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Factor Analysis of English Language Teacher Learning Scale for Assessing Pharmacy Graduates' Language Competencies

Abstract:

The English Language Teacher Learning Scale (ELTLS) has been tested in different academic fields worldwide. However, there is no evidence about its validation in Pakistan. This study reports on validation of ELTLS in Pakistan. The 49 items scale was tested on a sample of 112 teachers from pharmacy departments. The process of validation consisted of two stages. First, the scale was piloted to check reliability. Second, Exploratory factor analysis was used to identify the factor structure of the scale. The four factors are teacher cognition, teacher emotion, teacher motivation, and contextual variables. The Principal Component Analysis was applied with orthogonal Varimax rotation method to test the four-factor scale. The results provided evidence for the reliability and validity of the scale. Hence, the scale may be used for assessing language teaching and learning among teachers and students in the field of pharmacy. It is recommended that ELTLS may be tested in other contexts.

Key Words:

English Language Teaching, Higher Education, Exploratory Analysis, Psychometric Testing

Introduction

Effective communication is one of the most sought after and essential professional skills needed for individuals to be successful in the current 21st-century job market (Hulme, Snowling, West, Lervåg, & Melby-Lervåg, 2020). Pharmacy graduates also need to have quality language skills to perform better in the current competitive pharmacy professionals (Grabowski, 2015; Mesquita et al., 2010; Wallman, Vaudan, & Sporrang, 2013). The importance of English Language Teaching-learning cannot be disregarded in the reformation and development of language skills among pharmacy graduates (Cook, 2016; Stanley & Murray, 2013). Hence, the importance of using English language competency is very much focused on current pharmaceutical settings (Wallman et al., 2013). However, despite this realization, little evidence exists pertaining to psychometric validation of the ELTLS instrument in the field of pharmacy. Psychometric validation means validating a measuring instrument and assessing the reliability and validity of the measurement (Lee & Drajadi, 2019; Oxford & Burry-Stock, 1995). The psychometric properties of a measuring instrument relate to the construction and validation of the assessment instrument. In this study, psychometric properties of an instrument are the reliability and validity of the assessment instrument used to evaluate the perspectives of principals, teachers and students in VTIs of Pakistan. The current study addresses this gap by assessing the psychometric features in the field of pharmacy education. The current existing adds to literature related to the context of language teaching and learning by extending the application of ELTLS into the context of pharmacy education.

The existing research on English language teaching and learning in relation to pharmacy education does not include established scales, and it only assessed one aspect of student language development such as attitude towards patients (Adrian, Zeszotarski, & Ma, 2015; Coroban, 2019; Mesquita et al., 2010).

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To remedy this gap, some researchers have used different scales in different social science fields for assessing the abilities of students about learning of English language skills ([Echeverri, Brookover, & Kennedy, 2013](#); [Syakur, Zainuddin, & Hasan, 2020](#)). However, these researchers argue that the scale results cannot be generalized to different socio-economic background, cultural contexts due to variations in language teaching and learning outcomes and experiences ([Al-Sobhi & Preece, 2018](#); [Tenney, Paiva, & Wang, 2020](#)). Majority of the existing research studies related to the application of scales for assessing language teaching and learning have generally been limited to the traditional social sciences field. These measures do not effectively cover the issues of language teaching, and learning in the field of pharmacy education rather covered alternative instructional delivery. Even the alternative did not include pharmacy concepts in the relation of language learning and teaching ([Adrian et al., 2015](#); [Dang, Truong, & Wade, 2019](#); [Syakur, Junining, & Mubarak, 2020](#)). This study specifically contributes to this gap by validating the ELTLS instrument for assessing the English language teaching and learning outcomes of students and also the factors influencing language teaching and learning implementation in the field of pharmacy education from developing country perspective. The results of this study contribute to the knowledge base of language teaching and learning research and the future design and implementation of language teaching practices. In contrast to previous studies which focused on the perspectives of students or teachers, this current study included both participants' perspectives for the purpose of effectively addressing the long-standing gap in the methodological issues of English language teaching and learning in the field of pharmacy education by using valid measures developed to assess the perspectives of teachers and students in pharmacy institutes of higher education of Pakistan.

Literature Review

Developing an instrument representing different characteristics of teacher learning in ELT context for the current pharmacy education is important. There is a need to provide better language development opportunities for pharmacy graduates to enable them to perform as quality medical professionals ([Kimberlin, 2006](#); [Luiz Adrian, Zeszotarski, & Ma, 2015](#)). Many studies have reported the application of different language-related scales to measure the students' performance level in pharmacy ([Bradshaw, Tomany-Korman, & Flores, 2007](#); [Dilworth, Mott, & Young, 2009](#); [Schwappach, Massetti, & Gehring, 2012](#)). However, there is a lack of highly validated and reliable scales which could assess language teaching skills of the pharmacy graduates in the field of pharmacy. This issue exists in Pakistan, which possesses a large pharmacy industry. Hence, there is a need to develop and validate ELT related tools in the field of pharmacy. Furthermore, for the purpose of compensating the lack of an existing tool for measuring student' language learning in ELT context, the existing tools need to be improvised and validated for assessing teacher learning in ELT in pharmacy education. Developing instrument and ensuring its reliability and validity is a challenging task in psychometric researchers ([Aliakbari & Malmir, 2017](#); [Hartmann & Siegrist, 2018](#)). Standardized scales are important measuring tools for obtaining necessary information about service-learning implementation, programme evaluation and outcomes ([Delgado-Ballester, Munuera-Aleman, & Yague-Guillen, 2003](#); [Gagné et al., 2010](#)). They can be easily coded and analysed. An important point about a questionnaire is related to its validity and reliability that how it measures students' attitudes and skills and how accurately do students do self-evaluation on the basis of the questionnaire and its constructs ([Crutzen & Peters, 2017](#); [Gagné et al., 2015](#)).

In short, the above discussion and analysis of existing literature show that there is a lack of systematically developed instrument to test English Language Teacher Learning Scale in pharmacy context, especially in Pakistan. For a better understanding of the impact of language teaching to pharmacy graduates and their language learning experiences, it is essential to develop an instrument that helps in exploring the issues, factors and barriers to the application of such scales and their validation in pharmacy field. Researchers argue that good instruments help in identifying key beliefs, attitudes and perceptions on the target experiences ([Breugh & Colihan, 1994](#); [Silva, do Céu Taveira, Marques, & Gouveia, 2015](#)). The discussion given above shows that most of the existing scales available are either developed in the developed world context or does not properly cover all the psychometric principles of scale development in terms of reliability and validity. Although there

were some existing measures developed by earlier researchers in the field of pharmacy to capture language learning experiences of learners, however, these measures focused either on language learning outcomes from students' perspective in the developed world context. These measures lacked the ability to measure the evidence for its use in pharmacy context, which is an important area—the existing scales which did not effectively meet the requirements of this study.

Research Objectives

1. To validate the four-factor structure of the English Language Teacher Learning Scale (ELTLS) through exploratory factor analysis.
2. To determine the reliability of the scale in the context of the pharmacy field.

Methods and Materials

Sample

This descriptive survey study was designed for assessing the ELTLS in the context of the pharmaceutical setting of Pakistan. For data collection, all teachers from pharmacy departments of universities from all over Pakistan were approached out of which 112 teachers showed a willingness to participate in the study by giving sharing their perceptions through a survey questionnaire distributed to them. The participants were informed about the purpose, and the objectives of the study and their consent were also obtained prior to data collection.

Measure

The English Language Teacher Learning Scale (ELTLS) was used for data collection. The scale consisted of 50 items and four sub-scales, as shown in Table 1.

Table 1. Sub-Scales of ELTLS

S. No	Sub-scales	Number of items
1	Subscale one	Ten items
2	Subscale two	Ten items
3	Subscale three	Eleven items
4	Subscale four	Nineteen items
	Total	Fifty items

Data Screening

Skewness and kurtosis tests were conducted to check the data normality(Doherty, Mitchell, & O'Neill, 2011). The value of kurtosis for the items was within an acceptable range of |3|, and the value of skewness was also greater than|8| which was also within the acceptable range (Das & Imon, 2016; White, 2003). In addition, we also applied Shapiro-Wilk test to further ensure the normality of data which showed 0.92, $p > .05$, indicating a normal distribution in the groups. No prominent issue was found in the data.

Reliability and Validity

A pilot test was done for checking inter-item consistencies among all items and the variables the ELTLS (Cameron & MacKeigan, 2012). This helped to select and determine the difficulty level of the items of the scale. No items were found redundant, repetitive or ambiguous based on the perceptions of the participants. Cronbach's alpha test was conducted to check the reliability of the scale, which was quite high being above .70 in all subscales, as shown in Table 2.

Table 2. Reliability Statistics for ELTLS

S. No	Sub-Scales	Number of Items	Alpha
1	Teacher cognition and belief	9	.75
2	Teacher emotions	10	.79
3	Teacher motivation	11	.93
4	Contextual variables	18	.87
	Total	49	.95

Results

The main aim of this study was to explore and validate the dimension of ELTLS instrument in the context of pharmacy education. Sample adequacy was determined through various statistical applications, as discussed below.

Exploratory Factor Analysis (EFA)

Forty-nine item-scale was subjected to factor analysis on 84 respondents who participated in the study. EFA was used based on varimax method and principal component analysis (PCA) to explore the factor structure.

Table 3. Sample Adequacy Test

KMO Measure		.91
	Approximation of. Chi-Square	1728.522
BTS measure	DF	148
	Level of significance	.000

The above table shows KMO value .91, which indicates that the sample is adequate for conducting factor analysis. Bartlett's Test of Sphericity is .000 significant showing a strong relationship among the variables of the study which further supports the factor analysis

Table 4. Communalities for Extraction

Items No	Initial	Extraction
1	1.000	.541
2	1.000	.639
3	1.000	.597
4	1.000	.463
5	1.000	.423
6	1.000	.098
7	1.000	.477
8	1.000	.575
9	1.000	.485
10	1.000	.644
11	1.000	.509
12	1.000	.718
13	1.000	.643
14	1.000	.709
15	1.000	.563
16	1.000	.556
17	1.000	.410

18	1.000	.493
19	1.000	.690
20	1.000	.702
21	1.000	.589
22	1.000	.642
23	1.000	.660
24	1.000	.419
25	1.000	.522
26	1.000	.613
27	1.000	.594
28	1.000	.664
29	1.000	.712
30	1.000	.721
31	1.000	.728
32	1.000	.670
33	1.000	.652
34	1.000	.688
35	1.000	.726
36	1.000	.689
37	1.000	.662
38	1.000	.712
39	1.000	.749
40	1.000	.564
41	1.000	.670
42	1.000	.652
43	1.000	.688
44	1.000	.726
45	1.000	.689
46	1.000	.662
47	1.000	.712
48	1.000	.749
49	1.000	.564

Table 4 shows the communalities for extraction for the variables expressing the percentage of variance explained by the extracted factors. The table shows the variable of teaching material has the highest .749% variance, which is explained by the extracted factors in the communalities list. PCA method was used for the purpose of extraction.

Table 5. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	20.665	42.173	42.173	20.665	42.173	42.173
2	3.994	8.151	50.324	3.994	8.151	50.324
3	2.688	5.485	55.810	2.688	5.485	55.810
4	2.076	4.238	60.047	2.076	4.238	60.047
5	.985	.938	63.485			
6	.966	.9196	66.681			
7	.877	.911	69.492			

8	.755	.962	72.054
9	.714	.977	74.530
10	.783	.910	76.740
11	.760	.859	78.699
12	.665	.866	80.465
13	.612	.858	82.123
14	.659	.850	83.673
15	.615	.758	85.131
16	.614	.753	86.384
17	.566	.754	87.538
18	.558	.739	88.677
19	.521	.763	89.740
20	.483	.785	90.725
21	.426	.670	91.595
22	.410	.637	92.432
23	.399	.614	93.245
24	.335	.684	93.929
25	.318	.649	94.577
26	.309	.630	95.207
27	.280	.571	95.778
28	.255	.521	96.299
29	.235	.480	96.779
30	.228	.465	97.244
31	.199	.406	97.650
32	.196	.400	98.051
33	.178	.364	98.415
34	.176	.358	98.773
35	.140	.286	99.060
36	.125	.254	99.314
37	.109	.222	99.536
38	.199	.203	99.738
39	.173	.149	99.888
40	.155	.112	100.000
41	.132	.133	100.000
42	.102	.108	100.000
43	.152	.143	100.000
44	.159	.112	100.000
45	.118	.166	100.000
46	.133	.191	100.000
47	.032	.020	100.000
48	.037	.027	100.000
49	.018	.045	100.000

Table 5 indicates the number of factors extracted using the PCA method. Based on EFA, four crucial factors emerged: teacher cognition and belief, teacher emotions, teacher motivation, and contextual realities. The first component 'teacher cognition and belief' has the highest variance (42.17 %) of the total variance. The second factor 'teacher emotions' explains 8.15% of the total variance. The third factor 'teacher motivation'

explains 5.48 of the total variances. The fourth variable ‘contextual realities’ explains 4.23 in the variance. The four dimensions collectively explain 60.04 of the total variances.

Table 6

S. No	Component			
	1	2	3	4
1	.542			
2	.605			
3	.526			
4	.580			
5	.584			
6	.438			
7	.685			
8	.696			
9	.570			
10	.701			
11		.534		
12		.729		
13		.769		
14		.797		
15		.619		
16		.696		
17		.671		
18		.679		
19		.623		
20			.785	
21			.729	
22			.772	
23			.786	
24			.584	
25			.419	
26			.641	
27			.650	
28			.750	
29			.774	
30			.789	
31				.776
32				.712
33				.741
34				.711
35				.639
36				.718
37				.634
38				.845
39				.512
40				.685
41				.651
42				.634

43	.711
44	.718
45	.634
46	.545
47	.551
48	.622
49	.685

Table 6 shows the factor loadings for the variables based on the rotation method. Variables below .40 were suppressed in the analysis. The rotated component matrix showed 49 items scale loading on four components:10 variables (items) from 1-10 loaded on factor 'teacher cognition and belief'; Items 11-19 loaded on factor 'teacher emotions'; Items 20-30 loaded on factor 'teacher motivation'; Items 31-49 loaded on factor 'contextual realities.

Table 7. Factor Loadings, Inter Item Total Correlation, Mean and Standard Deviation

Item No	Factor	Loadings	Inter Item Total Correlations	MEAN	SD
1		.542	.683	2.37	.975
2		.605	.714	2.57	.959
3		.526	.725	2.39	.970
4		.580	.648	3.01	1.223
5	Teacher Cognition and	.584	.593	2.32	.944
6	Belief	.438	.411	3.78	.974
7		.685	.454	2.38	.909
8		.696	.563	2.54	.968
9		.570	.660	3.32	1.060
10		.701	.616	2.41	.986
11		.534	.612	2.45	.975
12		.729	.692	2.34	.993
13		.769	.542	2.14	.873
14		.797	-.608	3.79	.978
15	Teacher Emotions	.619	.642	2.74	1.042
16		.696	.547	2.44	1.018
17		.671	.531	2.46	.945
18		.679	.595	2.30	.899
19		.623	.737	2.73	.943
20		.785	.717	2.86	1.135
21		.729	.658	2.46	.975
22		.772	.713	2.57	.903
23		.786	.712	2.77	.989
24		.584	.564	2.83	.973
25	Teacher Motivation	.519	.572	2.45	.929
26		.641	.728	2.46	.960
27		.650	.737	2.41	.942
28		.750	.755	2.59	.998
29		.774	.767	2.54	.975
30		.789	.769	2.61	1.155
31	Contextual Realities	.776	.780	2.57	.920
32		.712	.733	2.55	.926

33	.741	.717	2.80	1.122
34	.711	.478	3.19	1.137
35	.639	.733	2.40	.909
36	.718	.777	2.73	1.057
37	.634	.746	2.75	.961
38	.845	.505	2.59	.957
39	.512	.438	3.55	1.153
40	.685	.364	1.93	.930
41	.651	.733	2.55	.926
42	.634	.717	2.80	.922
43	.711	.578	3.19	1.137
44	.718	.733	2.40	.909
45	.634	.777	2.73	.957
46	.545	.746	2.75	1.061
47	.551	.505	2.59	.957
48	.622	.538	3.55	1.153
49	.685	.464	1.93	.930

Table 7 shows that loadings for the first factor - ‘teacher cognition and belief’ (items 1-10) has loadings ranging from .438 to .701, which showed a good correlation among the variables. The mean for these variables ranged from 2.34 to 3.01, and lower standard deviation showed homogeneity in the responses for this factor. Loadings for the second factor - ‘teacher emotion’ (items 11-19) has loadings which ranged from .534 to .797 showed a good correlation among the variables. The mean for these variables ranged from 2.14 to 3.79, and the low standard deviation also indicated a strong homogeneity in the responses for this factor. The third factor - ‘teacher emotion’ (items 20-31) has loadings which ranged from .519 to .789 indicated a good correlation. The mean for these variables ranged from 2.41 to 3.19, and the low standard deviation showed strong homogeneity in the responses for this factor. Loadings for the fourth factor - ‘contextual realities’ (items 31-49) has loadings ranged from .614 to .845, which indicated a strong correlation among the variables. The mean for these variables ranged from 2.40 to 3.55, and the low standard deviation showed a strong homogeneity among the responses of the factor.

Discussion

Health professionals are required to be highly prepared for addressing the ever-increasing needs of patients and desperate population because they encounter a diverse community in the interconnected world. The role of the English language is also increasing as health professionals alongside as the medium of communication between health professionals and the patients worldwide. Hence, they need to be highly effective in communication skills, especially the English language in the current health market. The aim of this paper was to determine the psychometric features of ELTLS in the field of pharmacy education in the Pakistani context. The field of pharmacy supports the development of English language communication among students regarding their interaction with a global patient community. The global pharmacy standards also support the development of language skills, especially English, as a means of communication between patients and professionals. According to the world sustainable development goals, language competency is an essential skill needed for both teachers and students in all fields of education, and effective communication is considered to be the most coveted and sought-after professionals’ skills in the 21st-century job market. This skill is considered a highly desirable skill for students in order to become a lifelong learner and also a useful professional. This also confirms the health education policy that fully supports the promotion of language skills

among pharmacy students on a priority basis. The scale was purposefully developed to assess teacher's language teaching and to learn for promoting language skills of pharmacy graduates.

The scale was found to be highly reliable for measuring language teaching and learning in many other fields of education, such as social sciences and nursing. However, there was little evidence of its application and validation in the field of pharmacy in Pakistan. Findings of the present research showed overall higher reliability for the scale, which was at an acceptable level providing sufficient evidence with good reliability among high education teachers and pharmacy students in Pakistani universities. Additionally, the Cronbach's alpha of all the four sub-scales in the instrument was also above .70, which is also an acceptable level for a scale to be truly reliable. In earlier studies, the reliability level of the scale was below this threshold point. However, this study provided the evidence having stronger reliability coefficient. The variability in the data might have contributed to this. It is predicted that future applications of the scale in a different field may bring different results. Hence, future work is recommended for assessing reliability and concurrent validity of the scale and its sub-scales in other fields using a large sample base. Against the estimation of previous studies, the actual reliability evidence of the ELTLS was found higher in the context of pharmacy. Hence, it is stated that the instrument can be highly useful for assessing language teaching and learning not only among teachers but also students in other fields of education. Thus, ELTLS is recommended to explore language competencies among pharmacy students and also language teaching capabilities of teachers. This study confirmed the utility of the instrument to evaluate language skills and proficiency assessment among teachers and students in the field of pharmacy.

Although the ELTLS was found to be highly reliable and valid scale for assessing English language teaching and learning abilities of teachers and its application for promotion of language skills among pharmacy professionals in the Pakistani context, however, for data collection, the scale was administered to participants from universities in one province. It is possible that the results may be reliable and valid if used for data collection from other provinces due to high cultural, geographical and socio-economic variations. Therefore, it is suggested that in future studies, the instrument may be used for data collection in other provinces for more comprehensive and diverse results. Future validation studies may opt for larger samples and gender perspectives for getting more robust evidences for its reliability and validity. Confirmation factor analysis may also be used for construct validation of the instrument. In this study, the ELTLS was used as a post-measuring scale to assess teachers' English language teaching and to learn to pharmacy students in higher education institutions in Khyber Pakhtunkhwa Pakistan. The time and socio-linguistics variability might have affected the process of data collection and its results. Therefore, it is suggested that future studies should focus on a more focused sample in terms of sociolinguistic aspects. Students' perspectives, in terms of gender, could be another area to look at while collecting data. This will provide more realistic data related to teachers' language teaching and learning in other fields of study using the current ELTLS instrument.

Testing and validating the psychometric features of ELTLS in the field of pharmacy education was important due to its worldwide application and its importance for the language teachers in all educational settings. It was important to validate the 49 items scale in the Malaysian context to further improve the scale due to the importance of effective language proficiency for the respective teachers. The analysis of ELTLS revealed a four-factor model using varimax rotation. These factors were teacher cognition and belief, teacher emotion, teacher motivation, and contextual realities. The EFA approach applied to determine the psychometric features of the scale showed that the four-factor structure of ELTLS is a reliable and valid scale that can be used across disciplines and cultures. The ELTLS could also be used to assess pharmacy teachers' attitude towards language learning in the field of pharmacy. The results of the study further revealed that the scale could be used for assessing the attitude of both male and female teachers about the importance of language and its application in pharmacy. Pharmacy teachers may also use this scale to modify the pharmacy education programs across the countries for the improvement of effective language use among the pharmacy students.

Future Direction

Based on the findings of the present, it is recommended that further research should test the psychometrics of the current scale in other fields and contexts. Future studies could be conducted using confirmatory factor analysis in order to test the hypothesized model of the present four-factor structure. The results of this research study are surely hoped to encourage language researchers to conduct further studies and teachers of English language for considering the scale for enhancing language skills of pharmacy students. Since the results of the present research were representative of a smaller group of public sector higher education institutions based on a convenience sample approach. Hence, the results have limited generalizability which requires more robust studies in the future. The findings of the current study support the usefulness of ELTLS as a reliable and valid scale. It is also a psychometrically sound measure for assessing language learning among pharmacy students. A stronger four-factor model emerged in the context of Pakistani pharmaceutical field. Based on EFA testing for the four factors dimensional scale, it is suggested that the results of this study may be tested in another educational field to further improve the psychometric features of the scale.

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