

Speech Intelligibility And Good Sightline For Vision In Lecture Hall Acoustics As A Determinant For Effective Learning/Teaching Environment

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Abstract: The study investigated whether speech intelligibility from the teacher and good sightline for vision in lecture hall acoustics as determinant for effective teaching/learning environment. 300 students out of a total of 522 lecture hall seating capacity at the Federal college of Education (Technical), Omoku; Rivers State, Nigeria was used for the study. Instrument for data collection was the questionnaire that addressed what constituted indicators for speech intelligibility and good sightline for vision in lecture halls. Data was analyzed using the arithmetic mean and standard deviation and Z-test for two independent groups mean at 0.05 level of significance. The findings revealed that, in the opinion of the students, speech intelligibility and good sight line for vision were determinants for effective teaching/learning environment. The Z-test also indicated that, there was no significant difference in the mean response scores of the students. The implication was that, students were not afforded good speech intelligibility and sight line for vision. It was recommended that, the internal space of the lecture halls should be carefully designed for effective distribution of speech intelligibility; and good sight line for effective teaching/learning environment.

Index Terms: Sightline, Environment Speech, Intelligibility, Acoustics, Inappropriate, Teaching/learning,

INTRODUCTION

Lecture halls are primarily used for speech, and the intelligibility of the speech to the students of what the teacher is teaching is a top priority. Where the space is used for lectures, the students rightfully expect to understand every single word uttered by the teacher^{[1][2]}. In the absence of sound amplification or electronic aid, the larger the lecture hall space is the more effort the teacher must exert in order to make himself understood in every part of the lecture hall particularly the remote seats. Consequently, the students at the remote seats are also expected to strain their ears to hear what the teacher is teaching. In addition, students in the remote parts of any lecture hall are also expected to have good sight line without any obstruction^[3] to enable them see the chalk or white board, and the teacher. Otherwise, the students at the remote back row seats shall also strain their necks to see the chalkboard or white board. Acoustics on the other hand, is the science of sound which deals with origin, propagation and auditory sensation of sound, and also with design and construction of different building units to set optimum conditions for producing and listening to speech, music and so on [4]. Therefore, when the teaching/learning environment is appropriately designed acoustically, the learning space becomes life, speech intelligibility will be obtained and good sight line is assured.

The problem of speech intelligibility and good sightline for vision is the lack of attention given to it. This may be as a result of ignorance on the part of school administrators who only believe that any room space that can accommodate more than 100 students is a lecture hall; and therefore, the attendant acoustical problems that affect the teaching/learning environment do not deserve special consideration. The perceived acoustical problems in a lecture hall which are lack of speech intelligibility and good sightline for vision occur due to inappropriate acoustical design of the hall. When there is inappropriate design of lecture halls: the enclosure may not provide the needed sound reinforcement and thus speech intelligibility is impaired; and students at the remote seats at the back of the lecture halls may become passive listeners because those at the front row seats also obstruct them. This may cause sound attenuation, reduced hearing and impaired sight-line for vision. From the foregoing, this study became more relevant considering the fact that effective teaching/learning environment may not be achieved if the lecture halls cannot provide appropriate sound distribution for speech intelligibility and good sight-line for vision. The main objective of study was to investigate whether speech intelligibility and good sightline in lecture hall acoustic are determinants for effective teaching/learning environment. Specifically, it tried to find answers to the following research questions:

1. What is the opinion of students that, speech intelligibility in from the teacher in lecture halls is a determinant for effective teaching/learning environment?
2. What is the opinion of students that, good sightline of the chalk/whites board and the teacher in lecture halls is a determinant for effective teaching/learning environment?
3. Will there be any significant difference in the opinion of students that, speech intelligibility and good sightline in lecture halls are determinant for effective teaching/learning environment.

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METHODS

The study was a descriptive survey design; and results provided a basis for the establishment of significance difference and a relationship between the independent and the dependent variables. The study was conducted at the Federal College of Education (Technical), Omoku, Rivers State, Nigeria; and Multi-purpose hall with a volume of 882 m³ and a seating capacity of 522 of students was used for the study. A total of 300 students were randomly sampled from the two lecture halls. Data for the study was collected through questionnaire with seven question items. The first three question items dwelt on sound distribution and the remaining four question items dwelt on sight-line for vision. Each question item has four answer options of strongly agree (SA), agree (A), disagree (D) and strongly disagree (SD). The students are expected to tick or encircle any of the answer options that give them a correct perception of the effect of inappropriate acoustical design of lecture halls on effective teaching/learning in relationship to the questionnaire items. All the questionnaires administered were returned. All the questionnaire items were subjected to scrutiny by professional colleagues and were found to be valid. Further, the questionnaire items were pilot tested using 30 students other than the ones used for this study in the same lecture halls. The Cronbach alpha Co-efficient was used to determine the reliability of the questionnaire items. The reliability value was 0.63. Data for the study were analyzed using the arithmetic mean to establish the students' opinion on whether; speech intelligibility and good sightline for vision are determinants for effective teaching/learning environment. Using the four point scale, the decision rule assigned to the students' perception response scores were Strongly Agree (3.50-4.99); Agree, (2.50-3.49); Disagree, (1.50-2.49); and Disagree, (1.00-1.49). In addition, the Z-test of independent group means at 0.05 significance level for two-tailed was used test to establish whether there was any significant difference in the opinion of the students that, speech intelligibility and good sightline for vision are determinants for effective teaching/learning environment. The decision rule was that, where the calculated value of the test in the null hypothesis is equal to or greater than the critical table value, reject the null hypothesis, and if it is otherwise, do not reject the hypothesis.

RESULTS

The results of the students' response scores that, speech intelligibility from the teacher in lecture halls was a determinant for effective teaching/learning environment were presented in Table 1. In the results, it was the opinion of the students that, speech intelligibility from the teacher in lecture halls is a determinant for effective teaching/learning environment with Grand Mean (X_G) response scores of 3.35. The Grand Mean Standard Deviation (X_G) of 0.92 for the students' responses was small, and clustered together. This indicated that, the students' perception responses had a small variability, and therefore homogeneous.

Table 1: Students' mean response scores on speech intelligibility

Items SD _A	X_A
The teacher is required to talk out loudly for the students at back row seats hear him while teaching 0.84	3.52
The teacher is required to dictate out loudly the lesson to enable the students at the back row seats to take the notes correctly 0.84	3.56
During lectures, echoes experienced in the lecture hall affects hearing 1.08	2.98
Grand mean responses (X_G) 0.92	3.35

In addition, the results of the students' response that, good sight-line for vision of the chalk/white board and the teacher in lecture halls is a determinant for effective teaching/learning environment were present in Table 2. The results of Grand Mean (X_G) response scores of 2.87 was an indication that, it was also the opinion of the students that, good sight-line for vision of the chalk/white board and the teacher in lecture halls was a determinant for effective teaching/learning environment. Also, the Mean Standard Deviation (X_G) of 1.08 for the students' responses was also small, and close to the mean. This showed that, the students' perception response scores had a small variability, and therefore homogeneous. Presented in Table 3 was the results of the hypothesis on whether, there was any significant difference in the mean response scores of students that, speech intelligibility from the teacher and good sightline for vision were determinants for effective teaching/learning environment. The Z-calculated of 0.081 was less than the Z-table value of 1.645, indicating that there was no significant difference in mean response scores of students that, speech intelligibility from the teacher and good sightline for vision were determinants for effective teaching/learning environment. And the null hypothesis was not rejected at $P \leq 0.05$ and degree of freedom of 598.

Table 2: Students' mean response scores on good sightline for vision

Items SD _A	X _A
Students at the front row seats obstruct the view of those at the back row seats from seeing the chalkboard or whiteboard or the teacher 1.12	2.52
Not seeing the teacher or the chalk or white board reduces the level of understanding what the teacher is teaching 1.11	2.79
Since the students at the back row seats do not see the teacher or chalk or white board, they crowd the front row seats, thus exceeding the number meant for the seats 0.95	3.14
Crowding the front row seats affects students smooth note taking 1.09	3.03
Grand mean responses (X _G) 1.08	2.87

Table 3: Z-test for mean students' response scores on speech intelligibility and good sightline for vision

Assessed variables Z- table	X	SD	df	Z-Cal.
Speech intelligibility	3.35	0.91		
Good sightline for vision		2.87	1.07 298	0.081
	1.645			

DISCUSSIONS

The findings showed that, during lectures, not all the students, especially those at the back row seats hear the teacher properly because the speech from the teacher is not uniformly distributed and therefore not intelligible. The non-uniform distribution of the intelligible speech was due to the impaired direct path of the sound from the teacher, since the students are seated on the same floor level; and the speech from the teacher was attenuated by those students in the front row seats^{[5][6]}. The hall under study with a volume of 882 m³ was of medium size^[6] and do not require sound amplification if they are properly designed and constructed with carefully chosen building materials to provide the needed sound reinforcement and good sound distribution^[3]. Echoes experienced in the lecture halls were as a result of time delay between the arrival of the initial sound from the teacher and the reflected sound from the parallel walls. The presence of echoes in the lecture halls during teaching is a nuisance to teaching/learning. Echoes should therefore be avoided^[1]. Therefore, a proper distribution of the sound to every part of the lecture hall with

relatively low loss of sound energy from the sound source (teacher) to the students is a priority^{[5][7]}. The consequence of the effect of inappropriate acoustical design of lecture halls for speech intelligibility was that, the students at the remote seats were expected to strain their ears to hear what the teacher is teaching; and this is not good for effective teaching/learning. The findings also established that, there was poor sight-line for vision in the two halls. This was attributed to the fact that, all the students were seated on the same ground level. Therefore, the heads of those students seated in the front row seats obstructed the views of those students behind them. The implication of poor sight-line for vision is that, the students at the back row seats are expected to strain their necks to see the chalkboard or whiteboard and the teacher as well, and this had a negative effect on the teaching/learning environment. From the foregoing^[6] noted these of lecture hall with seats on the same ground level; "The spherical sound waves radiate outward from the speaker, and the intensity of these waves decreases inversely as the square of the distance. However, as it grazes over the clothing and hair of the sound absorptive audience, losses occur". They further asserted that; "This means that people seated near the back of an audience not only receive less sound energy because they are far from the sound, but they are also deprived of sound energy by the people in front of them." It is therefore true that, in any enclosure for speech intelligibility, there should be direct and clear sight line between the audience and the sound source to improve better hearing and viewing. In this regard^{[1][7]} also opined that, not only is this psychologically important, but it also guarantees that there will be a well defined direct arrival of sound. In addition, because students seated in the front row seats now obstruct the view of those students behind, most of the students from behind now pair-up with their fellow students in the front row seats thereby increasing the number per row of seats from five students eight or more students. The reason is to avail themselves of good hearing of the teacher, and good sight-line to see the chalk/ white board without any impairment. This situation constitute crowding of the row seats thereby creating difficulty for students to place their note books properly for effective note taking without any hindrance. Thus effective teaching/learning environment was affected negatively.

CONCLUSION AND RECOMMENDATION

The study established that, it was the perception of students that inappropriate acoustic design of lecture halls had a negative effect on effective teaching/learning. Appropriate acoustical design for effective sound distribution for speech intelligibility from the teacher to the students, and good sight line for vision that shall enable students to see the chalk/white board and teacher are essential for any teaching/learning room environment. To improve the speech intelligibility through direct paths of sound to the students, and good sight line for vision in the two lecture halls, the followings were recommended:

1. Treat the internal space of the lecture halls with carefully selected building materials to enhance proper sound distribution for speech intelligibility.
2. Rake or step the seating area so that each student in the hall is less obstructed by those in front.

3. The chalk or white board platform should of relative height so that student at back row seats can also see the chalk or white boards and the teacher properly.

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