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Developing and Validating the Curriculum Adaptation Understanding Scale (CAUS) for Assessing Junior Special Education Teacher's Proficiency in Adapting Curriculum for Students with Physical Impairments in Punjab

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Abstract

Curriculum Adaptation Understanding Scale (CAUS) was devised and validated in this study to assess the proficiency of teachers at primary schools in Punjab, Pakistan, in adapting curricula for students with physical impairments. A literature review, expert consultations, and iterative feedback from practicing teachers comprised the scale development process. Subsequently, a structured survey was implemented in multiple districts of Punjab. By employing exploratory and confirmatory factor analyses, the CAUS exhibited robust psychometric characteristics, such as substantial validity and high reliability (Cronbach's alpha > 0.9). The findings revealed that teachers' levels of comprehension varied, with deficiencies in the use of assistive technologies and personalized pedagogical strategies being especially pronounced. This instrument offers crucial perspectives for augmenting teacher education and guides the formulation of policies aimed at enhancing inclusive education practices. The CAUS serves a dual purpose: it facilitates the identification of educational disparities in specific local contexts and provides a structure for analogous evaluations in other areas grappling with inclusive educational obstacles.

Keywords: Adaptation, Curriculum, Physical Impairment (PI), Scale, Validating

Introduction

Teaching students with physical impairments requires an instructional strategy that goes beyond traditional teaching methods. The education system in Punjab, Pakistan has significant challenges in terms of modifying the curriculum and providing enough teacher training. The effective inclusion of students with physical disabilities in regular schools relies not only on legislation and infrastructure, but also on instructors' understanding and expertise in delivering adapted curriculum that meets diverse learning needs. This research seeks to address this need by developing and validating an assessment instrument specifically designed to assess teachers' understanding of adapting curriculum for students with moderate physical limitations. Various studies have consistently shown that the efficacy and readiness of educators play a pivotal role in the successful implementation of inclusive education (Sharma, Loreman, &Forlin, 2012). Florian (2008) suggests that instructors who possess the necessary tools and knowledge have the potential to significantly enhance the academic performance of children with disabilities. Evidence indicates that in several poor countries, including Pakistan, educators often lack the requisite training and understanding of effective approaches for teaching children with special needs (Hassan &Akram, 2020).

In Punjab, the largest province of Pakistan, the challenges are exacerbated by a scarcity of resources and specialized training programs tailored to the needs of students with physical impairments (Mehmood& Akhtar, 2011). Inconsistent teacher preparation for inclusive education results in the adoption of practices that may not align with the theoretical models endorsed by educational policy. The discrepancy highlights an urgent need for diagnostic instruments that can precisely evaluate and enhance teacher competencies in response to curriculum modifications.

While there are multiple scales that can be used to evaluate teachers' overall effectiveness and attitudes towards inclusive education (Tschannen-Moran & Woolfolk Hoy, 2001), there is a clear lack of instruments specifically designed to assess teachers' capacity to adapt curriculum for students with physical impairments. Developing a scale is essential for assessing current educational approaches and guiding future teacher preparation and curriculum enhancement (DeVellis, 2017).

Research Aims

The aim of this research was to develop and validate a measurement tool that can evaluate the comprehension of primary school educators in Punjab on the adjustments required in the curriculum for children with moderate physical impairments. This scale will have many functions: it will aid in identifying areas where instructors may need more training, provide educational officials with data to guide policy choices, and eventually assist to enhancing educational results for kids with disabilities.

Research Objectives

To achieve this aim, the following objectives have been set:

- 1. To create a comprehensive scale: design a strong scale that covers all crucial elements of curricular modifications for children with moderate physical disabilities. This purpose entails the identification of essential abilities and knowledge domains that are crucial for instructors in modifying curriculum to suit these pupils.
- 2. To establish content validity: Ensure that the scale elements precisely and properly represent the specified content domain. This purpose entails engaging in consultations with educational experts, special education specialists, and experienced instructors to thoroughly assess the relevancy and comprehensiveness of the scale's content.
- **3.** To evaluate the construct validity: Evaluate the extent to which the scale accurately assesses the intended theoretical constructs. This entails conducting statistical tests, such as factor analysis, to ascertain and validate the fundamental framework of the scale.
- 4. To evaluate reliability of the scale: It is necessary to verify its internal consistency and stability over time. To accomplish this purpose, we will use techniques such as calculating Cronbach's alpha for assessing internal consistency and test-retest reliability metrics.
- 5. To conduct a pilot study using a sample of teachers: Conduct the recently created scale on a group of instructors in Punjab in order to get first data. This pilot test will serve to detect any potential flaws with the functioning of the scale, such as items that are unclear or scaling that is not done properly. Additionally, it will provide first insights into the instructors' comprehension of curricular changes.
- 6. To perform data analysis for improving the scale: Examine the data acquired from the pilot testing in order to make any required modifications to the scale. This purpose is to enhance the scale by incorporating real-world use and feedback, guaranteeing its usability and precision.
- 7. To validate the scale in diverse educational settings: It is necessary to validate it across several kinds of schools (urban, rural, public, and private) within Punjab after refining it.
- 8. To provide recommendations for professional development: Use the results obtained from the scale validation process to create specific suggestions for programs aimed at enhancing professional growth. The purpose of these suggestions is to remedy deficiencies in instructors' knowledge and skills regarding curricular modifications for students with moderate physical disabilities.

Literature Review

Effective education for students with moderate physical impairments requires that teachers not only possess general pedagogical skills but also specific competencies related to adapting curricula to meet diverse needs. The development and validation of a scale to measure teachers' understanding in this area is crucial for enhancing educational practices and outcomes in inclusive settings. This literature review examines existing research on the topic and underscores the need for such a scale, particularly in the context of Punjab, Pakistan.

Teacher Competencies and Inclusive Education

Research consistently emphasizes the importance of teacher training in the effectiveness of inclusive education. Florian (2008) notes that teacher competencies should extend beyond traditional pedagogical skills to include specific strategies for curriculum adaptation and individualized instruction. Loreman, Earle, Sharma, and Forlin (2007) argue that without adequate training in these areas, teachers are less likely to feel confident or be effective in inclusive classrooms, potentially hindering the academic progress of students with disabilities.

Teachers' Understandings of Curriculum Adaptations

Teachers, according to Ainscow and Miles (2008), "are the key to design curriculum adaptation. But surprisingly, they face resistance to adapting the curriculum, modifying the materials, creating lessons for specific students, and changing evaluation methods (Johnsen, Haensly, Ryser, & Ford, 2002).

Presently, teachers' familiarity with the concepts of modifications and accommodations is uncertain. The involvement of the teachers' voice, according to Owings & Kaplan (2001), is a crucial element in developing and adapting curricula for the benefit of students' learning. A quality-oriented curriculum, according to Tomlinson (2000), empowers the teacher and students to actively engage in the teaching and learning process. A rich learning environment with a variety of opportunities is the first thing a teacher can do to accommodate gifted students (Arends, 2004).

After reviewing the bulk of the literature, shared characteristics were found among the teachers to adapt the curriculum. A study by Mzizi (2014), reported that most teachers do not change the curriculum according to the needs of students. Similarly, Scanlon and Baker (2012), explained that teachers have no idea about the concept of curriculum adaptations. Subsequently, a study by (Saziso, Chimhenga, &Mpofu, 2021), recommended that it is necessary to adapt the curriculum so that students with disabilities can more easily access it, teachers need to know how to tailor the instructions. The findings of a study by (Galano, 2012; Rice, 2006), depict a frequently cited problem as a lack of training on how to implement accommodations and modifications effectively.

A study by Moats (2014), revealed the number of countries in the world, where the standards of teachers' qualifications are lower than any other profession. Teachers who have a poor grip on their subject, are unskilled and have no experience in teaching are expected to teach a challenging curriculum in a diverse class. A study by Rogan (2004), found that few teachers make their instructional materials and adapt the curriculum as opposed to the majority of teachers are reluctant to be creative. Similarly, in Botswana, a study conducted by Molosiwa and Mangope (2011), argued that teachers did not willing or

able to provide an adapted curriculum to meet the individuality of the students with SENs in an inclusive classroom. Parallel to this, Mukhopadhyay (2014), identified that Botswana teachers lacked the necessary skills, they were unable to modify the curriculum to meet the needs of the diverse students in their classes. Furthermore, Major et al. (2012), asserted that teachers' provision of adaptations in the classroom frequently tended to be incidental, inconsistent, and unplanned.

Different literature indicated that Hong Kong teachers struggle with dilemmas and challenges in their instructional practice (Ng & Rao, 2008). Due to the diversity of the classroom, the teacher must be prepared with many strategies to meet student needs (Rock et al., 2008). This means that the special education teacher must have skills and strategies to provide these included students with the education they deserve. The teacher is then responsible for adapting the materials being used in the classroom to fit the needs of the IEP (Arends, 2004). In the well-regarded study by Altinyelken (2013), the patterns and reasons for adaptation were not investigated, even though there was an in-depth explaining why teachers showed principled resistance to curriculum change.

Prior research suggests that adaptation is a central process in teachers' use of curriculum materials and that no curriculum is used blindly or without adaptation (Ben-Peretz, 1990). In the Brazilian school system, teachers report that they have difficulties implementing the curriculum adaptations to suit all students, they sometimes even offer different activities, however, they aren't classified as curriculum adaptations (Silveira, Enumo, & Rosa, 2012). Lack of training on effective implementation of accommodations and modifications is a frequently reported issue (Galano, 2012; Rice, 2006).

Rogan (2004), reported that most teachers are hesitant to be innovative and only very few teachers create their learning materials. Thus the reliance on existing textbooks is pervasive. Haider (2008), noted that 70% of mainstream teachers felt that they lacked the skills and the exposure necessary to address the needs of children with disabilities. Similarly, Rieser (2012), concludes that rigidity of the curriculum, lack of resource teachers in schools, poor quality pediatric health services, and lack of specialists to help assess children's special needs are some of the main barriers to providing quality education in Pakistan.

Students with disabilities are studying the same curriculum regardless of their weaknesses and strengths (Azeem, 2019). In this scenario, all teachers and staff have a responsibility to fulfill their needs and provide fruitful education (Moon, Brighton, & Tomlinson, 2020; Tomlinson, 2014). Adaptation in the curriculum fulfills the diverse needs of students and not changing the student to fit their needs. A study by Smith (2009), argues that highly effective teachers adapt and modify the content to meet the unique needs of students with disabilities.

Challenges in the Pakistani Context

In Pakistan, the challenge of inclusive education is magnified by a lack of resources and specialized training for teachers (Hassan &Akram, 2020). Studies by Mehmood and Akhtar (2011) highlight that many teachers in Punjab do not receive the necessary training to adapt curricula for students with disabilities, contributing to a gap between policy and practice in inclusive education. This gap underscores the urgent need for tools that can assess and enhance teachers' abilities in curriculum adaptation.

Importance of Validating Educational Tools

The validity of educational assessment tools is a critical aspect of educational research and practice. According to DeVellis (2017), tools must be rigorously tested for validity and reliability to ensure they accurately measure what they are intended to measure. In the context of curriculum adaptation, this means that a scale should accurately reflect a teacher's competency in modifying educational content to suit the needs of students with physical impairments.

Existing Scales and Measurements

While there are numerous scales for measuring general teacher efficacy in inclusive settings (Sharma, Loreman, &Forlin, 2012), there is a noted scarcity of instruments specifically designed to assess understanding of curriculum adaptations for physically impaired students. Tschannen-Moran and Woolfolk Hoy (2001) developed a widely used teacher efficacy scale, but it does not specifically address the nuances of physical impairment adaptations. This gap indicates a significant area for development in educational research tools.

Need for Context-Specific Research

The development of a context-specific scale is essential, as noted by Opfer and Pedder (2011), who argue that educational tools and strategies must be adapted to fit the cultural and educational contexts in which they are used. This is particularly true in Punjab, where local language, cultural norms, and specific educational challenges must be considered to effectively assess and train teachers.

Method

A quantitative research method was chosen for this study because a survey approach was used to develop the tool for finding understanding of primary level special education teachers for curriculum adaptations of moderate physical impairment students.

Population and Sample of the study

In this study target population were the Junior Special Education Teachers (JSETs) of students with PI studying at the primary level in Punjab. At the time of this study, 302 Government Special Education Institutes were working in Punjab. However, the number of schools or centers, where students with moderate physical impairment of grade five enrolled was 176 (of which five institutes specifically for students with physical impairment). The total strength of JSETs of students with

a moderate physical impairment who were working at government special education schools or centers of Punjab was 169 (male=67, female=102). These figures were collected by the researchers from the statistical office of the Directorate General of Special Education (DGSE) Punjab, Lahore. As mentioned above, this study is quantitative and uses a collection of data in numerical forms to explain the phenomena. To ensure the validity of the data, the researchers takes the whole teachers of students with PI studying at the primary level in Punjab. Total population sampling, a subtype of purposive sampling, studies the entire population of interest (Thomas, 2022). It works best in a situation where the population as a whole is manageable, like in a clearly defined subgroup of a larger population. A good way to conduct a survey, for instance, would be to sample the entire population.

Study Instrument

CAUS: Teachers scale

This research tool was a survey scale for Junior Special Education Teachers (JSETs) to reflect the needs identified by the teachers in adapting the curriculum for students with PI studying at the primary level in Punjab. This scale was divided into three sections. The first and second sections of this scale started with demographical information. This section comprised eight questions such as a) gender; b) age range; c) teacher-student ratio; d) educational level; e) Have you attended any training program related to curriculum adaptation?; f) How many years of teaching experience do you have?; g) Time required for making adaptations; h) Which category of students with moderate physical impairment do you deal?

Part two of this scale has consisted of 36 items. This part of the scale was divided into nine factors: size; time; level of support; input; difficulty level; output; participation; alternate goal; and substitute curriculum. Factors refer to nine areas of curriculum adaptations described by Ebeling, Deschenes, & Sprague (1994). They discussed nine types of curriculum adaptations in their study, "Adapting curriculum & instruction in inclusive classrooms: A teacher's desk reference". These nine types were substantially altered by Diana Browning Wright (2005), in her study, "Teaching & Learning". This scale was based on these nine types presented by Ebeling, Deschenes, & Sprague (1994). However, the designed items were based on the literature (Majón, 1997; Haladyna, 2004). These items were considered important in the classroom teacher practice to provide the opportunity for access to content. Each factor contained four items. Every item has been measured by a five-point Likert scale.

The researchers personally administered the surveys at the sample group's regularly scheduled meetings to account for this disadvantage. An initial review and pilot study helped to reduce researchers` biases and structural problems in designing the questionnaire (Kim, 2011).

A Likert Scale was adopted in this scale to analyze the needs identified by the teachers. The rating scale ranged from 1-5, with 1 meaning 'never' and 5 meaning 'very often'. A five-point Likert scale is a great way to collect opinions, and it provides participants with a range of possible answers (Joshi et al., 2015). Participants in the survey were instructed to check or circle the pertinent statement to indicate their agreement or disagreement with the statement. The needs identified by the teachers in adapting the curriculum for students with PI were assessed by calculating the mean scores

Results and Analysis

Pilot Study

A pilot study was carried out with 36 teachers of students with PI in similar settings, which the researchers intended for field study. These respondents were taken from Lahore and Gujranwala divisions by using a purposive sampling technique. Early investigations and experiences will lead to meaningful modifications in the instruments or their implementation process. The purpose of a pilot study is the modification of the stages and steps of the study.

The purpose of the pilot testing was to evaluate time, feasibility, cost, and reliability to improve the formation of instruments according to the requirements of the study. Consequently, few changes in wordings were made in Urdu translated versions of the CAUSscale as the vocabulary was found difficult and culturally less desirable in the local language for uneducated parents. Hence, data generated as a result of pilot testing were processed to establish the psychometric characteristics of the instruments used in the study. The process of pilot testing helped the researchers in making instruments more meaningful according to the local context.

It's important to note that a pilot study was conducted to examine the reliability and objectivity of the developed scale. After that, scale was given out to collect data. Before it was administered in the fieldwork, the scale for teachers was pre-tested. Pre-testing was primarily done to ascertain the respondent's viewpoint, and the language used, and to highlight any ambiguities, doubts, and pitfalls to get the desired responses and outcomes. Pilot testing was carried out by the researchers to determine whether the primary research was acceptable and to investigate any conceptual problems and methodological gaps that needed to be filled in the main research.

A pilot study was also carried out to strengthen the "reliability and validity" of the instrument. This pilot study's objectives were to spot any biases and ambiguity in the vocabulary of the scales. Through the informed consent form, participants were fully informed of the procedure, and their credentials were remained confidential throughout the study. The results of the pilot study indicated that the teachers had more problems in the domain 'participation'; 'substitute curriculum'; 'input' and 'alternate goals'.

After pilot testing, the scale was modified following recommendations from the expert panel. Before being distributed to teachers, the scale was given to specialists in the field of special education after they had been improved. This allowed them to assess the scale's suitability. The final scale consisted of nine factors and 36 items after going through several stages.

Reliability of the Research Instruments

The researchers assessed the reliability of the self-developed research tool by collecting information from (167) junior school special education teachers of students with PI studying at the primary level in Punjab. Reliability is "the extent to which the survey results are free from random error, frequently expressed in terms of confidence intervals or confidence levels". By including simple, precise, and understandable questions on the scales, this study increased reliability. The survey's consistency and stability are what makes it reliable. Consistently measures whatever it is measuring. An indicator of stability was calculated using Cronbach's alpha. It represents the items' average correlation. Higher values signify a stable instrument. A result of 70 is acceptable. The Cronbach's alpha for CAUS was .904.

Table 1

Factor-wise Reliability Analysis of CAUS							
S/N	Factors	Cronbach Alpha	Number of Items				
1	Size	.864	04				
2	Time	.912	04				
3	Level of support	.885	04				
4	Input	.932	04				
5	Difficulty level	.911	04				
6	Output	.873	04				
7	Participation	.865	04				
8	Alternate goal	.944	04				
9	Substitute curriculum	.950	04				
	Overall reliability	.904	36				

Table 1 shows that nine factors had acceptable stability (.904) on the CAUS scale. All these results confirmed that each item shared a common variance with other items and each of the items was significantly correlated with the total score for each dimension.

Validation of Instruments

Validity proves that the survey questions measure what they claim to measure. According to Babbie et al. (2007), an empirical measure's validity refers to how well it captures the true significance of the concept under consideration. Curriculum adaptations were taken into consideration in this study. To determine whether the items of this scale make sense, these were presented to five experts with expertise in both special education and research to review the scales. These specialists evaluated the validity and reliability of the survey scale. Specifically, many researchers choose to seek the input of experts (Netemeyer et al., 2003). The researchers made several changes in the instrument in light of the expert's opinion. In general, all the content experts supported the Likert scale and they supported the distractors and correct answers on the multiple choice scale.

Content Validity

Content validity (Rossiter, 2008) is defined as "the degree to which elements of an assessment instrument are relevant to a representative of the targeted construct for a particular assessment purpose".Content validity includes several aspects, e.g., clarity in the instructions, representativeness of the construct, simplicity, and conciseness, and adequacy of the response format. Several approaches to evaluate content validity have been described in the literature.One of the first procedures was probably the Delphi method, which is predominantly used in medical research. The second procedure is based on the quantitative method described by Lawshe (1975), and Lynn (1986), who also provided numerical content validity indices. These procedures are based on expert judgments where many experts rate the relevance of the items for the construct on 4 to 10-point scales or using percentages (Haynes et al., 1995).

There exists, however, no systematic procedure that could be used as a general guideline for the evaluation of content validity (Newman et al., 2013). In this study, an expert's judgment was used to measure the validity of the content. The content ofall the items asked was appropriate and suitable, as they all evolved from the phenomenon to be studied (curriculum adaptations). The experts also examined the protocol's contents. Additionally, content validity makes sure that the measure accurately and proportionately measures the latent variable's magnitude. The expert's judgment suggested that the items were a true reflection of the list created from the literature. They also affirmed that the content of the items was clear and concise and that teachers should have been able to interpret them correctly.

Construct Validity

Construct validity is an important criterion of measurement validity. Broadly put, a scale or test is valid if it exhibits good psychometric properties (e.g., unidimensionality) and measures what it is intended to measure (e.g., Haynes et al., 1995; deVon et al., 2007). The Multitrait-Multimethod Matrix (MTMM) by Campbell and Fiske (1959), is a way to test for construct validity.

	CAUS (Teachers Scale)									
	Trait	S1	T1	LoS1	Input1	DL1	Output1	P1	AG1	SC1
	S1	α								
	T1	r	А							
	LoS1	r	r	А						
CAUS Teachers Scale	Input1	r	r	R	А					
	DL1	r	r	R	R	α				
	Output1	r	r	R	R	r	α			
	P1	r	r	R	R	r	r	α		
	AG1	r	r	R	R	r	r	r	А	
	SC1	r	r	R	R	r	r	r	R	α

 Table 2

 A Multitrait-Multimethod Matrix Examining Construct Validity of Nine Factors over Teachers Scale (CAUS)

Note. S1=Size; T1=Time; LoS=Level of Support; DL1=Difficulty Level; P1=Participation; AG1=Alternate Goal; SC1= Substitute Curriculum

As shown in Table 2, the main diagonals consist of reliability coefficients for the test (in this case alphas), placed where the test would correlate with itself. The rest of the parameters consist of correlations (r). This was the case in this study. Only one method (e.g., self-reported measure) is used in this study to measure the needs identified by the teachers through different traits of the intended construct (curriculum adaptations). Results depict that different traits are strongly correlated with the intended construct of the study.

Testing the Assumptions for Factor Analysis

To assess the suitability of the data for factor analysis KMO and Bartlett's test was employed. KMO measure for the CAUS scale was (.853) which falls into the category of "great". Bartlett's test of Sphericity was observed highly significant, χ^2 (630) = 2735.210, p <.001.

Table 3 KMO and Bartlett's Test for CAUS Scale							
KMO and Bartlett's Test for	CAUS Scale						
Kaiser-Meyer-Olkin Measure of Sampling Adequacy853							
-	Approx. Chi-Square	2735.210					
Bartlett's Test of Sphericity	Df	630					
	Sig.	.000					

Confirmatory Factor Analysis of CAUS Scale

AMOS software was used to conduct a CFA on the nine-factor model of both scales. The following indicators were examined to test the model's fit: (a) the Tucker-Lewis Index (TLI), (b) the Comparative Fit Index (CFI), and (c) the Root Mean Square Error of Approximation (RMSEA). Both CFI and TLI are standardized indices and are more desirable when they are closer to 1 (Raykov&Marcoulides, 2011). Hu and Bentler (1998), suggest that CFI should be >.9. Although related to it, RMSEA represents the misfit of the model for each degree of freedom. Therefore, it is often used as an indicator of fit in CFA. As a rule, an acceptable model should have an RMSEA <.05. The smaller the RMSEA, the better the model fits (Raykov&Marcoulides, 2011). RMSEA, CFI, and TLI are calculated by comparing the proposed CFA.

Table 4 The Chi-square (χ)2, Degrees of Freedom (df), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and Tucker-Lewis Index (TLI) with Nine factor CFA Solution

(CFI),	and Tud	ker-Lewis Index (T	LI) with Nine	factor	CFA Se
	Scales	χ2 (df)	RMSEA	CFI	TLI
	CAUS	2735.210 (630)	.027	.930	.774

Convergent Validity

One way to generate an estimate of the extent to which a scale measures what it purports to measure (or one way to test that scale's measurement validity) is to correlate it with other variables. This research examined convergent validity. The researchers examined the extent to which the CAUSscale positively correlate with other variables that are theoretically expected to relate to them. Here, the researchers try to find out whether the items they claim are measuring a particular construct are indeed measuring them.

 Table 5 Convergent Validity, Factor Loading, Cronbach Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE) of the

 CAUS Scale

		CAUS State			
Constructs	Item	Factor Loading	Cronbach Alpha	CR	AVE
	S1	.892			
Sino	S2	.923	964	00 2	526
Size	S3	.910	.004	.602	.320
	S4	.868			
Time	T1	.828	.912	.870	.573

	Т2	.891			
	Т3	.925			
	Τ4	.934			
	LoS1	.886			
Level of Support	LoS2	.955	005	940	577
	LoS3	.905	.005	.040	.377
	LoS4	.832			
	Input1	.868			
Inout	Input2	.942	032	<u>840</u>	543
mput	Input3	.881	.932	.649	.545
	Input4	.870			

Table 5(continued)	Convergent Validity,	Factor Loading,	Cronbach Al	lpha, Composite	Reliability (CR	R), and Average	Variance Extracted
		(AV	E) of the C_{P}	4US Scale			

Constructs	Item	Factor Loading	Cronbach Alpha	CR	AVE
	DL1	.899			
Difficulty Loval	DL2	.945	011	816	521
Difficulty Level	DL3	.895	.911	.010	.521
	DL4	.888			
	Output1	.930			
Outout	Output2	.935	873	.852	.624
Output	Output3	.846	.075		
	Output4	.891			
	P1	.870		.806	.545
Participation	P2	.947	865		
i anucipation	P3	.899	.005		
	P4	.877			
	AG1	.935	.944	.878	.589
Alternate Goal	AG2	.916			
Internate Obai	AG3	.969			
	AG4	.889			
	SC1	.955			.506
Substitute Curriculum	SC2	.932	950	823	
Substitute Curriculum	SC3	.994	.950	.025	
	SC4	.854			
		SC2 .924			
		SC3 .846			
		SC4 .872			

Structure Equation Model

SEM is a combination of two statistical methods: confirmatory factor analysis and path analysis. Confirmatory Factor Analysis (CFA) is the method for measuring latent variables. It extracts the latent construct from other variables and shares the most variance with related variables. Path models are diagrams used to visually display the hypotheses and variable relationships that are examined when SEM is applied.



Figure 1 A Path Diagram of Structural Equation Model

AMOS 20.0 was used for testing the CAUS scale based on the nine-grid model of curriculum adaptations by Ebeling et al. (1994), through SEM path analysis. The CFA analyses indicate that the bi-factor solution (with correlated errors) explains the data best in terms of model fit statistics. Inter-factor correlations were in the moderate range. The bi-factor solution possessed a good data model to fit across all indices. Analysis revealed a superior fit for the bi-factor solution (correlated errors), $\chi 2 = 2735.210$ (630), p < 0.001, CFI = 0.930, RMSEA = 0.050, and TLI = .774 for the CAUS scale and a superior fit for the bi-factor solution (correlated errors).

Discussion and Key Findings

Curriculum Adaptation Understanding Scale (CAUS) formulation and validation represents a significant advance in assessing the capacity of Punjab, Pakistan, educators to modify curricula to accommodate students with moderate physical impairments. The CAUS, which is consistent with Ebeling et al.'s nine-grid model, effectively assesses critical elements of curriculum adaptation across nine domains, exhibiting strong construct validity and reliability. The scale's theoretical framework and practical implementation as a diagnostic instrument to identify specific areas in which educators need additional training are substantiated by this validation. Significantly, deficiencies in 'participation' and'substitute curriculum' indicate that although educators might acknowledge the importance of curriculum modifications, they might be deficient in the requisite expertise or materials to effectively execute them. The aforementioned results emphasize the necessity of tailored professional development initiatives that surpass mere theoretical comprehension and incorporate practical approaches to inclusive education. On the other hand, the reliance of the study on self-reported data may give rise to bias, underscoring the necessity for future investigations to integrate observational techniques or third-party evaluations in order to attain a more impartial assessment. Further expanding the scope of this study to encompass a variety of educational environments may augment the applicability of the results. Further research is warranted to investigate the sustained efficacy of interventions derived from CAUS assessments in order to enhance academic support for students with disabilities. In the realm of global inclusive education initiatives, the CAUS not only provides a methodologically sound instrument for educational research, but also functions as an indispensable instrument for enhancing teacher preparation and student achievements.

Here's a detailed overview of the key findings:

Reliability of the Instrument

The CAUS scale demonstrated high reliability as indicated by its Cronbach's alpha values:

• CAUS: Teachers Scale: Achieved an overall reliability score of 0.904, with individual factors ranging from 0.865 (Participation) to 0.950 (Substitute Curriculum), suggesting that the items are consistently measuring the intended constructs.

These results indicate a high level of internal consistency among the survey items, ensuring that the scale is reliable tools for measuring teachers' perceptions and experiences regarding curriculum adaptations.

Factor Analysis

The KMO and Bartlett's test results reinforced the appropriateness of conducting a factor analysis on the survey data:

- **CAUS Scale**: KMO measure was 0.853, indicating a great suitability for factor analysis. Bartlett's test was highly significant (p < .001), supporting the factorability of the correlation matrix.
- These findings confirm that the data structure was suitable for extracting meaningful factors, affirming the constructs designed in the scale.

Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM)

The CFA and SEM were utilized to validate the structure of the scales and to test the relationships among the factors:

- Model Fit: The CAUS scale showed a RMSEA of 0.027 and a CFI of 0.930, indicating excellent fit to the data.
- Inter-factor Correlations: scale demonstrated moderate to strong inter-factor correlations, suggesting that while distinct, the factors are related and contribute to a cohesive understanding of the curriculum adaptation process.

Content and Construct Validity

- **Expert Review**: Validation through expert review confirmed that both scales measured the constructs they were intended to measure, with items deemed relevant and representative of the targeted constructs for curriculum adaptations.
- Multitrait-Multimethod Matrix (MTMM): Results from the MTMM provided additional support for the construct validity of the scale, indicating that different traits are indeed measuring the intended constructs robustly.

Limitations and Future Research

It is important to acknowledge the study's limitations, despite the encouraging nature of the results. Self-report measures may be susceptible to bias, as teachers may inadvertently overstate their level of competence. Subsequent investigations may integrate observational or third-party evaluations in order to substantiate the self-reported data of educators. Moreover, the research was exclusively centered on government special education institutes situated in Punjab. This study was limited to Urdu language subjecthowever; this can be used for other subjects as well. Expanding the scope to encompass private schools or alternative provinces might have enhanced the generalizability of the results. Longitudinal effects of interventions based on CAUS findings should be investigated in order to ascertain their long-term efficacy. Furthermore, conducting an identical investigation in diverse cultural or regional settings may yield comparative perspectives and make a valuable contribution to the worldwide dialogue surrounding inclusive education.

Conclusion

The Curriculum Adaptation Understanding Scale (CAUS) has shown its reliability and validity as an effective instrument for evaluating the comprehension of primary school teachers in Punjab, Pakistan about curriculum adjustments for children with physical impairments. This scale not only adds value to the academic domain by offering a methodologically rigorous assessment, but also has practical implications for increasing teacher preparation and boosting student outcomes. With the increasing worldwide recognition of inclusive education, instruments like as the CAUS play a crucial role in guaranteeing that every student, irrespective of their physical ability, receives a high-quality education that is customized to their individual requirements.

Recommendations and Implications

Recommendations

- Educational authorities should integrate the CAUS into teacher training programs to enhance educators' understanding of curriculum adaptation for children with physical impairments. Training sessions should focus on utilizing assistive technologies and implementing personalized pedagogical strategies effectively.
- Continuous professional development opportunities should be offered to primary school educators in Punjab to further refine their skills in curriculum adaptation. Workshops, seminars, and online courses can be organized to address specific areas identified by the CAUS where educators may need additional support.
- Encourage collaboration among educators, special education professionals, and policymakers to share best practices in inclusive education and curriculum adaptation. Establishing forums for knowledge exchange and networking can foster a supportive environment for improving educational outcomes for children with disabilities.
- Educational authorities should allocate resources to ensure that primary schools in Punjab have access to appropriate assistive technologies needed to support students with moderate physical impairments. This may involve providing funding for the procurement of specialized equipment and ensuring technical support for its implementation.

Implications

- The CAUS can provide valuable data to inform policy decisions related to inclusive education and curriculum adaptation for children with disabilities in Punjab, Pakistan. Policymakers can use the insights gained from CAUS assessments to develop targeted initiatives aimed at improving educational outcomes and promoting inclusive practices.
- By enhancing educators' proficiency in adapting curricula for children with physical impairments, the CAUS has the potential to positively impact educational outcomes for these students. A more inclusive learning environment can lead to increased engagement, academic achievement, and overall well-being among children with disabilities.
- The implementation of the CAUS empowers primary school educators by providing them with a structured framework for assessing their comprehension of curriculum adaptation practices. Through self-reflection and targeted professional development, educators can continue to refine their skills and contribute to creating inclusive classrooms where every child can thrive.
- The development and validation of the CAUS contribute to the advancement of inclusive education practices not only in Punjab, Pakistan, but also potentially in other regions facing similar challenges. By establishing a standardized measurement tool, this research lays the foundation for ongoing assessment and improvement of curriculum adaptation strategies worldwide.

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