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Research Article

Creating and Validating an Audio-Visual Scale for Assessing Teachers' Classroom Management Competency

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ABSTRACT

Audiovisual learning is crucial in the education system, enhancing the teaching and learning process. They serve as effective tools for disseminating knowledge and offer a dynamic information system. The study aims to develop and evaluate an audio-visual learning scale based on teachers' classroom management strategies and also assess the current state of audio-visual learning availability and usage in the teaching learning process. In this study, a questionnaire was designed to develop the audio-visual scale on teachers' classroom management approaches, with 28 items applied to 100 teachers and the remaining 25 items applied to 360 teachers in West Bengal, India. The study was analysed using mean, standard deviation, t-test for item analysis, and Cronbach's alpha for measuring item reliability on various items and data. The final scale is made from each statement, and the conclusion is that 23 items are perfect for measuring the audio-visual learning scale related to classroom management, which plays a crucial role in teaching.

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1. Introduction

Education is crucial for a good life, and effective teaching and learning are essential elements. One of the most groundbreaking inventions of the 21st century, the use of technology jars is now widely used in the classroom in a variety of ways, one of which is the audio-visual method. Teachers use various methods and materials to engage students and explain concepts. Teaching, instructional, and audio-visual aids all support learning and stimulate students' interest in learning. Classrooms use instructional tools like maps, charts, models, film segments, projection equipment, the radios, and televisions to make learning more effective and enjoyable (Rather, 2004). Audio visuals enhance education by improving student learning and sharing information. Their rapid access and comprehension of concepts have significantly increased over time, leading to increased productivity and understanding (Farooq, 2014). Audiovisuals, or teaching materials, are learning devices used in classrooms to enhance learning experiences. They follow Farouk's A.V. model, which aims to make knowledge clear through the senses. Teachers use these materials to present information in an appealing manner, facilitating the auditory and visual experience of students (Anzaku, 2011). In this method, teachers can easily present various topics to a large number of students, so this teaching learning method is very effective.

The audiovisual method is a valuable tool for incorporating visual and audio materials in lessons for elementary school students. Online lessons are a vital resource for supplying audio-visual materials since more students may engage in classes due to the improved accessibility of electronic and multi-media technology. Online education has become a priority for everyone, according to Babayev Javid, who emphasizes its significance (Javid, 2022). The study proposes a new perspective on audio-visual scene understanding, focusing on the cognition foundation of audio-visual modalities. This approach helps organize studies in a logical paradigm, ensuring intrinsic consistency across modalities, and looks back at the development of the discipline of audio-visual learning in modelling human perception. This approach is based on existing surveys and new research findings (Zhu et al. 2021; Vilaca et al. 2022). Audio-visual is a method that is used in the field of education in all three aspects—teaching, learning, and aid—which makes education better, where students can learn at home from any teacher in the world through various aids. Teachers can teach in different parts of the world at the same time.

The five senses that make up human perception are taste, smell, touch, hearing, and vision. As artificial intelligence technology has advanced, multimodality learning has become increasingly important for improving machine perception (Shannon, 1995; Krishna, 2019). Both academia and industry have extensively developed analyses of auditory and visual information, two significant perceptual modalities in daily life (He et al., 2011; Tong et al., 2019). Facial recognition, fine-grained visual classification, and speech recognition are notable

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accomplishments. To get around restrictions on perception tasks, audio-visual learning (AVL) utilizing both modalities has been introduced (Fu et al., 2019). Examining the connection between auditory and visual data generates more intriguing research questions and improves our understanding of machine learning (Li et al.,2019; Ding et al., 2021; Chang et al., 2020). Audio visuals play a crucial role in education, enhancing student learning and have seen a significant increase in usage over the years. The speed at which students can access and share these visual aids has significantly improved (Hasanova, 2023). Visual mediums should be suitable for developing real ideas about various life areas. Teachers can teach students concepts like electron movement in atoms using diagrams, tables, and real films. The aim of this study is Establishing and analysing a consistent structure to appraise teachers' application of audio-visual learning in classroom management.

2. Objectives of the Study

Audio visual is a great method that is used in education for various purposes. The main purpose of this study is –

1. To assess the items on the Audio-visual Learning Scale using t- test.
2. To assess the reliability of the Audio-Visual Learning Scale in order to validate it.

3. Methodology

3.1 Design

The study utilized a descriptive survey research design to examine the impact of audio-visual materials on knowledge dissemination for facilitators in selected literacy centres. In this study researchers were used simple random technique to collect the data. "Simple random sampling is a widely used method in scientific research, used for highly homogenous populations where members are randomly selected to participate" (Bhardwaj, 2019). This technique assures that each person has an equal probability of being included in the sample from the population, according to Acharya (2013). According to Best and Kahn (2016), basic random sampling is a tedious and seldom utilized method in research design.

3.2 Participants

After giving draft scale to one hundred (100) West Bengal teachers for item analysis, the researcher evaluated the internal consistency of the scale on three hundred six (306) teachers using the Cronbach's alpha method. Prior to submitting their responses, the participants were required to read the questionnaire. The points were then computed based on the appropriate scale that was allocated to every statement.

3.3 Item Pool

The study involved a conceptual framework, literature review, drafting of items and questions, and consultation with experts. An instrument developed by Rasul et al., in 2011 did not show sufficient statistical reliability due to the characteristics of the participants and was therefore not adopted. In order to improve classroom management, the researcher decided to develop a new scale for audio-visual learning (Martin et al., 1998; Savran & Çakıroglu, 2004; Yerin-Güneri et al., 2004).

3.4 Sub-scale

Audio-Visual learning (AVL) scale related to classroom management was defined as a multi-faceted construct that includes six broad dimensions: Time Management (5 items) Content Preparation (5 items), Student Perception (5 items), Class Control (4 items), Child Psychology (4 items), teacher Preparation (5 items) mentions at previous paper of Samaddar et al., 2023 (Samaddar et al., 2023).

3.5 Scoring of Tools

The study employs a 5-point Likert scale with 28 questions to measure students' Audio-Visual Learning in Classroom Management. According to Mukherjee et al., (2018), "The scale ranges from 1 (strongly disagree) to 5 (strongly agree)", with a maximum score of 140 (ranking 5 on each item). "The scale was developed using both positive and negative statements, with each item scoring as 'Strongly Agree' ('5'), 'Agree' ('4'), 'Neutral' ('3'), 'Disagree' ('2'), and 'Strongly Disagree' ('1'). Unfavourable statements were scored as 'Strongly Disagree' ('5'), 'Disagree' ('4'), 'Neutral' ('3'), 'Agree' ('2'), and 'Strongly Agree' ('1')".

3.6 Statistics

The study utilized item analysis to standardize the Audio-Visual learning-associated Classroom Management Scale, identifying poor items and comparing them with good items. Classical statistics like difficulty, discrimination, and reliability were used, and Cronbach's alpha was applied for reliability evaluation (Bichi, 2015). Item analysis is a statistical method used to assess the quality of individual items, item sets, and entire sets of items, as well as their relationship to other items, by examining their performance against external criteria or remaining test items (Thompson & Levitov, 1985). The information is utilized to enhance the quality of items and tests, with the concepts of item analysis being similar for both norm-referenced and criterion-referenced tests.

4. Result

A growth-optimal strategy aims to maximize wealth growth while mitigating bankruptcy risk, involving rapid wealth building, substantial risk-taking, and volatility, with favourable investment prospects and constrained potential losses. Contemporary research on growth-optimal strategies originated from Kelly's 1956 publication, which introduced a method for maximizing long-term wealth growth rate in multi-period investment contexts, focusing on compound returns (Kelly, 1956). The study involves analysing test scores and ranking them, with 27% of top and bottom students separated for analysis (Wiersma & Jurs, 1990; p.145; Hetzel, 1997). This value gives enough cases to investigate in order to maximize the differences between normal distributions. To promote stability and make discriminations clearer, it is important to have as many students in each group as possible, while also ensuring as many differences as possible (Popham, 1981). Compared to the diversity index, discrimination coefficients are more accurate because they are calculated for each test taker, using only the 27% upper + 27% lower) 54% of the total.

It has various types, including one sample t-test, two samples independent t-test, and paired t-test (Katherine et al., 2018). The one sample t-test compares a sample's mean to a probable population value. Data values must be independent, continuous, and derived from a basic random sample of the population in order for a test to be considered valid (Mishra et al., 2019). Depending on whether the study idea is directed or not, there are several possible formats for the statistical prediction for one-sample t-tests.

4.1 Item Analysis

Table 1: Discriminant coefficients for Subscales

Item	Upper Quadrille			Lower Quadrille			Comparison		
	N	Mean	SD	N	Mean	SD	t	df	p
AVL1	27	4.29	0.19	27	2.66	0.26	3.03	52	0.000**
AVL2	27	5.00	0.13	27	4.00	0.27	3.67	52	0.000**
AVL3	27	4.29	0.17	27	2.62	0.26	3.28	52	0.000**
AVL4	27	4.77	0.12	27	4.62	0.15	0.75	52	0.226
AVL5	27	4.88	0.06	27	3.59	0.26	4.80	52	0.000**
AVL6	27	5.00	0.15	27	4.11	0.25	3.52	52	0.000**
AVL7	27	4.25	0.18	27	2.37	0.23	3.18	52	0.000**
AVL8	27	4.88	0.08	27	4.40	0.18	2.36	52	0.010*
AVL9	27	4.88	0.06	27	4.55	0.20	1.52	52	0.066
AVL10	27	4.81	0.20	27	2.44	0.27	3.90	52	0.000**
AVL11	27	4.96	0.03	27	4.62	0.17	1.99	52	0.036*
AVL12	27	5.00	0.11	27	4.62	0.20	1.98	52	0.040*
AVL13	27	4.66	0.20	27	3.44	0.26	3.60	52	0.000**
AVL14	27	4.85	0.09	27	4.44	0.22	1.98	52	0.047*
AVL15	27	5.00	0.00	27	4.66	0.18	1.97	52	0.026*
AVL16	27	4.40	0.21	27	3.00	0.30	3.79	52	0.000**
AVL17	27	5.00	0.11	27	4.59	0.17	2.67	52	0.013**
AVL18	27	4.88	0.06	27	2.88	0.27	3.12	52	0.000**
AVL19	27	4.96	0.03	27	4.59	0.20	1.98	52	0.043*
AVL20	27	4.66	0.13	27	2.70	0.27	3.41	52	0.000**
AVL21	27	4.92	0.05	27	4.55	0.21	1.96	52	0.050*
AVL22	27	4.96	0.03	27	4.77	0.09	1.97	52	0.040*
AVL23	27	3.51	0.31	27	2.37	0.26	2.78	52	0.003*
AVL24	27	4.92	0.07	27	4.14	0.22	3.28	52	0.000**
AVL25	27	4.66	0.20	27	3.62	0.30	2.80	52	0.003**
AVL26	27	5.00	0.01	27	4.84	0.09	1.98	52	0.048*
AVL27	27	4.81	0.07	27	3.19	0.27	3.44	52	0.000**
AVL28	27	4.59	0.17	27	4.26	0.21	1.066	52	0.145

** 0.01 level of significance; * 0.05 level of significance

Ten items show significant differences between the highest and lowest groups when tested at the 0.05 level of significance (AVL 8, AVL 11, AVL 12, AVL 14, AVL 15, AVL 19, AVL 21, AVL 22, AVL 23, and AVL 26), and fifteen items show variations when tested at the 0.01 level of significance. The remaining three items (AVL 4, AVL 9, and AVL 28) from the Audio-Visual Learning (AVL) scale related to classroom management were removed because they did not indicate a significant difference between the highest and lowest groups, as shown in Table 1.

4.2 Validity

The degree to which gathered data accurately depicts the desired conclusion of an investigation is referred to as validity (Ghauri & Gronhaug, 2005; Field, 2005). To ensure both face and content validity, the audio-visual learning (ABL) associated with scale classroom management was subjected to expert validation. The degree to which a measure seems connected to a particular construct, as judged by non-experts such as test takers and legal system officials, is known as face validity. It involves researchers' subjective assessments of the instrument's relevance, reasonableness, unambiguity, and clarity (Oluwatayo, 2012). Content validity refers to the extent to which an instrument's items reflect the content universe it will be generalized to (Straub et al. 2004). It is crucial to apply content validity during the development of a new survey instrument to ensure it includes essential items and eliminates undesirable ones (Lewis et al., 1995, Boudreau et al., 2001).

4.3 Reliability

After verifying validity and the t test, the remaining 25-item questionnaire was applied to 306 samples for testing reliability using Cronbach alpha. Reliability testing is crucial for measuring instrument consistency (Huck, 2007). High internal consistency reliability occurs when scale items measure the same construct. According to Huck, 2007, Whitley, 2002 and Robinson, 2009, The Cronbach Alpha coefficient is the most commonly used internal consistency measure, especially when using Likert scales.

The study used the Cronbach alpha Test for Non-additivity to evaluate the internal consistency of the Audio-Visual learning (AVL) related classroom management Scale. The coefficient of

internal consistency assumes that items measuring the same construct should correlate (Cronbach, 1951; Kimberlin & Winterstein, 2008). The study analysed 25 items from the Audio-visual learning scale, covering its five subdimensions.

Table 2: Cronbach Alpha of the Audio-Visual learning Scale (AVLS)

Dimensions	n	Total Item	Mean	SD	Cronbach's Alpha
Time Management	306	4	3.69	0.958	0.544
Content Preparation	306	4	4.05	0.763	0.507
Student Perception	306	5	4.66	0.402	0.426
Class Control	306	4	4.37	0.631	0.506
Child Psychology	306	4	3.85	0.795	0.566
Teacher Preparation	306	4	4.42	0.621	0.523
AVLS	306	25	4.23	0.448	0.756

Table 2 indicates that the Audio-Visual Learning Scale (AVLS) has a Cronbach's Alpha of 0.756, "No absolute rules exist for internal consistencies, however most agree on a minimum internal consistency coefficient of .70 (Whitley, 2002, Robinson, 2009)". Other dimensions have alpha values of 0.544, 0.507, 0.426, 0.506, 0.566, and 0.523. As to (Duzgun & Kirkic, 2023; Hinkin, 1995), the analysis's Cronbach Alpha coefficient ought to be a minimum of 0.60 to ensure internal consistency and reliability. Four reliability cut-off points have been proposed by Hinton et al. (2004): good reliability (0.90 and above), high reliability (0.70-0.90), moderate reliability (0.50-0.70), and low reliability (0.50 and below) (Hinton et al., 2004). Two items have been excluded due to the low number obtained after Cronbach Alpha reliability test.

4.4 Final Scale

The 23 items on the Audio-Visual Learning Scale are divided into six dimensions: teacher preparation, student perception, class control, time management, content preparation, and child psychology, all of which were mentioned in a previous study by Samaddar et al., 2023 (Samaddar et al., 2023).

Table 3: Final form of Audio-Visual learning Scale

SI. NO.	Dimensions	Items	Total Items
1	Time Management	1, 2, 3,	3
2	Content Complete	4, 5, 6,7	4
3	Student Interest	8, 9, 10, 11, 12	5
4	Class Control	13, 14, 15, 16	4
5	Child Psychology	17, 18, 19	3
6	Preparation	20, 21, 22, 23	4
Audio-Visual learning Scale Total Item			23

5. Discussion

The study used a 28-item Audio-Visual learning measure for item evaluation after the pilot run. Verma recommended assessing quality using item DI value rather than difficulty (Varma, 2008; Emmer & Gerwels, 2005; Emmer & Hickman, 1991). Twenty-five items were accepted using a 0.05 level and 0.01 level of significance 't'-test; AVL 8, AVL 11, AVL 12, AVL 14, AVL 15, AVL 19, AVL 21, AVL 22, AVL 23, and AVL 26 items were accepted at the 0.05 level, and AVL 1, AVL 2, AVL 3, AVL 5, AVL 6, AVL 7, AVL 10, AVL 13, AVL 16, AVL 17, AVL 18, AVL 20, AVL 24, AVL 25, AVL 27 items were accepted at the 0.01 level, whereas two items (AVLS 4, AVL 9, and AVLS 28) that showed no significant difference between the higher and lower groups were discarded so no significant items were removed (Garret, 1984). The reliability is later confirmed using the Cronbach's alpha test, which has a value of 0.756. This leads to the exclusion of two items (AVL 2, AVL 21). Based on statistical analyses, a valid, reliable, and usable scale with 23 items and 6 dimensions has been determined.

6. Conclusion

The Audio-Visual learning is a method that can be used in the classroom management for all type of student from childhood to adolescence. Teachers believe visual aids create an enjoyable learning environment by incorporating sound, light, and colour, stimulating student interest and improving comprehension by allowing students to see what is happening (Jain & Billaiya, 2017). In audio-visual scenes, humans can perceive and infer interactions between objects, aiming for a more human-like perception. Audio-visual learning media develops students' cognitive skills, enabling inductive conclusion-taking and attitude-taking towards environmental phenomena, while also enhancing their soft skills, enabling assumptions and decision-making in problem-solving efforts (Sarwinda et al., 2020). Some Studies reveal that audio-visual models may not always outperform uni-modal ones, particularly in recognition tasks, due to the neglect of different learning characteristics in training (Xiao et al., 2020; Wang, 2020; Peng, 2022). Overall, students' interest in the audio-visual learning materials is increased, which may support their strong learning motivation to participate in the classroom learning process (Noer, 2012). Finally, it can be said that using this scale, a teacher can use the Audio-Visual Learning Scale to check how effective classroom management will be.

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