Science Students' Perception of Learning Environment and Its Impact on Their Performance

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The Asian Conference on Education 2023
Official Conference Proceedings

Abstract
In majority of schools, primary, secondary or tertiary, Learning Environment is being presented to be made up of only the curricular activities, undermining the co-curricular and extra-curricular activities. Whereas, Learning Environment as classroom social climate is not made up of only the learning aspect of the school, but also the interaction between the students and their teachers, the teaching-learning activities of the classroom, as well as the laboratories. Hence, this study investigates some science students' perception of their learning environment and its impact on their performance. The population of the study is all science students of all Colleges of Education in three Southern States of Nigeria. Sample for the study include all 200 level students offering five chosen science subjects in a College of Education each from the three states. Learning Environment Inventory (LEI) and data obtained from school's record of students' performance were the instruments employed in the study. The finding shows that the more positive the students perceived their learning environment, the higher their performance. It is therefore recommended that learning environment instrument be used in assessing the relationship between teachers and students, as well as the environment of learning institutions.

Keywords: Students, Perception, Learning Environment, Performance

Introduction

The academic study of the school environment, commonly called institutional research, offers invaluable insights for other researchers to make objectives operational. Researchers can show significant effects, clarify relationships, and expose consequences using analytical tools. For instance, class size may correlate with teaching methods, producing significant learning outcomes (Fraser, 1998).

The learning environment is complex, encompassing more than just the interaction between students and their teachers or tutors. It includes the teaching-learning activities of the classroom and the availability of appropriate facilities, such as laboratories, and extends beyond the physical school structure to include all activities. In schools with residential students, the learning environment also includes the physical campus, classroom activities (co-curricular activities), extracurricular activities, and the activities in the hostels. This comprehensive approach ensures that all aspects of the learning environment are considered, providing a holistic view of education in Nigeria –from primary through secondary to tertiary (Nwambam et al., 2018).

Understanding the students' perspective is a crucial aspect of education research. This study explores how students in Southwestern Nigeria perceive their learning environment. We will explore their sense of cohesiveness, speed of the class, equipment availability, difficulty in understanding, and satisfaction, which are all scales on the Learning Environment Inventory (LEI) (Fraser et al., 1982) (Fraser, 1998). Furthermore, we aim to establish whether a correlation exists between the learning environment and student achievement (Goh & Khine, 2002). By doing so, we hope to provide valuable insights that can be used to enhance the learning environment and, ultimately, student achievement.

Population

The population comprises all students offering the five chosen science subjects used in the study as teaching subjects in the chosen colleges of education.

Research Design

The study was carried out in three Colleges of Education in South-West Nigeria. The institutions are of higher education and award professional certificates to their graduates after three academic sessions using the same curriculum. The certificate awarded is the National Certificate of Education (N.C.E.), which makes the graduates professional teachers. The classroom perceptive approach to the learning environment was used in the study.

Sample

This comprises six hundred and six (606) second-year students of the chosen colleges. The students chosen are those offering science subjects (Biology, Chemistry, Physics, Mathematics, and Agricultural Science) as main teaching subjects along with Education, which is the principal and compulsory subject offered by all students. The second-year students were chosen because they have been in the colleges for more than three semesters and will be able to respond better to the items on the instrument than the first-year students who, at the time of the study, have not spent two semesters in the colleges. Third-year students were excluded from the study because they were in their final examination period.

Sampling Technique

Random sampling was used to select six hundred six (606) students offering the five chosen science subjects in the three Colleges of Education.

Sources of Data:

The primary source through which data was obtained is an inventory. Each student was given an inventory to respond to; the responses were quantified to obtain scores. The score of each student in the chosen science subjects in the first-semester examination of the 2020/2021 Academic Session was also obtained for the researcher to know the students' Academic performance in the perceived learning environment.

Instrument

The instrument is an inventory of the learning environment of the students referred to as the Learning Environment Inventory (LEI). The Learning Environment Inventory (LEI) is a well-established instrument designed to measure the social climate of learning within a classroom as perceived by its students. As an expansion and improvement of Walberg's (1966) Classroom Climate Questionnaire (C.C.Q.), the LEI encompass 18 scales that capture the nature of interpersonal relationships within the class, as well as the structural characteristics of the learning environment.

However, five scales constitute the LEI used for this study. The inventory has two parts. The first part covers personal information about the students – Name, Year of Study, and Subject. The second part consists of thirty items covering the five chosen scales. The students are expected to read each item and respond to each by putting a tick (✓) under the chosen option on the four-point scale to show the extent of their agreement or disagreement with each item. Six items were written for each scale for a consistent internal rating.

The scales are:

Cohesiveness: It is the intimacy that develops when several individuals interact for some time and separate group members from non-members.

Speed: This is the class's progress rate and tells how well the teacher can communicate with and adapt to the group's needs.

Equipment: These are learning materials available and provided during the teaching-learning process.

Difficulty: Difficulty in understanding shows how each student feels that he is learning in terms of ease, effect requirement, skill, or ability about the students.

Satisfaction: This shows whether students like or dislike the science subject they are offering, the teacher, classmates, or the class as a whole. Some of the items on these scales were modified, making the instrument an adapted form of the original LEI developed by Walberg & Anderson in 1968, which was revised in 1969.

Data Analysis

The data reported is based on a 1 to 4 score for each item. Strongly disagree is scored 1, disagree is scored 2, agree is scored 3, strongly agree is scored 4. Each student's score on any scale is based on adding scores for each item in the scale. Since each scale consists of six items, the range of scores on a scale is 6 to 24.

Krippendorff's (2011) alpha reliability shows the extent to which an individual respondent responds similarly to each item on the scale, that is, the internal consistency of each scale.

Table 1: Scale Reliability

Scale	Reliability (Co-efficient)
Cohesiveness	0.51
Speed	0.10
Equipment	0.41
Difficulty	0.44
Satisfaction	0.70

To describe the responses of students in each class offering the same subject to each scale, the percentage of low and high responses for each scale in each class was calculated and shown in the following tables.

Table 2: Frequency percentage of low and high responses for cohesiveness scale

Class	Low	High
Physics	-	100
Chemistry	-	100
Biology	-	100
Mathematics	5.9	94.1
Agricultural Science	10.4	89.6

All the respondents (students) in the Physics, Chemistry, and Biology classes had total scores of responses ranging from 13 to 24, which shows that all the respondents agree with the items on the scale. 5.9 and 10.4 percent had total scores for responses ranging from 1 to 12 in Mathematics and Agricultural Science classes, respectively. These two figures are the percentage of respondents who disagree with the scale items.

Table 3: Frequency percentage of low and high responses for speed scale

Subject	Low	High
Physics	19.0	81.0
Chemistry	12.0	87.9
Biology	38.9	61.1
Mathematics	11.3	88.7
Agricultural Science	6.5	93.5

In all classes, a minimum of 6.5 percent and a maximum of 38.9 percent of respondents having total scores ranging from 1 to 12 were recorded. These show the lowest and highest percentages of students who disagree with the speed scale items, which were recorded in Agricultural Science and Biology classes, respectively.

Table 4: Frequency percentage of low and high responses for equipment scale

Subject	Low	High
Physics`	76.2	23.8
Chemistry	57.6	42.4
Biology	44.4	55.6
Mathematics	62.7	37.3
Agricultural Science	64.9	35.1

Only the Biology class has less than 50 percent of the total respondents having total scores ranging from 1 to 12; all others have the majority of the respondents scoring low on the LEI scale. This shows that the science classes could be better equipped by the respondents. The respondents may usually be only allowed to use or come in contact with the equipment on their own in Biology classes, where a proportion of over 50% responded highly to the equipment scale.

Table 5: Frequency Percentage of low and high responses for difficulty scale

Class	Low	High
Physics	9.5	90.5
Chemistry	12.1	87.9
Biology	33.3	66.7
Mathematics	7.5	92.5
Agricultural Science	25.0	75.0

The biology class recorded the highest number of respondents having low total responses on this scale. This shows that 33.3 percent of the total respondents in the biology class disagree with items on the scale. This class was followed by the Agricultural Science class, with 25 percent of the respondents disagreeing with items on the scale. Most students in the remaining three classes agree with items on the difficulty scale.

Table 6: Frequency percentage of low and high responses for satisfaction scale

Class	Low	High
Physics	14.3	85.7
Chemistry	6.1	93.9
Biology	Nill	100
Mathematics	11.5	88.5
Agricultural Science	7.9	92.1

All the respondents in the Biology class had high total scores for responses on the satisfaction scale, which is a total score between 13 and 24. This shows that they all agree with the items on the scale, and most of the respondents in the other classes also agree with the items on the scale.

For all the scales, a more significant percentage of the respondents responded highly to each subject except for the equipment scale.

As a measure of item validity, each item was correlated with the scale to which it belongs using the total number of respondents (606). The coefficient values shown in Table 7 were obtained for the items on the LEI scale used.

Table 7: Correlation of Items with scales

Item	Correlation value
1.	0.34
2.	0.53
3.	0.33
4.	0.54
5.	0.66
6.	0.58
7.	0.45
8.	0.40
9.	0.61
10.	0.61
11.	0.55
12.	0.53
13.	0.37
14.	0.16
15.	0.58
16.	0.51
17.	0.32
18.	0.49
19.	0.48
20.	0.44
21.	0.53
22.	0.29
23.	0.30
24.	0.34
25.	0.68
26.	0.48
27.	0.30
28.	0.41
29.	0.42
30.	0.32

The validity of an item is the extent to which the interpreted results of a test is warranted, the extent to which it fits the scale on which the item is put Kimberlin & Winterstein (2008).

One item on the difficulty scale just slightly measures what it is expected to measure (item with correlation value of 0.16). Two items on the cohesiveness and satisfaction scales have low correlation values, three items on equipments and difficulty scales have low correlation values. All other items on the LEI scales have been shown to measure what they are supposed to measure substantially.

Table 8: Number of respondents used for each subject

Subject	Number of respondents
Physics	63
Chemistry	96
Biology	54
Mathematics	162
Agricultural Science	231
Total	606

Raw scores were obtained for each student in each class being used in the study in three courses taken in the first-semester examination of the 2020/2021 Academic Session. Two courses carry three credits each, and the third carries two credits. The weighted means of the scores were then calculated for each student by multiplying the raw score obtained by the students in the various courses by the number of credits each course carries. All these figures were added and divided by 8, the total number of credits for the three courses. This resulted in the weighted mean for each student in the subject.

To know the mean achievement score of all the students in each subject used for the study, the weighted means of all the students in each subject were added and divided by the total number of respondents. The mean achievement score and standard deviation values for each class are shown in Table 9.

Table 9: Mean Achievement and Standard Deviation Values for subjects

Subject	Mean Achievement Score	Standard Deviation
Physics	48.43	7.22
Chemistry	56.84	7.64
Biology	52.56	8.18
Mathematics	40.32	13.63
Agricultural Science	58.44	9.68

The standard deviation shows the amount of variability of all the scores in a distribution (sample in this study). Relating the sample sizes to the mean achievement scores obtained, it can be said that the smaller the sample size, the higher the achievement and the lower the variability among scores though this has been proved otherwise by the mean achievement score in Agricultural Science sample. However, the mathematics sample proves that the lower the mean achievement score, the higher the variability among students scores in the class.

Taking a mean achievement score of 40 as the pass mark, it will be observed that the mathematics class has the least mean achievement score of 40.32 which is just a little above pass mark chosen though the mathematics sample is not the largest sample.

Four null hypotheses were tested in the study and they are stated below:

1. There will be no significant relationship between cohesiveness and the performance of science students.
2. There will be no significant relationship between speed of the class and the performance of science students.
3. There will be no significant relationship between difficulty in understanding and the performance of science students.

4. No significant relationship will exist between satisfaction and performance of science students.

Table 10: Observed values of scale correlated with achievement scores

Scale	Observed
Cohesiveness	0.163
Speed	0.195
Difficulty	0.325
Satisfaction	0.865

An alpha (α) level of 0.01 r should be 0.0972 to be significant. All observed r values were more outstanding than 0.0972; thus, all the null hypotheses were rejected.

The alternative hypotheses were accepted that a significant relationship exists between the scales and achievement scores. This means that the scales show a pattern of relationship with achievement.

The difficulty scale also gives this type of meaning to its relationship pattern with achievement, which is only sometimes the case in a practical sense.

Finding of the Study

The reliability values obtained using coefficient alpha 8 ranged from 0.1 to 0.7, the highest being the satisfaction scale and the lowest the speed scale. These values show the extent of internal consistency of the scales on the LEI used.

The students' responses to each of the scales in the LEI showed that a more significant percentage of the students responded highly to the scales for each subject except for the equipment scale. This means that the students' learning environment agreed with the items describing the environment on the other four scales of LEI used. In contrast, the environment needs more equipment, or students are usually not allowed to come in contact with the instruments alone.

In biology alone, over 50% of the respondents agree with equipment availability for students. Respondents to all the scales in all other subjects disagreed with equipment availability, thus agreeing with the unavailability of equipment for the subject.

Most items in the LEI used were found to be valid. There are a few cases where the correlation values obtained from the correlation of each item with the scale it belongs to are low, indicating low validity of the items.

It was also found that there was a significant relationship between the cohesiveness, speed, difficulty, and satisfaction scales with the students' achievement.

The scales were identified as independent variables, while achievements were identified as the dependent variable.

Conclusion

The perceptual approach that entails recording or reporting by an individual with direct experience with the environmental situation over time will enable an individual to give a better and more reliable report/judgment of the environment he is describing. The use of the Learning Environment Inventory LEI in assessing class environments has undoubtedly contributed to the perceptual approach to measuring the classroom climate.

Recommendations

- Learning environment instruments should be used in assessing the relationship between teachers and students since this also affects students' academic performance. The findings will provide teachers feedback on improving relationships with students for higher academic performance.

- Instruments for measuring the environment of learning institutions should be used in institutions of learning and the various fields of learning. The findings will point out defects in the institution's programs and administration patterns, and improvement methods can be suggested.

Acknowledgement

I would like to express my sincere gratitude to the organizers of the Asian Conference on Education who availed me the opportunity to contribute my quota to the world's education through my research and writing. I would also like to thank Dr Olufunmilola T. Yekinni for her unwavering insight, support and guidance which were instrumental throughout this research. Also, Engineer Idogwu Kingsley for his contribution in making sure that this paper is up to standard. I am deeply grateful to the anonymous reviewers whose feedback through their comments and suggestions on the manuscript made the research come out as a stronger piece.

Finally, I would like to thank my family members for their invaluable support, belief and encouragement which served as motivation throughout this journey. The completion of this work would not have been possible without the collective contributions of the individuals and organization mentioned above. I am deeply honored to have had the opportunity to work with them

References

Fraser, B. J. (1998). Classroom environment instruments: Development, validity and applications. *Learning environments research*, *1*, 7-34.

Fraser, B. J., & Walberg, H. J. (2005). Research on teacher–student relationships and learning environments: Context, retrospect and prospect. *International Journal of educational research*, *43*(1-2), 103-109.

Goh, S. C., & Khine, M. S. (2002). *Studies in educational learning environments: An international perspective*. World Scientific.

Kimberlin, C. L., & Winterstein, A. G. (2008). Validity and reliability of measurement instruments used in research. *American journal of health-system pharmacy*, *65*(23), 2276-2284.

Krippendorff, K. (2011). Computing Krippendorff's alpha-reliability.

Nwambam, A. S., Nnennaya, O. O., & Nwankpu, I. S. (2018). Evaluating the entrepreneurship education programme in Nigerian universities for sustainable development. *Journal of entrepreneurship education*, *21*(1), 1-13.

Walberg, H. J., & Anderson, G. J. (1968). Classroom climate and individual learning. *Journal of educational Psychology*, *59*(6p1), 414.

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