

Noise Pollution at School Environment Located in Residential Area

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ABSTRACT

Noise pollution around the educational area can negatively affect the performance of both teachers and students. The noise level should be around the range of 35 dBA to 55 dBA in the school area. Little attention has been given by individuals or government concerning noise pollution in schools' surrounding. A study of this problem is presented in this paper by doing some measurement on the noise level at schools located in residential areas case study at Sekolah Kebangsaan Sri Skudai, Sekolah Kebangsaan Taman Universiti IV and Sekolah Menengah Taman Universiti has been conducted to measure noise level in its surrounding. The results from this study shows that the rate of noise level in Sekolah Kebangsaan Sri Skudai is very high and not suitable for schools' environment.

INTRODUCTION

Nowadays, many schools are located near busy places such as city, shop and residential area. This occurs because of limited places to build a school or the rapid development surrounding the schools.

School must be located in a quiet environment. Noise pollution in school environment disturbs the activities in school such as study, discussion and teaching session. The rate of noise pollution in school environment is very high in Malaysia. Acts and regulations concerning noise pollution are limited and not strictly adopted.

PROBLEM STATEMENT

Development of residential area surrounding the city increases the activities in the city such as constructions and traffic. This will lead to noise pollution problem. Schools located in a big residential area that is fully equipped with infrastructures are prone to noise problem.

In other countries, school that is located in a busy area has its own technology to reduce sound from surroundings. Many schools are built with sound insulation buildings. In Malaysia, some of the schools near busy are built many years earlier before the development takes place. The school's building made of wood or concrete which has no sound insulation characteristic. When the area is developed without a good planning, this will cause noise pollution to the school's environment. This is a very important matter that we should take into account and if it is possible, to solve this noise pollution problem before it's too late.

OBJECTIVES OF THE STUDY

The aim of this study is to give some information about the quality of noise pollution in school environment located in residential areas. Three schools are chosen and the comparison between the measured noise level is performed.

The objectives of this research are:

1. To identify the source of noise in school environment;
2. To identify the effect of noise to student and teacher;
3. To compare between measured noise level and rating level; and
4. To compare the quality of noise in three different schools located in different environment.

SCOPE OF THE STUDY

Studies of noise pollution are very general. The overall of this paper will only include noise pollution problem in school environment. Basic knowledge in aquistic field is a must before starting this research. This knowledge can be gained by doing literature survey.

Case study will be done at schools located in the residential area. Data can be collected by performing field measurement and by questionnaire. Factors that must be considered before doing the research are location of the school, school's surrounding and the school's topography. The selected schools are Sekolah Kebangsaan Sri Skudai, Sekolah Kebangsaan Taman Universiti IV and Sekolah

Menengah Taman Universiti. These schools fulfill the criteria needed, that they are situated in residential area in Skudai, Johor. The noise level measured from these schools is then compared to know which school has a very high noise level.

IMPORTANCE OF THE STUDY

It is hoped that this study is useful for controlling noise pollution in school surrounding from becoming worst. This is important to make sure that classroom's activities can be done comfortably. Constructing a school in busy places is not a good idea. Schools have to be built in a quiet place. Sometimes, school building that is located near noise sources are left useful because of the noise that disturbs teachers and students during study session. In a point view of economic, it is a waste to abandon any buildings. To make sure that the building can be used, some renovations has to be done with the buildings. These renovation activities need a lot amount of costs. Because of that, it is important to plan properly before building any schools.

LITERATURE REVIEW

There are many researches that have been performed on noise pollution in school environment. Sanz and Garcia (1993) has performed a research on noise pollution from traffic activities near school area. This research includes negatives impact to teachers and pupils' performance due to the noise pollution especially from traffic activities around the educational centers. Two public schools in Valencia, Spain were selected for study.

Ikenberry (1974) focused on noise in schools and its control for schools that have been constructed near existing freeways, airports and industries. Schools with a noisy environment give so many problems to the student during study period. Little attention has been given to the problem of noise compatibility for schools and its surroundings.

Public school children were tested to determine whether quiet (45-55 dBA), average (55-70 dBA), and noisy (75-90 dBA) classroom had a relationship to written task performances of relatively short duration (Slater,1968). This research has been done by Slater and she found that student gives a good performance in a quiet classroom better than in the average and noisy conditions.

Nowadays, many researches have been performed by research institutions and agencies on noise pollution in school environment, its impact and mitigation measures. This shows the importance of controlling noise pollution in the school surroundings.

DEFINITIONS OF NOISE POLLUTION

Noise has many definitions depending on where the sounds exist and its effect to the recipient. The definitions of noise by Christopher are "sound which is undesired by the recipient" (Penn, 1979). Noise is defined as unwanted sound, consequently it can be considered as the wrong sound in the wrong place at the wrong time (Kiely, 1997). There have been a lot of definitions that has been given to noise depends on the knowledge and understandings of the individuals. Noise is a subjective matter and even with a sound measurement it does not necessarily give a guide to what noise is. Noise in this study can be defined as sound that is unwanted to human, it is human as the recipient of sound has the right to judge either the sound can be called noise or not. Every human receives noise in different ways. It depends on some factors such as age, sex and mood of a person. This mean that noise rate can only be measured by giving range of guidelines for the determination of 'noise sound' or 'non-noise' sound.

NOISE MEASUREMENT

Unit used to measure sound pressure level is decibel (dB). Sound also can be measured using Pascal (Pa) but measurement in Pascal would therefore produce quite unmanageable numbers. The decibel scale is simple and easy to use without involving long linear numbers. Decibel also gives a much better approximation of the response of human ear to loudness.

With every unit of decibel it must be included a weighting network at the end of it. This weighting network used to differentiate sound based on its frequency. There are three categories of weighting system that is always used, i.e., A, B and C. The difference between weighting network A, B and C are A discriminates against the low frequencies. B also discriminates against the low frequencies but to a lesser extent, and C to the least extent. There is also a D weighting but it is used to measure noise from airplanes. In this study, the weighting network of A will be used because its characteristic is almost the same as characteristic of human ear.

Instrument used to measure noise level at source is sound level meter. The unit used in this instrument is decibel. Sound level meter is designed to react with sound is similar to reaction human ear. The difference is that the sound measured by this instrument will be processed and changed into numbers for interpretation purposes.

Sound level meter consists of microphone, amplifier, network weighting (A, B and C) and a meter. Microphone is an important part of the instrument. The sound will enter the sound level meter through the microphone and the acoustic energy of sound wave will be transferred into electric signal by microphone. After all the transformations have been completed the meter will process the input data in decibel values.

NOISE POLLUTION AT SCHOOLS' ENVIRONMENT

Schools' surroundings are the place that is considered as noise abatement zone. Schools' environment especially located in the busy area has a high rate of noise pollution. There are many new schools built near roadways in residential areas without noticing the impacts of the traffic activities to the schools' environment.

Noise pollution at schools' environment is due to many sources. It depends on where the school is built. A school which is located near the city center has a very high noise pollution range because it has many sources that will lead to noise pollution. In large residential area the sources of noise pollution is limited but in some cases, it still leads to noise problem. Activities such as traffic congestion, construction, people pass-by and shops lot can also disturb school's activities because of the noise it makes. Schools located near the construction site will be disturbed by construction activities such as piling, hammering and operation of big machines. All these activities will lead to noise. Noise from vehicles especially motorcycles, buses and trucks are also very annoying and disturbing. Factors such as the road conditions, road uses and traffic light also affect the noise range.

In the research of Ikenberry (1974), he has determined some effects of noise pollution to school students, such as:

1. They did not hear the teacher as well;
2. They found it more difficult to hear lectures and classroom discussions;
3. It was more difficult to study;
4. They felt it was necessary to talk loudly in class in order to be heard;
5. Some teachers spoke too loudly; and
6. Outside noise bothered them.

Slater (1968) has proved that students will perform better under quiet conditions than under noisy conditions. She also makes a conclusion that boys would be more detrimentally affected by noise than girls would. Noise pollution in school environment disturbs during study sessions. Students cannot concentrate with what they are learning and consequently, they will lose their interest to study.

Teachers also cannot teach effectively during teaching session. This is due to the uncomfortable classroom conditions that the students cannot hear their voice clearly and the students will hardly understand what the teacher is trying to teach.

There are many ways to reduce noise pollution problems from getting worst especially in schools' environment. They are:

1. Using a school building that has sound insulation system;
2. Building a high fence using concrete wall or wood;
3. Planting more trees in the school's surrounding;
4. A good planning before building a school;
5. Stop or remove the noise;
6. Society awareness about the noise problem;
7. A strict laws concerning noise pollution; and
8. Speed limit for road users near school surrounding.

RESEARCH METHODOLOGY

Collecting data from school can be divided into two categories, i.e., by measuring noise rate and by questionnaire. Questionnaire forms are given to the school's students and teachers. In this form, there are questions regarding noise problem and ways to solve it. By answering this questionnaire, it will helps to get some information about the noise rate in particular area. Measuring the physical data is done using sound level meter. In this study, sound level meter with data logger is used. Data observation is done for 8 hours during class sessions. The data are then processed using computer because the sound level meter data logger can keep the measured sound rate in its memory. Readings are also collected in several points in the school area to identify points where they are highly polluted with noise.

All the data measured are then compared with the standard and guideline that has been used widely. To be able to hear and understand spoken messages in the classrooms, the background sound level should not exceed 35 dBA Laeq during teaching session. For outdoor playgrounds the sound level of noise from external sources should not axceed 55 dBA Laeq, the same value given for outdoors residential areas in daytime (Berglund et al, 1999).

DATA ANALYSIS

The site measurement had been done in accordance to the ISO Recommendation R-1996; Assessment of Noise with Respect to Community Response (Schult 3, 1982). The sound level meter or SLM had been used in acquisition of noise level

at the study site. The noise level measurements are gathered for period of 8 hours at an interval of 5 seconds which then are plotted into graphical form. The graph plotted is the Sound Pressure Level (Decibel, DBA) versus time measured (second) graph. The data presented will show the noise level range, its mod and min readings. Treatment of physical data will give us an insight into the noise problem pertaining in the study area.

Apart from the physical site data measurements, a social survey in the form of questionnaires are given to both students and teachers. Results from the questionnaire are helpful in the assessment of the effects of noise in the school environment and will also aid in the search for source of noise. The results obtained from the questionnaire are presented in pie chart form for easy discussions and interpretations.

ANALYSIS OF NOISE MEASUREMENT

Figures 1 to Figure 3 show the Noise Level measurement in the form of line graphs. The summaries of these graphs are given in Table 1.

Table 1 Summary of noise level measurement.

	Sekolah Kebangsaan Sri Skudai	Sekolah Kebangsaan Taman Universiti IV	Sekolah Menengah Taman Universiti
Noise Level Range (dBA)	56 – 77	53 – 72	42 – 59
Maximum of SPL (dBA)	77	72	59
Mod of SPL (dBA)	68	62	45
Allowable Noise Level (dBA) (a) Classroom (b) Outdoor	35 – 45 below 55	35 – 45 below 55	35 – 45 below 55

From Table 1, it shows that noise problem does exist in Sekolah Kebangsaan Sri Skudai. The minimum of noise level is about 56 dBA and it is only suitable for outdoor activities in school. The allowable noise rate in the classroom is between 35 dBA to 45 dBA. The mod of noise level is 68 dBA and it is not suitable for school environment. Sekolah Kebangsaan Sri Skudai is located near highway and shophouses. These are the main sources that caused noise pollution problem.

The noise level in Sekolah Kebangsaan Taman Universiti IV is suitable for outdoor activities in school only. The noise level in this school surrounding is in critical range. It is important to take some measures in order to prevent the noise pollution from getting worst. The noise level in Sekolah Taman Universiti is suitable for classroom. This school has the criteria of a good planning for building a school. The noise level in this school is low because it is located far from main road and other noise sources.

RESULTS FROM QUESTIONNAIRE

Data from social survey are also important to make sure the study achieves its objectives. The data are gained by giving some questionnaire form to the students and teachers to be filled. The questionnaire forms are given to teachers and students in Sekolah Kebangsaan Sri Skudai only. This is because from the measured data, it shows that this school has a poor noise quality. After analyzing the data, some useful information is obtained and has been summarized using a pie chart. The following figures show the result collected from the questionnaire.

Figure 4 shows that 95% of the respondents agree that the school has noise pollution problem and only 5% disagree with the statement. When asked about the sources of noise pollution, 41% said that it is caused by the student themselves, 30% from traffics, 12% from construction, 12% from people passing by, 3% from miscellaneous sources like noise from pet/fighting animals and 2% because of the shopping activities (Figure 5).

The noisy duration during is office hours shown in Figure 6, i.e., 8 am to 9 am (17%), 12 noon to 1 pm (20%), 1 pm to 2 pm (18%), and 2 pm to 3 pm (16%). The noise is caused by traffic congestion because during that time people are going back and forth using the nearby roads. Figure 7 shows that 81% of the respondents agree that noise pollution has a negative impact to study/work and only 4% are disagree. The negative impact cause by noise pollution in school environment are given as below (Figure 8):

- Disturbance of study/teaching (27%)
- Hearing problem during classes (26%)
- Mental stress (17%)
- Diffcults to do discussion (12%)
- Health problem (headache) (10%)
- Need to speak louder (8)

Figure 9 shows that 82% of the respondents agree that noise pollution in school environment must be controlled. From Figure 4.10, it shows that 3% of the

respondents know about the act/regulation concerning noise pollution in Malaysia. It means that the public is not interested to know about noise pollution or the government has not regulate effectively to control the noise problem. Awareness of the effects of noise on public is minimal and therefore it should be addressed by the local authority as soon as possible.

CONCLUSIONS AND RECOMENDATIONS

From the data that has been collected, it shows that some schools in residential area does have noise problem. It depends on where the schools are built. In residential area it is very important to build a school far away from shops and main road. Some measures need to be taken to improve the quality of noise in schools that has already been built near the noise sources. The schools should be built with noise insulation building and if it is cannot be done, the school should be closed or moved. In Malaysia, rules and regulations concerning noise pollution control include only noise from vehicles or industrial area and none for schools area. Research about noise pollution in school environment is still new and not widely studied in Malaysia.

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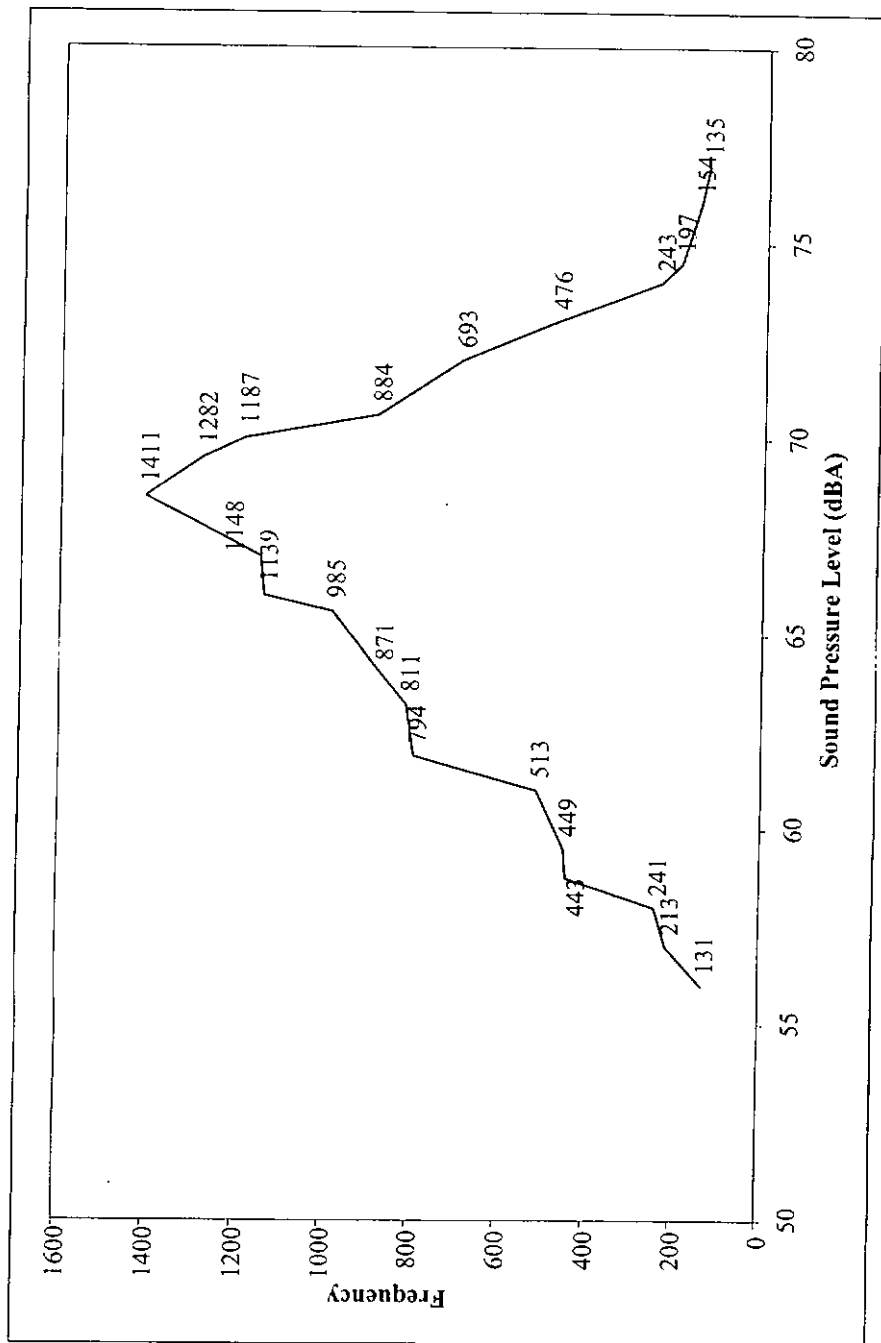


Figure 1 Noise measurement data for Sekolah Kebangsaan Sri Skudai.

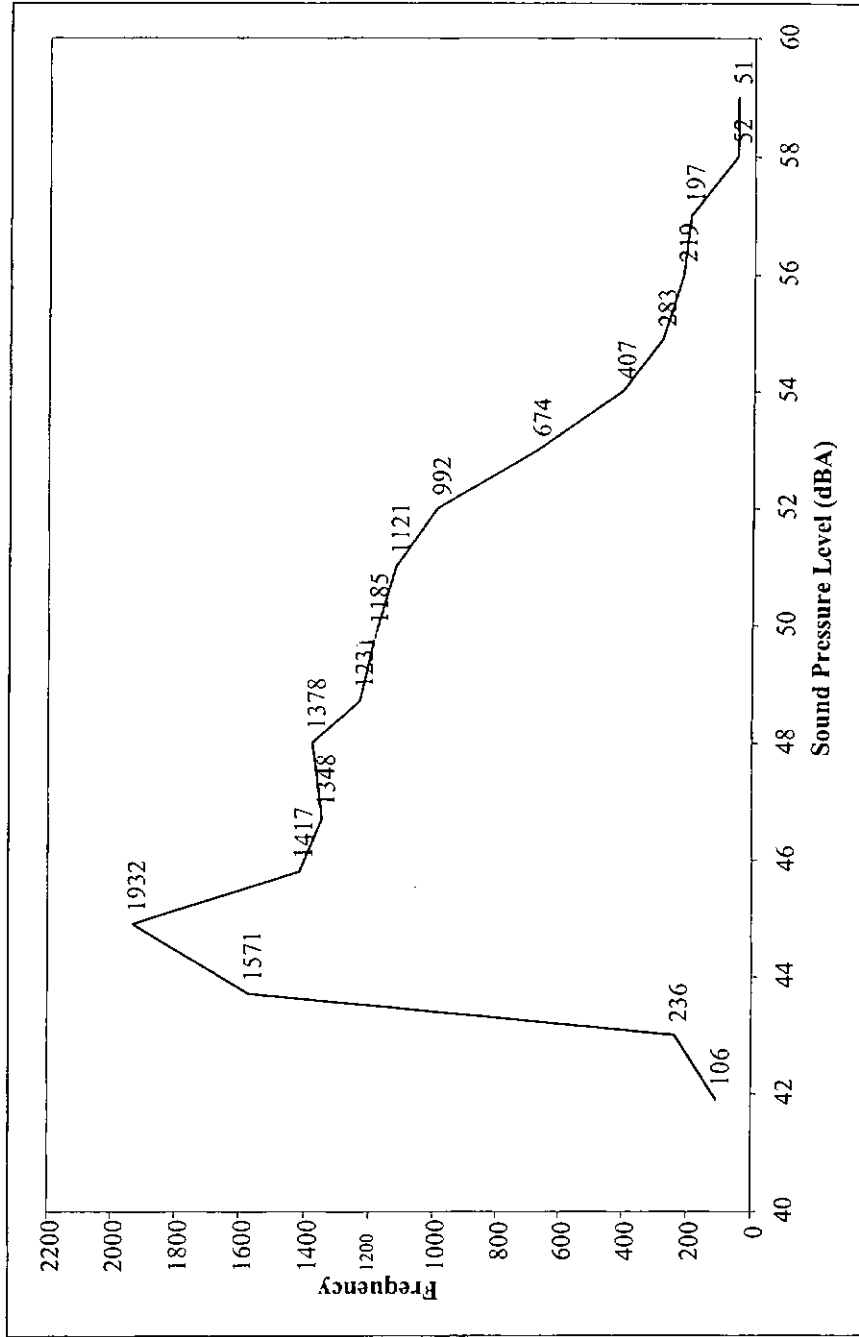


Figure 2 Noise measurement data for Sekolah Menengah Taman Universiti.

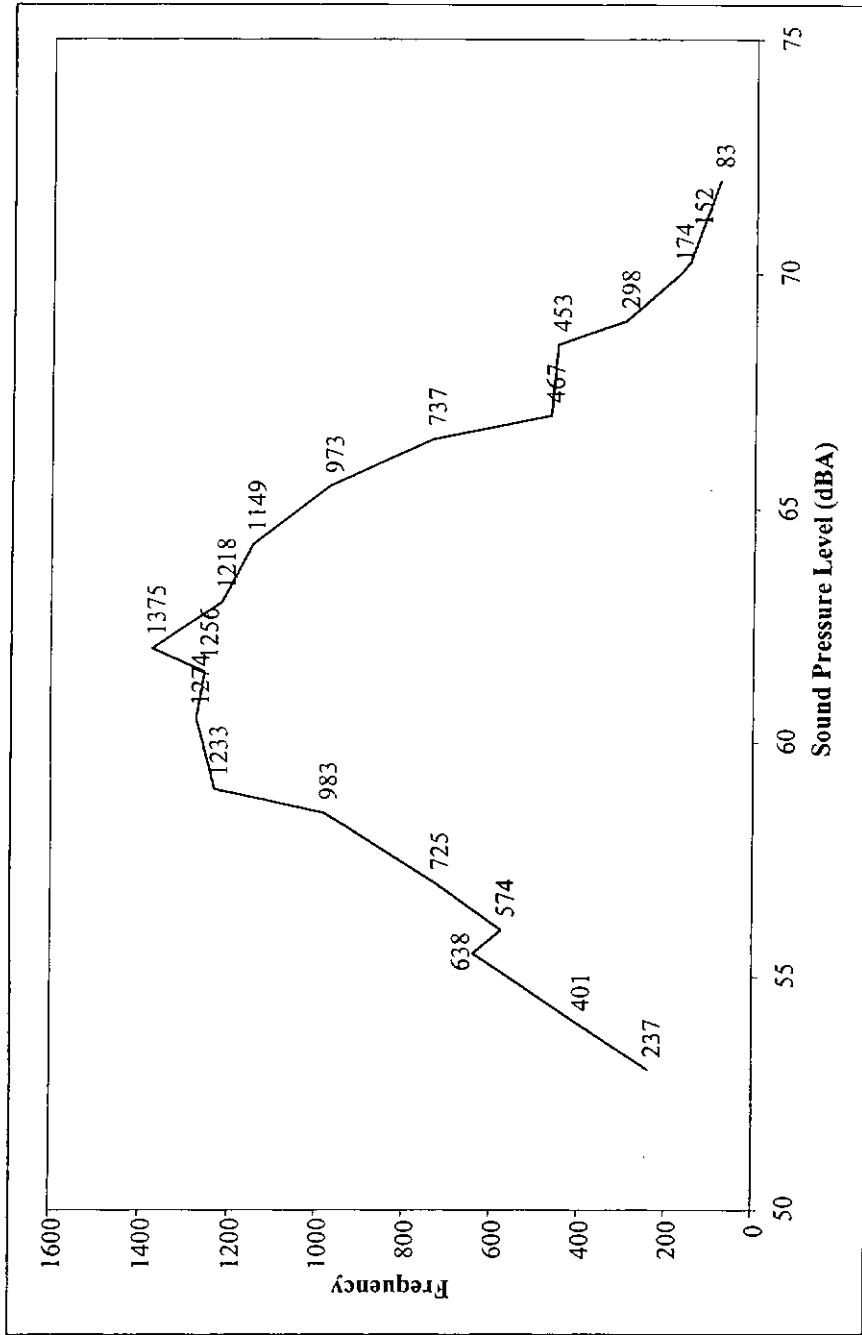


Figure 3 Noise measurement data for Sekolah Kebangsaan Taman Universiti IV.

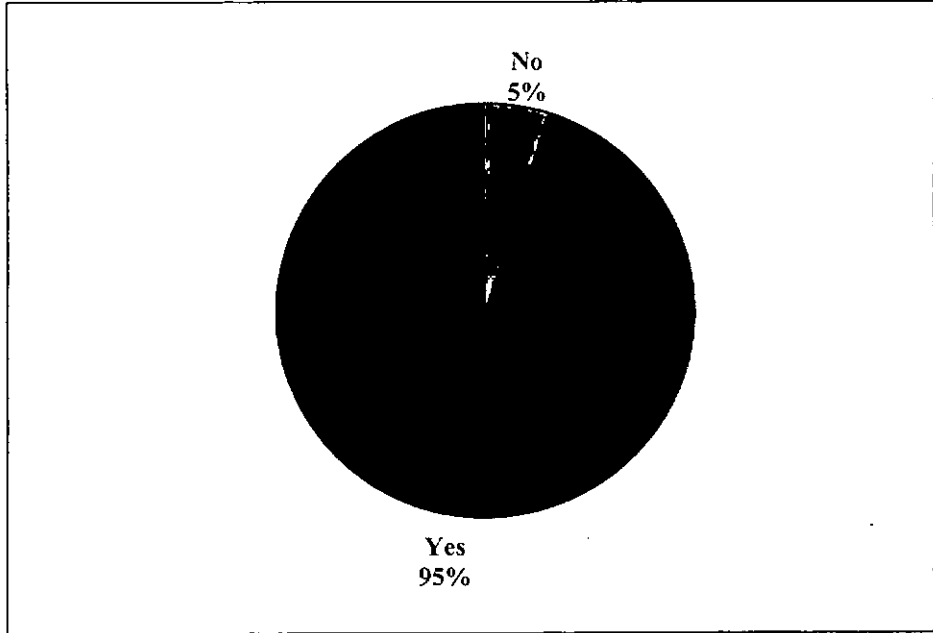


Figure 4 Noise problem in school area.

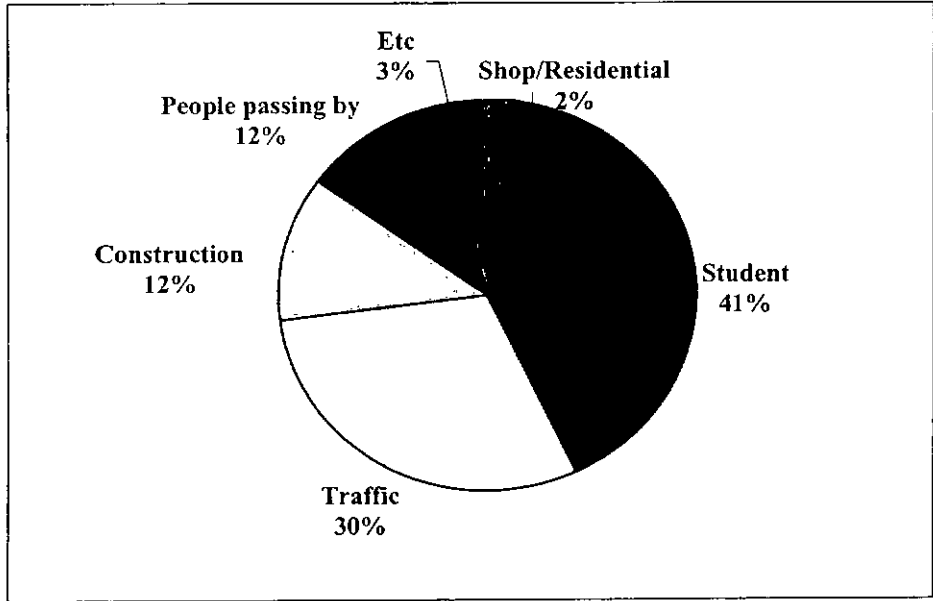


Figure 5 Sources of noise.

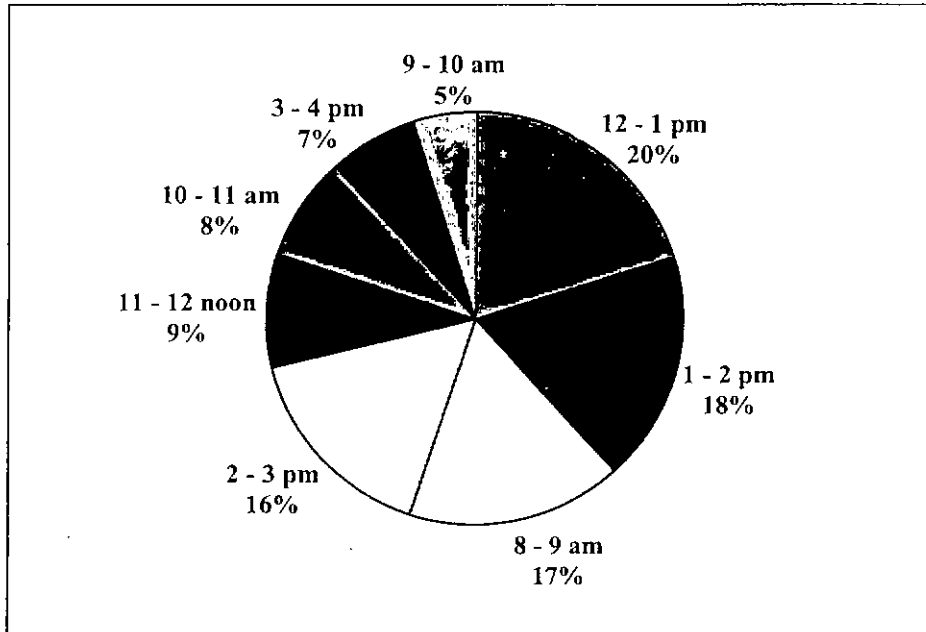


Figure 6 Noisiest time.

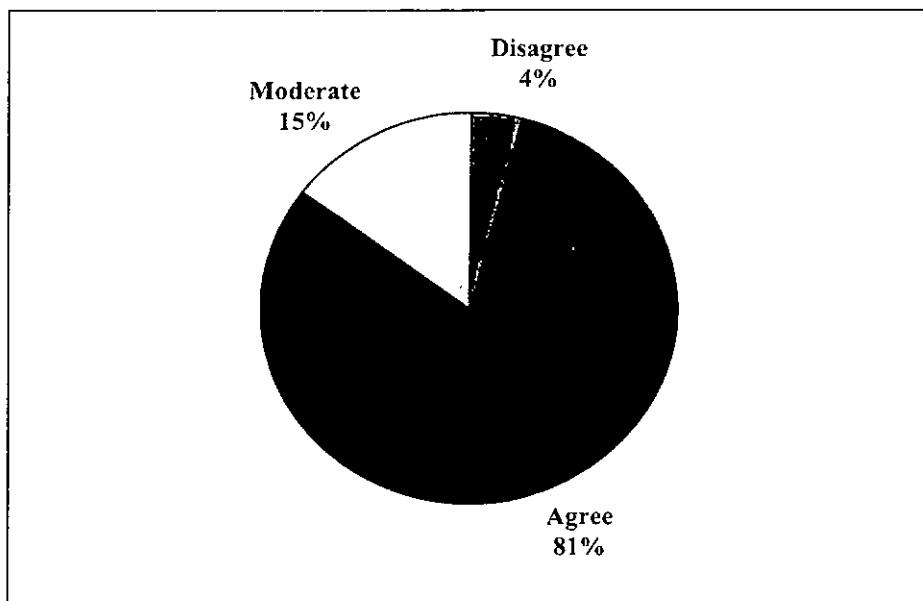


Figure 7 Noise disturbs study/work.

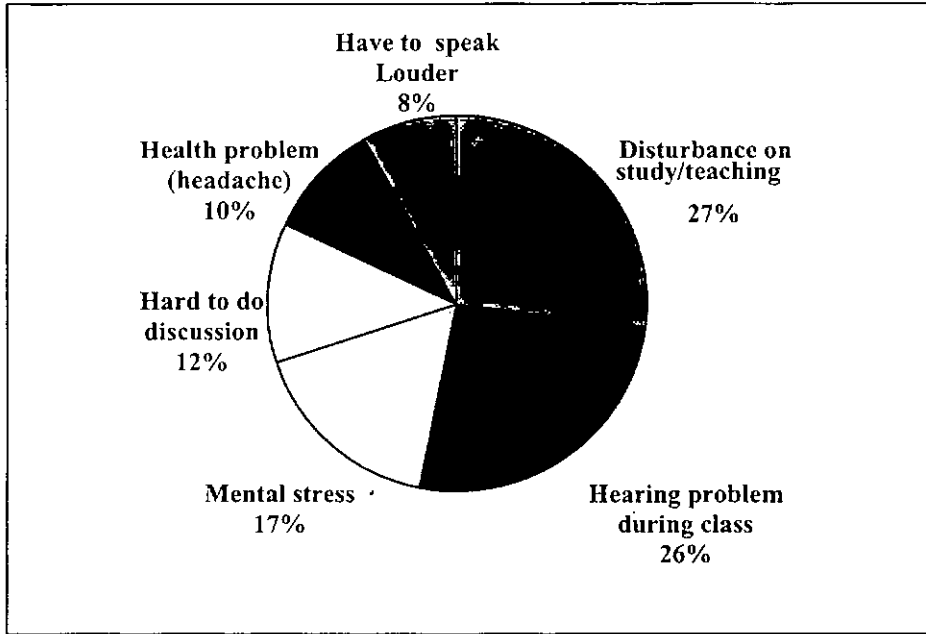


Figure 8 Effect of noise.

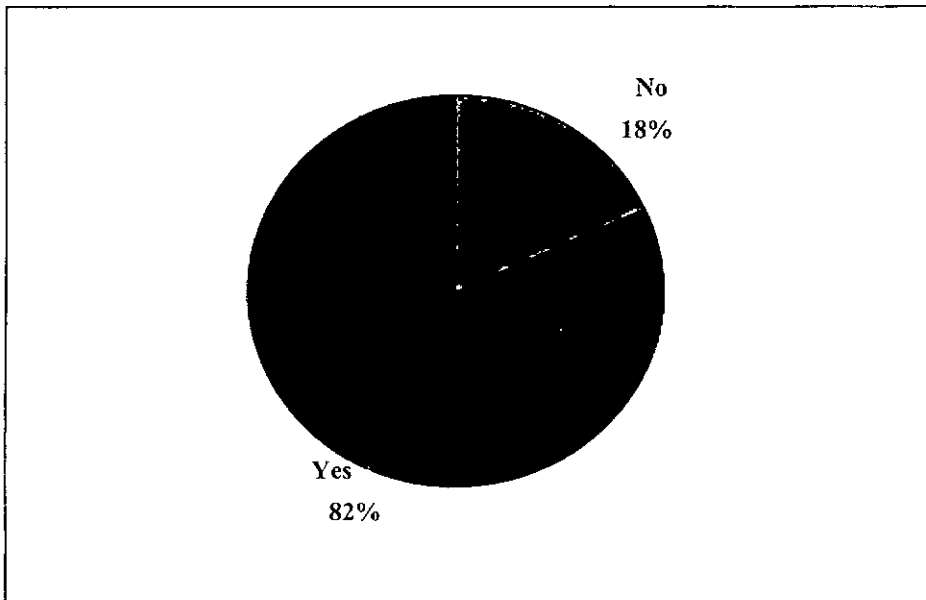


Figure 9 Noise problem must be controlled.

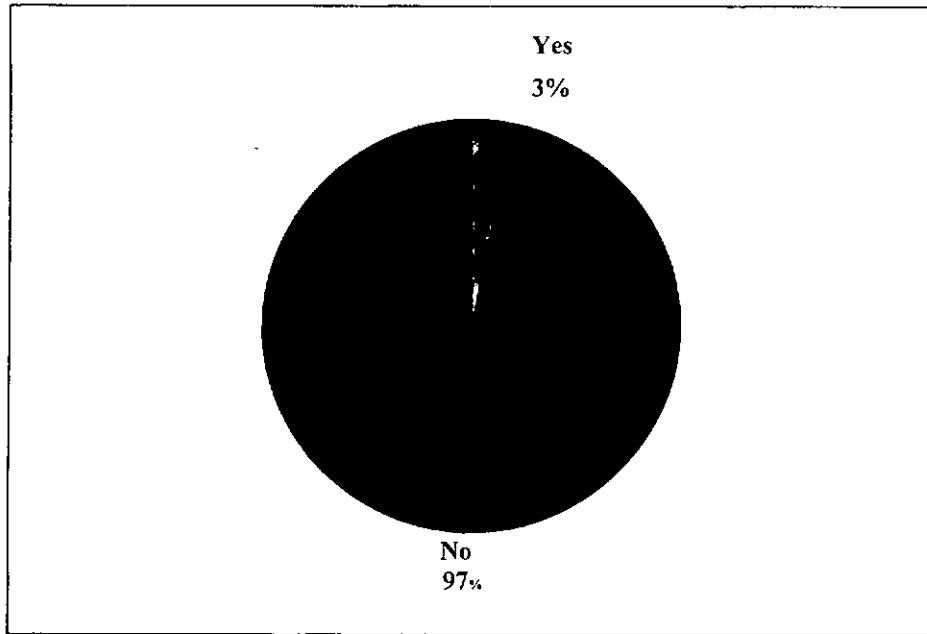


Figure 10 Awareness of any acts/regulations concerning noise pollution.