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THE INSTITUTIONAL FACTORS AFFECTING THE ACHIEVEMENT IN PHYSICS IN TRIPOLI, LIBYA

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ABSTRACT. *This study primarily attempts to investigate if there is any relationship between selected factors namely gender, school and student factors and academic achievement in physics of high school students in Tripoli, Libya.The sample consisted of 100 science students, 50 males and 50 females from two randomly chosen high schools in Tripoli, Libya. Two instruments were used in the study. The physics achievement test (PAT), was designed to assess student performance in physics. The second was a student questionnaire (SQ), designed to obtain information on personal characteristics of the students, school factors and student factors. The main findings of the study indicae that gender was found to be significantly associated with achievement in physics. Specifically, female students were found to perform better than male students. Among the school factors, the factor which emerged as influencing students' achievement in physics was the teacher factor.*
Keywords*:* Sudens achievmen, instituional factors, physics,tripoli

1. Introduction. Science education has become a major concern in almost all countries and its development has been accorded a high priority. Libya is no exception. Science is taught in Libyan schools at the preparatory level as General Science and as separate subjects - Physics, Chemistry and Biology - at the high school level. The impact of scientific progress, proceeding at a rapid pace, demands that children should receive a sound education in the sciences. Thus, physics, the science of properties of matter and energy, is recognized as a essential component of a child's education. Education in physics helps the child to understand the physical universe (as in answering such questions as "why is the sky blue?') and also develops skills such as observing accurately and completely, analyzing, thinking and judging. In addition, it fosters and develops interest, positive values, curiosity and creativity. All these acquired through education in physics are required to satisfy the needs of socio-economic development in Libya such as energy, natural resources and productivity. Another important reason for the inclusion of physics in the child's education is that the ideas and results of physics is relevant to society and every day life.

Hence physics is of utilitarian value to the child and the society. For the nation to develop economically, it necessitates that the children be literate in physics and technology.

Apart from the quantitative expansion in the education system, the Libyan government has made efforts to improve the quality of education at all levels. In the area of science education, including physics education, at the lower secondary and high school level, the teaching of General Science and pure Sciences including Physics has been upgraded. Teachers have been trained, laboratories and facilities have been provided in each school and, to support the teaching staff, laboratory assistants have been employed. Since physics is an experimental science, the importance of laboratory activities has been stressed.

However, in spite of the attention given, it is common knowledge that student performance in physics examinations is poor. In the 1989 final examinations, Taugihia, only twelve percent of the students obtained a pass grade in physics.

Research findings, to date, on student academic achievement (performance in examinations) have suggested a number of different factors as influencing student performance. This is evident from the mention of the findings of these few studies. For instance, the Coleman et.al report [11] suggested that academic achievement was affected by family background factors (eg. Socio economic status of parents) and that per pupil expenditure and school factors had little relationship to achievement.

Anderson [1] found "the prior learning and attitudes that students bring to particular classrooms and courses influence what they learn in these classrooms' .

Bourke [5] found that teacher effects was stronger than all other school inputs, with the effects becoming more pronounced with increasing grade level. Further, according to the review by Glasman et.al.,[18] , some studies have suggested a relationship between performance and the availability and use of the school library.

The findings of past studies, in certain cases, have suggested the same factor as having a different effect in different countries or context. For example, Heyeman et.al.,[22], contrary to the earlier study mentioned by Coleman et. al. [11] , found that, in lower income countries, the influence of pupils ' social status on achievement was not significant and that school factors had greater influences. It is clear therefore that attention needs to be paid to research on factors determining student performance in a particular country or context in order to be useful to educators in improving the educational processes towards better student performance.

1.2 Statement of Problem.The problem is the poor performance and achievement in physics by the students studying in high schools in Tripoli, Libya.

1.3 The Factor Causing the Problem.1. **Fixed factors**, which are beyond the control of educators, specifically the factors of gender and. 2. **Alterable factors**, which may be altered by educators, specifically, availability of laboratory and availability and use of the school library, qualification of teacher, teacher change frequency, teacher quality and student interest in physics and his/her perception of the value of physics. More specifically, the researcher sought to answer the following questions:

1. Is there any significant difference between male and female students in their physics achievement?
2. Is there any relationship between students' achievement in physics and school factors in terms of the :
   - i) Availability of physics laboratory?
   - ii) Availability and use of school library?
3. Is there any relationship between student achievement in physics and the teacher factors in terms of :
   - i) Qualification?
   - ii) Teacher quality?
   - iii) Teacher turnover?
4. Is there any relationship between students' achievement in physics and :
   - i) Their interest in physics?
   - ii) Their perception of the value of physics in society?

1.4.Objectives of the Study. This study concerned itself with the levels of performance in physics and the factors associated with it.

The specific objectives of the study were to :

1. Determine the level of achievement in physics among high school students in Tripoli, Libya, in terms of their performance in a physics test, designed by the researcher.
2. Determine whether the variable gender is associated with students' achievement in

physics.

3. Determine whether there is an association between students' achievement in physics and students' awareness of the availability of a physics laboratory in the school.
4. Determine whether there is an association between students' achievement in physics and the availability and use of the school library.
5. Determine whether there is any influence of qualified or unqualified teachers, teacher turnover and teacher quality on students' achievement in physics.
6. Determine whether there is any relationship between students' interest in physics and their perception of value of physics and students' achievement in physics.

1.5 Significance of the Study. The research is of dual significance. Firstly, it adds to our knowledge in the area of determinants of academic achievement. Specifically, the results of the study will provide us with information as to whether the factors such as gender, school factors and student factors influence academic achievement in physics in the Libyan context.

Secondly, it is hoped that the findings will enable better planning of education in Libya, in terms of the allocation of resources for provision of relevant and necessary school facilities and training of school personnel.

The findings of this survey study may indicate some influencing factors, which may be investigated further using an experimental approach to determine the factors linked to academic achievement of students in physics.

1.6 limitation of the Study. The investigation is limited to students in Tripoli and to final year high school students. The sample of the study comprised only 100 science students. It does not adopt a causal model which will entail a large sample and a more sophisticated analysis, which is not within the resources of time and money of a single researcher. Further, the study only deals with a few factors, in other words, it is not a multi-variate study.

The instrument used to measure academic achievement in physics only dealt with a limited content area of Electricity and Magnetism and not the whole domain of physics.

1.7 Operational Definitions of Terms

Academic achievement in physics: The percentage mark obtained by students in the physics test designed by the researcher.

School factors: School factors in this study include school facilities (library and laboratory.) and teacher factor (specifically teacher qualification, teacher turnover and teacher quality).

Student factors: Student factors in this study refer to students' interest in physics and their perception of the importance/value of physics in society.

High school: This level follows the three years of preparatory school. Admission to the University is based on the successful completion of this level of education, which is three years.
The certificate earned at the end of the high school is termed Taugihia.

2 Review of Related Literature. The influence of diverse variables such as gender, school facilities and experiences (including teacher quality) and student variables on academic achievement of students have been and is continuing to be an area of interest to educators and educational planners both in the developing and developed countries. In other words, many researchers have focused on the important issue of factors influencing student achievement. The question of whether genetic factors, and educational investment of resources into schooling make a difference in educational achievement has been tested by many researchers in many countries at various levels of education. Educational achievement has been taken to mean general school achievement or achievement in specific subject areas.

From among all the factors researched into, in the search for the determinants of academic achievement, it was decided in this study to focus on four groups of factors of interest to the researcher, namely"

i. Gender of students.
ii. School inputs, specifically availability of a physics laboratory, availability and use of a library and certain teacher characteristics

iii. Students' interest in physics and their perception of the role of physics in society

Hence, this review will consider briefly the researches on the relationship or association of the three above-stated groups of factors to academic achievement, particular achievement in the sciences.

2.1 The Relationship between Gender and Academic Achievement. The variable gender has been found to influence educational achievement. The claim that the boys perform better than girls is supported by the findings of [3][6][12][13][27]. Siebert [32] found that male students were generally superior to female students. This finding was further supported by Dietz [13] , who from his study in California of high school seniors concluded that male students were superior in their understanding of economics due to their greater interest and exposure through reading. The results of the international survey of teaching and learning in 19 countries (IEA study) also found that boys were superior in performance in science and mathematics subjects than girls [12].

The National Assessment of Educational Progress (NAEP) studies in the 70s and the Assessment Performance Unit (APU) [3] study too supported the claim that, in the sciences and mathematics, male students perform better than female students.

The studies of Bowman et.al.,[6] on the participation of women in education in the Third World seem to lend support to the view that there are male-dominated subject areas, for example science and mathematics, in which females perform poorly. He suggested that if females wish to study male-dominated subject areas they require a lot of continued encouragement and support.

From the results of the British Columbia Science Assessment, Tivoli et.al.,[36] found that boys performed better than girls in science among the final year secondary school students in Kenya.

Other researches such as the studies by Fennema et.al., [15], and Boyle et.al.,[7], however make the claim that there are no significant influences of gender on academic achievement. Fennema et.al.,[15] found no gender-related differences in mathematics learning in 2 high schools, when the mathematics courses enrolled in was held constant. Similarly, Boyle et.al.,[7] using a sample of Australian elementary school children found that the reading and mathematics achievement did not differ significantly across sex.

On the other hand, the findings of certain researches have contradicted the normal claim that the male students perform better than female students [10][34]. They reported that boys rather than girls tend to underachieve in high schools in the United States. Cheah [10], using a Malaysian sample, found that girls performed better in science than boys.

The findings of the researches on the issue of sex-related differences in science achievement is equivocal and not conclusive. The researches differ in context, population, subject area, etc. More variables than the gender of students are involved and these give rise to varying conclusions. For instance, in the study by Tunhikorn [37] on "Attitudes towards and Achievement in Science of secondary students in Kasetsart Demonstration School in Bangkok, Thailand", the subject areas and grade levels vary. Hence, he found no significant differences in physical science achievement between boys and girls in grades 7 and 8 but found significant differences in grade 9, with boys scoring significantly higher. The study also found significant differences in biological science achievement between boys and girls in grade 7, with girls scoring significantly higher, but no significant difference was found in grade 9.

Several researchers have posited plausible explanations for the differences in achievement found across gender. Some attribute the differences to genetic influences [15].

2.2. The Relationship between School Variables and Academic Achievements. The identification of school variables, which influence student achievement, has been a concern of researchers even before the 60s. For example, Goodman [19] found that per pupil expenditure, teacher experience, number of specialist teachers, classroom atmosphere was significantly associated with achievement. However, increased activity in this field of research ensued with the report by Coleman et.al.,[11] that socio-economic variables accounted primarily for the explained

variance in student achievement and school characteristics had little or no impact. The IEA study [12] also indicated that school variable effects on science achievement was only minimal. These findings are contradicted by Heyneman [20], who, from data collected in Uganda, showed that school inputs, especially school resources, account for a high proportion of variance in achievement.

Further, Heyneman and Loxley [21] conducted a re-analysis of the data collected for the IEA study and showed that for the developing countries, a much larger proportion of the variance in science achievement is explained by school effects. The regression analysis produced the proportion of explained academic achievement variance due to school effects (material resources and teachers) as 90.0 % for India, 88.0 % for Columbia, 81.0 % for Thailand and Brazil, 22.0 % for Australia, 26.0 % for Scotland and 27.0 % for Sweden.

School effects research focused on a variety of school inputs which include school physical facilities (school library, science laboratory and equipment), overall expenditure, textbooks, average class size, teacher characteristics (qualifications, experience, teacher quantity and quality, teaching method, nature of teacher-pupil interactions), existence of science society or clubs and curriculum.

With reference to school material resources, Jacobson et.al., [24], reported that ninth grade students in American secondary schools often used textbooks in the study of science but only sometimes used library books.

Some students never used library books. Simmon et.al., [33], in reviewing studies, state that availability of textbooks demonstrated a positive relationship with student achievement. Similarly, Fuller [16] reported significant effects of material inputs such as availability of textbooks and library and its use on academic achievement.

Laboratory work is accepted as an integral part of science instruction [17]. The laboratory is posited by many science educators as beneficial in the teaching and learning of science but research on the effects of laboratory is inconsistent in both low and high income countries. Even the re-analysis of the IEA survey study data, for developing countries by Heyneman et.al., [21] did not show significant effects of laboratory facilities on science achievement.

With regard to research on the effect of teacher characteristics on academic achievement the reviews of studies in the area by Rossi [30] and Simmon et.al., [33], state that the findings seem to be equivocal. For example, they found that in 19 out of 32 studies, students taught by teachers without teaching qualifications performed as well as those taught by professionally trained teachers.

However, other researchers suggested that there is substantial evidence that professionally trained teachers do make a difference in students' performance and attitude formation, especially in developing countries [8][23][31].

For example, Husen et.al., [23] found that motivation to learn science is influenced by teachers and extent of exposure to science experiences.

Rutter et.al.,[31], from data collected from schools in England, demonstrated that the school plays a significant role in enhancing academic development of children.

An early study by Mayeske [26] suggested that teacher characteristics, such as number of teachers with a higher degree, types of undergraduate preparation, teacher experience and teachers' verbal score, exert a stronger influence on student achievement than physical facilities and programs in the school.

Gallagher [17] listed the quality of instructional experience, which is dependent of school resources (both human and material), as one of the nine factors having a significant effect on variance in achievement and attitudes in science. Further, Simmon et.al., [33] indicated that assignment of homework (a teacher variable) demonstrated a positive relationship with achievement.

Anderson [1] concluded that students' perception of their classroom and the instruction they experience influences their achievement and attitudes. Specifically, he found that the extent to which students perceived their classrooms as having an academic orientation, has a weak but consistent influence on student achievement across the countries studied. In addition,

students' perception of the degree to which their teachers provide the necessary structure for their learning (an aspect of teacher quality) also exerts a weak but consistent influence on student achievement. In terms of classroom activities and teacher behaviors, he reports that students achieve lower in classrooms in which more time is spent on activities related to classroom management.

According to Heyneman [20] and Theisen et.al.,[35], school material resources and human resources are considered important factors in school learning. The teacher is important in that he or she is the person who selects plans and provides the educational experiences in line with the curriculum guidelines. The material resources aid the teacher in organizing learning experiences, which the student can benefit from. The effect they posited however depended on the implementation.

2.3 The Relationship between the Student Variables and Academic Achievement. Another factor found associated with students achievement or underachievement, in the literature, is the student factor. A variety of variables, within the student factor, have been investigated to determine their influence on student achievement. These include student prior learning or achievement and experience, aptitude, ability, intelligence level, study habits, student autonomy, attitudes towards school and towards school subjects, aspirations, interests, motivation and self concept. This section of the review will focus on researches examining the effect of student prior achievement and experience, student interest and attitudes towards school subjects on academic achievement.

Prior achievement in the relevant subject area logically seems necessary for success in school. Several researchers for e.g. Anderson [1], similarly found that prior learning and achievement, relative to the subject matter being taught, influenced students ' achievement in all the participating countries.

Benbow et.al.,[4] conducted a survey investigating the predictors of high achievement in mathematics and science among mathematically talented students. They found that pre-college experiences in mathematics and sciences were associated with high academic achievement. However, ability of seventh grade students was not found to be a good predictor of subsequent achievement.

With regard to interests and attitudes of students, Chakravarthy [9] found that attitudes towards mathematics among Malay students in Kuala Lumpur, Malaysia were affected by their interest in the subject. Interest in science was found to be positively related to the success in science [14]. Examined the interests of a sample of university psychology students and found that the interest variable discriminates between the high achieving, average achieving and low achieving male students. However, they found that interest does not discriminate among female students of differing achievements levels.

Several researchers [4][26][29] have investigated the influences of student attitudes on students ' achievement. Similarly, Rajagopal [29] found that students who held positive attitudes towards the study of the English Language performed better in the English Language attainment test than students who held negative attitudes towards English language.

Benbow et.al.,[4], to answer the questionnaire attitudinal variables associated with high academic achievement in science? Studied variables such as liking the subject and consideration of a career in mathematics, biology, chemistry and physics. The effect sizes for differences between both male and female high achievers and low achievers were significant. For the female students, the most powerful discriminant variable was found to be having considered a career in mathematics or sciences. The relationship between differences in attitudes towards science and academic achievement in science was found to become stronger as the student progressed through high school to college graduation attitudes towards science clearly influences academic achievement in science.

Mayeske [26] went a step further, to conclude from his findings, that students' attitudes is a stronger determinant of verbal achievement than the socio-economic status variables.

Students' perception of the value of science in society and its contribution to solve

everyday life problems has also been investigated A study conducted in the Nether lands [25] on students' attitudes towards the place of science in society found that the majority of students agreed that science is an important factor for improving their lives. Similarly, Jacobson et.al., [24] found that ninth grade students in American secondary schools viewed science positively. The majority of students believed that science is important and relevant for a country's development and that scientific inventions improve their standard of living. He also found that most students were disposed favorably to the study of science and indicated a desire to find out more about the world in which they live. This desire to learn science is related significantly to achievement in science.

2.4. Summary. In summary, research on the factors contributing to differences in achievement reveals a complex picture, owing to the many diverse variables that interact in the teaching and learning processes and how these variables affect achievement. Socio-economic variables have been consistently found to be a source of variation in academic achievement at least in the developed countries. Gender emerged as another source of variation in achievement. Certain teacher and student variables also seem to exert an influence on academic achievement. However, the effect of the laboratory which is accepted and perceived as beneficial to science learning has not been demonstrated to influence achievement.

3. Research Methodology.

3.1 Design of the Study. The influence of selected factors on high school students' performance in physics was investigated empirically on the basis of a survey of students in terms of their academic achievement in physics (dependent variable) and selected influencing factors.• The data on the influencing factors (independent variables) were obtained from the students using a questionnaire. The variables examined are listed in the Table 1.

Table 1. Variables in the Study

Independent Variables	Dependent Variables
- Gender - School factors - Perception of availability of physics laboratory - Availability and use of library - Teacher qualification - Teacher quality - Teacher turnover student factors - interest in physics - perception of value of physics in society	Students' achievement in science in physics test

3.2 .Population and Sampling. The population of the study was the high school students in city of Tripoli, Libya. The sample of students was restricted to final year high school students. There were 20 high schools in Tripoli and only 2 high schools were selected for the study. The 2 high schools were selected by cluster random sampling. It was found that in the 2 high schools, the number of year three classes ranged from three to seven. The researcher then selected two classes of students from each school by simple random sampling making a total of 100 students from the two schools. This represented about 10% of the total students population (100 students of students).

3.3 Instrumentation. Two instruments were used in the study. The first, the achievement test, was designed to assess student performance in physics. The second was a questionnaire, designed to obtain information on personal characteristics of the student, school factors and student factors.

3.31.The Physics Achievement Test(PAT). The Physics Achievement Test (PAT) a pencil-and-paper test was developed by the researcher.

The test consisted of 25 multiple choice items, based on the first four chapters of the grade three

physics text book entitled "General Physics Electricity and Magnetism" for the Libyan High Schools. The test items were drawn up to cover the content and objectives of the area of physics already taught by teachers in Tripoli by December 2009.

3.32 Validity Report. PAT consisted of 25 question items. The question items were contructed such that they were representative of the whole domain of content of the four chapters and in accordance with the emphasis given the specific content topics by the teachers. Both the lower (i.e. knowledge and understanding) and higher (application and analysis) levels of cognitive processes were tested by these items. The table of specification of the final form of the test is presented in Table 2.

Table 2. Specification of the Test

Content	Low level	High level
Forces & Electric Fields	1,2,3,4,14	5,6,8,9
Electric Strain	7,11,12,22	10,17,25
Electric Capacity & Capacitors	13,16,21,24	18,19,20
Electric Instruments	15	

The draft test comprising 40 items was given to three physics lecturers in the department of physics of faculty of science of the Tripoli University in Tripoli. The lecturers were asked to judge and comment on these 40 items in terms of coverage, phrasing, ambiguities, difficult vocabularies and distractors. This test of 40 items was also pilot tested with a group of 30 high school final year students in one Tripoli school, not included in the sample of the study.

The responses were item analyzed revisions were made based on the comments of the judges and students and the item analysis results. Some items were discarded and the amended test of 25 items was judged by the judges as content valid. The final form appears in Appendix IA.

3.33 Reliability of the Test. For reliability, a random sample of 30 students from one school in Tripoli was chosen for the test-retest procedure, the test being administered two weeks apart. The Spearman correlation r had a calculated value of 0.84.

3.34.The Student Questionnaire (SQ). The Student Questionnaire (SQ) , comprising 19 items, obtained information on demographic variables of the students (Items 2-7) , school factors (Items 8-15) , student interest in physics (Items 16-18), and student perception of the value of physics in society (Item 19).

The draft questionnaire was given to two lecturers in the Faculty of Education of the Tripoli University in Tripoli. Based on their comments and the data from the pilot testing with 10 students, some items were deleted and revisions were made where necessary. The final questionnaire appears in Appendix 2. The researcher found no problems with reliability of student responses during the pilot testing.

3.4. Data Collection Method. The researcher obtained official permission to administer the test and the questionnaire to the chosen sample from the High School Office in the People's Committee of Education in Tripoli. The test was administered to all the students in each of two grade three classes from each school by the researcher.

At the beginning of the administration of the test and questionnaire, the purpose of the study was explained to the students. The students were not permitted to consult each other during the conduct of the test. The students were given only 30 minutes to complete the test. Upon completion of the PAT, the students were given the questionnaire. The students were given 20 minutes to complete the questionnaire. The administration of the test and the questionnaire to all the sampled students was completed within two weeks.

3.5. Analysis of Data. The data collected were coded and analysed. The researcher used the Statistical Packaqe for Social Science (SPSS/PC+) Norusis (1988) for the analysis of the data. Each item of the questionnaire was separately analyzed and cross-tabulated for factors, that is, gender, school variables and student variables.

The following analytical procedures were conducted on the coded data:

1. A t-test was carried out to determine whether there was any significant difference in the performance of male and female students.
2. Since the data utilized for determining the relationship were of nominal nature, the Chi square test was employed to determine whether students' achievement in physics was related to the independent variables, namely physics laboratory, availability and use of school library, qualification of teacher, teacher quality, teacher turnover, students' interest in physics and their perception of the value of physics in society.
3. A measure of association, Cramer's V [28] , was employed to determine the strength of the relationship of the factors to students' achievement in physics.

4. **Results and Discussions**. This study focused on the influence of a number of independent variables on students' achievement in physics. This presents and discusses the results of the analyses of data collected through a student questionnaire (SQ) and an achievement test in physics (PAT).

4.1. Students Achievement in the Physics Test (PAT). Students' achievement in the PAT was varied. The highest score obtained in PAT was 88 marks and the lowest was 16 marks. Therefore, the range of marks for the sample of students was 72. The sample of students was categorized into three groups in terms of their performance in PAT.

Students who obtained scores of 65 marks and above were categorized as high achievers. Students who scored between 41 and 64 marks were categorized as medium achievers. Low achievers were students who scored 40 marks and below. The number and percentage of students in each category was obtained and are as presented in Table 3.

Table 3. Student Achievement in PAT

Achievement levels	Average Score	Number	percent %
High	65-88	29	29.0
Medium	41-64	40	40.0
Low	16-40	31	31.0
Total		100	100

The majority, 44.0% (44) of students appear to fall in the medium level of achievement, though there was a fair proportion 24.0% (24) of students who obtained high scores, while the remaining 32.0 % (32) of students obtained lower than 40 marks.

4.3. Relationship between Gender and Academic Achievement. In order to answer Research Question whether there is any significant difference between male and female students in their physics achievement, the mean score and standard deviation for the male and female groups were obtained and a t-test was conducted on the data. The results are presented in Table 4 below.

Table 4. Means and Standard Deviation for PAT by Gender

Gender	Number	Mean Score	St. Devition	t-test value
Male	50	54.19	13.922	
Female	50	58.86	14.311	3.58***

Note *** P ≤ 0.001

Table 4 suggests that both sexes on average, had medium achievement level in PAT, but the girls performed significantly better than boys The girls achieved a mean score of 58.86 while the boys had a mean score of 54.19.

The variable gender was found to significantly influence students' achievement in physics ($P < 0.001$).

A further analysis was conducted to investigate the influence of the gender variable. The sample of male and female students was categorized into three groups in terms of their

performance in the PAT as presented in Table. Table 3 presents the frequencies and percentages of male and female students in the high, medium and low achievement categories.

Table 5. Cross-tabulation of Achievement Levels in PAT by Gender

Gender	Students' Achievement Level							
	High		Medium		Low		Total	
	N		N	%	N	%	N	%
Male	9	18.0	22	44.0	19	38.0	50	50.0
Female	20	40.0	18	36.0	12	24.0	50	50.0
Total	29	29.0	40	40.0	31	31.0	100	100.0

Chi square = 12.64 at P 0.001 , Cramer's V = 0.1605

From Table 5 above, it is observed that only 18.0% (9) of male students obtained high achievement in the PAT, while a greater proportion, 40.0 % (20) of female students obtained high achievement in the PAT. On the other hand, 38.0% (19) of males were among the low achievers in the test compared to only 24.0% (12) of female students who obtained low achievement in the same test (PAT).

It is again clear, from the chi square test performed on data presented in Table 3, that there is a significant relationship between gender and achievement with girls performing significantly better than boys in physics, the Physics Achievement Test (PAT).

4.4 The Relationship between School Factors and Academic Achievement. The school factors which were investigated in this study included students' perception of availability of a physics laboratory, availability and use of a library and teacher variables.

4.41. Relationship between Availability of Physics Laboratory and the PAT. Table 6, presents the data relevant to investigate the relationship between students' achievement in the PAT and students' perception of the availability of physics laboratory in order to answer Research Question 6 (i).

Table 6. Cross-tabulation of Students' Achievement Levels in Physics by Students' Perception of Availability of a Physics Laboratory

Availability of a physics Laboratory	Students' Achievement Level							
	High		Medium		Low		Total	
	N		N	%	N	%	N	%
Available	13	26.0	24	48.0	13	26.0	50	69.9
Not Available	16	32.0	16	32.0	18	36.0	50	30.1
Total	29	29.0	40	40.0	31	31.0	100	100.0

Chi square = 3.695 , not significant , Cramer's V = 0.0867

All high schools in Tripoli are provided with pure science laboratory each for physics, chemistry and biology. In spite of it, a fair number of students, 30.1% (148) of students, indicated that their school had no physics laboratory, indicating that they were not aware that their school possessed a physics laboratory.

From Table 6, it is observed that there appears to be little difference in the proportion of students achieving high and low level performance between students who indicated that a physics laboratory was available in their school and students who stated that their school had no physics laboratory.

The Chi square test conducted suggests that there is no significant relationship between students' achievement in the PAT and their perception of availability of physics laboratory in their schools.

A science laboratory is one of the essential requirements of any successful school science course and a physics course for that matter. Physics is a practical subject and hence it does not depend solely on theoretical knowledge but needs the laboratory as well. However in

this study, the availability of physics laboratory appears to have made no difference in students' achievement in physics. This result may probably be due to the way the physics laboratory was made use of in physics teaching. It does not seem that the laboratory made a difference in student learning of physics and therefore it may be inferred that the physics laboratory was not made use of effectively, whenever the laboratory was used.

4.62. Relationship between Availability and use of library and the PAT. The library is described as the hub of a school. This study, hence, investigated the influence of the availability of the library and its use on students' achievement in physics.

4.621 Availability of library and the PAT. Table 7 presents the relevant data to investigate the relationship between students' achievement in the PAT and students' perception of the availability of school library in order to answer Research Question 6 (ii). The majority, 66.4 % (326) of students indicated that a library is available in their schools, while about 33% (165) indicated that their schools had no library.

Table 5. Cross-tabulation of Students' Achievement Levelsin Physics by Availability of a Library

Availability of a Library	Students' Achievement Level							
	High		Medium		Low		Total	
	N		N	%	N	%	N	%
Available	22	44.0	30	60.0	14	28.0	66	66.0
Not Available	7	14.0	10	20.0	17	34.0	34	34.0
Total	29	29.0	40	40.0	31	31.0	100	100.0

Chi square = 4.0764, not significant, Cramer's V = 0.0911

From Table 5 above, it is observed that 44.0% (22) of students, who indicated that their schools had a library, obtained high achievement in the Physics test, and 14.0% (7) of students, who indicated that their schools had no library obtained high achievement in the test. On the other hand, 28.0% (14) of students, who indicated that their schools had a library, obtained low achievement in the physics test, compared with 34.0% (17) of students who indicated that their schools had no library. The data appear to show that students' perception that their schools had a library did not however influence achievement in the PAT.

The Chi Square (4.08) obtained from the analysis of data given in Table 5 shows that there is no significant relationship between students' achievement in physics and availability of a school library.

4.622. Use of School library and the PAT. Table 7 presents the relevant data to investigate the relationship between students' achievement in the PAT and students' use of school library. Although more than 66% professed that their schools had a library (Table 5), only 29.0% (29) indicated that they made use of the library (Table 6) .

From Table 6 below, it is observed that 24.0% (12) of students, who indicated that they did not use the school library, obtained high achievement in the Physics test, while 34.0 % (17) of students, who used the school library, obtained high achievement in the test. On the other hand, 64.0% (31) of students, who indicated that they did not use the school library obtained low achievement in the test, and 00.0% (0) of students, who used the school library obtained low achievement in the test.

Table 6. Cross-tabulation of Students' Achievement Levels In Physics by Students' Use of the School Library

Use of School Library	Students' Achievement Level							
	High		Medium		Low		Total	
	N		N	%	N	%	N	%
Not used at all	12	24.0	28	56.0	31	64.0	71	71.0

Made use of library	17	34.0	12	24.0	0	00.0	29	29.0
Total	29	29.0	40	40.0	31	31.0	100	100.0

Chi square = 2.3027, not significant, Cramer's V = 0.0685

The Chi square analysis of data presented in Table 6 shows that there is no significant relationship between students' achievement in physics and the use of the school library (Chi square 2.30, not significant) . The findings with regard to use of the school library seem to be consistent with that of availability of school library. It appears that both availability of school library and its use do not influence students' achievement in physics.

4.63 Teacher Variable and the PAT

The teacher variables considered in this study include teacher qualification, students' perception of teacher quality and teacher turnover.

4.631 Teacher Qualification and the PAT. In order to answer Research Question 7 (i), Is there any relationship between students' achievement in physics and the teachers ' qualification, the data on teachers ' qualifications were obtained from responses to Item 12 of the student questionnaire (SQ). Table 13 presents the data o investigate the relationship between students' achievement in the PAT and the students' perception of their teachers' qualification.

Table 7. Cross-tabulation of Students' Achievement Levels in Physics by Students' Perception of Qualification of Teachers

Qualification of Teacher	Students' Achievement Level							
	High		Medium		Low		Total	
	N		N	%	N	%	N	%
Qualified	24	48.0	25	50.0	13	26.0	62	62.0
Unqualified	5	10.0	15	38.0	18	32.0	38	38.0
Total	29	29.0	40	40.0	31	31	100	100.0

Chi square = 0.31755, not significant, Cramer's V = 0.0254

From Table 7 above, which presents the data on whether the students perceived their teachers as qualified or not, it is observed that of the 62.0% (62) of students who indicated that their teachers are qualified, 24.0% (48) of these students obtained high achievement in the physics test, and 26.0% (13) of these students obtained low achievement.

However, Chi Square computed was found to be not significant at the 0.01 level. There appears to be no significant relationship between students' achievement in physics and students' perception of their teachers' qualification.

4.632 Teacher Quality and the PAT. In order to answer Research Question 7 (ii), i.e., Is there any relationship between students' achievement in physics and the teacher quality, the students' perception of the quality of their teachers was obtained from their responses to Items 13 - 15. Students were asked to respond to (i) whether they understand what was taught (Item 13), (ii) whether they needed further explanation in physics (Item 14) and (iii) whether they needed more exercises in physics (Item 15) .

Table 8 presents data on whether or not the students understood what was taught to them in physics. Table 8 shows that a large proportion, 56.0% (56) of students indicated that they understood physics taught by teacher while 43.0% (43) of students stated that they did not understand physics taught to them.

From Table 8 below, it is observed that a higher proportion, 58.0% (29) of students, who indicated that they understood physics taught by the teacher, obtained high achievement in the physics test as compared to 6.0% (3) of students who obtained a low level of achievement.

On the other hand, at 43.0% (43) of those who stated that they did not understand physics as taught by the teacher, only 0.0% (0) obtained high achievement, while 56.0% (28) obtained a low level of achievement in the PAT.

Table 8. Cross-tabulation of Students' Achievement Levels in Physics by Whether Students' Understood Physics from Teacher

Understood Physics from Teacher	Students' Achievement Level							
	High		Medium		Low		Total	
	N		N	%	N	%	N	%
Yes	29	58.0	25	50.0	3	6.0	57	56.0
No	0	00.0	15	38.0	28	56.0	43	43.0
Total	29	29.0	40	40.0	31	31.	100	100.0

Chi square = 35.27 at P 0.001 , Cramer's V = 0.2680

The Chi square was found to be 35.27 and was significant at the 0.001 level. It is therefore clear that there is a significant relationship between perceived teacher quality with respect to teacher's ability to make students understand and students' achievement in physics.

Table 9 presents the frequencies and percentages of students' in the high, medium and low achievement categories by students need for further explanation. From Table 9 below, it is observed that a larger proportion, 54.0% (27) of the students who indicated that they needed extra explanation in physics obtained low achievement in the physics test, but only 20.0% (10) of the students obtained high achievement in the physics test.

On the other hand, while 38.0% (19) of the students who indicated that they did not need extra explanation in physics obtained high achievement in the physics test, 8.2% (4) of the students obtained low achievement.

Table 9. Cross-tabulation of Students' Achievement Levels in Physics by Students' Need for Extra Explanation

Need for Extra Explanation	Students' Achievement Level							
	High		Medium		Low		Total	
	N		N	%	N	%	N	%
Yes	10	20.0	20	40.0	27	54.0	57	57.0
No	19	38.0	20	40.0	4	8.0	43	43.0
Total	29	29.0	40	40.0	31	31.	100	100.0

Chi square = 12.37554 at P 0.001, Cramer's V = 0.1588

The Chi square computed (12.38) was found to be significant at the 0.01 level therefore, be inferred that of significance. It may, there is a significant relationship between achievement in physics and teacher quality in terms of the students' need for extra explanation.

Table 10 presents the frequencies and percentages of students in the high, medium and low achievement categories by students' demand for extra exercises in physics. Table 16 shows that a high proportion of students 60.5% (297) indicated that they needed extra exercises in physics, in other words that the teachers did not give them enough exercises in physics. From the same Table 16 below, it is observed that a smaller proportion i0.4% (31) of students who expressed that they needed extra exercises in physics obtained high achievement in the physics test, compared with 46.1% (137) of students who obtained low achievement in physics.

Further, a larger proportion, 43.8% (85) of students who expressed that they did not need extra exercises in physics obtained a high achievement, while only 10.3% (20) who indicated that they did not need extra exercises obtained low achievement.

Table 10. Cross-tabulation of Students' Achievement Levels in Physics by Students,

Demand for Extra Exercises in Physics

Need Extra Exercises in Physics	Students' Achievement Level							
	High		Medium		Low		Total	
	N		N	%	N	%	N	%
Yes	14	28.0	24	48.0	23	46.0	61	61.0
No	15	30.0	16	32.0	8	16.0	39	39.0
Total	29	29.0	40	40.0	31	31.	100	100.0

Chi square = 102.58 at P 0.0001 , Cramer's V = 0.4571

The Chi square computed (102.58) was found to be significant at the 0.0001 level of significance. It may, therefore, be inferred that there is a significant relationship between student achievement in physics and extent of exercises given by teacher. To conclude, teacher quality in terms of teacher explanation and teacher provision of enough exercises appears to be significantly related to students' achievement in physics.

4. 633 Teacher Turnover and the PAT. The effectiveness of physics teaching may be affected by teacher turnover and hence one of the questions of this study was whether there is any relationship between students' achievement in physics and teacher turnover. In order to answer this question one of the statements in Item 12 required students to indicate whether physics teachers are changed during the period of the year.

Table 11 presents the relevant data to investigate the relationship between students' achievement in the PAT and students' perception of teacher turnover.

Table 11. Cross-tabulation of Students' Achievement Levels in Physics by Teacher Turnover

Physics Teacher Turnover	Students' Achievement Level							
	High		Medium		Low		Total	
	N		N	%	N	%	N	%
Yes	9	18.0	7	14.0	9	18.0	25	25.0
No	20	40.0	33	66.0	22	44.0	75	75.0
Total	29	29.0	40	40.0	31	31.	100	100.0

Chi square = 4.91612 at P < 0.01 , Cramer's V = 0.i001

About a quarter of the students sampled indicated that their physics teachers were changed during the year. Hence, there is a fair amount of teacher turnover. From Table 17 above, it is observed that only 16.5% (20) of students whose physics teachers were changed throughout the year obtained high achievement in the test, while 37.2% (45) of students obtained low achievement in the test.

However, the Chi square analysis on the data given in Table 17, produced a non-significant result. Teacher turnover therefore, does not appear to influence students' achievement in physics.

4.64 Summary of the Relationship between the School Factory and Student Academic Achievement. Table 12 summarizes the aspect of the relationship of school variables and students' achievement in physics. As shown by the values of Cramer's V correlation, given in Table 18, it is clear that the teacher variable appears to be the more important factor influencing physics learning than availability of physical facilities such as a physical laboratory and a school library. The perceived quality of the teacher in terms of making students understand physics and providing students with extra exercises appear to be the important teacher variables influencing students' achievement in science. This seems reasonable since the teacher is the person who provides the learning experience for the students.

Table 12 .Relationship between School Variables and Students' Achievement in PAT

Variables	Cramer's V correlation
Availability of physics laboratory	**0.0867**
Availability of school library	**0.0911**
Use of school library	**0.0685**
Teacher qualification	**0.0254**
Teacher quality	
Teaching towards understanding	**0.2680**
Need for extra explanation	**0.1588**
Need for extra exercises in Physics	**0.4571**
Teacher turnover	**0.1001**

5. Conclusions and Recommendations

5.1. **Conclusion.** This study set out to examine certain variables which might have some bearing on the level of performance of students in the high schools in Tripoli, Libya in the field of physics. The performance of students measured was restricted to cognitive development in physics. The population of the study was final year high school students. There were 37 high schools in Tripoli and only 2 high schools were selected for the study. The 2 high schools were selected by cluster random sampling. A total of 100 students took part in the study. The sample used represented about 10% of the total student population (1009 students). Two instruments were used in the study. The first, the achievement test, (PAT), was designed to assess student performance in physics. The second was a student questionnaire, (SQ), designed to obtain information on personal characteristics of the student, school factors and student factors.

The performance of students was found to be varied (the range being 72 marks). The determinants of this variability in achievement in physics were the interest of this research.

In this section, the major conclusions derived from the study will be summarized. In addition, the findings will be related to past research studies, and their implications will be discussed.

Gender was found to be significantly associated with achievement in physics. Specifically, female students were found to perform better than male students.

This result concurs with the findings of Stockard et.al., [34] , Cheah [34] but contradicts the findings of Siebert [32] , Dietz [13] , Comber et.al.,[12] , NAEP [27] , Fennema et.al.,[15]. One plausible explanation for this variation in the result in this study, of girls performing better than boys, may be that, in Libya, the female students might have put in more effort in their studies. In other words, the achievement motivation of female students may be higher than that of boys.

Among the school factors, the factor which emerged as influencing students' achievement in physics was the teacher factor. Specifically two elements of teacher factor, that is, clarity of presentation, in other words, making students understand what they are taught and teacher provision of adequate exercises were found to be significantly related to students' achievement in physics.

Surprisingly the availability of physics laboratory was found not to be significantly associated with students' achievement in physics. This result may have been due to lack of effective use of the laboratory in physics teaching in Tripoli. Some 30 % of the students sampled were not even aware that a physics laboratory existed in their school. This is an indication that in some cases the laboratory was not utilized at all for the teaching of physics.

The library was also not found to be influencing students' achievement in physics, here was no significant relationship of availability of library and students' achievement in physics was found. This contradicts the finding of Fuller [16], that the library (a material input) and its use had a significant effect on achievement.

5.2 Recommendations. The results of these analyses might perhaps be taken as indicators for the need for a more detailed study to be carried out on the problem of students' level of achievement in physics in Libya. The present work, devoted to certain High Schools in Tripoli,

could only be considered as an exploratory study. It is to lay the ground work touching on certain pressing issues while leaving the more deep-seated questions to be tackled in a more elaborate study.

The study, specifically, only concerned itself with the relationship between selected variables and student growth in the cognitive domain. Hence, student growth in areas other than the cognitive area needs to be studied. Since school learning, specifically physics learning, is a complex phenomenon with many variables involved and the variables interacting with one another, a multi-variate study on a national scale is recommended. This multi-variate study will be invaluable to shed light on the ways the social, political and educational factors operate and influence student learning.

The main concern, as it is with every educationist, had been the child's performance. The child's learning being the central focus, the educational process needs more attention, hence the influence of teacher-student interactions in the classroom on physics achievement needs to be undertaken through use of survey and observational strategies. Further, the teacher factor, specifically teacher quality in terms of clarity of presentation and provision of adequate work exercises for students to practice and consolidate the application of knowledge and skills, emerged as an important variable influencing students' achievement. This points to a need to rethink the preserves and in-service teacher education curricula and teacher preparation methods. Variables demonstrated as important such as teacher clarity of presentation need to be broken down into specific behaviors which are presumed to comprise them and these specific behaviors need to be developed in the teachers so as to improve the quality of teachers.

Further, it is recommended that special courses, seminars and workshops for the teachers be provided, on a regular basis, to encourage them to develop their knowledge and skills and hence improve student achievement in physics.

The teachers also need to be skilled in the effective use of the physics laboratory, equipments and school library to promote students ' learning. Further, the teachers should be able to develop interests in physics among their students through being able to engage students effectively in class activities and in science society activities.

Gender was found to influence students' achievement within the sample studied. Nature of gender differences at all levels of education need to be examined in addition to the origins of gender related differences in the children and consequences of gender differences.

The study also raises certain socio-economic issues. Since a fair relationship between parental education and occupational levels and performance of students in physics was indicated by the study, there is a need for the authorities to restructure some of their policies so as to address the issue of the socio-economic levels of parents critically. Exposure to science-related experiences at home is a function of the socio-economic status of the family, hence it is necessary to raise the socio-economic levels of parents.

To conclude, this study on the factors contributing to differences in achievement in physics has merely scratched the surface but has identified some variables which are associated with achievement in physics. However, further research (survey and experimental studies) is still needed to guide the practice of physics education towards improving the level of students' achievement in physics.

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