

# **BARRIERS ON ESL CALL PROGRAMS: AN EXPLORATORY FACTOR ANALYSIS APPROACH**

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## **Abstract**

This paper proposes a methodology to discover the barriers that influence English as second language (ESL) teachers in the use of computers in their classrooms. The participants in the study were sixty-seven ESL teachers who applied computer assisted language learning (CALL) in the classroom or computer lab in schools in Corpus Christi Independent School District (CCISD) and Kingsville Independent School District (KISD) in South Texas. The survey study included the participants' demographic data, twenty variables influencing the use of CALL, and five open-ended questions. The researcher designed and verified the reliability and validity of the questionnaire. The resulting survey data was then analyzed using Exploratory Factor Analysis (EFA) that to capture the information in the survey data and identify a set of three key factors hinder the use CALL in ESL. Factor analysis was selected as it is one of the most powerful statistical techniques in succinctly identifying the major factors influencing the outcome of the research especially when the factors may not be measurable directly and effectively during the survey which is the case in this study. The findings demonstrate that there are three key barriers that impact teachers who use CALL programs to teach ESL, and ESL teachers may change their roles as they implement CALL programs. The results can help educators to better understand the impact of CALL and to anticipate the barriers of CALL program they may face.

## **Introduction**

Computer aided education in general and computer aided instruction for ESL in particular have penetrated the mainstream education system for the past five years due to its profound capability of breakthrough the geographic boundary and rigid schedule of traditional classroom instruction. However, just like every other disruptive technology, it also experiences its fair share of resistance. To reach its full potential, it is important to identify the major barriers impeding the growth of this new technology.

The purposes of this paper are two-folded:

- 1) To identify the barriers that CALL coursework has on the classroom and address how language teachers use computer technology in their teaching.
- 2) To explore how these barriers impact teachers who use CALL.

## **Research Questions**

The following research questions were addressed in this research project:

1. What barriers do ESL teachers encounter when using CALL programs?
2. How do these barriers impact teachers who use CALL programs to teach ESL?

The questionnaire design was further complicated by the fact that some factors, such as "acceptance of technology" might not be intuitive to subjects and hence not directly measurable and hence must be measured by a set of measurable variables. 20 measurable

variables were identified based on the author's professional expertise. The objectives of this study were to extract the key factors from the set of measurable variables in the questionnaire.

Several measures were used to insure the validity and reliability of the research instrument. The validity of the instrument was examined by a panel of experts (N=3). Each panelist examined the instrument for content, clarity, and appropriateness. In order to insure the reliability of the instrument, the Cronbach Alpha correlation Statistical Procedure was applied to test for internal consistency.

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### **Subjects**

According to Thomas (2005), most researchers study the people, institutions, and events that are convenient— those that happen to be at hand. In this study, the researcher used the following samples as the source of subjects. The target populations were from elementary schools, middle schools, high schools, colleges/universities and ESL/EFL private schools in Kingsville and Corpus Christi, Texas. The participants in the study were English as second language (ESL) teachers who applied CALL in the classroom or computer lab. The teachers' experience ranged from more experienced (more than 20 years experience, n= 5) to less experienced (5 or fewer years of experience, n= 31). A total 69 ESL teachers were surveyed and 67 ESL teachers returned the survey. The return rate on this survey was 97%.

The population in the study was 67 ESL teachers, of whom three (4.48%) were males and sixty-four (95.52%) were females. Teachers' teaching level: thirty-five (52.2%) were elementary school teachers, fourteen (20.9%) worked in middle school, thirteen (19.4%) taught in high school, two (3.0%) worked in college/university and three (4.5%) were from ESL/ EFL private school. Thirty-one teachers (46%) had taught less than 5 years, six (9%) between 5-9 years, twenty-three (34%) between 10-14 years, two (3%) had taught between 15-19 years, and five (8%) more than 20 years of experience. Educational credentials of ESL teachers: fifty-five (82.1%) had a bachelor's degree, nine (13.4%) had a master's degree, and three (4.5%) had a doctorate degree. The next item from the output is the Kaiser-meyer-olkin (KMO) and Bartlett's test. The KMO measures the sampling adequacy which should be greater than .5 for a satisfactory factor analysis to proceed. The KMO measure is .685. We can see that the Bartlett's test of sphericity is significant. That is, its associated probability is less than type I error which is .05. In fact, it is actually .000. This means that the correlation matrix is not an identity matrix.

### **Instrument**

The researcher developed the survey, which consisted of twenty-nine items divided into six sections. Section 1 surveys the demographics of the participants. Each respondent was asked to provide personal information such as gender, current teaching level, years of teaching experience and educational qualifications. Section 2 asks the respondents about the school's funding for the computer assisted language learning program. Section 3 includes items concerned with the availability of computer hardware and software. Section 4 includes statements regarding the respondents' technical and theoretical knowledge of the use of computer assisted language learning programs. Section 5 includes statements eliciting the basic views of respondents toward the use of technology in the classroom, their insights of administrative and actual support, and their

self-estimated use of technology. Section 6 includes open-ended questions for respondents' suggestions and barriers on the use of CALL programs to teach ESL.

### **Data analysis**

The major steps in statistical analysis are summarized as follows:

I. Validity and Reliability of the Research Questionnaire

II. Factor Analysis

The objectives of Exploratory Factor Analysis (EFA) are to identify the underlying factors influencing the outcome of measurable response variables through survey data. The analysis can be further complicated by the fact that some or all these factors may not be measurable directly. Hence, during the survey design stage, the researcher may propose measurable variables which may contribute to the response of the study. Based on measured data from the survey, factor analysis is used to explore the correlation among measurable variables and determines whether the relationship can be summarized in a smaller number of factors.

The information in the survey data is captured by the Pearson Product-Moment correlation coefficient matrix. The key idea of factor analysis is to extract "factors" from the correlation matrix such that the content of the correlation matrix may be reconstructed with small number of these factors in contrast with the full set of measurable variables proposed. Factor analysis consists of the following steps.

Step 1: Compute the  $N \times N$  correlation coefficient matrix where  $N$  is the number of measurable variables in the survey questionnaire.

Step 2: Compute Bartlett's test of specificity to determine whether correlation exists between measurable variable. Notice that if Bartlett's test is not significant, this implies that correlation matrix is not significantly different from the identity matrix and hence the set of measurable variables are not correlated and hence each measurable variable is indeed a factor influencing response. In this case no factor extraction is possible. The analysis will be terminated here. Otherwise go to step 4.

Step3: Compute the Kaiser-Myer-Olkin (KMO) Measure of sampling adequacy. The rule of thumb should be KMO value greater .5 for a satisfactory factor analysis to proceed.

Step 4: Factor extraction based on Principle component analysis:

Compute the Eigenvalues of the correlation matrix. The magnitude of the Eigenvalues exceeding a certain pre-predetermined threshold will identify one significant factor. The rule of sum of the Eigenvalues exceeds one will identify a significant factor (with some exceptions.) The number of factors can also be determined graphically by Scree plot (for detail explanation of Scree plot is described in the Thompson (2004).

Step 5: Compute Pattern/Structure Community Coefficient for each measurable variables. Community variable measures the amount of variance, and hence information contents can be recovered by the identified set of factors extracted in Step 4.

Step 6: Varimax Orthogonal Factor rotation and Kaiser Normalization:

The survey data is analyzed using EFA described above with (SPSS) for Windows 12.0. Key barrier for using CLASS program in ESL instruction are summarized as following:

**Table 1**  
**Factor Analysis and Reliability of the Research Instrument**

Factor	Variables	Communalities	Eigenvalues	% of Variance	$\alpha$ coefficient
Journal of Technology skills	6	.773	7.008	38.864	.846
	7	.961			
	11	.775			
	12	.950			
	15	.856			
	16	.963			
Funding for teaching through technology	1	.589	5.327	29.541	.841
	2	.590			
	3	.963			
	4	.836			
	5	.976			
	8	.963			
	9	.836			
	10	.976			
	19	.834			
	Acceptance of Technology	13			
14		.864			
17		.951			
18		.741			
	20	.720			

### Conclusion

This paper proposed a complete methodology to survey and identifies key barriers affecting using CALL programs in ESL instructions using sampling survey and exploratory Factor analysis techniques and SPSS 12.0 statistical analysis packages. The results could be valuable information to educators to better understand the impact of CALL coursework on classroom instructions and the methodology presented in this paper can potentially applicable to many other research projects as well.

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