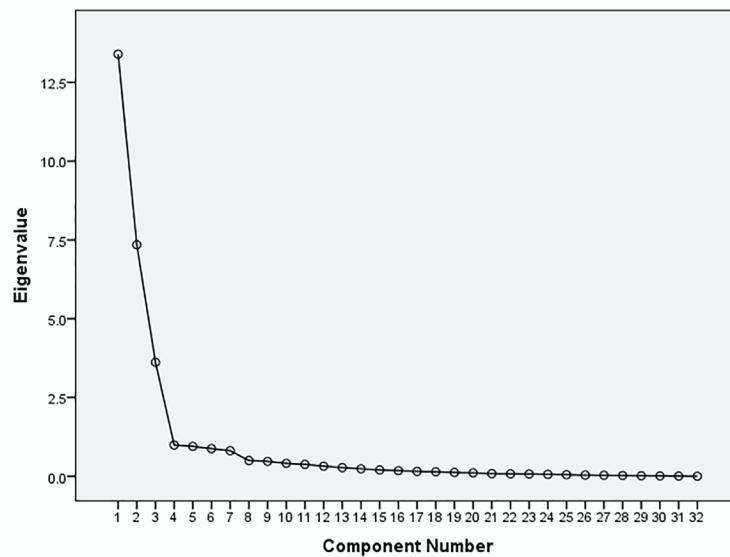


Figure 1: Scree plot

Table 2: Validity and reliability of the problem-solving questionnaire using EFA, AVE, CR, and Cronbach’s test

Constructs	Items	Loadings	AVE	CR	Cronbach’s alpha
Approach-avoidance style	q22	0.953	0.714	0.975	0.852
	q16	0.946			
	q17	0.939			
	q18	0.937			
	q21	0.917			
	q19	0.891			
	q20	0.878			
	q14	0.855			
	q24	0.850			
	q23	0.847			
	q27	0.793			
	q15	0.782			
	q26	0.777			
	q12	0.771			
	q13	0.710			
Problem solving confidence	q9	0.967	0.801	0.977	
	q4	0.959			
	q6	0.946			
	q8	0.945			
	q11	0.938			
	q3	0.937			
	q10	0.928			
	q7	0.873			
	q5	0.869			
	q2	0.852			
Personal control	q1	0.555	0.684	0.915	
	q31	0.876			
	q32	0.863			
	q29	0.845			
	q30	0.821			
	q28	0.724			

According to this Table, the highest loading of the first 16 items is on the first factor (i.e. items q12-q27) and 11 items (q1-q11) on the second factor, and 5 items (q28-q32) on the third factor. Based on this correlation and the largest factor load, they can be classified into some factor. These factors were named approach-avoidance style, problem-solving confidence, and personal control, respectively. Furthermore, in Table 2, AVE shows the degree of correlation of a structure with its indicators the more this correlation is greater than 0.5, the better the fit will be. In this study, AVE shows it to be more than 0.5.

3. Reliability: In this study, Cronbach’s alpha and composite reliability were used. Convergent validity exists when composite reliability (CR) is greater than 0.7. Also, CR must be greater than AVE. In this case, any convergent validity condition is present. The results of Cronbach’s alpha coefficient showed three variables were above 0.07, indicating an acceptable level of reliability (Table 2).

*Data Analysis*

The questionnaires were collected in two ways. It was either given to the students in

person or sent electronically. In this way, some questionnaires were collected in electronic forms and others with the cooperation of professors. Data analysis was carried out by Pearson correlation coefficient and multiple regression by using SPSS software 23.

**Result**

*Demographic Characteristics*

The descriptive information of the research population is shown in Table 3.

Demographic characteristics showed that of 232 paramedical sciences students who participated in this study, 84 (36.2%) were male and 148 (63.8%) were female. Further information can be found in Table 3. Meanwhile, the descriptive statistics of problem-solving such as the mean and standard deviation of the scores of the three subscales of the problem-solving questionnaire are presented in Table 4.

According to Table 4, the average problem-solving confidence was the highest at 3.71 and the mean of approach-avoidance style subscale was the lowest at 3.20. However, all the three subscales were above the average level.

The first hypothesis of the research was

**Table 3:** The summary of the respondents’ demographic characteristics

Category	Profile	Frequency	Percentage
University of Medical Sciences		89	38.36
Islamic Azad University		143	61.63
Gender	Male	84	36.2
	Female	148	63.8
Age	≤19	11	4.74
	20-25	107	46.12
	26-30	85	36.63
	31-35	21	9.05
	≥36	8	3.44
Field of study	Nursing	91	39.22
	Laboratory sciences	75	32.32
	Public health	66	28.44

**Table 4:** Descriptive statistics of problem solving

Variable	Mean	SD	t	P value
Problem solving confidence	3.71	0.450	t=24.191	<0.001
Approach-avoidance style	3.20	0.542	t=5.790	<0.001
Personal control	3.42	0.581	t=11.209	<0.001
Problem-solving (Total)	3.44	0.272	t=16.534	<0.001
Information-seeking behaviour	3.49	0.478	t=15.633	<0.001



that there is a significant relationship between the components of problem-solving and information-seeking behavior of paramedical sciences students. To answer this hypothesis, we used Pearson correlation coefficient; the results are depicted in Table 5.

As shown in Table 5, there was a significant relationship between the subscales of problem-solving, i.e., problem solving confidence ( $P < 0.001$ ), approach-avoidance style ( $P < 0.001$ ), and personal control ( $P < 0.001$ ) with information-seeking behavior in ESP, as a dependent variable. In terms of the intensity of correlation, the obtained results for problem solving confidence ( $r = 0.319$ ), approach-avoidance style ( $r = 0.151$ ), and personal control ( $r = 0.251$ ) were all direct (positive) and at moderate level. Also, there was a significant relationship between problem-solving with online information-seeking behavior in ESP, as a dependent variable ( $P < 0.001$ ). In terms of the intensity of correlation, the obtained result for problem-solving confidence ( $r = 0.394$ ) were direct (positive) and at a moderate level.

The second research hypothesis states that problem solving predicts the online

information-seeking behavior of paramedical sciences students in English and ESP courses. First, multiple regression was used to predict the subscales of problem solving, and the result was the best solution to see which of these subscales of problem solving can better predict information seeking behavior, from regression to the method it was used stepwise regression. The results of the analysis are presented in Tables 6 and 7.

Based on Table 6, the value of the obtained R was equal to 0.353. That is, the Pearson correlation between the predicted values and the real values of the dependent variable was 0.35. The coefficient  $R^2$  was equal to 0.125, which means that through combining three independent variables, the amount of explained variance of the information-seeking behavior in English and ESP courses defined 12% of the variance of the dependent variable. Also, the value of F observed in 3 degrees of freedom was equal to 10.830 and  $P < 0.05$ , which is significant at the level of 0.05. The coefficients of the equation related to the prediction of information-seeking behavior in ESP courses using independent predictor variables are shown in Table 6.

**Table 5:** Pearson correlation coefficient matrix between problem-solving and information-seeking behavior

	Information-seeking behaviour	Problem solving confidence	Approach-Avoidance Style	Personal Control	Problem-solving (total)
Information-seeking behaviour	1				
Problem solving confidence	0.319**	1			
Approach-avoidance style	0.151*	0.394**	1		
Personal control	0.251**	0.358**	0.525**	1	
Problem-solving (total)	0.299**	0.702**	0.825**	0.826**	1

\* $P < 0.05$  at the 0.05 level; \*\* $P < 0.001$  at the 0.01 level

**Table 6:** Predictor variables of information-seeking behaviour

Model		Unstandardized Coefficients		Standardized Coefficients	t	P value
		B	Std. Error	Beta		
1	Problem solving confidence	0.292	0.073	0.275	3.996	<0.000
	Approach-avoidance style	-0.045	0.067	-0.051	-0.678	0.499
	Personal control	0.148	0.061	0.179	2.418	0.016
R=0.353		F=10.830				
R <sup>2</sup> =0.125		P<0.001				

As it can be seen in the Table, the two variables of *problem solving confidence* and *personal control* had a  $P < 0.05$ . Thus, they can significantly explain the variance of information-seeking behavior in ESP courses. However, the approach-avoidance style does not contribute to this research. Furthermore, considering the standardized beta coefficients indicated that the coefficient of the effect of the problem solving confidence was equal to 0.275 and in personal control, it was -0.179). Thus, these variables can explain changes in information-seeking behavior in English and specialized language courses.

According to the results of Table 6, two subscales that had an important contribution in predicting information-seeking behavior using stepwise regression, the importance of each is displayed in Table 7.

Based on Table 7, the *approach-avoidance* style variable was removed from the Table, and the analysis was performed with two variables: *problem solving confidence* and

personal control.

In the first step of the regression model, the regression equation analysis was done on *Problem solving Confidence*. In fact, this variable with a correlation coefficient of 0.319 had the highest correlation with information retrieval behavior. The adjusted coefficient of the explanation of *problem solving confidence* was equal to 0.101, which shows that this component can explain 10% of changes in information-seeking behavior. In the second step, regression equation was carried out on the *personal control* variable, and so the correlation coefficient increased to 0.351, and the coefficient of explanation enhanced to 0.123. Accordingly, it can be assumed that the two-dimensional *problem solving confidence*, and *personal control* together explain about 11% of the changes in information-seeking behavior. In addition, since the value of F in the second step was 16.054 at the level ( $P < 0.05$ ), it could be a good predictor of information-seeking behavior.

**Table 7:** Predictor variables of information-seeking behaviour

Model		Unstandardized Coefficients		Standardized Coefficients	t	P value	R	R <sup>2</sup>	Adjusted R Square	F
		B	Std. Error	Beta						
2	Problem solving confidence	0.279	0.070	0.262	3.960	<0.000	0.351	0.123	0.115	16.054
	Personal control	0.129	0.055	0.157	2.368	0.019				

**Table 8:** Predictor variables of information-seeking behaviour and gender effect

Model		Unstandardized Coefficients		Standardized Coefficients	t	P value	R	R <sup>2</sup>	Adjusted R Square	F
		B	Std. Error	Beta						
1	Problem solving confidence	0.279	0.070	0.262	3.960	<0.001	0.351	0.123	0.115	16.054
	Personal control	0.129	0.055	0.157	2.368	.019				
2	Problem solving confidence	0.280	0.071	0.264	3.961	<0.001	0.351	0.123	0.112	10.680
	Personal control	0.131	0.055	0.159	2.377	0.018				
	Gender	0.016	0.062	0.016	0.256	0.799				

The third hypothesis stated that the relationship between problem-solving and information-seeking behavior was moderated by gender. The results of the analysis are presented in Table 8.

According to Table 8, testing the effect of gender effect as a moderator with problem solving confidence and personal control as predictors indicates that problem solving confidence and personal control were significantly moderated by gender effect. As such, the relationship between problem-solving and online information-seeking behavior is moderated by gender.

## Discussion

The present study aimed to investigate the relationship between problem-solving and online information-seeking behavior in ESP courses. Based on the findings, there was a significant relationship between the components of problem-solving and online information-seeking behavior of paramedical students. Besides, in terms of the intensity of correlation, there was a direct (positive) and moderate correlation among problem solving confidence, approach-avoidance style, and personal control. The finding is in tandem with (58) who argues that the process of information-seeking behavior is in connection with cognitive factors like problem solving. Similarly, (59) notes that the process of information seeking is associated with different processes of problem solving. In the same line, (60) in his model explains that information seeking can be regarded as a form of problem solving. Also, Newman et al. (44) investigated the relationship between Canadian public health professionals' cognition of their problem-solving abilities and their information-seeking behaviors. In this study, an electronic survey was used to gather data. Based on the findings, the researchers found a significant relationship between perceived problem-solving abilities and collaborative information-seeking behavior, but not individual information seeking. As the authors argue, if public health professionals adopt a shared approach to problem solving,

they are more likely to collaborate with others in seeking information to complete a task. In another study, Parhamnia and Farahian (45) found that students with problem solving skills had higher degrees of self-efficacy and had a considerably better performance regarding information seeking behavior.

As to the second hypothesis of the study which states that problem-solving skills are able to predict online information-seeking behavior, the results indicated that the two variables of *problem solving confidence* and *personal control* could explain the variance of online information-seeking behavior in English and ESP courses in a meaningful way; however, avoidance style did not have a significant role. In other words, the results of the stepwise multiple regression showed that the variable *personal control* had more effects on the students' information-seeking behavior than *problem solving confidence*. Perhaps, it can be concluded that *personal control* is the main factor in information seeking behavior. As such, educational departments and university administrators need to promote the students' beliefs in their ability to effectively perform a certain behavior to achieve the desired goal in order to improve their information seeking behavior.

The third hypothesis aimed at investigating the role of gender as moderating factors in the relationship between students' problem solving and information-seeking behaviour. The findings revealed that gender had a significant impact on the relationship between problem solving and information seeking behaviour. This suggests that with respect to the students' age, problem solving skills predict their information seeking behavior.

All in all, the findings are in line with the literature (44-45) on information-seeking behavior because information-seeking begins with the need for information, helps one to locate the information, and ultimately may lead to problem-solving. The results are supported by a study conducted by (45) who investigated problem solving and self-efficacy skills in information-seeking behavior. As reported, students with problem

solving skills have higher degrees of self-efficacy and a better performance regarding information-seeking behavior. In this regard, (61) introduced information-seeking as a prerequisite to problem-solving (54, 61). In addition, (57) believes that information-seeking process is related to cognitive factors such as thinking, comprehension, memory, cognition, learning, and problem-solving.

## Conclusion

Since information-seeking behavior originates from the mental states of individuals, in general, the findings of the present study may indicate the effect of problem-solving variables on information-seeking behavior. Further studies are needed to support a cause and effect relationship. In addition, the findings of this study can lead to a clearer explanation of the relationship between problem-solving and information-seeking behavior from a theoretical and practical point of view. It can also provide a deeper understanding of the information-seeking process from a psychological perspective. Since the present study explored the relationship between problem-solving and online information-seeking behavior, the results are expected to serve as a foundation for future research and to explore and identify newer research areas from the psychological dimension of individuals. Problem-solving is an essential skill for students, especially medical students, and can be considered as the basis of the training process for paramedical sciences students, and it is very important to promote and cultivate it among students of this field. This skill may improve the students' information-seeking behavior, help them search for information more optimally, and show a considerable progress in courses such as general English and ESP. It is expected that by learning problem-solving skills, paramedical students would be more skilled at finding information. In research studies, students of other disciplines in medical universities should be recruited in order to probe the relationship between problem solving and information-seeking behavior.

In addition, by holding training courses on using problem-solving skills, an important step can be taken to promote the information-seeking behavior of paramedical students. Therefore, it is recommended that problem-solving should be considered as an effective educational program by those involved in the higher education curriculum of the Ministry of Health and Medical Education.

This study, like any other one, had its limitations, one of which was its sample size which makes the results less generalizable. Another limitation was that the population in this study was from the departments of paramedical schools and did not include other schools. Accordingly, future studies can recruit students from other paramedical students. We also recommend that a larger geographical region should be considered as the population in future studies. As such, paramedical students from different provinces and cities can be invited to take part in the study. This can enable the researchers to have more dependable and generalizable results.

## Acknowledgments

We would like to thank all students who took part in the study.

**Conflict of Interest:** None declared.

## Authors Contribution

FP: performed the statistical analyses and wrote the final draft. MF: conducted the procedures, gathered the data, and wrote the first draft. Both authors read and approved the final manuscript.

## Funding/Support

No financial support or funding were received for this paper.

## References

- 1 Jonassen N, Partridge H, Hughes H. Understanding the information literacy experiences of EFL (English as a Foreign Language) students. *Reference Services Review*. 2014; 42(4): 552- 568. doi:10.1108/RSR-05-2014-0015.

- 2 Aouine A, Fodil MS. EFL Teachers' Views and Implementation of Problem-Solving Tasks in Algerian Secondary Schools. *International Journal of Research in English Education*. 2020; 5(2): 61-81. doi:10.29252/ijree.5.2.61.
- 3 Ormond JE. *Essentials of educational psychology*. Pearson Merrill Prentice Hall: Press Publications, 2006.
- 4 Kim JY, Choi DS, Sung C-S., Park JY. The role of problem solving ability on innovative behavior and opportunity recognition in university students. *Journal of Open Innovation: Technology, Market, and Complexity*. 2018; 4(4): 1-13. doi:10.1186/s40852-018-0085-4.
- 5 Doghonadze N, Gorgiladze G. Problem-solving in teaching foreign languages to students of pedagogical departments. *IBSU Scientific Journal*. 2008; 2(1): 101-114.
- 6 Pedersen S, Liu M. The transfer of problem-solving skills from a problem-based learning environment: The effect of modeling an expert's cognitive processes. *Journal of Research on Technology in Education*. 2003; 35 (2): 303-320. doi:10.1080/15391523.2002.10782388.
- 7 Jin Q, Kim M. Metacognitive regulation during elementary students' collaborative group work. *Interchange*. 2018; 49 (2): 263-281. doi:10.1007/s10780-018-9327-4.
- 8 Oacioglu G. Prospective teachers' problem-solving skills and self-confidence levels. *Educational Sciences: Theory & Practice*. 2008; 8(3): 915-923. [https://files.eric.ed.gov/fulltext/EJ837771 .pdf](https://files.eric.ed.gov/fulltext/EJ837771.pdf).
- 9 Surya E, Putri FA, Mukhtar M. Improving mathematical problem-solving ability and self-confidence of high school students through contextual learning model. *Journal on Mathematics Education*. 2017; 8(1): 85-94. <https://files.eric.ed.gov/fulltext/EJ1173627.pdf>.
- 10 Mahzoonzadeh Bushehri F. The relationship between students' problem-solving skills and creativity mediated By self-efficacy: Modelling structural equations. *Journal of Innovation and Creativity in Human Sciences*. 2017; 6(4), 27-50. [http://journal.bpj.ir/article\\_531611.html?lang=en](http://journal.bpj.ir/article_531611.html?lang=en).
- 11 Heppner PP. *The Problem-Solving Inventory*. Manual Palo Alto. CA: Consulting Psychologies Press; 1988.
- 12 Elliott T. Social problem-solving abilities and adjustment to recent-onset spinal cord injury. *Rehabilitation Psychology*. 1999; 44, 315–332. <https://doi.org/10.1037/0090-5550.44.4.315>.
- 13 Wang C-W, Horng RY, Hung S-C, Huang Y-C. The Effects of creative problem-solving training on cognitive processes in managerial problem-solving. *Problems and Perspectives in Management*. 2004; 2(1): 101-112.
- 14 Kanbai Y, Okanlı A. The effect of critical thinking education on nursing students' problem-solving skills. *Contemporary Nurse*, 2015; 53(3): 1-18. doi:10.1080/10376178.2017.1339567.
- 15 Sheykhholeslami A, Omidvar A. The effectiveness of critical thinking training on problem solving styles (efficient and inefficient) of students. *Journal of School Psychology*. 2017; 6(2): 83-99. doi: 10.22098/jsp.2017.569.
- 16 Ulger K. The Effect of problem-based learning on the creative thinking and critical thinking disposition of students in visual arts education. *The Interdisciplinary Journal of Problem Based Learning*. 2018; 12(1): 1-19. doi. org/10.7771/1541-5015.1649.
- 17 Ahmady S, Shahbaz S. Impact of social problem-solving training on critical thinking and decision making of nursing students. *BMC Nursing*. 2020; 19 (94): 1-8. doi.org/10.1186/s12912-020-00487-x.
- 18 Utami B, Probosari RM, Saputro S, Ashadi, Masykuri M. Empowering critical thinking skills with problem solving in higher education. *Journal of Physics: Conference Series*. 2018; 1280 (3), 1-5. doi.10.1088/1742-6596/1280/3/032047
- 19 Zakir Shahrak M. Search process: information seeking behavior of users and information retrieval systems. *Information*

- and Notification Monthly. 2008; 15, 60-50.
- 20 Nasiri M. The studying the behavior Behbahan students and influence and the effect of teachers on their informing pattern. *Journal of Academic Librarianship and Information Research*. 2005; 43 (39), 153-181.
  - 21 Kundu DK. Models of information seeking behaviour: A comparative study. *International Journal of Library and Information Studies*. 2017; 7(4): 393-405. doi:10.2139/ssrn.4289303
  - 22 Majidi M, Shakerian G. The study of information seeking behavior of AllamehTabataba'i university faculty members in using online resources. *Journal management System*. 2016 2(6): 105-126. 105-126. doi: 10.22054/JKS.2016.4108.
  - 23 Davarpanah MR. Scientific communication: information need and information behavior. Tehran: Chapar; Dabizesh, 2007.
  - 24 Marchionini G. Information seeking in electronic environment. Cambridge: Cambridge University Press, London, 1995.
  - 25 Masoumirad R. The Impact of information-seeking behavior on research performance of Guilan University faculty members. *Culture-Communication*. 2016; 17(33): 171-189. doi: 10.220 83/JCCS.2016.15435.
  - 26 UNESCO. COVID-19 education response: education sector issue notes. Retrieved September, 15, 2021, from <https://unesdoc.unesco.org/ark:/48223/pf0000373338/PDF/373338eng.pdf.multi>.
  - 27 United Nations. Policy brief: Education during COVID-19 and beyond. Retrieved September 15, 2021, from [https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/08/sg\\_policy\\_brief\\_covid-19\\_and\\_education\\_august\\_2020.pdf](https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/08/sg_policy_brief_covid-19_and_education_august_2020.pdf).
  - 28 World Health Organization. Considerations for school-related public health measures in the context of COVID-19. Retrieved October 16, 2021, from [https://apps.who.int/iris/bitstream/handle/10665/332052/WHO-2019-nCoV-Adjusting\\_PH\\_measures-Schools-2020.1-eng.pdf?sequence=1&isAllowed=y](https://apps.who.int/iris/bitstream/handle/10665/332052/WHO-2019-nCoV-Adjusting_PH_measures-Schools-2020.1-eng.pdf?sequence=1&isAllowed=y).
  - 29 Murphy MP. COVID-19 and emergency e-learning: Consequences of the securitization of higher education for post-pandemic pedagogy. *Contemporary Security Policy*, 2020; 41(3): 1-14. doi:10.1080/13523260.2020.1761749.
  - 30 Schindler LA, Burkholder GJ, Osama AM, Morad A, Marsh C. Computer-based technology and student engagement: a critical review of the literature. *International Journal of Educational Technology in Higher Education*. 2017; 14(25): 2-28. doi:10.1186/s41239-017-0063-0.
  - 31 Shohel M, Mahruf C, Kirkwood A. Using technology for enhancing teaching and learning in Bangladesh: challenges and consequences. *Learning, Media and Technology*. 2012; 37(4): 414-428. doi:10.1080/17439884.2012.671177.
  - 32 Nomass BB. The impact of using technology in teaching English as a second language. *English language and literature studies*, 2013; 3(1): 111-116. doi:10.5539/ells.v3n1p111.
  - 33 Al-Mansour NS, Al-Shorman RA. The effect of computer-assisted instruction on Saudi University students' learning of English. *Language and translation*. 2011; 24: 51-56. doi:10.1016/j.jksult.2009.10.001.
  - 34 Eynon R, Malmberg LE. Understanding the online information-seeking behaviours of young people: the role of networks of support. *Journal of Computer Assisted Learning*. 2011; 28(6): 514-529. doi:10.1111/j.1365-2729.2011.00460.x.
  - 35 Cevik YD. Predicting college students' online information searching strategies based on epistemological, motivational, decisionrelated, and demographic variables. *Computers & Education*. 2015; 90: 54-63. doi:10.1016/j.compedu.2015.09.002.
  - 36 Moattarian A, Tahririan MH. Language needs of graduate students and ESP courses: The case of tourism management

- in Iran. *RALs*, 2014; 5 (2): 4-22. [https://rals.scu.ac.ir/article\\_11009cba30ae831a99ae7c128ced6b3c2d03.pdf](https://rals.scu.ac.ir/article_11009cba30ae831a99ae7c128ced6b3c2d03.pdf)
- 37 Khany R, Tarlani-Aliabadi H. Studying power relations in an academic setting: Teachers' and students' perceptions of EAP classes in Iran. *Journal of English for Academic Purposes*. 2016; 21: 72-85. doi:10.1016/j.jeap.2015.12.002.
  - 38 Dziecioł-Pędich A. ESP in polish tertiary language courses– in search of definition. *Journal of Language and Education*. 2015; 1(4): 6-14. doi:10.17323/2411-7390-2015-1-4-6-14.
  - 39 Akbari Z. Academic English needs of Iranian paramedical students and practitioners: An ESP context. *International Journal of Language Learning and Applied Linguistics World*. 2014; 5(2): 274-286.
  - 40 Huang Y-H. Students' and an ESP teacher's views on industry-academia cooperation: co-teaching a business english course. *The Asian ESP Journal*. 2013; 9(1): 54-83. <http://asian-esp-journal.com/wp-content/uploads/2016/01/AESP-Volume-9-Issue-1-July-2013.pdf>.
  - 41 Alaei MM, Ershadi AR. ESP program in Iran: A stakeholder-based evaluation of the program's goal, methodology, and textbook. *Issues in Language Teaching*. 2016; 5(2): 279-306. doi:10.22054/ILT.2017.8062.
  - 42 Farahian M, Parhamnia F. Nursing students' information-seeking behavior in ESP courses: Do quality of education and reflective practice matter?. *Future of Medical Education Journal*. 2020; 10(2): 9-15. doi: 10.22038/fmej.2020.45189.1307.
  - 43 Chen T-CK. University EFL Students' Use of Online English Information Searching Strategy. *Iranian Journal of Language Teaching Research*. 2019; 8(1): 111-127.
  - 44 Newman K, Dobbins M, Yost J, Ciliska D. Information seeking when problem solving: Perspectives of public health professionals. *Worldviews on Evidence-Based Nursing*. 2017; 14(2): 145-153. doi:10.1111/wvn.12187.
  - 45 Parhamnia F, Farahian M. Problem solving and self-Efficacy skills in information seeking behavior: a survey among thesis writing postgraduate students. *National Studies on Librarianship and Information Organization*, 2020; 31(1): 66-78. doi: 10.30484/NASTINFO.2019.2265.1871.
  - 46 Ozkanal B, Gulen SK, Gunes EP. Online information searching strategies of open and distance learners: Anadolu University sample. *Turkish Online Journal of Distance Education*. 2021; 22(3): 163-176. doi:10.17718/tojde.961831.
  - 47 Ek S. Factors relating to problems experienced in information seeking and use: findings from a cross-sectional population study in Finland. *Information Research*. 2017; 22(4), paper 775. Retrieved from <http://InformationR.net/ir/22-4/paper775.html> (Archived by WebCite at <http://www.Webcitation.org/6vNzTcTtS>).
  - 48 Heppner PP, Krauskopf CJ. An information-processing approach to personal problem solving. *The Counseling Psychologist*. 1987; 15, 371-447. doi: 10.1177/0011000087153001.
  - 49 Heppner PP, Petersen CH. The Development and Implications of a Personal Problem-Solving Inventory. *Journal of Counseling Psychology*. 1982; 29, 66. doi:10.1037/0022-0167.29.1.66.
  - 50 Clark, J. C. (2002). Problem solving and personality Factors of Two At-Risk College Population. College of Human Resources and Education of West Virginia University. Morgantown, West Virginia.
  - 51 A Rastgo A, Naderi E, Shariatmadari A, Sifnaraghi M. The Impact of Internet Information Literacy Training on University Student's Problem Solving Skills. *Journal of New Approaches in Educational Administrations*. 2011; 1(4): 1-22.
  - 52 Jalili A, Hejazi M, Entesar Fomani G, Morovvati Z. The Correlation between IQ with Educational Performance and Problem Solving Mediation. *Journal of Health Promotion Management*. 2018; 7 (1) :1-8 URL: doi.10.21859/jhpm-08011.

- 53 Mahmoudian Azar Sharabian S. The Effect of Triz Training on the Problem Solving Ability of Specialized Industry and Mining holding Managers. *Journal of Applied Educational Leadership*. 2021; 2(2): 53-68
- 54 Mansourian Y, Sangary M. An investigation of information seeking behavior of graduate students of Kharazmi University in writing dissertation. *Human Information Interaction*. 2016; 2(2): 1-8. <http://hii.khu.ac.ir/article-1-2485-en.html>
- 55 Nokarizi M, Davarpanah MR. The Analysis of information seeking patterns. *Journal of Library and Information Science*. 2006; 9(4),119–152.
- 56 Riahi R. Information behaviors and information seeking of nursing students of Mazandaran University of Medical Science. *JMED*. 2017; 12 (3): 195-211.
- 57 Yamin Firouz M, Davarpanah M. Information needs, information seeking and modeling behavior. *National Studies on Librarianship and Information Organization*. 2005; 16(3): 123-132.
- 58 Ingwersen P. (1996). Cognitive perspectives of information retrieval interaction: Elements of a cognitive IR theory. *Journal of Documentation*, 52(1), 3–50. doi:10.1108/eb026960.
- 59 Wilson TD. Human information behavior. *Informing Science*, 2000; 3 (2), 49-56. doi:10. 28945 /576.
- 60 Marchionini G. Information retrieval interfaces for end users. *Journal of the American Society for Information Science*. 1992; 43: 156-1 63. doi:10.1002/(SICI)1097-4571(199203)43:2<156::AID-ASIS>3.0.CO; 2-U.
- 61 Wilson TD. Models in information behavior research. *Journal of Documentation*. 1999; 55 (3): 249-270. doi:10.1108/EUM0000000007145.