Factorial Validation of an Academic Environment Scale for Undergraduate Education Students in Jos, Nigeria

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Abstract

This study developed and validated an academic environment assessment scale for undergraduate education students in the Faculty of Education of a University, Nigeria. Dearth of reliable academic environment assessment scale and persistent poor performance of students over the years in Research Methods and Statistics courses prompted the study. Academic variables, such as students' personal dispositions and interactions with the course lecturers, which are intertwined with stress, tension and frustration, are assumed to be contributing factors to success or failure in the courses at the undergraduate level. A sample of 310 students was drawn from a population of 790 final year undergraduate education students in 2013/2014 academic session, using a stratified sampling technique. A 43-item Academic Environment Scale (AES), which sought perceptions of students about their academic environment developed and validated by the researchers, was used for data collection. Data collected were analysed using exploratory factor analysis technique and Cronbach alpha method. The data passed the Kaiser-Meyer-Olkin (KMO) test for adequacy of sample and Bartlett's test of sphericity for suitability of data for factor analysis. The Kaiser's rule (eigenvalue ≥ 1) and scree plot were adopted in extraction of five factors as underlying structure of the instrument. The factors were labeled respect for students, academic guidance to students, commitment to academic work, relationship with lecturers and freedom of learning, based on the description of items that loaded on them. The reliability coefficient of 0.91 was also established for the instrument. The factor analysis and reliability results provided clear evidence for factorial validity and reliability of the instrument. It was recommended, based on the findings, that the instrument should be used for exploring students' perceptions of personal and social academic environment variables and as a valid diagnostic tool for providing guidance and counseling support to students.

Keywords: Factorial validation, academic environment, education undergraduate students, Nigeria

Introduction

The importance of conducive academic environment to sound teaching and learning cannot be over emphasized. The term Academic environment is used interchangeably with learning/school environment in some quarters. Academic environment therefore refers to the totality of the settings in which teaching and learning takes place. It can also be viewed as the atmosphere in which one attempts to learn, which can aid in the learning experience or distract from and diminish it (Psychology Dictionary, 2014). According to Divaris, Barlow, Chendea, et al. (2008) a higher education environment, by definition, should foster both professional and personal development. It

should offer a unique opportunity to cultivate values such as cooperation, volunteerism, service among others to those in need and more. Furthermore, Psychology Dictionary (2014) reiterated that academic environment can greatly aid or considerable diminish students' abilities to study and do well in school. In support of this view, Williams, Persaud and Tuner (quoting Marsden, 2005) stated that safe and orderly class room environment (instructional space) and school facilities (accessories) were significantly related to students' academic performance in school. The three researchers also quoted Glassman (1994), asserting that a comfortable and caring environment among other treatments help to contribute to students' academic performance.

To further support the notion of the impact of academic environment on students' performance in school work, Divaris, Barlow, Chendea, et al. (2008) stated that an ideal educational environment should enable students to acquire the necessary theoretical and interpersonal competencies and expose them to experiences equivalent to the environment in which they are likely to be after graduation. Thus, academic environment comprise both the physical and psychosocial components. The physical components include the classroom, class size, library facilities, the laboratories, lighting, temperature and the location of the school. Psychosocial components, on the other hand comprise of the interactions that exit between the students and the lecturers, interaction between the students and the physical surrounding or components of the school system, as well as their emotion and attitude to academic work.

Literature review reveals that there are different perceptions of the academic environment among authors. Uzoka and Fabiyi (2007) are of the view that academic environment in Nigeria Universities are deficient. They opine that in many universities in the country, there are inadequate classrooms to comfortably accommodate admitted students while the classes available are in poor state, laboratories lack necessary equipment to function and library materials are obsolete. They also

noted that adequate funds are not provided to pursue research activities which are the focal point of university education.

Furthermore, Okwilagwe, (2004) stated that there also exit low level of commitment to academic work by students and lecturers, poor academic relationship, lack of respect and personal attention to students, little or no academic guidance in our tertiary institutions. In support of this, Orlu (2010) and Ali (2013) stated that poor interaction/relationship between teachers and students is another environment variable which affect students' performance in our tertiary institutions. Furthermore, Nwogu (2012) stated that academic/learning freedom in Nigerian tertiary institutions is faced with a lot of hurdles. He reiterated that both students and lecturers do not enjoy full liberty to inquire, carry out critical thinking and publish research findings. Also, Kenny (2014) stated that there is little or no academic guidance for many students in Nigerian tertiary education. He noted that often, guidance services are thin on the ground, with students not having access to the range of services they require to make informed educational decision this thus affect their academic performance. Thus, this work emphasis was laid on the psychosocial aspect of the school environment.

The theory that provided theoretical basis for the explanation of the influence of the academic environment on the learning process and performance of students is Ecological Systems Theory developed by Urie Bronfenbrenner in 1977. The theory examined purely physical elements of school environment to more complex models of psychosocial relations between students in the classrooms as well as between the teacher and students. The theory assumes that the school environment consists of four environment systems: Microsystem, Mesosystem, Exosystem and Macrosystem. In his model, the center is the student surrounded by different systems. The microsystems are the immediate settings in which the child lives, such as school. Mesosystems represent the relationships between different microsystems and the people in the microsystems. The exosystem includes the social organizations, agencies, and services which the child does not have

direct interaction with. Macrosystems are attitudes and ideologies of the culture in which the child lives. In Bronfenbrenner's theory, there is one more layer, which is not cited in every resource, called the chronosystem which represents "the patterning of environmental events and transitions over the life course, as well as socio-historical circumstances" (Santrock, 2001, p. 47).The theory further stated that there is a strong, positive relationship between students' level of commitment to their studies and their perceptions of the classroom environment (Miller and Cunningham, 2011). Thus, the theory lays emphasis on the importance of teachers, school and the larger sociocultural environment on the developmental learning process of the learner. It concluded by associating academic environment variables with numerous positive and negative students' outcomes.

The purpose of the study was to develop and validate a scale that should be used as a diagnostic tool for improving psychosocial academic learning environment variables in order to enhance performance of undergraduate education students in the University. In order to achieve this purpose, the following research questions were raised:

1. What is the factor structure of the Academic Environment Scale?

2. What are the dimensions of the Academic Environment Scale?

3. What are the internal consistencies of Academic Environment Scale (AES) and its subscales?

Method

The study was an instrumentation research that dealt with the development and factorial validation of an academic environment scale for undergraduate education students of the University of Jos, Nigeria. The population of the study comprised 790 undergraduate education students from different departments in the Faculty of Education at the University of Jos in 2013/2014 academic session. Data was collected from a sample of 310 undergraduate education students from different units in the Faculty of Education at the University of Jos. Stratified and simple random sampling

techniques were used for the selection of sample from the population. The choice of these sampling techniques is to ensure equal and independent probabilities of selection of the elements of the population from the different units of the Faculty to be included in the sample. This was necessary since students were distributed into different departments.

The items of the instrument were developed by the researchers after extensive review of relevant literature. However, relevant items of the Academic Environment Scale (AES) in the areas of commitment to academic work by students/ lecturers, relationship with lecturers, freedom in students learning, academic guidance students, personal attention to students and respect for students were adapted from the works of Okwilagwe (2004); Gaff, Crombag, and Chang, (1976); and Ramsden (1979). To ensure the validity of the instrument, construct validity was established. The choice of construct validity became necessary because it provides basis for establishing the extent to which academic performance of students can be interpreted in terms of certain psychological constructs such as commitment, relationship, freedom, guidance, respect and attention used in the study.

The data collected were analyzed using the Statistical Package for Social Science (SPSS) software. Responses from the instruments were coded and analysed. Factor analysis was used to determine the factor structure of the instrument, while reliability analysis was run to determine the Cronbach alpha coefficient of internal consistency reliability the scale and its subscales.

Results

To establish the factor structure of the Academic Environment scale for undergraduate education students, Exploratory Factor Analysis (EFA) was carried out. EFA was used to explore possible underlying factor structure of a set of observed variables without imposing preconceived structure on the outcome (Williams, Brown, & Onsman, 2010).

Data screening was done with the use of Pearson Correlate Coefficient Matrix with the aim of determining the pattern of relationship among the items of the instrument. The determinant for correlation matrix for the Scale was 6.87E-011 (0.000687), which is greater than the necessary value of 0.00001. Therefore, multicollinearity was not considered to be a problem for the data. Since all the items of the scale correlate fairly well and none of the correlation coefficients are particularly large, no factor was eliminated at this stage. Furthermore, Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were used to assess the suitability of the data for factor analysis. The KMO index for the scale was 0.81 indicating that the correlation matrix was factorable. The Bartlett's test for this scale is highly significant ($p< 0.001$), and therefore factor analysis is appropriate (Field, 2005).

Principal Components Analysis (PCA) was conducted to confirm the appropriate number of factors to be extracted. Thompson and Daniel (1996) recommended the use of multiple criteria for factor extraction. They include Kaiser's criterial (eigenvalue> 1 rule, Kaiser, 1960), Scree test (Cattell, 1966), cumulative percentage variance extracted (Harn, 1965) and 50-60% explained variance threshold for stopping extraction of factors (Hair, Tathan & Black, 1995). The PCA was run using 43 items and 12 factors were extracted accounting for 68.41% variance. This simply means that the 12 factors that loaded with eigenvalue greater than 1 are responsible for 68.41% of variations in students' response in terms of their perceptions of the academic environment. Factor 1 contributed the highest percentage variance of 23.41% with eigenvalue of 10.01, while factor 12 contributed the least percentage variance of 2.34% with eigenvalue of 1.01. The summary of this is presented in Table 1.

Table 1

Percentage Cumulative Variance for the scale on Research Statistics

Factors	Eigenvalue	% of variance	Cumulative %
1.	10.07	23.41	23.41
2.	3.65	8.48	31.89
3.	2.75	6.40	38.29
4.	2.12	4.92	43.22
5.	1.80	4.18	47.40
6.	1.66	3.85	51.25
7.	1.45	3.37	54.62
8.	1.38	3.22	57.84
9.	1.27	2.94	60.78
10.	1.20	2.79	63.57
11.	1.08	2.50	66.07
12.	1.01	2.34	68.41

The elbowing point in the scree plot occurred between 5th and 6th components, with 47.40% of the variance accounted for by the first-five components (all with eigenvalues >1.0). The scree plot is shown in Figure 1. The researcher chose the fifth factor based on Kaiser (1974) recommendation.
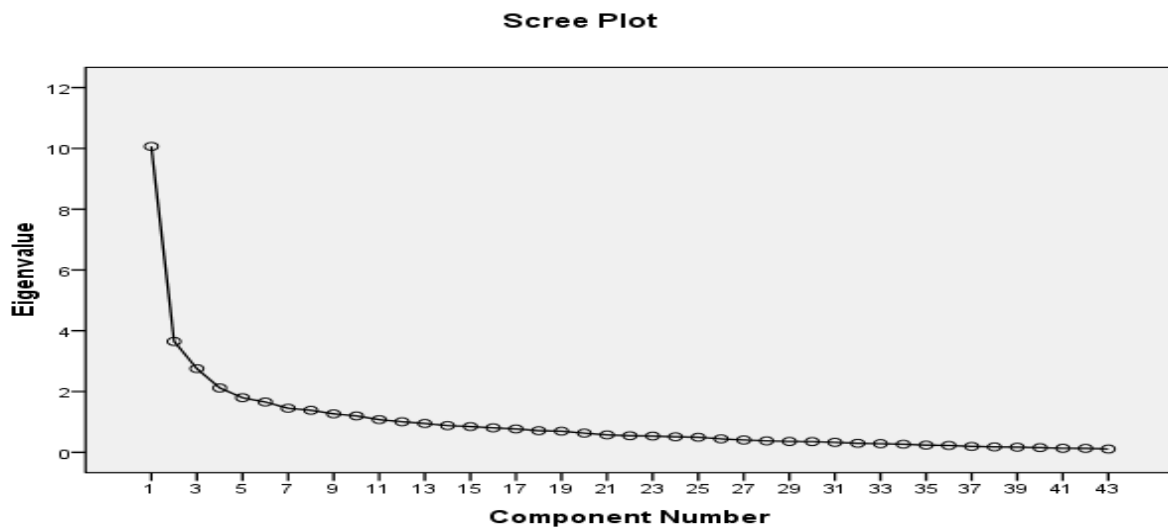

Figure 1   Scree plot for Academic Environment Scale (AES) for Research Statistics

Therefore, since the items were uncorrelated Orthogonal Varimax rotation method was employed. The result in the Table 2 shows that the items loadings less than 0.40 were excluded; the analysis yielded a five-factor solution with a simple structure (factor loadings ≥ 0.40). Thus, the items

that do not load on any factor and those that loaded on several factors (1, 2, 3, 4, 5, 6, 14, 18, 21, 22, 23, 32, 36, 37 and 38) were considered complex and discarded. The items that loaded on a factor were carefully studied and label appropriately based on the underlying tune of the items. Table 9 contains the detail of items that loaded on each factor.

Five items (39, 40, 41, 42 and 43) loaded on Factor 1. The items which loaded on this factor relate to respect given to students by lecturers. Thus, this factor was labeled "Respect for students by lecturers". Six items (28, 29, 30, 31, 34 and 35) loaded on the second factor. These items reported guidance given to students. This factor was named "Academic guidance to students". The seven items (7, 8, 9, 10, 11, 12 and 13) that loaded on factor three reported students' and lecturers' commitment to the teaching and learning. The factor was labeled "commitment to academic work". The six items (15, 16, 17, 19, 20 and 33) that loaded on factor four reported the level of relationship between lecturers and students. This factor was labeled "Relationship with lecturers". Four items (24, 25, 26 and 27) loaded on the fifth factor. These items reported students' freedom in learning. Thus, this factor was named "freedom in students' learning".

The dimension of the Academic Environment Scale was presented in Table 3. This gives a brief description of the components of the scale. It also contains the list of items that loaded on each factor. The reliability of the AES was determined using Cronbach coefficient alpha. The coefficients of internal consistencies are presented in Table 4. The reliability coefficient obtained for the instrument was 0.91, which was judged to be high and adequate (Fraenkel and Wallen, 1993). The estimate further shows that the items on the instruments were quite homogeneous and reliable.

Table 2

Rotated Component Matrix for 28 items

Components	1	2	3	4	5
Q42: Needs	0.832				

Q41: Feelings	0.821			
Q43: Recognition	0.774			
Q39: Adequate time	0.746			
Q40: Commitment	0.448			
Q30: Feedback		0.759		
Q35: Attention		0.703		
Q29: Proper guidance		0.671		
Q31: Supervision		0.659		
Q28: Discussion		0.649		
Q34: Intellectual development		0.410		
Q12: Adequate preparation			0.799	
Q10: Punctuality			0.712	
Q9: Innovation			0.675	
Q11: Commitment			0.659	
Q13: Steadfastness			0.624	
Q8: Dedication			0.558	
Q7: performance			0.430	
Q15: Interest				0.712
Q16: Needs				0.680
Q17: Aspiration				0.596
Q20: Academic support				0.554
Q19: Emotional support				0.542
Q33: Approachability				0.473
Q26: Skills of analysis				0.771
Q25: Advancement in knowledge				0.747
Q27: Critical inquiry				0.738
Q24: Liberty				0.687
Number of items	5	6	7	6	4

Table 3

Dimension of Academic Environment Scale for Undergraduate Education Students

S/N	AES Subscale	No. of items	Description	Items

1	Respect for students	5	Recognizing and respecting students uniqueness, needs and feelings, showing commitment to teaching as well as allocating adequate time to students to solve their problems	39, 40, 41, 42, 43
2.	Academic Guidance to students	6	Personal attention and guidance given to students by way of supervision, feedback and listening to their view	28, 29, 30, 31, 34, 35
3.	Commitment to academic work	7	Dedication to duty by lecturers expressed through innovative way of teaching and commitment, adequate preparation, punctuality and steadfastness	7,8,9, 10, 11, 12, 13,14
4.	Relationship with students	6	Responsiveness to students needs expressed through being sensitive to their needs and aspirations, support through encouragement and being approachable	15, 16, 17, 19, 20, 33
5.	Freedom in students learning	4	Freedom of learning expressed by allowing students to source for additional learning materials, develop skills of critical inquiry and express interest	24, 25, 26,27
	Total	**28**		

Table 4

Internal Consistency Reliability Coefficients for Academic Environment scale (AES) and sub-scales

	AES Sub Scales	Number of items	Internal Consistency (α)
1.	Respect for students by lecturers	5	0.85

2.	Academic guidance to students	6	0.85
3.	Commitment to academic work	7	0.81
4.	Relationship with lecturers	6	0.83
5.	Freedom in students' learning	4	0.78
	AES	28	0.91

Discussion

For research question one, the factors that were found to best approximate simple structure in terms of achieving easy interpretation were five and they accounted for 47.40% of the total variance in the perceptions of academic environment factors for Education students. Therefore, the resulting factor structure of the Academic Environment Scale (AES) is corroborated by those of Okwilagwe (2004) and Gaff, *et al* (1976) except for some dimensions not represented in the scale. The differences could be attributed to divergent cultural background as one of the studies was carried out in Europe.

Finding on reliability analysis for research question three presented in Table 4 shows that the instrument is reliable. The reliability coefficient of the instrument is 0.91, which is judged to be high and adequate (Fraenkel and Wallen, 1993). The estimate further shows that the items on the instruments were quite homogeneous and reliable. The implication of this is that the instrument is reliable and can be used to measure the perceptions of Education students of their academic environment factors overtime in that the instrument will yield consistent results on the constructs measured. Since the Academic Environment Scale (AES) for Undergraduate Education Students is a valid and reliable instrument, it is recommended for use by any researcher who intends to collect data on students' perception of their academic environment factors within the University of Jos and beyond. It can also be used as a valid and reliable diagnostic tool to identify the cause of academic

failure in any course of study and for improving psychosocial academic learning environment variables in order to enhance performance of undergraduate education students in the course.

Conclusion

The purpose of this study was to develop and validate an academic environment scale undergraduate education students in the Faculty of Education, University of Jos. The study was motivated by dearth of valid and reliable academic environment scales and persistent poor performance of students in Research Methods over the years. Principal Components Analysis (PCA) was conducted to confirm the number of factors to be extracted. Five factors were extracted for the instrument and each of the factors was labeled based on the description of items that loaded on them. The reliability coefficient of the instrument was 0.91. Based on the findings of the study, it was concluded that the Academic Environment Scale (AES) for undergraduate education students is a valid and reliable academic environment scale, which can be used to collect data on students' perceptions about their psychosocial academic environment variables. The data collected would be useful to lecturers and students in making necessary adjustments in their behavior and practices in order to improve students' performances. It was recommended, based on the findings, that the instrument should be used for exploring students' perceptions of personal and social academic environment variables and as a valid diagnostic tool for providing guidance and counseling support to students.

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