



# Design and psychometrics of communities of practice questionnaire in Tabriz University of Medical Sciences

Nayer Seyednazari<sup>1</sup>, Sadegh Maleki Avarsin<sup>1\*</sup>, Jahangir Yari Haj Atalou<sup>1</sup>

Department of Educational Sciences, Tabriz Branch, Islamic Azad University, Tabriz, Iran

## Article info

### Article Type:

Original Research

### Article History:

Received: 20 Sep. 2017  
Accepted: 20 Nov. 2017  
published: 30 Dec. 2017

### Keywords:

Psychometrics  
Validity indicators  
Reliability  
Communities of practice

## Abstract

**Background:** Given the importance of knowledge and learning, as well as teaching-learning processes at the Tabriz University of Medical Sciences (TUMS), creating an effective learning environment and structure is necessary. Since communities of practice (CoPs) can be a useful environment for creating and sharing knowledge and providing learning opportunities, the purpose of this study was to design a standard instrument to develop a pattern of CoPs in TUMS.

**Methods:** In order to achieve the research objectives, a 37-item questionnaire was designed following a comprehensive literature review. This questionnaire was given to 14 experts at TUMS to determine face and content validity. The Communities of Practice Questionnaire (COPQ) was given to 30 individuals in the target group to determine reliability. Its internal consistency was calculated using Cronbach's alpha coefficient. Exploratory factor analysis (EFA) was used to evaluate the construct validity and to estimate the stability, retest method and the intraclass correlation coefficient (ICC).

**Results:** After extracting validity indicators, 2 items whose content validity index (CVI) and content validity ratio (CVR) were lower than the equivalent values in the Lawshe table were removed, and a 35-item questionnaire was finalized; the full scale CVR and CVI were 0.78 and 0.92, respectively. Based on the results of EFA, 6 factors were identified that could explain approximately 60% of the variance.

**Conclusion:** The Communities of Practice Questionnaire can be a valid tool for evaluating CoPs in medical schools for creating and sharing knowledge and creating learning opportunities among faculty members.

**Please cite this article as:** Seyednazari N, Maleki Avarsin S, Yari Haj Atalou J. Design and psychometrics of communities of practice questionnaire in Tabriz University of Medical Sciences. Res Dev Med Educ. 2017;6(2):94-100. doi: 10.15171/rdme.2017.019.

## Introduction

In recent years, with the advancement of research in the field of knowledge management and the emphasis on the integration of knowledge creation and sharing processes, the working patterns and structures of organizations are of renewed interest, especially educational organizations and universities and, in particular, universities of medical sciences (UMS) that deal with human health. An example of one such structure is communities of practice (CoPs), which are different from work groups and work teams.

CoPs are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly.<sup>1</sup> CoPs are intersubjective social structures that constitute a normative and epistemic ground for action.<sup>2</sup> These communities offer a new vision and approach to develop a learning organization<sup>3</sup> and a

structural solution to promote knowledge development, learning and performance.<sup>4</sup> CoPs have been identified as an effective method to extract and disseminate tacit knowledge.<sup>5</sup> As a vehicle for learning, a CoP is a place where people generate new knowledge that both increases knowledge and facilitates the flow of knowledge capital in an organization.<sup>6</sup>

CoPs are thus regarded as very important since they create a link between individual and organizational learning.<sup>7</sup> They help people learn and thus increase performance in the workplace.<sup>8</sup> The critical point of a CoPs perspective is that a social context for learning- where relationships between people become a basis for solving problems, doing practices and enhancing specialized knowledge - is essential in order to formulate these communities.<sup>9</sup> Learning in CoPs occurs in a trusted work environment and targeted social

\*Corresponding Author: Sadegh Maleki Avarsin, Email: s.maleki@iaut.ac.ir



© 2017 The Authors. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, as long as the original authors and source are cited. No permission is required from the authors or the publishers.

participation through social engagement and collective activity.<sup>10</sup> A community of practice is an environment in which organizational learning mostly forms based on cultural vision.<sup>11</sup> This semi-formal and autonomous group focuses on collaborative teamwork and the mutual sharing of knowledge and experience among members in order to supplement current organizational structures.<sup>12</sup> CoPs promote interaction between different components of the organization, which encourages creativity and innovation.<sup>13</sup> The selection of members is voluntary, based on their interests, commitment and skills for the main activities of the community.<sup>14</sup> Community members participate due to “value added,” the excitement of building new ideas, and the satisfaction of relationships.<sup>15</sup> CoPs can be a strategy for enhancing organizational development. This is because they reinforce both formal and informal learning in the workplace<sup>16</sup> and, in providing opportunities to apply knowledge, tools, and social relationships, discriminate among individuals’ activities.<sup>17</sup> CoPs have positive influences on individual, group and organizational performance. Individuals mutually engage with others participating in the same practice, learn to conduct work-related tasks, and thus improve their ability to perform their work-related tasks, with an outcome being improved performance for individuals, the CoP and the organization.<sup>18</sup>

It is known that due to the positive impact of CoPs on creating and sharing knowledge within and outside the organization, an increasing number of organizations use these as strategic tools.<sup>19</sup> The main mission of UMS is to foster scientific development and promote physical and social health. The knowledge acquired by UMS in this role is reflected in their clinical decision-making and practices, creating added value in medical sciences. Therefore, CoPs in these universities have an important function in achieving these goals, since they promote sharing and transferring of knowledge and experiences among members, learning and improving methods of doing work, professional development and performance of faculty members through communication and interactions. The Tabriz University of Medical Sciences (TUMS) sees a need to set up, cultivate and develop CoPs to attain and implement goals for various programs in the fields of education, research, etc. This study has been carried out for the first time in UMS in Iran and until the implementation of this study, there were no reliable tools for assessing the components of CoPs in these universities. Most of the previous studies were conducted in commercial, industrial and service organizations or abroad without including all components of CoPs<sup>20-22</sup>; therefore, the development of a comprehensive model of CoPs based on the perspective of faculty members seems necessary. The purpose of this study was to design a psychometrics Communities of Practice Questionnaire at the TUMS.

## Materials and Methods

### *Design and participants*

The present study was a cross-sectional, psychometric survey. First, through conducting a literature review about CoPs, components of CoPs were extracted and a questionnaire was constructed with 37 items. The psychometrics of tool, face, content and construct validity, internal consistency and repeatability were examined. To determine the face and content validity of the instrument, 14 faculty members of the TUMS 10 associate professors and 4 assistant professors from different departments, participated. To examine reliability and construct validity, 2 groups of faculty members of TUMS participated in this study; 30 faculty members were included in a pilot study in order to examine the reliability of the instrument. The sample size for performing factor analysis recommended by different authors is 5-10 samples for each item.<sup>23</sup> Construct validity was examined using data from 210 faculty members (each sample for each item).

### *Face validity*

In determining face validity via a qualitative method, experts were asked to review the Communities of Practice Questionnaire (COPQ) in order to simplify and comprehend the questionnaire’s measures; incoherent and ambiguous words and phrases were corrected and replaced based on their feedback. The face validity of the COPQ was quantitatively measured using the impact method.<sup>24</sup> In order to assess the impact scores, participants were asked to rate the significance of each of the items on a 5-point scale. To confirm the face validity of each item, its score should not be less than 1.5.

### *Content validity*

To answer questions such as “Does the designed tool consist all important aspects of the measured concept? Does the construction of the tool examine what is to be studied?” the content validity of the tool was examined quantitatively and qualitatively.<sup>25</sup> In order to evaluate content validity qualitatively, evaluators were asked to provide feedback based on criteria such as “grammar structure, using proper words, placing items in their proper place,” and any necessary changes based on feedback were made.

The content validity of the test was assessed quantitatively by 2 indicators, (a) content validity ratio (CVR) to ensure that the most relevant and correct content was selected (the necessity of the item), and (b) content validity index (CVI) to ensure that the tool items were valid to measure.<sup>26,27</sup> To determine CVR, the panel of experts was asked to comment on each of the items based on a 3-point scale. Based on the number of experts who evaluated the questions, acceptable minimum amount of CVR was obtained based on the Lawshe table, and the 2 items for which the CVR value was less than the sufficient amount according to the number of experts were deleted. To

evaluate the CVI, the Waltz and Bausell method was used.<sup>28</sup> Experts express their views on 3 criteria of 'simplicity', 'relevance', and 'clarity or accuracy' of each item based on a 4-point scale. The CVI score is calculated by aggregating the concession points for each item that was ranked third or fourth (highest score) by the total number of specialists.

### **Reliability and repeatability**

In order to ensure of the similarity, accuracy, predictability and reliability of the results in the same conditions, the reliability of the COPQ research tool was estimated using Cronbach's alpha coefficient, and to test the stability of the questionnaire, the intraclass correlation coefficient (ICC) method was used.<sup>29</sup> In order to conduct a re-test over the period of 2 weeks, 30 persons from the target group completed questionnaires on a 5-point Likert scale (1 = absolutely proper to 5 = absolutely improper).

### **Construct validity**

The questionnaires were distributed among 210 faculty members of the TUMS from different departments, consisting of both genders, with academic ranks of professor, associate professor and assistant professor. After collecting the data, in order to verify the construct validity, exploratory factor analysis (EFA) using the principal component method was done. To ensure the appropriateness of data for factor analysis, Kaiser-Meyer-Olkin (KMO) and Bartlett test of sphericity was used, and to determine the number of factors, the Kaiser criterion or eigenvalue was used.<sup>23,30</sup>

### **Statistical analysis**

The data were analyzed using SPSS 21 and Excel to check the face and content validity; reliability; KMO and Bartlett test of sphericity. EFA was performed with EQS 6.1.

## **Results**

### **Participants**

71.4% of experts who examined face and content validity were associate professors and the rest were assistant professors. In order to check reliability, the majority of faculty members who participated in the pilot study were faculty of the pharmacy and research centers (33.3% and 26.7% respectively).

For conducting construct validity, 58.1% of participants were male and 41.9% were female. In terms of rank, 13.3% of them were professors, 23.8% associate professors, and 62.9% were assistant professors. The majority (37.1%) were from the faculty of medicine and the rest of them were from other departments and research centers.

### **Face validity**

In this research in the face validity study by qualitative method, items that required correction were amended. In quantitatively measures of face validity, impact scores of items that were higher than 1.5 were considered

appropriate and were maintained.

### **Content validity**

After calculating CVI for each item, items with a score of above 0.79 were accepted, and items with a CVI between 0.70 and 0.79 were again reviewed and corrected by the experts.

Then, based on the number of experts who evaluated the questions, the minimum amount of CVR acceptable was obtained based on the Lawshe table.<sup>28</sup> Based on these results, the average size of CoPs with a CVR of 0.42 and asynchrony virtual communication with the CVR of 0.28 were deleted, because their CVRs were less than the corresponding value for the Lawshe table (<0.51), and approved items with an acceptable level of significance ( $P < 0.05$ ) were considered essential for this tool. Content related to CVI and CVR of the COPQ are given in Table 1. The CVR and CVI of the COPQ after eliminating 2 items was 0.78 and 0.92, respectively.

### **Reliability and repeatability**

Using the Cronbach's alpha coefficient, inner consistency of the tool was calculated to be 0.89 and the ICC was 0.92. Based on the recommended rate by researchers,<sup>31,32</sup> these results are acceptable.

### **Construct validity**

According to results, the value of the KMO index was 0.881 and Bartlett's test of sphericity was performed, with a result of 3906.519 with a  $P < 0.001$ , which indicates the justification of the implementation of the factor analysis. Based on the PCA and scree plot, 6 factors were identified with eigenvalues higher than 1 that could explain 58.493% of the variance. Results are shown in Figure 1.

Table 2 shows results of the factor loadings in the related rotated matrix.

## **Discussion**

Learning occurs through the process of participation in social learning systems (SLSs) and CoPs are one of the constructive elements of SLSs. Because previous studies have shown that CoPs have individual, social, and organizational benefits, it is necessary to establish these communities in educational organizations, including UMS, which are centers of knowledge creation and sharing, learning, and scientific development. Studies of CoPs have been carried out in commercial, industrial and service organizations<sup>20-22</sup> yet there was not a standard tool that encompassed all components of CoPs while considering the specific context environment of a university. What was significant in assessing validity is that from the perspective of experts, the objectives of CoPs; helping members to solve problems, consulting community leaders with members in making decisions and using their suggestions, the presence of community members in a freely and voluntary manner in a CoP, lack of restrictions on the presence of members

**Table 1.** CVR and CVI of questionnaire

Item number	Item	CVR	CVI
1	Boundary crossing of CoP within the organization	0.85	0.92
2	Boundary crossing of CoP inter-organizational	0.71	0.88
3	Boundary crossing of CoP across organizational units	0.71	0.95
4	The aim of CoP is to help problem solving	1	0.95
5	The aim of CoP is to transfer of best practices and experiences among members	0.85	0.78
6	The aim of CoP is stewarding knowledge	0.57	0.9
7	The aim of CoP, innovation and the development of initiative ideas	0.57	0.76
8	Establishment of CoP in top-down approach	0.85	0.88
9	Establishment of CoP in down-top approach	0.85	0.85
10	Consultation of the leader of the community with the members in decision making	1	1
11	Community leadership role play distribution widely among members	0.85	0.95
12	Leader's friendly attitude with members and sensitivity to their needs	0.71	0.97
13	Determining and communicating the duties of community members by management	0.57	0.85
14	Small size of community of practice	0.71	0.97
15	Average size of community of practice	0.42	0.78
16	Large size of community of practice	0.57	0.92
17	The participation of members of the community in a freely and voluntarily manner	1	0.92
18	The participation of members in CoP based on bureaucratic expectation	0.57	0.9
19	A combination of voluntary and compulsory participation of community members	0.85	0.85
20	Membership without limitation for them in CoP	1	0.92
21	Select members with specific features to attend in CoP	0.57	0.9
22	Homogeneous members in CoP	0.71	0.97
23	Heterogeneous members in CoP	0.71	1
24	Membership in CoP in a continues manner	1	0.92
25	The presence of members in CoP temporarily	0.71	0.9
26	The interaction of members CoP is face-to-face	0.85	1
27	Communicating the members of CoP only in virtual synchronous manner	0.57	0.83
28	The association of community members only in virtual asynchronous manner	0.28	0.88
29	The interaction of members in CoP is a combination of face-to-face and virtual manner	0.85	0.83
30	Formal Participation of members	0.71	1
31	Informal Participation of members	0.71	0.97
32	Trust among members of CoP	1	1
33	Trust between community leaders and members	0.85	0.97
34	Commitment and engagement of community of practice Leader's	1	0.95
35	Commitment and engagement of community members	1	0.97
36	Internal organizational facilitator	0.71	1
37	External organizational facilitator	0.57	0.92

in a CoP, presence of members in the community in continuous manner, leader and member engagement and commitment in community activities, and trust between members of CoPs, were distinguished more necessary and it can be concluded that more informal and liberal aspects of CoPs have been of great importance and value to experts in their opinion. Their selection of the above indicators, in most cases, confirms the previous studies. As the exploratory study by American Productivity and Quality Center has shown, "CoPs have different strategic goals, and most communities have mechanisms for community members for mutual assistance to solve work problems and common ideas and can act as a practical and effective tool for problem solving".<sup>33</sup> There is also a need

for appropriate leadership and management support,<sup>34,35</sup> and a participatory leadership style is one of the common leadership styles in CoPs, which, according to Yukl, is the ability to influence leader decisions through employee participation in decision making and empowerment.<sup>36</sup> According to Schiavone<sup>14</sup> and Mládková,<sup>15</sup> participation in CoPs is voluntary. Dubé et al, in their study, stated that the process of selecting members for the CoPs can be open and members can be present in these communities without any restrictions. The process of selecting members is also related to the sustainability of membership. Open CoPs tend to have floating and temporary members, as volunteers join communities when they are asked, while closed communities tend to

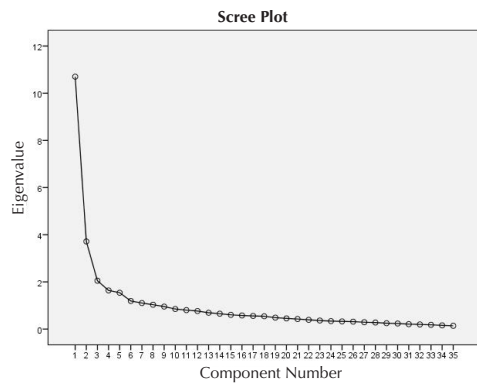


Figure 1. Scree plot.

Table 2. Exploratory factor loadings of Components

	Component					
	1	2	3	4	5	6
S32	.765					
S33	.698					
S22	.671					
S31	.660					
S34	.639					
S30	.575					
S10	.566					
S27	.550					
S28	.524					
S14	.496					
S8		.709				
S13		.695				
S17		.637				
S25		.626				
S21		.568				
S23		.565				
S20		.417				
S26			.695			
S29			.683			
S35			.641			
S24			.627			
S15			.468			
S18			.457			
S19			.442			
S6				.808		
S7				.765		
S5				.725		
S4				.501		
S11					.661	
S12					.647	
S16					.550	
S9					.544	
S1						.817
S2						.623
S3						.601

have fixed members.<sup>37</sup> According to Carlson (cited by Koch and Fusco<sup>38</sup>), building trust in members is the key to the success of community. Vestal (cited by Borzillo<sup>39</sup>) also states that community success largely depends on the level of commitment and engagement of members. However, due to the comparison of the results of Dubé et al regarding the relationship between the choice of members and the sustainability of members,<sup>37</sup> it was found that experts of the TUMS determined the process of selection of members and the stable presence of members in CoPs were considered necessary, which could be due to the fact that, in the opinion of the experts of the university, members who are constantly present in the community are more aware of the issues in these communities and thus can take better steps to resolve problems and issues. The extracted components from the EFA were consistent with the theoretical foundations of CoPs such as the purpose of forming these communities,<sup>1,33</sup> the various leadership styles that are appropriate to the structure of communities, and the role of leaders in community development.<sup>34,35,40</sup>

**Limitations**

In this study participants were faculty members, which limits the external validity and generalizability of the results to other members of the TUMS. Another limitation of this study was the lack of confirmatory factor analysis to confirm the results of the EFA. Therefore, it is necessary to conduct studies comprising other members of this university and to confirm the results of this study using other psychometric methods.

**Conclusion**

The results of this study indicate that the designed tool is a standard and valid tool for measuring the CoPs at the TUMS, because it was designed with all the components of the CoPs and the local environment of this university.

**Ethical approval**

The research project has received the confirmation of the Ethics Committee with the number of IR.IAU.TABRIZ.REC.1396.86.

**Competing interests**

The authors declare that there is no conflict of interest.

**Authors' Contributions**

This article is an excerpt from the doctoral thesis, which according to the Islamic Azad University regulation, the student as the first author, who has done all the activities related to the compilation of the article under the supervision of the supervisor as the second and corresponding author and consultant professor.

**Acknowledgements**

We would like to express our gratitude and appreciation to the faculty members of TUMS who have provided assistance in completing the questionnaires.

**References**

1. Wenger E, Wenger-Trayner B. Introduction to Communities



- of Practice. A Brief Overview of the Concept and its Uses. Available from: <http://wenger-trayner.com/introduction-to-communities-of-practice/>. Accessed 2015.
2. Adler E. The Spread of Security Communities: Communities of Practice, Self-Restraint, and NATO's Post—Cold War Transformation. *European Journal International Relations*. 2008;14(2):195-230. doi: 10.1177/1354066108089241.
  3. Gray I, Parker J, Rutter L, Williams S. Developing communities of practice: a strategy for effective leadership, management and supervision in social work. *Social Work Social Sciences Review*. 2010;14(2):20-36. doi: 10.1921/174661010X537199.
  4. Neufeld D, Fang Y, Wan Z. Community of practice behaviors and individual learning outcomes. *Group Decision Negotiation*. 2013;22(4):617-39. doi: 10.1007/s10726-012-9284-8.
  5. Lee S, Hong JY, Suh E. Measuring the change in knowledge sharing efficiency of virtual communities of practice: a case study. *Int J Technol Manag*. 2016;70(1):58-75. doi: 10.1504/IJTM.2016.074675.
  6. Saint-Onge H, Wallace D. Communities of Practice: High-Trust Vessels for Increasing Capabilities. In: Saint-Onge H, Wallace D, eds. *Leveraging Communities of Practice for Strategic Advantage*. New York: Routledge; 2012. p. 27.
  7. van Winkelen C, McKenzie J. Integrating Individual and Organizational Learning Initiatives: Working Across Knowledge Management and Human Resource Management Functional Boundaries. *Electronic Journal Knowledge Management*. 2007;5(4):527-38.
  8. Chang J, Chang W, Jacobs R. Relationship between participation in communities of practice and organizational socialization in the early careers of South Korean IT employees. *Human Resource Development International*. 2009;12(4):407-27. doi: 10.1080/13678860903135805.
  9. Yeo RK. How does learning (not) take place in problem-based learning activities in workplace contexts? *Human Resource Development International*. 2008;11(3):317-30. doi: 10.1080/13678860802102609.
  10. Andrew N, Ferguson D, Wilkie G, Corcoran T, Simpson L. Developing professional identity in nursing academics: the role of communities of practice. *Nurse Educ Today*. 2009;29(6):607-11. doi: 10.1016/j.nedt.2009.01.012.
  11. Hara N. *Communities of Practice: Fostering Peer-to-Peer Learning and Informal Knowledge Sharing in the Work Place*. Berlin: Springer; 2008.
  12. Hearn S, White N. *Communities of Practice: Linking Knowledge, Policy and Practice*. London, UK: Overseas Development Institute; 2009.
  13. Rivera A, Carlos J. Communities of practice: improving knowledge management in business. *Bus Educ Adm*. 2011;3(1):101-11.
  14. Schiavone F. *Communities of Practice and Vintage Innovation: A Strategic Reaction to Technological Change*. 1st ed. New York: Springer; 2013.
  15. Mládková L. Dysfunctional communities of practice – thread for organization. *Procedia - Social Behavioral Sciences*. 2015;210(Suppl C):440-8. doi: 10.1016/j.sbspro.2015.11.392.
  16. Steinert Y. Learning from experience: from workplace learning to communities of practice. In: Steinert Y, ed. *Faculty Development in the Health Professions: A Focus on Research and Practice*. 1st ed. The Netherlands: Springer; 2014. p. 141-158. doi: 10.1007/978-94-007-7612-8.
  17. Abigail LK. Do communities of practice enhance faculty development? *Health Professions Education*. 2016;2(2):61-74. doi: 10.1016/j.hpe.2016.08.004.
  18. Schenkel A, Teigland R. Improved organizational performance through communities of practice. *Journal of Knowledge Management*. 2008;12(1):106-18. doi: 10.1108/13673270810852421.
  19. Wang CY, Yang HY, Chou ST. Using peer-to-peer technology for knowledge sharing in communities of practices. *Decis Support Syst*. 2008;45(3):528-40. doi: 10.1016/j.dss.2007.06.012.
  20. Hasmath R, Hsu JY. *Communities of Practice and the NGO Sector in China*. Stockholm, Sweden: International Society for Third Sector Research Conference; 2016.
  21. Al Azali R. *Communities of practice, knowledge creation, and corporate sustainability: a study of Bahrain service industry [dissertation]*. Bentley: Curtin University; 2010.
  22. Probst G, Borzillo S. Why communities of practice succeed and why they fail. *Eur Manag J*. 2008;26(5):335-47. doi: 10.1016/j.emj.2008.05.003.
  23. Pallant J. *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using the SPSS program*. 4th ed. Maidenhead: Open University Press; 2010.
  24. Hajizadeh E, Asghari M. *Statistical Methods and Analysis Considering Research Methodology in Bioscience and Health Sciences*. 1st ed. Tehran: ACECR Press; 2011. [Persian].
  25. Polit DF, Beck CT, Owen SV. Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Res Nurs Health*. 2007;30(4):459-67. doi: 10.1002/nur.20199.
  26. Lawshe CH. A Quantitative Approach to Content Validity. *Pers Psychol*. 1975;28(4):563-75. doi: 10.1111/j.1744-6570.1975.tb01393.x.
  27. Newman I, Lim J, Pineda F. Content validity using a mixed methods approach: its application and development through the use of a table of specifications methodology. *J Mix Methods Res*. 2013;7(3):243-60. doi: 10.1177/1558689813476922.
  28. Waltz CW, Bausell RB. *Nursing Research: Design, Statistics and Computer Analysis*. 6th ed. Philadelphia: F.A. Davis; 1981.
  29. Drost EA. Validity and reliability in social science research. *Education Research Perspectives*. 2011;38(1):105-23.
  30. Ledesma RD, Valero-Mora P. Determining the Number of Factors to Retain in EFA: an easy-to-use computer program for carrying out parallel analysis. *Practical Assessment, Research Evaluation*. 2007;12(2):1-11.
  31. DeVon HA, Block ME, Moyle-Wright P, Ernst DM, Hayden SJ, Lazzara DJ, et al. A psychometric toolbox for testing validity and reliability. *J Nurs Scholarsh*. 2007;39(2):155-64. doi: 10.1111/j.1547-5069.2007.00161.x.
  32. Tavakol M, Dennick R. Making sense of Cronbach's alpha. *Int J Med Educ*. 2011;2:53-5. doi: 10.5116/ijme.4dfb.8dfd.
  33. Pavlin S. Community of practice in a small research institute. *J Knowl Manag*. 2006;10(4):136-44. doi: 10.1108/13673270610679426.
  34. Zboralski K. Antecedents of knowledge sharing in communities of practice. *J Knowl Manag*. 2009;13(3):90-

101. doi: 10.1108/13673270910962897.
35. Scarso E, Bolisani E, Salvador L. A systematic framework for analysing the critical success factors of communities of practice. *J Knowl Manag.* 2009;13(6):431-47. doi: 10.1108/13673270910997105.
  36. Filstad C. Learning and knowledge as interrelations between CoPs and NoPs. *The Learning Organization.* 2014;21(2):70-82. doi: 10.1108/TLO-11-2012-0077.
  37. Dubé L, Bourhis A, Jacob R, Koohang A. Towards a typology of virtual communities of practice. *Interdisciplinary Journal Information, Knowledge Management.* 2006;1:69-93.
  38. Koch M, Fusco J. Designing for growth. In: Kimble C, Hildreth P, Bourdon I, eds. *Communities of Practice: Creating Learning Environments for Educators.* North Carolina: Information Age Publishing; 2008.
  39. Borzillo S. *Communities of Practice to Actively Manage Best Practices.* Wiesbaden: Deutscher Universitäts-Verlag; 2007.
  40. Gilley A, Kern SJ Jr. Groups, Teams, and Communities of Practice: A Comparison. *Adv Dev Hum Resour.* 2010;12(1):46-60. doi: 10.1177/1523422310365312.