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RESEARCH PAPER

Confirmatory Factor Analysis of Perceived Educational Effectiveness Scale for Teachers of Students with Hearing Impairment

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ABSTRACT

The goal of this study was to create an indigenous scale that would assess the perception of the teachers of students with hearing impairment about the educational effectiveness in Government special education institutions in Punjab Province as well as the psychometric properties of their perceptions of the educational effectiveness. This study applied a quantitative perspective to approach the problem. The population of this study included teachers of pupils with hearing impairment who were working in government special education institutions in Punjab Province. The sample for this study was chosen using a random sampling strategy. As a sample for this study, 300 teachers of students with hearing impairments were chosen. The researchers created an indigenous scale. 50 statements were all scored out of five point likert scale. Confirmatory factor analysis was carried out through IBM SPSS AMOS (Analysis of moment structure) version 25.0 using structural equation modeling (SEM).

Keywords: Confirmatory Factor Analysis, Educational Effectiveness, Hearing Impairment, Scale for Educational Effectiveness

Introduction

According to UNCRPD Article 26, Habilitation and Rehabilitation calls for appropriate measures, including peer support, to help people with disabilities achieve and maintain their maximum level of independence, full physical, mental, social, and vocational ability, and full inclusion and participation in all facets of life. The article also urges nations to organize, enhance, and broaden comprehensive rehabilitation services and programs, which should get started as soon as possible and be based on a multidisciplinary assessment of each person's needs and assets. These services and programs should also include the provision of assistive technologies and devices. (UNCRPD, 2006).

It is stated in the section titled "The Right of Access to Education" that children with disabilities must have effective access to and receive education in a way that promotes the fullest possible social integration. This is done by making reasonable accommodations and providing supportive services (EFA, 2000). The following factors, among others, are dependent on the outcome of rehabilitation, according to Spectrum Health Lakeland (2020):

- The type and extent of any ensuing impairments and disabilities
- The patient's general health
- The nature and severity of the sickness, ailment, or damage
- Family support

Literature Review

Lytle, Johnson and Hui (2005) reported that oral/aural education and hearing restoration are the main priorities of Chinese national policy. However, many varieties of

Chinese Sign Language are used often in schools for deaf students. Speech and hearing are the main subjects of early childhood education. Low expectations for deaf students are reflected in the elementary and secondary school curricula, which also lack the same academic material as is offered to hearing students. Opportunities for higher education are scarce. For mainstreamed students, there are no support services like note-takers or interpreters. There are no programs for deaf educators or interpreters. There aren't many jobs, and most deaf individuals are unemployed. Deaf persons who were interviewed for the piece discuss their wants, their aspirations, and the changes they have noticed, some of which are due to recent inspiring international partnerships.

Rather than being discrete traits, instructor level elements are interconnected (Hramiak, 2017). Using the Dynamic Model of Educational Effectiveness to Identify Stages of Effective Teaching: An Introduction to the Special Issue was the topic of a study by Creemers and Kyriakides (2013). This places emphasis on teacher conduct in the classroom and centers attention on fundamental teaching abilities; refers to the five dimensions—frequency, focus, stage, quality, and differentiation—that are used to gauge how well these components are performing in the model.

With a greater understanding of the factors influencing teachers' perception of efficacy in deaf education contexts, teacher training and development can be increased. The findings demonstrating that teacher beliefs are significantly influenced by collective efficacy beliefs of the school environment underscore the significance of administrator training and professional development for all, as opposed to a micro level concentration on the teacher (Garberoglio, Gobble, and Cawthon, 2012). Moores (2018) argued that we could only have oral-only education or manual communication, but not both, despite the fact that helping deaf children fully develop both of their skills is the logical option. This false dichotomy still exists today despite evidence to the contrary. As long as there are deaf people, signs and sign languages will be utilized, but it is our responsibility to ensure that deaf children have access to them from birth and throughout their whole academic career.

Teaching skills can be categorized into four different types of teacher behavior: the fundamentals of direct teaching; incorporating quality elements into direct teaching and addressing active teaching; acquiring quality in active teaching and expanding one's reach; and achieving quality and differentiation in teaching using a variety of strategies which can be distinguished and eventually go from teaching-related skills associated to direct instruction to more complex abilities related to new teaching methodologies and teaching differentiation (Kyriakides, Archambault and Janosz, 2013). The teachers were extremely positive about the value of using progress tracking with children who are deaf or hard of hearing. They claimed that the data generated by the regular and consistent use of easy-to-administer and grade examinations was used to evaluate the effectiveness of schooling. They claimed that the data were also used to improve instruction and have discussions about student performance with parents, other teachers, and the students themselves (Luckner and Bowen, 2010).

Educational Effectiveness Scale for teachers of students with hearing impairment was based and designed through The Dynamic Model of Educational Effectiveness by Bert P. M. Creemers and Leonidas Kyriakides.

Material and Methods

Quantitative research method was used to conduct this study along with descriptive research design.

Population and Sampling Strategy

Population of the study was teachers of the students with hearing impairment enrolled in Government special education institutions in Punjab Province. Random sampling technique was used to conduct this study. 300 number of teachers of students with hearing impairment were selected as a sample of this study.

Development of scale for Teachers of the Students with Hearing Impairment

The first part of the questionnaire for the teachers of the students with hearing impairment enrolled in government special education institutions in Punjab province contained demographic information of the respondents about the age, gender, marital status, religion, qualification, working experience, designation, area of specialization, job scale. Job status, salary, city, district, school and language. All information regarding the demographics helped to define the demographics of the sample as well as the characteristics of sample. This questionnaire was based on dynamic model by Creamers and Leonidas Kyriakides. The questionnaire consisted of five parts. The first part of the questionnaire was based on the effectiveness of education at system level. The second part of the questionnaire was based on school level, to check the effectiveness of education at school level. The third part of the questionnaire had been drawn to check out the effectiveness of education at classroom level. The fourth part of the questionnaire was at of student level and the fifth part of the questionnaire was based on the outcomes, the real outcome, and the real result of all the procedure. This part of the questionnaire was dealing with the achievements of the students with hearing impairment enrolled in government special education institutions in Punjab Province.

While following the rules and regulations of the dynamic model, each and every phase of the questionnaire was being measured by taking into account the five dimensions. Those dimensions were frequency, focus, stage, quality and differentiation. All the factors of the questionnaire defined the effectiveness of education while taking into account those five dimensions. The questionnaire was consisted on 50 questions. Researcher recorded the responses of the teachers of students with hearing impairment against five points

Table 1
Descriptive Statistics of the Teachers Children with Hearing Impairment (N = 300).

Variables	*Teachers (N = 300)*	
	f%	*%*
Gender		
Men	79	26.3
Women	221	73.7
Age		
20-25	4	1.3
25-30	43	14.3
30-35	113	37.7
35-40	90	30.0
40-45	33	11.0
45-50	10	3.3
50-55	5	1.7
55-60	2	.7
Education		
M.Sc	208	69.3
M.Phil	92	30.7
Experience		
0-5	108	36.0
5-10	91	30.3

Variables	*Teachers (N = 300)*	
	f%	*%*
10-15	61	20.3
15-20	32	10.7
20-25	3	1.0
25-30	2	.7
30-35	3	1.0
Designation		
J.S.E.T	147	49.0
S.S.E.T	153	51.0
Divisions		
Bahawalpur	13	4.3
D.G.Khan	34	11.3
Faisalabad	58	19.3
Gujranwala	32	10.7
Lahore	80	26.7
Multan	26	8.7
Rawalpindi	19	6.3
Sahiwal	16	5.3
Sargodha	22	7.3
Districts		
Bahawalpur	11	3.7
RaheemYar Khan	2	.7
D.G.Khan	19	6.3
Rajanpur	10	3.3
Layyah	3	1.0
Muzaffargarrh	2	.7
Faisalabad	25	8.3
T.T.Singh	29	9.7
Ciniot	2	.7
Jhang	2	.7
Gujranwala	2	.7
Gujrat	2	.7
Hafizabad	9	3.0
Sialkot	16	5.3
Narowal	2	.7
Mandi Bahaudin	1	.3
Kasur	14	4.7
Lahore	64	21.3
Nankaana Sahib	2	.7
Khanewal	9	3.0
Multan	12	4.0
Veharri	3	1.0
Lodhran	2	.7
Jehlam	2	.7
Rawalpindi	13	4.3
Chakwal	2	.7
Attock	2	.7
okara	13	4.3
Sahiwal	1	.3

Variables	*Teachers (N = 300)*	
	f%	*%*
PaakPattan	2	.7
Bhakar	1	.3
Sargodha	11	3.7
Khushab	1	.3
Mian Wali	9	3.0
Institute		
Center	113	37.7
School	164	54.7
College	23	7.7

Data Collection from Teachers

Data was collected for this study from 300 number of teachers of the students with hearing impairment enrolled in Govt. special education institutions in Punjab Province. From Punjab Province, all nine divisions were included in data collection. From these divisions, 34 districts were included in the process of data collection. The data was collected from centers, schools and colleges of Govt. special education institutions of Punjab province. Education of the teachers was between M.A and M.Phil. Both male and female teachers were included in data collection.

Results and Discussion

Confirmatory Factor Analysis of the educational effectiveness questionnaire (EEQ) for *teachers*

To validate the factor structure of the educational effectiveness questionnaire (EEQ) for *teachers* of students with hearing impairment, confirmatory factor analysis (CFA) was conducted on 50 items. Confirmatory factor analysis was carried out through IBM SPSS AMOS (Analysis of moment structure) version 25.0 using structural equation modeling (SEM). The EEQ consisted of five sub-factors, labeled as system, school, classroom, students and outcomes. The indices of the model fit are indicated in table 2

Table 2
Confirmatory Factor Analysis of Educational Effectiveness Questionnaire for Teachers of Students with Hearing Impairment (N = 300).

Model	χ^2	*df*	χ^2/df	*GFI*	*CFI*	*NNFI*	*RMSEA*	*SRMR*
Initial Model	2876.45	1165	2.47	.71	.76	.77	.07	.07
Model Fit	2231.32	1161	1.92	.93	.94	.92	.06	.05
$\Delta\chi^2$	645.13*							

Note. GFI= Goodness of fit index, CFI=comparative fit index, NNFI = non-normed fit index; RMSEA=root mean square error of approximation, SRMR=Standardized root means square, $\Delta\chi^2$ = chi-square change.

Table 2 shows the fit indices of the educational effectiveness questionnaire (EEQ) (teacher version) for both absolute and relative model fit. The first model's absolute fit index revealed that the estimations of the fit were excellent, estimates as χ^2 (1161) = 223.32 $p <$ .05. In a typical model, the sample size and the number of estimated parameters is thought to have a significant impact on the chi-square statistic, which is used to measure the absolute model fit (Hair et al. 2010). Therefore, in this perspective, researchers advised taking into account various relative fit indices, such as the Goodness of Fit Index (GFI), Cumulative Fit Index (CFI), Normative Fit Index (NFI), Root Mean Square Approximation Error (RMSEA), and Standardized Root Mean Square (SRMR).

Some guidelines were suggested to be followed in order to assess the model's fit; for instance, the χ^2/df should vary between 0 and 3. To be deemed excellent estimates for the model, the RMSEA and SRMR estimates must be .08 or less, while the CFI, NNFI, and GFI estimates must be .90 or higher (Hu & Bentler, 1999). The fit indices of the initial model were observed and found that the χ^2/df was 2.47. Whereas the estimates of the RMSEA and SRMR were .07 and .07 while the CFI, NNFI, and GFI were .71, .76, 77 respectively. As a result, the specified criteria for model fit were not fully met by the present estimations of the relative fit.

So, the model modification procedure was started in order to achieve the model fit. Therefore, only those covariances between the error terms that had contextual meaning were extracted from the indicators of the measurement model of the EEQ (Teacher Version) (Kenny, 2011). Following the drawing of the covariances between the error components, the absolute and relative fit indices were once more compared. The GFI, CFI, and NNFI values were.93, .94, and.92, respectively, while the RMSEA and SRMR were.06 and.05, respectively. As a result, the model fit indices and criteria fell into the category of excellent model fit.

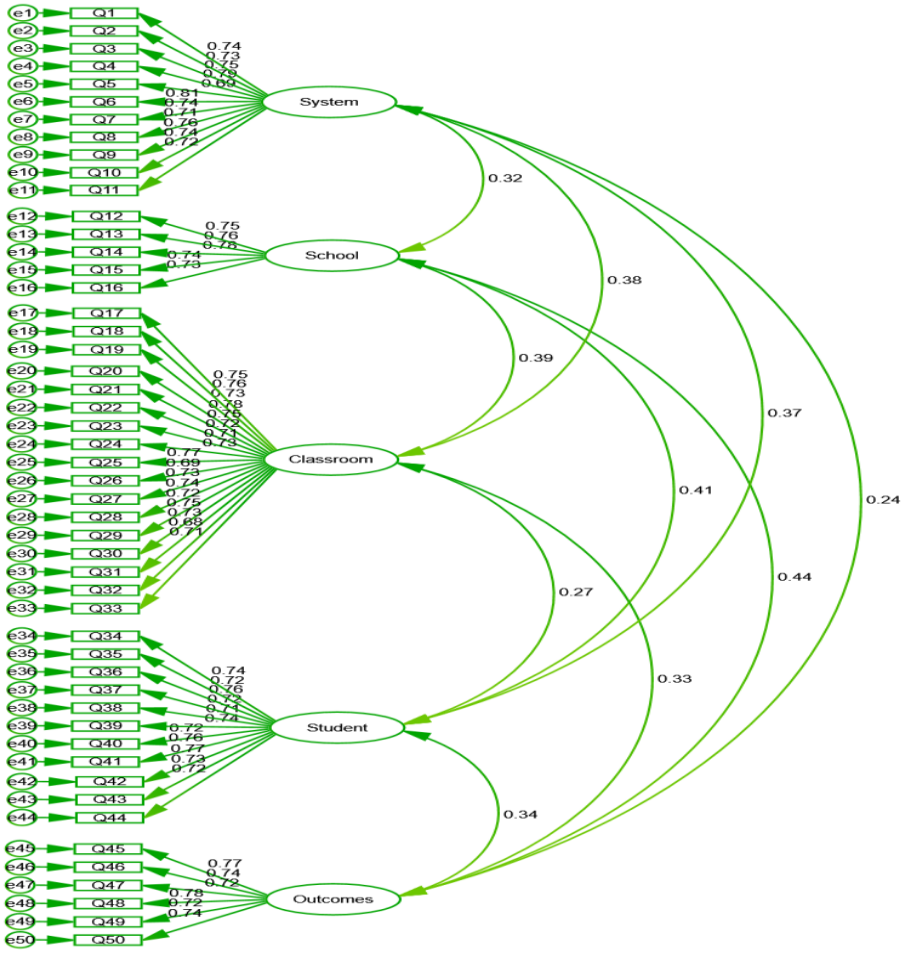

Figure 1
Confirmatory Factor Analysis of Educational Effectiveness Questionnaire for Teachers of Students with Hearing Impairment (N = 300).

Table 3
Confirmatory Factor Analysis of Educational Effectiveness Questionnaire for Teachers of Students with Hearing Impairment (N = 300).

Factors	α	*CR*	*AVE*	*MSV*	λ
System	.82	0.932	0.554	0.194	

1. The opportunity exists for all subject-specialist special education instructors to evaluate the goals of the National Policy for Persons with Disabilities.					0.74
2. All types of pupils with special needs are given equal access to educational opportunities under the National Policy for Persons with Disabilities.					0.73
3. For the education of students with hearing impairment, the National Policy for Persons with Disabilities satisfies the demands of the twenty-first century.					0.75
4. The Special Educational Needs with Provisions for Students with Hearing Impairment were expressly addressed in the National Policy for Persons with Disabilities.					0.79
5. The National Policy for Persons with Disabilities makes clear how important access is to the education of students who have hearing loss.					0.69
6. The homes of students with hearing impairments are reasonably close to special education establishments.					0.81
7. All buildings for children with hearing impairment are created with their requirements in mind, in accordance with the National Education Policy for Persons with Disabilities.					0.74
8. Special education teachers who are qualified and experienced are offered in accordance with the requirements of the pupils who have hearing impairments.					0.71
9. Institutions in the Punjab province are created based on the number of pupils who have hearing impairments.					0.76
10. High-quality education is provided by institutions on a temporary level for students with hearing impairment.					0.74
11. For pupils with hearing impairment, the contemporary educational environment is suitable for individualised instruction.					0.72
School	.90	0.867	0.566	0.152	
12. A zero-rejection method is used to enrol students with hearing impairment in government institutions, as per the National Policy for Persons with Disabilities.					0.75
13. All institutions that offer special education to hearing-impaired pupils do so successfully and on an individual basis.					0.76
14. Equal educational opportunities are offered to pupils with hearing impairments in all institutions for students on a temporary level.					0.78
15. The purpose of consolation teacher training programmes is to enhance the professional skills of qualified teachers.					0.74

16. According to the National Policy for Persons with Disabilities, follow-up studies were created to improve educational activities.					0.73
Classroom	.87	0.952	0.537	0.168	
17. On the presentations of every subject, there is a lesson orientation.					0.75
18. What is expected of hearing-impaired students is explained to them.					0.76
19. For the hearing-impaired children, a variety of exercises are planned throughout the class in a manageable quantity.					0.73
20. Each exercise is given enough time to be completed during the session.					0.78
21. Students with hearing loss are urged to develop their problem-solving skills.					0.75
22. The methods of instruction are tailored to the needs of the students who have hearing loss.					0.72
23. Regular homework assignments are given to the kids.					0.71
24. Students who have hearing loss can answer the questions using an alternative sentence or another pattern.					0.73
25. The children are given enough time to reply appropriately.					0.77
26. The objectives of the class are linked to the questions.					0.69
27. Inquiring is suitable in this setting.					0.73
28. The assessment questions are pertinent to the curriculum's goals.					0.74
29. The assessment process is tailored to the needs of the hearing-impaired children.					0.72
30. The time allotted for teaching children with hearing impairments in the classrooms is used efficiently.					0.75
31. To allocate teaching time among different tasks, careful preparation is done.					0.73
32. Children with hearing impairments have individualised educational plans created for them.					0.68
33. Before the teacher demonstrates how to solve a practical problem to the class, students are free to come up with their own answers.					0.71
Students	.91	0.928	0.541	0.194	
34. Students with hearing impairments are taught problem-solving strategies to improve their abilities.					0.74
35. For the tenacity of the deaf kids, objectives are remembered.					0.72
36. The academic tasks are given enough time during the school day.					0.76
37. When a student with hearing loss has a difficulty understanding the lesson, the teacher offers assistance.					0.72

38. Regardless of the socioeconomic level of the pupils with hearing impairment, educational services are offered.					0.71
39. In this educational system, there is no gender discrimination against the kids who have hearing impairments.					0.74
40. The students who have hearing impairments are not subject to any religious discrimination in this educational system.					0.72
41. The likelihood that kids with hearing impairments will survive in their social circles increases with education.					0.76
42. For greater understanding, teachers encourage hearing-impaired students to participate in class discussions.					0.77
43. The hearing-impaired kids are given independent projects to develop their way of thinking.					0.73
44. Activities are planned to inspire pupils to pursue their dreams in life.					0.72
Outcomes	.87	0.882	0.556	0.137	
45. Students with hearing impairments are given explanations of the goals and significance of learning activities.					0.77
46. Students with hearing loss have the opportunity to fully develop their cognitive abilities.					0.74
47. Students who have hearing loss are prepared to complete the assignment.					0.72
48. By practising, students with hearing impairments can present their ideas.					0.78
49. Students with hearing impairments gain new learning skills.					0.72
50. Your hearing-impaired youngster has improved their ability to obtain a well-paying career while pursuing an education.					0.74

Note. CR = Composite reliability, AVE = Average variance extracted, λ (lambda) = standardized factor loading

After achieving the stringent criteria of model fit, the factor structure of the educational effectiveness questionnaire (EEQ) was psychometrically evaluated and reliability and validity (convergent and discriminant) of the educational effectiveness questionnaire was determined. The investigators suggested that composite reliability and Cronbach's alpha reliability coefficients should be .70 or greater for the constancy of the factor structure while the index of average variance extracted (AVE) should be .50 or greater to claim the good convergence of the measurement (Hair et al. 2010; Henseler et al., 2016). The average variance extracted (AVE) is the average of the square root of the factor loading for the respective factor (Hair et al., 2010).

The percentage of the variance for the educational effectiveness questionnaire (EEQ) was .55, .57, .54, .54 and 57 for system, school, classroom, students and outcomes respectively. However, the reliability coefficients, including composite and Cronbach's alpha, ranged from .87 to .95 for the all five factors.

Table 4
Descriptive Statistic and Fornell-Larcker Criterion for the Educational Effectiveness Questionnaire for Teachers of Students with Hearing Impairment (N = 300).

Factors	*M*	*SD*	MaxR(H)	Student	School	Classroom	System	Outcomes
Student			0.929	**0.736**				
School			0.868	0.390	**0.752**			
Classroom			0.952	0.410	0.320	**0.733**		
System			0.933	0.440	0.380	0.240	**0.744**	
Outcomes			0.884	0.340	0.370	0.270	0.330	**0.745**

Note. M = mean, SD = standard deviation,

To determine the discriminant validity, two distinctive ways were adapted (Henseler, Hubona, and Ray 2016; Voorhees et al., 2016). In the first method, the square root of average variance extracted AVE ratio of each factor was compared with proceeding correlations of the factors (Fornell and Larcker, 1981). The evidence showed that the square root of AVE is greater than the correlation. In the second method, the AVE was compared with the maximum shared variance MSV of each respective factor. Haire et al. (2010) suggested that the maximum shared variance should be less than the value of average variances extracted, which means the percentage of explained variance of the same factor should be greater than any other factor. Hence, the estimates showed that the average variance extracted was greater than the maximum shared variance of all respective factors.

Table 5
Descriptive Statistics and Cronbach's Alpha for System, School, Classroom, Student Levels and Outcomes for the Teachers (N = 300) of the Institutes of the Students with Hearing Impairment.

Variables	*K*	*Ranges*				α
		M	*SD*	*Actual*	*Potential*	
System Level	11	36.65	8.06	16-55	11-55	.92
School Level	5	18.37	3.49	7-25	5-25	.87
Classroom Level	17	67.21	8.97	31-85	17-85	.93
Student Levels	11	48.84	6.04	24-60	11-55	.92
Outcome	6	23.38	3.56	12-30	6-30	.88

Note. K = number of items, α = Cronbach's Alpha.

The above table shows the descriptive statistics including (mean, standard deviation, actual and potential ranges) and internal consistency by using Cronbach's alpha reliability of system, school, classroom, student levels and outcomes for the teachers of the students with hearing impairment. The reliability evaluation exhibited an excellent internal consistency ranging from .82-.93 for the constructs.

Conclusions

The scale was trustworthy and valid. It matched up with its subscales. This scale is very beneficial to determine the educational effectiveness for teachers of students with hearing impairment.

References

Assembly, U. G. (2006). Convention on the Rights of Persons with Disabilities. *GA Res*, *61*, 106.

Creemers, B., & Kyriakides, L. (2007). *The dynamics of educational effectiveness: A contribution to policy, practice and theory in contemporary schools*. Routledge.

Creemers, B. P., & Kyriakides, L. (2013). Using the dynamic model of educational effectiveness to identify stages of effective teaching: An introduction to the special issue. *Journal of Classroom Interaction*, *48*(2), 4-10

Education for All (2000). *The EFA movement.* United Nations Educational, Scientific and Cultural Organization.

Fornell, C., & Larcker, D. F. (1981). Structural Equation Models with Unobservable Variables and Measurement Error: Algebra and Statistics. *Journal of Marketing Research*, *18*(3), 382–388

Garberoglio, C. L., Gobble, M. E., & Cawthon, S. W. (2012). A national perspective on teachers' efficacy beliefs in deaf education. *Journal of deaf studies and deaf education*, *17*(3), 367-383.

Hair, Joseph F., William C. Black, Barry J. Babin, & Rolph E. Anderson. (2010), Multivariatedata analysis: Global edition

Henseler, J., Hubona, G. and Ray, P.A. (2016), "Using PLS path modeling in new technology research: updated guidelines", *Industrial Management & Data Systems*, 116 (1), 2-20

Henseler, J., Ringle, C.M. and Sarstedt, M. (2016), "Testing measurement invariance of composites using partial least squares", *International Marketing Review*, 33 (3), 405-431. https://doi.org/10.1108/IMR-09-2014-0304

Hramiak, A. (2017). Using the Dynamic Model of Educational Effectiveness to explore development of practice by Teach First beginning teachers. *Journal for educational research online*, *9*(1), 190-209.

Li-tze Hu & Peter M. Bentler (1999) Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives, *Structural Equation Modeling: A Multidisciplinary Journal, 6* (1), 1-55, DOI: 10.1080/10705519909540118

Kenny, D. A. (2011). *Correlated errors. Respecification of latent variable model.* http://davidakenny.net/cm/respec.htm

Kyriakides, L., Archambault, I., & Janosz, M. (2013). Searching for Stages of Effective Teaching: A Study Testing the Validity of the Dynamic Model in Canada. *The Journal of Classroom Interaction*, *48*(2), 11–24

Luckner, J. L., & Bowen, S. K. (2010). Teachers' use and perceptions of progress monitoring. *American annals of the deaf*, *155*(4), 397-406.

Lytle, R. R., Johnson, K. E., & Hui, Y. J. (2005). Deaf education in China: History, currentissues, and emerging deaf voices. *American annals of the deaf*, *150*(5), 457-469.

Moores, D. F. (2018). Quality education and sustainable learning trajectories for deaf learners. *American annals of the deaf*, *163*(4), 463-470.

Spectrum Health Lakeland (2020). *What is Rehabilitation?* https://www.spectrumhealthlakeland.org/medical-services/rehabilitation/what-is-rehabilitation

Voorhees, C. M., Brady, M. K., Calantone, R., & Ramirez, E. (2016). Discriminant validity testing in marketing: an analysis, causes for concern, and proposed remedies. *Journal ofthe academy of marketing science*, *44*, 119-134.