International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 01 | Jan 2021 www.irjet.net p-ISSN: 2395-0072

The Effect of Industrial Noise on Students' Cognitive and Skill Perception in Mechanical Workshops

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Abstract - The research analyzed the level of noise emitted from the forging machine inside the mechanical workshop and its effect on cognitive and skill perception of the students.

This study carried out an engineering treatment for the machine by creating an isolation box around the source of the noise using inexpensive local materials in the insulation process, such as: domestic glass, clear glass, fiber, sponge, tin, and clear plastic. The study found that the use of these insulating materials reduces the noise level by (36 dB).

The level of the emitted noise before treatment was 113 dB while it becomes (77 dB) after the engineering treatment , and this is permissible globally, and it showed that the best insulation materials are three, which is sponge because it contains Noise dampening holes, with perforated steel (1mm) and perforated plastic (1mm). These results were included in the design of educational situations for students.

The cognitive and skill perception were measured before and after noise treatment and the research reached an improvement in the cognitive perception and skill performance of the participating students, and increased their satisfaction. Hence, it can be said that reducing the machine noise by a reduction equivalent to (36 dB), has led to an increase in the students' research sample's feeling of satisfaction with the educational environment inside the mechanical workshops by (52.22%). It also increased their cognitive and skill perception by (44.43%) and (54.46%), respectively.

Key Words: *Forge-Forming Machine, Noise Emitted, Workshop, Cognitive and Skill Perception.*

1. INTRODUCTION

Noise is generally defined as an unwanted and unwanted sound that usually disrupts the activity or balance of a person's life. Nowadays, with the rapid growth of industrial and technological advancement, humans are facing noise pollution in the working and living environments as a major problem. This increased anxiety has been shown to cause health risks apart from hearing loss in those exposed [1-3].

Human performance is influenced by many factors such as type of job, level of job complexity, work context and work conditions such as heat, light, humidity, dust, pollution and noise. Continuous exposure to environmental stresses in the workplace can have adverse effects on human performance as it may cause problems with concentration, adverse health outcomes, etc. [1-3].

2. REVIEW of PREVIOUS PUBLISHED STUDIES:

E. Atmaca [3] aimed to measure noise levels in three factories in Turkey, they are as follows; (cement factory, iron and steel factory, and spinning and weaving factory). In order to determine the psychological and physical effects that workers are exposed to. The study conducted a questionnaire on 256 workers. A digital noise level meter. It is concluded that the noise was not within the permissible limits, and that 75% of the workers suffer from mental disorders, and 61% of Workers suffer from nervous irritation under the pressure of the impact of noise, 31% of workers suffer from hearing problems, and 33% of workers did not use ear protectors. Based on these results the study recommended that the noise problem should be taken into account during the operations of establishing factories, and determining the location Dedicated to places and equipment that make noise, and to adhere to international standards for safe noise levels.

Researcher Essam Omran [4] analyzed the level of sound pressure emitted from the production places, and the effect of that on noise pollution inside the plastic bags factory of the Furat General Company for Chemical Industries, and the results showed that the noise level in most workplaces exceeded the permissible limits, as well as the researcher referred to methods of treatment Noise pollution, including: (the rubber cushions, which reduced noise pollution by 33.5%). The research confirmed that noise is a

pollutant that threatens most civil society institutions, especially educational institutions, as a result of its negative impact on the performance level of workers in these institutions, including students, technical, administrative and teaching staff.

Alayrac Marquis et. al. [5] described the environmental impact of the industrial establishment through a better understanding of the dense and multiple sources of industrial noise. The research was based on the first step of building a perceptual classification of different industrial noise. Perceptual tests were performed for each category separately through the same procedure Experimental by testing the effect of sound pressure level and noise characteristics (frequency and tones). Through statistical analysis, the research reached developing indicators for each category of perception based on classic indicators such as (sound pressure level) or on improved indicators to match the observed characteristics.

The importance of the research presented by Atheer Abdullah [6] was represented by proposing a number of solutions to reduce noise problems inside the factory. Diagnosing local problems of the impact of noise in the internal environment of the factory, and providing an information base on noise problems and their impact on the individual worker and productivity in the Furat Company General for Chemical Industries (Plastic Bags Factory). The researcher did the following: A) Measuring the noise level by developing a computer program (Matlab), by recording wave signals within the factory space to reach the noise level in decibels. B). To test the first hypothesis related to floors, ceilings and walls, and its role in reducing the noise level through the use of tables and absorption coefficients for the materials from which the plant is built. Their mathematical equations, and testing the second hypothesis related to the role of barriers in suppressing noise and the type of structural material used in its construction. C) Conducting a questionnaire process for a number of factory workers and taking their views on health complications resulting from noise in the internal environment of the factory. Identifying the causes of noise, and their suggestions about the size of the internal environment of the factory, and the number of hours proposed by workers to determine the period of work in the factory, and the extent of the impact of noise in factories on workers' job performance and then on the production process and speed at work. The research reached the most important conclusions regarding the practical aspect, which include advanced computer programs (matlab) that are included in the fields of noise measurement and determination of the appropriate ones. The use of barriers within industrial spaces and the role they play in reducing the noise level, and the method of dividing internal spaces in factory sections through barriers. Re-arranging the sites of the machines that would reduce the noise level, and then came recommendations and suggested solutions that may help reduce noise levels within the internal environment of the factory.

Muhammad Al-Azzazi [7] studied and collected information about the nature of traffic, transportation, and noise problems and their levels in the city, then secondly, the application of measures to protect against this noise, which can be divided into two types of procedural applications as follows: (planning applications, in which the noise level is reduced. The actual source of noise such as highways and arterial roads, and architectural applications at the future, which are represented by buildings, which is the last line of defense to reduce noise). The application process is followed by the actual measurement stage, then evaluation and confirmation of noise levels reduction, which is undertaken by the monitoring and follow-up phase, and finally the research paper summarizes Numerous principles and planning and design considerations that would protect against traffic noise or at least reduce its impact on urban residents. The research found the estimation of the main noise levels in the city in the main urban streets, with a noise level ranging between (68 - 80), and the reasons for the increase in noise levels, which are concentrated in the increase in car and trip ownership, were studied. Alternatives to reduce noise on both sides of roads and in urban areas. The proposed places to implement these measures were studied, as follows; (Controlling land use and its relationship to traffic, which is a long-term suggestion, the use of plants and the environmental impact it represents, the use of sound barriers, the coverage of some roads, partial coverage, Legislation and laws, observance of architectural design).

Jamal Ahmed et al . [8] aimed to identify the size of the noise problem in new cities and the stages of their development and to identify deficiencies in completing the treatments for site coordination elements, which in turn leads to exposure to the different voids of traffic noise by monitoring noise values on many traffic axes. . To achieve this goal, the research presented some theories and planning ideas, analyzed them from an audio perspective, and projected these theories on the new cities in Egypt. The research reached a study of the elements of coordinating green and built sites and their impact on protecting the elements of cities from the noise emanating from the movement axes at all levels, then the research moved to the investigative part, which dealt with the sources of noise, which are the axes of external and internal movement and the industrial zone in one of the new cities, which is the city of 6 October. The research recommended the necessity of monitoring and measuring noise levels in these axes and comparing these values with international standards and rates, as well as monitoring existing treatments to protect against noise, and some proposed treatments to provide a comfortable sound environment within these cities.

Waad Omran [9] aimed to identify the noise resulting from the machines in two food industries companies; one of which is the production of biscuits and juices, while the other for the production of dairy. By measuring, the noise levels with an approved scale, and comparing the

measurement results with international standards in order to know the levels of noise to which the workers are exposed. In the industrial establishment, the research recommended placing noise as a basic pillar when designing various machines and devices. It also recommended isolating the sections in which there is a lot of noise from other departments and paying attention to preventive maintenance that includes moving parts because this helps to reduce the noise level by a large percentage.

The research presented by Yasmine Najm [10] aims to identify noise pollution, its sources, and the negative effects it has on human mental and physical health, as well as its effects on productivity, while laying out adequate means to treat it. The research work indicated that industrial noise varies in intensity with the difference in the type of industry and the size of the factory. The research concluded that noise pollution causes health damage to individuals, both in terms of mental health and the psychological behavior that results from it as well as physical effects as well as causing heart disease, diabetes and impeding the ability to communicate verbally. The study recommended in the end to tighten industrial safety measures Workers in terms of the use of protective equipment such as earplugs that reduce the noise level by the equivalent of 20 dB.

Hussain Sultan et al. [11] aimed to reduce or dampen the noise from small generators by isolating them with available materials at low cost. The researcher measured the sound intensity of the sound wave emitted as a result of the generator's work before and after the insulation and chose the optimal material for insulation. In this study, a small electric generator was isolated using three widely available local insulating materials: (fiber, carton of egg dishes, sponge). The study showed that the insulation of the sponge is the best, and the reason is that the sponge contains many small gaps that cause high impedance to transmit sound energy.

Abeer Derbas [12] aimed to show the extent of the importance of creating a legal system for civil liability for unfamiliar neighborhood damages resulting from environmental pollution, especially as environment-related legislation did not address this issue as required, and to demonstrate the extent to which the general rules of liability could be adapted and developed. Civilian damages in proportion to the nature of the damage. The research addressed its topic through two chapters, in which the legal nature of civil liability for disadvantages of unfamiliar neighborhoods resulting from environmental pollution was explained in the first chapter, and by an exposure to what are disadvantages to unfamiliar neighborhoods, the pillars of civil liability for unfamiliar environmental damage, and the legal basis for this liability. The second chapter dealt with the legal implications of civil liability for the disadvantages of unfamiliar neighbors resulting from environmental pollution, which were represented in explaining methods of compensation for these damages, and mechanisms for assessing compensation. In addition to addressing the civil liability claim for environmental damages, and the extent to which insurance is possible Civil liability resulting from these damages, then the research ended with a conclusion with the results and recommendations that were reached.

Dimou Iliadis et al. [13] aims to estimate the potential exposure of woodworking workers to industrial noise pollution. The research was based on measuring the noise in the site and the state of the study during the processing of sawn wood, and a proposal was reached for a new framework for assessing the disturbances caused by the noise. The developed model has proven effective.

Abd al-Wali al-Ajlouni [14] aimed to determine the levels of exposure to noise and measure the effect of each level on workers. Through the research procedures, he was able to monitor three levels: The first level: chronic pollution, which is a permanent and continuous exposure that causes permanent hearing loss. The second level: it is a temporary infection with physiological damage, which is exposure to the source of the noise for limited periods of time and leads to injury to the middle ear. The third level; it is temporary infection without harm and leads to temporary hearing loss that returns to its normal state. The research also found that there is no accurate method for determining the type of relationship between noise and the resulting effects. That the effects differ from one person to another and it depends on several factors such as; the intensity of the sound, its intensity, duration of exposure to it, and the distance between the person and the source of the noise.

The research presented by Sadi Faris [15] aimed to reduce the impact of noise on the health of two years in industrial establishments. This research came to show its impact and methods of prevention in the workplace. The research also targeted the process of measuring with high techniques to identify places where noise levels predominate, and then studying the effect of noise on individuals in terms of: (noise intensity, distance between the factor and the noise source, place area, wave nature, duration of exposure to noise, personal factors, age, Genetic factors, previous medical conditions). The research found prevention methods in terms of the following: (initial medical examination, periodic medical examination, engineering prevention, prevention by planning and design, use of protective ear devices, semi-inserts, ear caps, soundproofing helmets, noise isolation from reflections and spread, insertion A change in work design, creating regulations and laws to protect employees).

The research presented by Aida Allam [16] aims to study the effects of air transport activity at Cairo International Airport on the environment, and how to evaluate and reduce these effects by using statistical methods (designing a questionnaire form), as well as previous studies in this field. The research was based on the work of four

questionnaire tables, which stipulate a case study at Cairo International Airport (description of the work environment - providing a safe and secure work environment - health effects within the work environment - environmental variables within the work environment). The study reached some results that will have an effective effect in reducing the risks that pollute the work environment in the field of air transport, including the external environment and the internal environment at Cairo International Airport.

The research presented by Hoda Kubba [17] aims to study noise pollution at the Technical Institute. The researcher measured the noise from the beginning of the official working hours to the end of the official working hours in three periods (8:30 AM - 10:30 AM, 10:30 AM - 12:30 PM) 12: 30-2: 30 p.m.) In internal locations, namely the Technical College and the Technical Institute (where the Technical Institute included the library, administrative departments, and technological departments). And external sites, which are the main entrance to "inquiries" and green areas, using the sound level meter (GM1351). In this research, three internal spaces were chosen to perform the measurement, which are (the main courtyard, lecture halls, and teaching rooms) on the ground floor and (the main courtyard, lecture halls, laboratories or teaching rooms). On the first floor of the administrative and technological departments and (the main courtyard, lecture halls, laboratories). On the second floor of the Department of (Tourism, Legal Administration) and (Main Courtyard, Laboratories and Teaching Rooms). On the ground floor of the Technical College. The maximum value of the noise was measured in each indoor and outdoor space covered by the study, and then the total average of the noise intensity in the indoor and outdoor locations was calculated per school day. The research found that the highest level of noise intensity in the school day was in the administrative departments (tourism and legal administration) and it was (76.6 dB), while the lowest noise intensity rate for the school day was in the institute's library and it was (62.7 dB) for the indoor sites. As for the outdoor locations, the highest level of noise intensity in the school day was in the green areas and it was (70.3 dB), while the lowest value of the noise intensity was in the main entry "Inquiries", and it reached (66.0 dB). The results of the research indicated that the level of noise intensity in both indoor and outdoor locations is high and exceeds the permissible limits according to the recommendations of the Environmental Protection Organization (EPA), which requires a noise level (30-40 dB) inside educational institutions and (45-55 dB) outside educational institutions. Exceeding the level of noise beyond the permissible limit is not desirable in the educational atmosphere because it causes reactions such as mental distraction, inability to concentrate and nervous tension, as well as its impact on the health of students and the technical, administrative and teaching staff and their level of performance. Therefore, educational institutions are required to develop appropriate solutions to reduce the risk of noise on the teaching process.

The research presented by Shaima Saeed [18] aims to assess the problem of noise pollution and its health effects in some hospitals in the governorates of Cairo and Giza. The researcher assessed the noise levels inside hospitals and their health impact on humans. A random sample was chosen for (12) hospitals from governmental hospitals in the governorates of Cairo and Giza. As it was taken into account that some of these hospitals are located on a high-traffic road, while others are located on a less-dense road. The results of environmental noise levels outside hospitals ranged between (58 - 79 dB), while noise levels inside hospitals ranged between (52 - 75 dB). It indicates that the noise levels that have been detected inside hospitals are higher than the permissible limits in the Executive Regulations, due to reasons related to exposure to different sources of noise inside and outside the hospital. The researcher reached several urgent recommendations to reduce noise inside the hospital, including the Ministry of Health and placing signs inside the hospital noting that the voices should not be loud by the visitors and to remain calm inside the hospital. It also includes some recommendations, including that the governorates should reduce the noise around hospitals, including controlling street vendors, whose presence leads to traffic congestion, which leads to traffic congestion, causing the raising of voices, placing traffic guiding signs indicating this, setting up sound barriers on both sides of the road, Intensification of planting trees around hospitals in order to reduce the noise transmitted from vehicles on the road to patients' rooms.

The research presented by Marwa El Mahy [19] aims to assess the noise level in factories through measurement and analysis inside the production halls of factories that were taken as cases for study. The measurement showed the noise level exceeded the permissible limits, and the research found that the noise emitted by the machines is of a very high level, leading to direct damage to the workers' hearing sense, and indirect physiological, psychological and neurological damage. Then the study recommended the use of insulation materials for both floors and walls, which helps reduce the noise level and the use of barriers to isolate the machines, which reduces the noise emanating from them.

Bozkurt Demirkale [20] targeted access to industrial noise maps as part of ensuring environmental noise control. It was found that there is a relationship between the noise level in the industrial area and the use of industrial buildings. The research was based on a numerical analysis and some field research. The sound levels of the industrial noise sources were determined to create the map, the boundary values published in the Turkish Environmental Noise List were used, the persons affected by the excessive noise levels were identified, and the design of barriers and

their impact on noise reduction were assessed to acceptable values.

Bashar Hassan [21] aims to reveal the nature of the relationship between the psychological and social work environment and the level of productivity from the point of view of the research sample. The research used the descriptive and analytical method, and it was conducted on a sample consisting of (182) workers who were selected in a simple random way, and a special questionnaire was applied to them. It includes articles on the psychological and social work environment and the level of productivity. He found a relationship between the psychological work environment and the level of productivity. This study recommended the issuance of a specialized magazine that helps in the psychological and social education of workers and the need to pay attention to the work environment in order to match the psychological and social factor of the workers and help reduce boredom and fatigue.

2.1 Comment on previous researches:

The research covered a number of previous researches closely related to the current field of research. From the previous review of these researches, it is evident that there is clear agreement among all these researches that exposure to industrial noise is one of the most serious threats to the safety and security of workers and students. It negatively affects them physiologically, psychologically and psychologically, when exposure to a sound level exceeds the acceptable and stipulated exposure limits, which are estimated at about 85 dB. And when the health of workers and students is affected, it affects their level of performance and thus affects their productivity and students' acquisition of skills. Therefore, it is necessary to make noise measurements in factories and educational workshops and to make the necessary treatments to solve this problem in educational factories and workshops that emit loud noises. Hence, the current research has benefited from this in its methodological procedures related to this regard, through which it was possible to determine the following.

2.2 Research aims and questions:

The research aims to study the effect of industrial noise within the mechanical workshops at the industrial technical institutes on students' cognitive and skill. To address the research problem, this research tried to answer a major question represented in the following:

1- How to study the effect of industrial noise on the cognitive and skill perception of students inside the mechanical workshops and methods of treatment.

2- Including the results in designing educational situations for these students, and reaching proposed solutions in this regard.

2.3 Research importance:

- Providing an appropriate learning environment for students, especially in workshops and laboratories.
- Developing the educational process and achieving the hopes and goals entrusted to them regarding their scientific and practical future, which the labor market requires.
- This enables students to learn the knowledge and concepts and acquire the skills related to the specialization itself as one of the most important materials that represent great importance especially at this time.
- Provides the opportunity for individual, self and continuous learning for students.
- It benefits those in charge of preparing, developing and organizing curricula in industrial technical educational institutions in order to keep pace with the developments that occur in the field of work and its applications, especially in the field of production technology as one of the most important materials that are of great importance especially now.

2.4 Research sample:

The research tools were applied to a sample of 20 students from the second year students in the Production Technology Department at the Industrial Technical Institute in Zagazig.

3. RESEARCH METHODOLOGY and PROCEDURES:

To achieve the objectives of this research, the research proceeded is performed according to the following steps:

1. Conducting a survey of research studies, studies and literature related to the research topic.
2. Preparing and equipping the tools and devices on which laboratory experiments were conducted.
3. Selecting the measuring devices required for conducting laboratory experiments.
4. Achieving engineering results, by measuring the industrial noise level through the noise level meter by recording wave signals within the workshop space to reach the noise level in dB.
5. Preparing the research tools represented in the questionnaire, the cognitive achievement test and the observation card for the skillful aspect related to this regard.
6. Field experimentation on the research sample, and the application of pre and remote research tools.

7. Collecting data, analyzing it statistically, and drawing conclusions.

8. Make the required insulation adjustments to the test bench to reduce noise.

9. Repeating the research tools represented in the questionnaire, the cognitive achievement test and the observation card for the skillful aspect related to this regard after modification

10. Interpretation and discussion of the results.

11. Research recommendations, and proposed research in light of the research results.

3.1 Noise reduction methods:

In general, three methods can be used to reduce noise [22-24]:

1. Reducing noise at the source (re-designing machines and using noise absorbing materials)

2. Reducing noise at the receiver (use of ear protectors in addition to helmets and earplugs)

3. Reducing the noise between the transmitter and the receiver (the use of noise absorbing materials in walls and ceilings - installing machines on soundproof bases)

According to the nature of the problem both the first and the third methods cannot be used, while the second methods is the only choice. Different treatment material can also be used.

3.2 Practical and experimental aspects:

- The background noise level was measured (without machine operating) using the Sound Level Meter (GM 1356).

- The Metal Forging Machine was operated and the noise level measured in the places of the students, who were arranged in a semi-circle at a distance of 2 m from source as shown in Figure (1).

- The educational performance; knowledge and skills) of students were also measured in the same places using the directed test, which is shown in Appendix No. (1) as well as the note card presented in Appendix No. (2).

- The modification of the forging machine inside the mechanical workshop was made to reduce the noise level of the machine, by making two insulation boxes made of aluminum that are placed on both sides of the machine around the noise source, and it rises from the base of the machine by a distance of (57 cm).

- Description of the insulation box; (height 58 cm, length 45 cm, width 15 cm), hollow from the inside to put the insulation materials inside, and then make two iron bases of angular steel with a thickness of (3 mm) in the form of a rectangle with dimensions on the inside (15 cm x 45 cm) Then, the base of the box is fixed to the base of the machine using screws for the purpose of fixing the insulation box on it using rivets, then making another support fixed with the base of the machine to fix the base of the insulation box Figure (2).

- Noise intensity was measured at the same locations as the aforementioned students.

- The insulation materials used with the box have been changed according to attached table No. (1).

- The noise intensity and the students educational performance were measured after each case.

- In order to increase students' visibility, different measurement results when the insulation box is installed at a 120^0 angle on the Forging Machine were performed and the soundproof glass insulation was used as shown in Figure (3).

Fig.1 Arrangement of students in semi-circle around the forge-forming machine.

Fig. 2 Shape of the forge-forming machine after the installation of isolation box.

Table -**1**: Results of different measurement positions using insulation materials

	Insulating materials	Measuring positions				
		1	2	3	4	5
1	Background noise	65.9	65.5	65.2	65.8	66.3
2	Noise after the machine is running without insulation	112.4	112.1	112.0	112.2	112.7
3	Noise after running when the box is empty	111.5	111.3	110.8	111.1	111.7
4	Noise after operating and using Viber with the box	98.7	98.3	97.9	98.1	98.8
5	Noise when using egg carton paper with the box	92.3	92.1	91.9	92.1	92.2
6	Noise when using insulating glass with the box	97.3	97.3	97.0	97.4	97.6
7	Noise when using a cork with the box	87.5	87.4	87.1	87.3	87.6
8	Noise when using cork without the box installed on the corners	88.7	88.5	88.2	88.6	88.9
9	Noise with the use of perforated sheet with corks with the box	81.6	81.4	81.1	81.5	81.9
10	Noise with the use of perforated sheet with the box without corks	83.5	83.2	83.0	83.3	83.7
11	Noise with the use of perforated sheet with corks fixed at the corners	83.7	83.4	83.2	83.5	83.9
12	Noise with the use of perforated sheet with cork with perforated plastic fixed at the corners without the box	79.1	78.7	78.4	78.8	79.3
13	Noise with the use of perforated sheet with corks, with perforated plastic fixed inside the box	77.4	77.0	76.8	77.1	77.6

Fig 3. Shape of forge-forming machine after the installation of isolation box at angle of 120^0.

The following table shows the measured results that were monitored by the sound level meter during the isolation process of the forge-forming machine.

Table -**2**: Results of different measurement positions using insulation materials with box at 120^0.

	Insulating materials	Measuring positions				
		1	2	3	4	5
1	Background noise	66.3	65.8	65.2	65.5	65.9
2	Noise after the machine is running without	113.6	113.2	112.7	113.1	113.5

	insulation					
3	Noise after running when the box is empty	111.9	111.3	110.8	111.2	111.6
4	Noise after operating and using Viber with the box	99.0	98.7	98.2	98.5	98.8
5	Noise when using egg carton paper with the box	93.2	92.9	92.3	92.7	93.0
6	Noise when using insulating glass with the box	98.3	97.8	97.5	97.8	98.1
7	Noise when using a cork with the box	88.8	88.3	87.9	88.4	88.7
8	Noise when using cork without the box installed on the corners	89.9	89.4	88.8	89.3	89.6
9	Noise with the use of perforated sheet with corks with the box	82.6	82.1	81.7	82.0	82.3
10	Noise with the use of perforated sheet with the box without corks	84.7	83.9	83.5	83.9	84.5
11	Noise with the use of perforated sheet with corks fixed at the corners	83.8	83.1	82.8	83.2	83.5
12	Noise with the use of perforated sheet with cork with perforated plastic fixed at the corners without the box	79.9	79.3	78.7	79.1	79.6
13	Noise with the use of perforated sheet with corks, with perforated plastic fixed inside the box	78.4	77.9	77.3	77.7	78.2

3.3 Questionnaire preparation:

The questionnaire is designed to have four main sections:

1. To achieve the objectives of the educational research, a questionnaire, a cognitive achievement test and a note card was designed by reviewing the literature related to this regard, in addition to the researcher's personal experience through his work as a teacher in the production technology department at the Industrial Technical Institute in Zagazig, as well as through the results reached from the side Applied engineering.

2. The questionnaire directed to students of the research sample included in its final form (30) phrases, and the phrases were characterized by diversity and objectivity, and this is explained (Appendix 1).

3. The test directed at students for the research sample included in its final form (4) questions, and the test questions were varied and objective, and this is explained (Appendix 2).

4. The observation card directed to the students of the research sample included in its final form (4) major skills and (30) minor skills, and it was characterized by diversity and objectivity, and this is explained (Appendix 3).

4. Results and Discussions

4.1 Noise Reduction:

It is easy to recognize that noise emitted around the machine can be reduced from almost 113 dB to 77 dB using insolation No.13 in table 1, which is presented in Figure 4. In addition, it can be seen that the SPL are almost equal at all student positions.

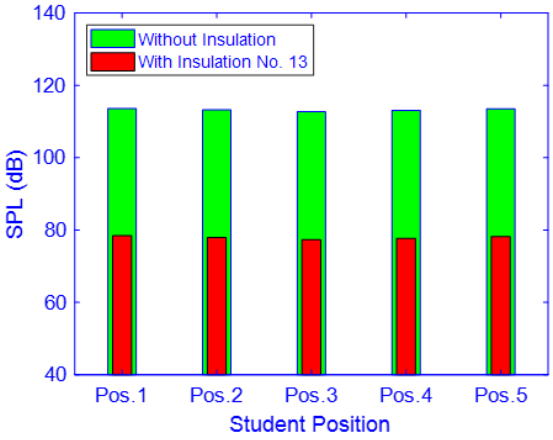

Fig.4 Emitted noise from machine at student position without and with using insolation No. 13 in Table 1.

To increase the distance of the student view, the design of the insolation had been changed from 90^0 that is shown in Figure 2 to 120^0, which is presented in Figure 3. Very small increase in noise emitted from the machine can be seen in Figure 5.

The effect of noise insolation on student' performance can be seen in Figure 6. One can easy see that the average student scores have been totally improved. Hence, it can be said that reducing the noise level from (113 dB) to (77 dB), i.e., by a reduction equivalent to (36 dB), has led to an increase in the students' research sample's feeling of satisfaction with the educational environment inside the mechanical workshops by (52.22%). It also increased their cognitive and skill perception by (44.43%) and (54.46%), respectively.

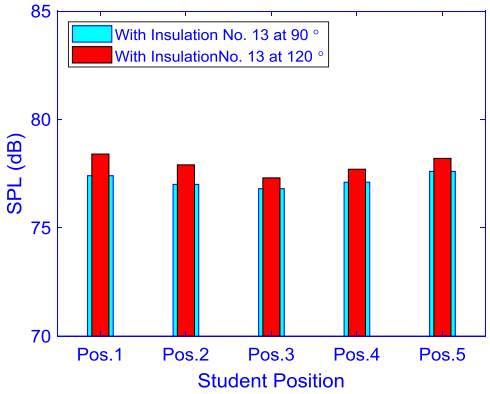

Fig.5 Emitted noise from machine at student position using insolation No. 13 in Table 1 and Tables 2.

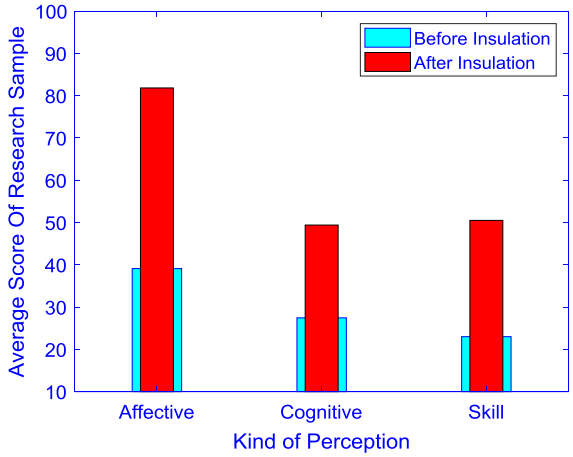

Fig.6 Average score of student perception before and after noise insulation see Appendix 3.

4.2 Statistical data processing:

Appropriate statistical methods were used in the processing of the research data:

1- Using the mean and standard deviation search, each of which was calculated through the equations assigned to that. 2- The research used Degree of Freedom (D.F) for the research sample group of students, by using the assigned equation.

3- The research used the level of significance (a) of 0.05, meaning that the decision that will be taken has an error rate of about (5%), which is correct and correct at (95%), and this is common in research and studies of an educational nature Psychological and social.

4- The research used the T-test, or the so-called (T-test). To find out the significance of the differences between the averages of the students 'scores for the research sample before and after, by calculating the difference between the arithmetic averages, and estimating the standard error of the difference between these averages, as measured by the tabular value at the level of significance ($\alpha = 0.05$), and the corresponding degree of freedom.

5- The research used the Black Equation to calculate the effectiveness of the educational module presented to the sample of the research, as the adjusted gain percentage for Black if it is greater than 1.2, which is the acceptable limit indicated by Black for effectiveness, which indicates the effectiveness of the program in this regard.

4.2.1 Statistical data analysis:

- Appendix 4 shows the values of the arithmetic means, standard deviations, and variance of the students 'scores for the research sample, pre and post, in each of the questionnaire, the test, and the note card.

- The difference between the arithmetic averages, and the estimation of the standard error of the difference between these averages, as measured by the tabular value at the level of significance (α = 0.05) and the corresponding degree of freedom, and then calculate the value of the T percentage (T) using the statistical methods used in processing data.

- By comparing both the calculated and tabular T-ratio value, it is noted that the calculated value is greater than the tabular, for the three research tools, represented in the questionnaire, the test and the observation card.

- The null hypothesis was rejected and the alternative hypothesis was accepted, so there are statistically significant differences between the averages of the students 'scores in the cognitive achievement test and the observation card and questionnaire in favor of the post application, at a level of statistical significance (0.05), and degrees of freedom equivalent to (19).

- Therefore, it can be said, in light of the above, that the research has achieved the desired goals of it with the research sample students.

- The formula for modified gain ratio for Black was applied, where it was found that the value of the calculated Black modified gain ratio is greater than the acceptable limit indicated by Black, since for the test the value of the calculated Black modified gain ratio was (1.35), which is greater than the acceptable limit indicated by Black (1.2), For the note card, the value of the calculated Black modified gain percentage was (1.42), which is greater than the acceptable limit indicated by Black also (1.2). Hence, it can be said that the proposed research has effectively achieved the desired objectives, whether it is related to concepts and knowledge, or related skills in this regard.

4.3 Summary of Results:

Based on the measured results:

- The noise level around the machine in the hemispherical plane assigned to students is approximately equal
- Sound pressure level (SPL) decreases with doubling of the distance between student and forge-forming machine by 6 dB.
- The SPL of the machine can be reduced 36 dB using a box of outer perforated sheet and inner perforated plastic sheet filled with cork.
- The viewing area for students can be increased by changing the inside angle of the box from 90 degrees to 120 degrees while not compromising the noise level.

Based on the results presented on Appendix (4), when the SPL of the machine is reduced 30 dB:

- The average score for the research sample; the affective perception is improved from 39.1 to 81.825 i.e. it is almost duplicated.
- The cognitive perception is improved from 27.45 and 49.4.
- The skill performance is changed from 23 to 50.5.
- It is noted from the previous table that by comparing both the value of the calculated and tabular T-percentage (T), the calculated value is greater than the tabular, for the three research tools referred to in the table, namely: (questionnaire, test, note card). Then the null hypothesis is rejected and the alternative hypothesis is accepted, so there are statistically significant differences between the averages of the students 'scores in the research sample in the three research tools in favor of the post application, at a level of statistical significance (= 0.05α), and degrees of freedom equivalent to 19. Therefore, it can be said in In light of the above, the research has achieved the desired objectives of it with the research sample students.
- Hence, it can be said that reducing the noise level from (113 dB) to (77 dB), i.e., by a reduction equivalent to (36 dB), has led to an increase in the students' research sample's feeling of satisfaction with the educational environment inside the mechanical workshops by (52.22%). It also increased their cognitive and skill perception by (44.43%) and (54.46%), respectively.
- To ensure the effectiveness in this regard, the modified gain equation for Black was applied, where it was found that the value of the calculated Black modified gain ratio is greater than the acceptable limit indicated by Black (1.2), as for the test, the calculated value amounted to (1.35). Note (1.42).

5. Conclusions:

- The elements that make up the workshop (floors, ceilings, walls) are used to suppress or increase the noise inside the workshop.
- After taking the students 'opinions through a questionnaire on the internal environment in the workshop, many indicators were reached that contribute to solving the noise problem in this workshop.
- The use of insulating materials within the internal environment of the workshop plays a major role in reducing the noise level inside the workshop space, which may reach (30 dB). For example, using (fiber, local glass, cork, tin, and transparent plastic).
- Local materials are widely available, such as fiber, glass, sponge, and cartons used to fill eggs (due to the low cost and damping capabilities, with which the noise from the machine can be reduced.

- Noise depends on several variables such as distance from the source. Studies indicate that the intensity of the noise decreases with the increasing distance from the source causing the noise, and hence the relationship is inverse.
- If the student moved to a distance estimated to double the first distance from the noise source.
- It is noticed that the insulation of the perforated sheet with sponge and with perforated plastic is the best, and the reason is that the perforated sheet, sponge and perforated plastic contain many small gaps that cause a great suppression in the noise level, and the noise level loss reaches (30 dB)
- After including the results in the design of educational situations for the students, the research reached an improvement in the cognitive perception and skill performance of the participating students and increased their satisfaction after the isolation process that was carried out on the machine.
- Lack of complaints of headache and fatigue after the operation of the engineering isolation.

ACKNOWLEDGEMENT

Financial and moral supports from Helwan University and its staff at the Faculty of Technology and Education cannot be expressed.

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Appendix No. (1)

An applied level to know the effect of the industrial noise level inside the workshop

No.	The paragraphs	agree	Neutral	disagree
1	The level of noise emitted by the machine does not negatively affect the cognitive achievement range.			
2	The level of noise emitted by the machine does not negatively affect the skill performance during the execution of the skill.			
3	The noise level emitted by the machine does not affect the hearing process during the annotation process.			
4	The workshop has earplugs that are placed in the ear during the loud noise emitted by the machine.			
5	Each student has healthy sized earplugs.			
6	You are not trained in the use / use of personal protective equipment in the workshop			
7	In the workshop there is a first aid box to be used upon exposure to injury.			
8	There are insulators that block the industrial noise caused by machine operation.			
9	The student does not wear personal protective clothing during training in the workshop			
10	There are indicative panels for industrial safety in the workshop with sufficient safety.			
11	The time the student stayed inside the workshop during the training on the machine does not need ear protectors.			
12	The degree of the noise level emitted by the machine does not adversely affect the student when ear protectors are not used			
13	The workshop space is suitable for reducing the noise emitted by the machine during training.			
14	The area of each machine inside the workshop is suitable for good student visibility during the demonstration process and skill performance			
15	The workshop has enough windows to reduce the level of noise emitted by the machine			
16	The distribution of machines inside the workshop is appropriate with the size of the workshop, allowing more than one machine to operate simultaneously			
17	The height of the workshop is inversely proportional to the degree of the noise level . The height of the workshop is appropriate in relation to the noise emitted by the machine.			
18	The distance between the workshops inside the institute negatively affects the students at the time of training while operating any machines in other workshops			
19	Through your study of the machine parts, the machine is installed on a base that absorbs vibration			
20	The distance between the noise source and the student is an inverse relationship. The distance between the student and the source of the noise during training is insufficient			
21	Age stage and noise level have an inverse relationship. The greater the age of the student exposed to the noise, the less the noise effect, and the smaller the age of the student exposed to the noise, the greater the noise effect			
22	Among the non-auditory effects is the difficulty in communicating during the noise. You can communicate with the trainer while the machine is in operation			
23	Exposure to constant noise from the machine does not tend to cause feelings of fatigue, nervousness, malaise, and tension			
24	Health status and noise level have an inverse relationship			
25	The higher the health status of the student, the less the noise effect, and the lower the health status of the student, the greater the noise effect			
26	The student's genetic factors are relevant to his susceptibility to noise emitted from the source. Physical working conditions			
27	The windows and walls are made of sound-insulating materials so that external noise does not reach the inside of the workshop and negatively affect the performance			
28	The level of lighting inside the workshop is suitable and does not cause eye fatigue			
29	Students with low vision have good vision during training			
30	The temperature level inside the workshop is not suitable and causes fatigue			

Appendix No. (2) The test directed to students, the research sample in the final form (before and after insulation)

Name: Grade:

Duration: Max. Score :60

Please, answer the following questions

Question 1: (15 marks)

(A) Defined both: (Simple sound - compound sound - noise)

(B) Complete the following phrases:

1- Noise is measured using a device called .....

2- The World Health Organization has determined the global permissible noise level, which is .....

3- One of the health prevention methods inside the workshops to protect the ear from noise is the use of .....

4- Exposure to constant noise emitted by the machine tends towards the sensation ....., ..., ...

Question Two: (15 marks)

Put a sign (√) in front of the correct phrases and a mark (×) in front of the wrong phrases:

1- The industrial noise emitted from the machine during the explanation process affects the hearing process ()

2- The best material used in the noise isolation process of the machine is glass ()

3- The relationship between the effect of noise level and human age is positive ()

4- The noise knocking machine is installed on a base that absorbs noise ()

5- The method of installing the isolation box at an angle of 90 is better than installing it at an angle of 120 ()

Question Three: (15 marks)

1- What are the environmental factors that affect students within the educational process?

2- What are the types of barriers used to reduce noise according to the way they work?

3- What are the suggested insulation materials to be used to isolate machine noise, and which is better?

Question Four: (15 marks)

1- Explain, with a drawing, how to make the holes with a diameter (1 mm) in the shout plate used for insulation.

2- Explain with a drawing how the isolation box works?

3- What is the correct way to be followed while using the noise meter?

The final score for the test and note card (Appendix 4)

The values of the arithmetic means, standard deviations, and variance of the students' scores, the research sample pre and post, in both the questionnaire, the test and the note card

Research tools used	Measure the affective		Test to measure the		Observation card for skill	
Results of application of search	before	after	before	after	before	after
Average score for the research	39.1	81.83	27.45	49.4	23	50.5
The standard deviation of the research samnle	1.77	1.67	5.66	5.01	2.43	2.94
Variation of the search sample	3.13	2.79	32.04	25.10	5.91	8.64
The difference between the mean scores of the students	42.73 , (52.22%)		21.95, (44.43%)		27.5, (54.46%)	
Estimate the standard error of the difference between the two	0.56		1.73		0.88	
T Ratio (Calculated)	76.30		12.69		31.25	

Appendix (3): Note card addressed to students, research sample in its final form (before and after)

Note Card Usage Instructions.

Students' data whose skill performance is to be noted.

Put a sign (×) under the appropriate scale for each sub-skill

Name :..... Grade :..... Department: .....

Semester: ..... Date : .....

Note card addressed to students for the research sample in its final form (before and after). Overall score (60)				
Key skills	Sub-skills	Skill degree		
		(0): Skill not performed	(1): Skill performed	(2): Skill performed perfectly
Insulation box design	1- Preparing the measuring tools used to determine the dimensions of the box and the base. 2- Cutting the appropriate lengths for the base and the box from flat iron and corner steel. 3- Assembling angle iron and rebar iron using welding. 4- He is good at using the welding machine. 5- Good welding is applied between the two welding joints 6- Operate the drill and make good use of the holes necessary to secure the base to the box. 7- He is good at handling the rivet machine to fix the base with the insulation box. 8- Apply industrial safety rules when dealing with welding and drilling machine 9- Iron surfaces are polished with paint			
Installation of insulation box on the base of the machine	1- Determine the height specified from the base of the machine to the top to place the isolation box. 2- Determine the appropriate place to place the insulation box 3- Installing the isolation box base on top of the machine base 4- It can fasten well to the base of the box with the base of the machine 5- Fill well for the spaces between the isolation box and the body of the machine using silicone 6- Putting the box at an appropriate angle to allow a good view for students while operating the machine 7- Application of industrial safety rules while dealing with the machine			
Choosing suitable insulation materials for good insulation	1- Determine the type of insulation materials used in insulation 2- Determine the width, height and thickness of all insulation materials to match the dimensions of the box 3- Determine the thickness of the appropriate sheet used for insulation 4- Dividing sheet sheets with appropriate dimensions of length and width to determine the centers of the holes 5- Applying the Shankara tools well to locate the centers of the holes 6- Using a hand drill and using it well, the			

	drilling of holes is carried out well			
Putting insulation materials inside the box and correct measuring methods	1- Determine the insulation materials that are best in terms of use The machine is running at the highest speed 2- Putting the insulation material inside the box well 3- Application of industrial safety rules while dealing or approaching the machine 4- Place the measuring device on a firm base to obtain correct readings 5- Determine the measurement distance from the ground to the level of the ear 6- Determine suitable places to take multiple readings and compare them 7- Determine a time period for the measurement period, let it be 30 seconds, to take a steady reading 8- Apply industrial safety instructions when taking the measuring point near the machine's motor			
Skill performance degree				