

## Measuring problems & challenges in the implementation of Blended learning Instruction: Construction and Validation of an Instrument for Students

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### ABSTRACT

**Purpose:** The present paper aims on the development of an instrument that can measure the problems and challenges of students of higher education when studying through blended learning.

**Design/Methodology/Approach:** This paper describes the process of the construction and validation of a psychometric instrument to identify and measure the problems and challenges of students from higher education institutions of India. A five-point Likert scale was developed, after a comprehensive review and analysis of the available literature.

**Findings:** The final scale consisted of 12 items, which were administered on a representative sample of 211 students from higher education, further to validate it an exploratory factor analysis and Monte Carlo PCA were performed. The present questionnaire was finalized to be consisted three dimensions (dimension 1=5 items, dimension 2= 4 items, and dimension 3= 3 items) has been found valid and reliable to study the students' problems & challenges in blended learning.

**Originality/Value:** The finalized scale would be significant to identify the major problems & challenges in the implementation of blended learning instruction which would be significant to manage and enhance the blended learning process in Indian context.

**Paper Type:** Empirical Research Paper

**KEYWORDS:** Blended Learning | Students | Higher Education | Problems and Challenges

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## Introduction

The significance of blended learning instruction in the educational system is being increasingly realized and the urge to implement it is rising day-by-day. However, the increasing implementation of blended learning (Oliver & Trigwell, 2005) instruction requires to know how the students are taking it. Since, an effective instructional process focusses on the extent to which it is capable to deliver what has been intended through it, so it becomes imperative to understand about its various aspects, its benefits, and of course its limitations (Chopra et al., 2023; Aisha, 2020). As, in India also, blended learning has been on the edge of its wide implementation across the country, the National Education Policy, NEP (2020) suggests that for further improvement in the transaction of instruction in blended learning (NEP, 2020), it is important to study the problems & challenges (Hinrichsen & Coombs, 2013; Aisha & Ratra, 2020a, 2020b, 2021; Sherry, 1995) that students face in its process. It also has been observed that there are an increasing number in the researches that focus the problems of students in a blended learning environment (Aisha & Panda, 2020). However, there found a lack of a reliable and valid psychometric instrument that can measure the problems & challenges of students. Thus, the present paper describes about the steps undertaken in the construction and validation of an instrument (Mishra & Panda, 2007) that can measure the problems and challenges of students of higher educational institutions in blended learning environment in Indian context.

## Preparation of draft for questionnaire

To construct the questionnaire, a thorough review of the literature was done, then a pool of questions was created. A five-point Likert scale (Likert, 1932) (from strongly disagree, disagree, neutral, agree and strongly agree, coded as 1, 2, 3, 4 and 5 respectively) was developed, after a comprehensive review and analysis of the available literature which were given to more than 12 experts belonging to various specializations in the field of education such as distance education, educational assessment and measurement, information and communication technology, curriculum design etc. as well as some language experts were also consulted. The valuable suggestions and advice from experts were obtained for improving the content validity of the scale. Incorporating the suggestions of the experts, some of the items have been deleted, modified and reframed, which enhanced the content validity of the scale in terms of language, item clarity, appropriateness, etc. in the Indian context. Finally, after getting the experts' approval, the revised version of the scale consisted of 22 items was subjected for data collection. A sample of 211 students from different higher education institutions were collected on it.

## Methods

### Participants

Since, India has wide geographical conditions as well as a huge heterogeneity among the populations; and so, the students and their varied backgrounds; which can impact the extent of problems & challenges they may face in a blended learning environment. So, this instrument has been appended with some relevant demographic details to be studied along with the specific problems & challenges that students may face in a blended learning environment. The sample considered in the present study and the institutions were from Indian higher educational background; however, it can be applicable or adapted for the students undertaking blended learning worldwide. Thus, the present instrument with psychometric (Nunnally, 1978) properties can also be used for comparative purposes.

### Statistical Analyses

The preliminary data analysis, descriptive statistics, and exploratory factor analysis (EFA) were done using SPSS version 26. Monte Carlo PCA was done to examine the factor structure. Additionally, criteria for composite reliability, convergent validity and discriminant validity were checked.

## Results

In order to develop the scale (DeVellis, 1991), the initial draft of the questionnaire underwent statistical analysis to measure problems & challenges faced by the students in undertaking blended learning, consisted of 22 items; which was analyzed by checking the Cronbach reliability analysis. The initial reliability showed a low value (.475). To investigate the problem of low reliability a correlational analysis was conducted. The results individual items' correlational analysis between the items' total correlation were observed. After running a correlational analysis, seven items viz., items 1, 9, 10, 14, 15, 19, and 20 were detected with a lower value. In other words, these items' values were lower than the critical value in the correlation table (<.1946). Therefore, these items were deleted. The critical values were determined with the degree of freedom (N-2=209), and a two-tailed hypothesis. In the next step, the reliability of the items was checked one more time. The purpose of rechecking the reliability is to find out whether correlational analysis was able to clean inappropriate data or items or not. Therefore, out of 22 items, 7 items were deleted; then, the reliability has increased after removing the items to a reliability coefficient Cronbach's alpha value=.622.

Furthermore, to present the descriptive statistics of the items and examine the inter-item correlation matrix an item analysis has been conducted for descriptive statistics of the 15 items. The 15 items' inter-item covariance matrix were observed. Then the item-total statistics was investigated. It

showed if any items needed to be deleted for increasing the total Cronbach alpha. Since the current alpha was acceptable and already some items have been deleted, no item was deleted at this stage; also, if the items would have been deleted at this point, only a slight change would have been obtained. Therefore, at this stage, the reliability including 15 items was established ( $\alpha = .622$ ) which is considered acceptable. In other words, after running item analysis, it was revealed that three items viz., items 18, 12, and 13 showed a high sample variance, so they were deleted to increase the reliability. But the process of deleting was stopped here since the total Cronbach value is acceptable ( $\alpha = .622$ ). Therefore, the final reliability was considered as an acceptable value (Griethuijsen, et al., 2015; Hulin et al., 2001 and Taber, 2018).

## Exploratory Factor Analysis

In this step, exploratory factor analysis (Beavers et al., 2013) has been run to check out the number of factors and validation of the items. For meeting the assumptions, the sample size, factorability, and outliers were checked. In the present work, 211 samples have been selected. The sample size (Krejcie & Morgan, 1970) was checked and found enough for running EFA (Tabachnick & Fidell, 2007). The correlation matrix was observed which presented a correlation between all items. The correlation should not be greater than .90. (Field, 2005). It was observed that, item 8 demonstrated correlation higher than .90. However, item 21 is showing a correlation of .91 which was ignored since this value was rounded to .90. The second part of the correlation matrix indicated significant values of the items' correlation. In this section the sig. should be  $< .05$ . But in reality, it is not possible to obtain this value. Many items demonstrated a value greater than .05. Moreover, the determinant value was found greater than  $> .00001$ . If it was less than this value, then the data would have shown multicollinearity.

Further, the value of KMO was .534. This value meets the critical index;  $KMO > .50$  (Kaiser, 1970). Also, Bartlett's test of Sphericity was significant which indicated the sample size was adequate for factor analysis. However, since the value of KMO was acceptable, but not strong, an additional analysis has been conducted to investigate the reason of low KMO. The results were observed through the Anti-Image Matrices analysis. The anti-image matrix analysis provided information on the problematic items or the low value. If any items affect the overall KMO value, those items should be removed. This could be applicable when the KMO comes out less than .50 ( $< .50$ ). As, here it was observed that there were items 8 and 11 which were lower than .50 which affects the KMO. Since, the KMO is not lower than .50, no items had been deleted at this stage.

To check the number of loaded factors, an initial analysis was run to find out the number of loaded factors. The Communalities results of the items were observed. At this

stage the total variance explained and the scree plot illustrated that there were 5 factors with an Eigenvalue higher than 1. However, a parallel analysis was conducted to compare the loaded factors with FA (Brown, 2015). The total variance was found more than .50. The results of the parallel analysis were analysed.

## Monte Carlo PCA for Parallel Analysis

The results of the parallel analysis showed that all 5 factors which were loaded by EFA, were completely the same as parallel analysis results. Through pattern matrix, the number of items under each factor was observed. Item 2 was loaded for factor 1 (.526) and factor 3 (.671). The difference between both values was calculated ( $.526 - .671 = -.145$ ). The difference was found greater than .10. Therefore, the item has been considered an appropriate item; since .671 is higher than .526, and the item is considered under factor 4. Besides, item 16 is loaded under factor 1 (.428) and factor 4 (.487). The difference was lower than .10 ( $.428 - .487 = -.059$ ). It showed this item has an overlap and should be removed. Furthermore, item 22 was loaded under factor 3 (.434) and factor 5 (.556). The difference was found greater than .10 ( $.434 - .556 = -.122$ ) and the item was selected under factor 5, since .556 was greater than .434. Finally, item 6 was loaded under factor 1 (.445) and factor 5 (.602). The difference was higher than .10 ( $.445 - .602 = -.157$ ). The factor is considered under factor 5. But there was a problem, since the minimum items under each factor should not be less than 4 items, therefore the process was repeated for the PCA. The results of the EFA with 4 factors was observed. At this stage, the new KMO has been generated, the new KMO has increased to .584 with 4 factors. Also, the Sphericity value was found significant. The cumulative outcomes showed a total cumulative variance of less than .50. However, it was very close to .50. Now, at this stage, the scree plot indicated the number of factors (3 factors). The new loaded factors with the number of variables under each factor were checked. Item 22 was loaded under factors 1 and 2. The difference between two items was found higher than .10. Therefore, the item was considered under factor 2. Item 16 was loaded under factors 2 and 3. The difference was found lower than .10. The item showed an overlap and it was deleted. Here, it was also noted that the negative value was ignored under factors. Thus, an exploratory factor analysis was conducted with the orthogonal rotation method. Thus, the final scale consisted of 12 items, which were loaded under three factors. Under factor 1, five items were loaded. Besides, four items were loaded under factors 2; and three items were loaded under factor 3.

## Construct Validity

*Composite reliability:* The composite reliability analysis for all three factors revealed an excellent value which proved the CR reliability.



**Convergence Validity:** To find out the convergence validity the average variance extracted (AVE) was calculated. If the AVE was found greater than .50, it would be stated that the component established the convergence validity. Though, the AVEs outputs demonstrated somewhat low values; however, the CRs for all the three factors were above .70; so, the convergent validity is acceptable for these factors (Hair et al, 2014). If the items explain more errors than the variance in the constructs, the AVE had less than 0.50.

**Discriminant Validity:** According to the Fronell-Larcker (1981) criterion, the correlation between a construct and any other construct must be greater than the square root of the average variance retrieved by the construct. Discriminant validity considered to be proven when this prerequisite met. In the next step, the square root of the AVE was calculated, then the obtained value was compared with the component correlation. Since the square roots of the AVE found greater than the correlation, therefore discriminant validity considered to be established. The data from the correlation matrix of the factors was checked which revealed that the square root of AVEs was greater than the correlations of each component. Therefore, the discriminant validity was established and the tool was considered completely valid and reliable to be used. The final number of items for the present scale to identify the problems & challenges of students in studying through blended learning is 12 items. Then, final reliability coefficient Cronbach's alpha value was calculated which came out as =.612.

## Discussion and Conclusion

The present questionnaire has been based on 5-point Likert-Scale, from strongly disagree, disagree, neutral, agree and strongly agree, coded as 1, 2, 3, 4 and 5 respectively. Further, the interpretation of scoring of the items has been suggested to be done in reverse manner, which indicated that the higher the score of the respondents, lower or lesser the problems & challenges they were facing in blended learning environment; and vice versa. The final number of items for the present instrument was determined to be 12; with the final reliability coefficient Cronbach alpha value as =.612. Accordingly, the present questionnaire with three dimensions (dimension 1=5 items, dimension 2= 4 items, and dimension 3= 3 items) has been found completely valid and reliable to find out the major problems & challenges in the implementation of blended learning instruction which would be significant to manage and enhance the process of implementation blended learning process in Indian context.

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### Annexure 16.3.2

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### Reviewers Memorandum



**Reviewer's Comment 1:** The study demonstrates a well-structured methodology for developing and validating a psychometric instrument to assess students' challenges in blended learning. The use of exploratory factor analysis (EFA) and Monte Carlo PCA for parallel analysis strengthens the reliability and validity of the instrument, ensuring its applicability in diverse educational contexts.

**Reviewer's Comment 2:** This research fills a critical gap in the literature by developing a validated scale specifically tailored to Indian higher education institutions. Although the statistical validation is rigorous, the study could benefit from a larger sample size to further enhance the generalizability of the findings, particularly considering the diverse student demographics in India.

**Reviewer's Comment 3:** The paper is structured logically, making it easy to follow. The explanation of the statistical analyses, including reliability testing and factor validation, is detailed and precise. Yet more in-depth discussion on the practical implications of the findings would strengthen the paper. Specifically, recommendations for policymakers, and educators, on how to mitigate these identified challenges in blended learning environments would add more value to the research.



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**Conflict of Interest:** Author of a Paper had no conflict neither financially nor academically.

### Editorial Excerpt



The article has 0% of plagiarism which is the accepted percentage as per the norms and standards of the journal for publication. As per the editorial board's observations and blind reviewers' remarks the paper had some minor revisions which were communicated on a timely basis to the authors (Noor and Amiteshwar) and accordingly, all the corrections had been incorporated as and when directed and required to do so. The comments related to this manuscript are noticeably related to the theme "**Measuring problems & challenges in the implementation of Blended learning Instruction: Construction and Validation of an Instrument for Students**" both subject-wise and research-wise. The paper is well-written, structured logically, and maintains a professional tone. This research fills a critical gap in the literature by developing a validated scale specifically tailored to Indian higher education institutions. The study's findings contribute valuable insights into the challenges faced by students in blended learning environments, aligning with the National Education Policy (NEP) 2020 and providing a foundation for further empirical research in the domain. After comprehensive reviews and the editorial board's remarks, the manuscript has been categorized and decided to publish under the "**Empirical Research Paper**" category.

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The acknowledgment section is an essential part of all academic research papers. It provides appropriate recognition to all contributors for their hard work and effort taken while writing a paper. The data presented and analysed in this paper by (Noor and Amiteshwar) were collected first handily and wherever it has been taken the proper acknowledgment and endorsement depicts. The authors are highly indebted to others who facilitated accomplishing the research. Last but not least, endorse all reviewers and editors of GJEIS in publishing in the present issue.

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