Original Research Article

Optional Subject and Students' Academic Performance of Class IX in Samdrupcholing Dungkhag

Abstract

A study was conducted to determine student's preferences and factor influencing the choice of optional subject, to find which student perform better and mainly to analyze the effect of the optional subject on performances in Schools of Samdrupcholing Dungkhag. The survey method was used to collect data through a structured questionnaire survey. There was 220 student studying in class IX. The study showed that Class IX students generally preferred Computer Application subject. The main factors that influence the choice of an optional subject were interest on the subject followed by future career, an influence of seniors, teachers, and schools. The descriptive analysis showed that Economic student performs better than Computer Application and Environmental Science taking student. To make concrete findings on which student perform better further statistical test is required. The moderation analysis indicated significant interaction effect of Computer Application subject on performance and gender ($p = .03$), student type ($p < .001$), Day school ($p = .001$) and Central school ($p = .07$). Economic subject showed significant interaction effect on performances and parent involvement in students' academic ($p = .04$), parents' qualification ($p = .004$), and Central school ($p = .009$). Environmental Science subject showed a significant effect on performances and student type ($p = .001$), Day school ($p = .002$) and boarding school ($p = .02$). There is a need for further inquiry and study to include the factors like teachers, assessment mode, socio-economic factor and more to analyze the effect.

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INTRODUCTION

In Bhutanese school education curriculum system there are optional subjects for class VIII pass students. The students getting through from class VIII have to make a choice among three optional subjects that are Computer Application, Economics, and Environmental Science. Before 2015 there were only two optional subjects (Computer Application and Economics) for class VIII pass students to continue their education in class IX. From the year 2015, an additional optional subject Environmental Sciences was added in class IX by Royal Educational Council (REC) in collaboration with RSPN. In schools usually, the number of students to be taken based on the optional subject are planned or fixed in advance. In the process, some of the students do not get their preferred optional subject in class IX. Looking into student's preferences over the optional subject, it will be easy to determine the number of slots to be created in the coming year for the schools. It will also help the schools to manage teachers.

Most students say and think that Computer Application subject is easier and can score better compared to other two subjects. Therefore most of the students are influenced to take up Computer Application. There is no evidence in proving that Computer Application subject is easier and score better in the examination. There is also no concise knowledge and documents that give the insight on what basis student choose the optional subject than Computer Application being easy and scoring subject. Teachers also assume that students opting the subject Computer Application (Computer Application taking student) perform better in examination than student opting for Economics and Environmental Sciences.

There is a need to identify the factors that influence the student to take up optional subjects and there is a need to analyze the effect of optional subject on student's performance. This is because for class IX student's optional subject has become one of the main challenging issues to decide on which subject to take up and as well factor that would determine their performance in the examination. The study on taking up of the optional subject by students' and its influence to the academic performances will help the students to make a sensible choice of the optional subjects. This study will also help the students to form a basis for making a choice of the optional subject and help schools and teachers to make necessary changes in administering of the optional subjects to students. Analyzing the interaction between the optional subject and student performance will help to determine which subject is making a real difference in performance.

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This will also help the school and student to find the ways to work on the particular optional subject (like which group of student and subject need improvement) and work on it accordingly and identify optional subjects as one of the factors in determining performance.

1.1 Research questions:

1. Which optional subject is preferred most and which optional subject taking student performed better?
2. What are the factors or determinants that influence the choice of optional subjects?
3. Does optional subject effect the performances of the students?

1.2 Objectives of the study: The aim of the study is:

1. To analyze the optional subject preferred by the student and which optional subject taking student performed better
2. To identify the factors that influence the choice of optional subject
3. To analyze the effect of the optional subject on students' academic performances.

Comment [H1]: Do not leave paragraph without citing the source.

Comment [H2]: There is a need to revise the research questions . The results and discussion part is not neatly aligned with the research questions of the study.

Comment [H3]: Research question 1 is double barreled. Separate preferred optional subjects and optional subjects chosen have better performance

Comment [H4]: Research question must not be answerable by yes or no. kindly revise research question #3.

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Literature review

Singh et al. (2016) investigated the factors influencing students' academic performance. The authors focused on factors like learning facilities, communication skills and proper guidance from parents on student academic performance to analyze the significance of those factors. The study revealed that there is a positive and statistically significant impact of those factors on student academic performance. While carrying out a cross-sectional survey at Middle East Technical University in Ankara in Turkey on factors affecting academic performances, a significant relationship was found between students' achievements and factors such as preparatory school attendance, high school graduates from, father's educational level and class attendance (Erdem, 2012). Ogweno et al. (2014) observed that student age, career choice, gender, study times, and class attendance positively influenced students performance in secondary school agriculture. Adeleke et al. (2013) found that the determinants of career interest choice investigated have significant effects on career interest choice but not all the determinants have positive significant effects on academic performance of senior secondary school leavers in Financial Accounting in terminal public examinations. Goodb (2016) findings on "increase body weight and academic performance in university students showed a correlation between healthy body weight and improved academic performance. A case study carried out in Udzungwa Secondary School, Kilolo, Iringa, Tanzania on "student's preferences on science subject" showed that among many other reasons, the common reasons for students' preferences and poor performance on science subject at ordinary level secondary school included: age of learner, sex, ignorance, shortage of learning materials, gender bias by subject teachers, and lack of guidance to students on the future importance of science (Mwajombe, 2012).

Haider et al. (2015) studied the students' motivation and its relationship with their academic performance from the data collected from 120 students. The study revealed that intrinsic motivation and extrinsic motivation had a positive impact on students' academic performance. This study also revealed that motivation is very important part of students study life and play a very important role in student success.

Parent's involvement in a child's education is consistently found to be positively associated with a child's academic performance. The study examined with a sample of 158 seven-year-old participants, their mothers, and their children indicated a statistically significant association between parents' involvement and a child's academic performance, over and above the child's

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intelligence. Multiple mediation models indicated that the child's perception of cognitive competence fully mediated the relationship between parent involvement and the child's performance on a standardized achievement test. The quality of the student-teacher relationship fully mediated the relationship between parent involvement and teacher ratings of the child's classroom academic performance (Tapor, Keane, Shelton, & Calkins, 2011). Nobel (2006) found that academic activities of students, the perception of their adapting strategies and background qualities like family pay and parents guidance were indirectly connected to their compound scores, during academic achievement in secondary school. Studies have also been done on the impact of peer influence on student performance. Goethals (2001) investigated that peer influence has more influential effects than family. Peer help was positively associated with the students' average grade point and also found that homogeneous group students do better than heterogeneous group students. Rangvid (2003) found that mixing skills influence weak students positively but on the other hand the results for brilliant students were found negative.

Few authors have carried out the studies on "Student Status and Academic Performance" as an approach to the quality determinants of university studies in Greece. This study employs administrative and survey data to assess the impact of students' socioeconomic background on educational outcomes. The academic and social profiles of 867 students, studying in a University of Economic and Social Studies, are analyzed by means of Ordinary Least Squares and Quantile Regression Methods. Authors have taken into account of the existing institutional framework which gives rise to substantial differentiation in the duration of studies among students. Thus, besides examining the influence of students' status (working and non-working) on degree grades they also examine whether the documented negative influence of long duration of studies on grades is associated to students' status. The findings of the authors reject both hypotheses; working students do not achieve lower grades than their non-working peers; the negative impact of the length of studies on grades is not linked to status, and affects both working and non-working students in the same way. The prolonging of studies seems to be an institutional effect deriving from the conditions of schooling rather than from students' financial circumstances (Katsikas & Panagiotidis, 2010).

Teacher and teaching methods are considered one of the main determinant/factor that affects the students' performance. Wenglinsky (2001) carried out the study with regard to teacher's classroom practices and student performance. The study, in particular, explores the link between

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classroom practices and student academic performances by applying multilevel modeling to the 1996 National Assessment of Educational Progress in mathematics. The author's findings were, the effect of classroom practices when added to those of other teachers characteristics are comparable in size to those of student background, suggesting that teachers can contribute as much to student learning as a student themselves. Ganyaupfu, (2013) took a sample of 109 undergraduate students from the College's Department of Economic and Business Sciences to analyze the differential of three teaching methods (teacher-student interactive, student-centered method and teacher-centered) on students' academic performance. Author derived the students' assessment test scores from the internal class test prepared by the lecturer using the inferential statistics course. The differential effectiveness of the three teaching methods on student academic performance was analyzed using the General Linear Model-based univariate ANOVA technique. The author found significant differences on the effectiveness of the three teaching methods and made a conclusion that teacher-student interactive method was the most effective teaching method, followed by student-centered method while the teacher-centered approach was the least effective teaching method. 'In the study carried out in Zimbabwe's rural Secondary Schools with Marimasimbe Secondary School (Gokwe South – Midlands Province) showed that the type of school leadership by the head, career guidance, teacher-pupil ratio, qualified and dedicated teachers as well as discipline and order are the major internal factors affecting students' academic achievement. The study also showed identified external factors are family socioeconomic status, school-community relations, distance or proximity to the school and witchcraft practices. Other findings are that boys perform better than girls at ordinary level. The researcher recommends the creation of conducive school environment by school heads, taking career guidance more seriously, employment of adequate qualified teachers who are dedicated to their work, maintaining discipline and order by both parents and teachers among others.' (Nyoni, Nyoni, & Bonga, 2017). Social media also play a vital role in an academic performance of the students. Qingya Wang (2011) looked into the effect of social media on college students. The authors finding indicated that most college students use social media and spent many hours checking social media sites.

Morales (2008) analyzed the impact of several factors potentially affecting the academic performance of Economics fresher (first-course undergraduates) at Universidad Carlos III de Madrid over the period 2002-2005. The authors finding was that those students who completed a

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technical track at high school tend to perform much better in subjects involving math skills than those who followed a social sciences track (supposedly tailor-made for future economics students) and that the latter does not perform significantly better in subjects where prior training in economics helps. In a sample of 50 respondents (students) selected from the Department of Political science, Gomal University, Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan to analyze the impact of ICT on students' performance. The study showed that ICT has a significant impact on student learning process and the majority of student in Gomal University claimed the use of ICT to do the task, such as preparing assignments and sequencing classroom activities (Khan, 2015).

Many studies have been conducted to analyze the factors that affect the students' academic performance. In Bhutanese school context, optional subject in secondary school (class IX) also determine the academic performance of the students. Few studies have been conducted on the preferences of the subject and its effect on student academic performance. But the study on preferences of the optional subject and its influence on overall students' academic performance is yet to be determined.

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Materials and Method

3.1 Study area

The study was conducted in Samdrupcholing Dungkhag, under Samdrupjongkhar Dzongkhag. There are four schools in Smadrupcholing Dungkhag (one lower secondary school, one middle secondary school, one higher secondary school and one central school). They are Pemathang Lower Secondary School, Phuntshothang Middle Secondary School, Karmaling Higher Secondary School and Martshalla Central School. Karmaling Higher Secondary School and Martashalla Central School provides boarding facilities to the students.

3.2 Data collection procedures

The structured (close-ended) question was used to collect the quantitative data from 2017 batch of class IX students of Samdrupcholing Dungkhag. The data was collected only from class IX students because they were the target population of study. The factor influencing the choice of the optional subject of the students was determined by collecting the primary data through the questionnaire. The intervening factor in student's performance (gender, student type, class VIII performance level, parents' involvement in academic, parents' qualification, parents' occupation, and school type) and optional subject taken by students was determined through the questionnaire. The information on student performances (overall marks in percentage) was also collected through questionnaire.

3.3 Sampling

The target population for the study was class IX students. There were three schools with class IX students in Samdrupcholing Dungkhag (Phuntshothang Middle Secondary School, Karmaling Higher Secondary School, and Martshalla Central School). The census survey method was used to collect the data. Census method was adopted for data collection because Farooq (2013) points out that census method is suitable in the following cases: where the universe is not vast, where there is enough time to collect data, where a higher degree of accuracy is required and where there is enough availability of finance.

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3.3.1 General information of the respondents

The most of the students were from Central School followed by Day School and Boarding School. There was 39% of students from Central School, 36% from Day School and 25% from Boarding School.

Table 1: Demographic information of the Student (N=220)

Demographic Information	
Total Respondent	220
Female	57%
Male	43%
Average Age	16 Years
Minimum Age	14 Years
Maximum Age	22 Years

Table 2: Information on student type

Student and School Type	Respondent %	No. of student
Boarding Student	61	134
Day Scholar	39	86
Total	100	220

3.3.2 Category of the student based on class VIII performance

The student was categories based on the performance in class VIII. The student scoring the marks above 50 were categorized as above average student and 50 and below as below average student. There were 85% of student who was above average student and rest 15% were below average student.

Comment [H5]: Data here can be placed in 1 table.

3.3.3 Qualification of the parents

There were 81% of student's parent who was uneducated, 7% of parents with primary level schooling, 3% with secondary level schooling, 4% with middle secondary level schooling, 2% each with higher secondary and degree level, and 1% of student's parent with master level qualification. For the main analysis, the qualification of parents was categorized as educated and uneducated.

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3.3.4 Occupation of the parents

Seventy-six percent of student's parent were farmers, then 8% were from arm force, 4% drivers, 3% businessmen and gomchens, 2% government employees, rest fishery worker, livestock officer, teacher, and the engineer was 1% each. To carry out an analysis, the occupation of parents were categorized as non-farmer and farmer.

3.3.5 Involvement of parents and ways parent help in academic of students

There were 61% of parents who involved in their child's academic and rest 39% do not get involved. Among the 69% who got involved in student's academic, 67% of the parents ask about the academic performance from the teacher, 11% parents help their child with providing guidebook or reference books, 6% of parents reminds student time to time to study and give advice, 5% of parents check daily activities of the students related to academic, 4% of parents' guide the students in doing homework, and 2% of parents go through student notebook and other 2% send their child for tuition. In general, the involvement of parents was divided into two for the analysis (parents who help in academic and does not help in academic of the student).

Comment [H6]: This part can be deleted since the study respondents are students.

3.4 Data analysis

Descriptive statistics (charts, frequency table, and percentage) was used to analyze the general information of the students and supporting information needed for study (like demographic information on parents, schools, performances of the student, factors influencing the choice of the optional subjects etc.). Box plot was used to analyze the performances of the student based on various demographic and other factors. To analyze the effect of the optional subject on the performance of the student, moderation analysis as prescribed in the book written by Field (2013) was done. Before the moderation analysis binary logistic regression was carried out for the controlling of the various factors or variables influencing the choice of the optional subject. Based on the result of the binary logistic regression while carrying out moderation analysis, for the result with a significant difference in the choice of the optional subject based on various factors, were taken as covariant. The moderation analysis was carried out to analyze the effect of the optional subject on the performance of the student because the moderation analysis gives the interaction effect of two variables or factors on outcome. The optional subject was taken as moderator to analyze its effect on outcome (performance) in combined interaction with other factors (predictors).

Comment [H7]: In the Data analysis , focus only on the descriptive statistics that you will use in the Research problems of your study.

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3.4.1 Conceptual moderation model

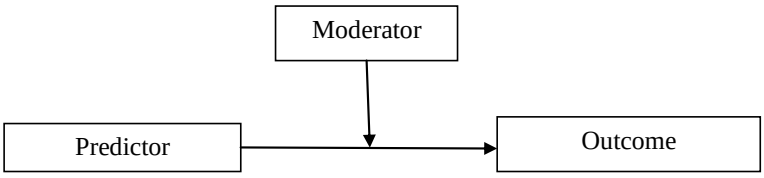

Figure 1: Conceptual moderation model (Field, 2013)

In this study, the predictors (other factors) are the gender of the student, student type, parent involvement in academic, parents' qualification, parents' occupation, performance level in class VIII and school type. The optional subject was the moderator and the outcome was the performance (overall mid-term marks in percentage) of the student. The moderator was broken down into three (Computer Application, Economics and Environmental Science) in order to run the moderator analysis since there are three different subjects as moderator. The basic concept applied here was that the predictors' influence or effects the choice of the optional subject as well as the performances of the student. Using this model it determines the influence or effect of moderator under the given predictors on outcome through regression process.

The combined effect of two variables on another is known conceptually as moderation, and in statistical terms as an interaction effect (Field, 2013). There are many predictors that effect the performances of the students. For instances, the choice of the school type or the parental background of the student determines the performances but at the same time, there is also an issue for the class IX student to make a choice of optional subject. We are interested in whether the optional subject effect the performances of the student or not. Therefore to determine the effect of the optional subject, the three different optional subject was taken as moderator across various predictor of performances. The interaction effect of an optional subject on predictors will determine the value and significance of the effect of optional subject on the outcome combined with the predictor. For example, the gender of student determine the performances of the student. Now to see the effect of Computer Application subject on gender wise performance, we analyzed the interaction of Computer Application on gender wise performances. By carrying out the same process with each predictor we analyzed whether the optional subject effect performances of the student or not.

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4.4.2 Statistical moderation model

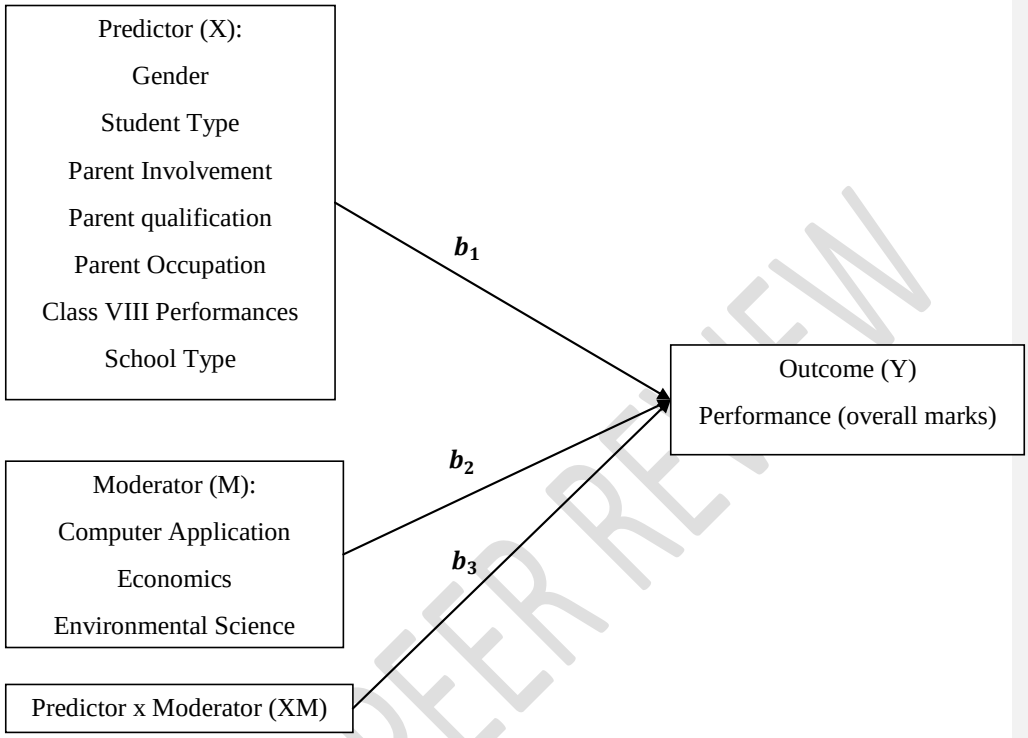

Figure 2: Statistical moderation model (Field, 2013)

General Regression model for the study of the effect of optional subject

$$Y_i = (b_0 + b_1 Predictor_i + b_2 Moderator_i + b_3 Interaction_i) + \varepsilon_i$$

$$Performance_i = (b_0 + b_1 Factor_i + b_2 OptionalSubject_i + b_3 Interaction_i) + \varepsilon_i$$

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Results and Discussion

Comment [H8]: 1.In the results and discussion part , focus in answering all the research questions you posted in the first part of the paper. Remove discussions which are not part of the Research problems mentioned earlier. 2. Present the findings, then discuss it. Support discussion with relate studies or literature

4.1 Choice of the optional subject by students

In the beginning, 139 students wanted to opt Computer Application subject, 52 student economics, and 29 students environmental science. But in actual, there was 135 students taking Computer Application subject, 44 students taking an economics subject and 29 students taking

environmental science (Table 3). This shows that most preferred optional subject by the student was Computer Application followed by Economics and Environmental Science. Most students preferred Computer Application subject because students generally perceived that Computer Application is easy and scoring subject and other reason associated was due to the mode of examination. While most of the student think and feel Economic to be tough subject so the student prefers not to take Economics compared to Computer Application. Environmental Science subject was least preferred because the subject was new in the school curriculum for the student and there was no full-time well-trained teacher to teach.

Table 3: Total number of students currently taking a different optional subject

Optional Subject	No. of Student initially opted	No. of Student Currently Taking
Computer Application	139	135
Economics	52	44
Environmental Science	29	41
Total	220	220

4.2 Reason for choosing optional subject currently

Comment [H9]: This is not in the research question

The choice of optional subject by the student was based on following reason or factors: influence by parents, influenced by friends or peer, influenced by teachers, influenced by the school system, future career of the student, influence by seniors and others (to get aware of environment and world is digital world). There were 71% of student who based their choice of the optional subject based on the interest they had on the subject, 14% chose based on future career, 6% influenced by friends, 3% influenced by seniors. 2% influenced by teachers, 2% influenced by the school system, 1% influenced by parents and 1% chose the optional subject based on the interest to gain knowledge (Figure 3). This indicates that main reasons for making the basis for the choice of the subject was interest on the subject and base on future career optional subject holds for them. The future career could be the scope of the particular optional subject for them in the job market.

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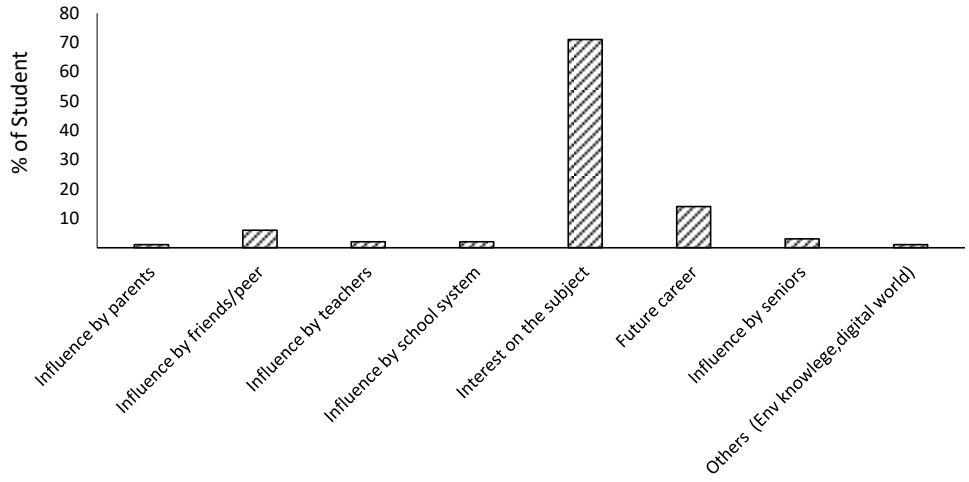

Figure 3: Factors influencing the choice of optional subject to the students

4.3 Satisfaction of the student with the choice of optional subject

Comment [H10]: Not in the research Problem

Most of the student was satisfied with the choice of the optional subject they chose. The pie chart below shows that 94% of the student was satisfied with the choice of the optional subject and only 6% of student was not satisfied with the choice of optional subject (Figure 4).

Figure 4: Percentage of student satisfied with the choice of optional subject

The reason associated with the satisfaction of the student was, 67% student got the subject of their interest, 19% said the optional subject they chose was easy to score marks, 4% student said subject they chose was easy, 3% said their midterms mark of the subject they chose was good and 1% said their teacher to teach optional subject of their choice was good (Figure 5). The

finding shows that the main reason for the satisfaction with the choice of the optional subject were students' got the subject of their interest and subject they choose was easy to score marks in the examination.

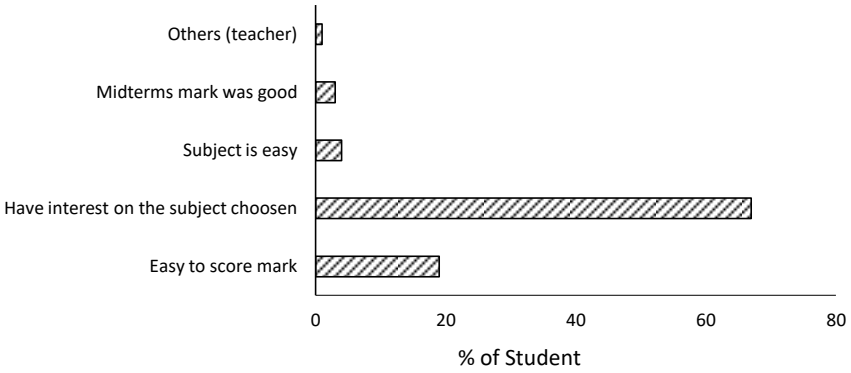

Figure 5: Reason for satisfaction with the choice of optional subject

The reason associated for the student being not satisfied with the choice were subject student chose was difficult, the student could not score marks, had interest in other optional subject and student think they could score better in other optional subjects than the subject they chose. From the 6% of student who were not satisfied with the choice of the optional subject, 3% of student gave the reason that they had interest on other optional subject and 1% each of student said they could score better in other optional subjects than subject they chose, could not score better and subject they chose was difficult (Figure 6). The most common reason for not satisfied with the choice of the subject was because the student had interest in other subjects. This means that student those who were unsatisfied with the optional subject they might have chosen the subject due to the influence of friends, peers, family or school or without any knowledge of the subject.

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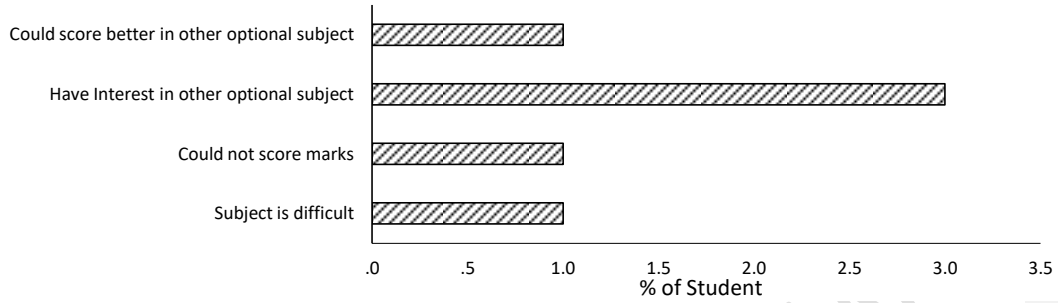

Figure 6: Reason for not satisfied with the choice of optional subject

4.4 Performances of students based on the choice of optional subject

4.4.1 Student's perception of performance based on the optional subject taken

Comment [H11]: Discussion must focus on the performance in the different subjects chosen by the students. Just present the and discuss the data. Presenting the reasons here is not part of the research problem.

Irrespective of the student type (taking Computer Application, Economics or Environmental Science), most of them perceived that those students taking Computer Application perform better in examination than those taking other optional subjects. There were 84% of student who perceived that Computer Application taking students performed better in the examination, 12% perceived Economics taking students performed better and 4% perceived Environmental Science taking students performed better (Figure 7). The reason for perceiving the Computer Application student performing better could be because the student might have seen Computer Application student with high marks in the Computer Application subject compared to other two subjects.

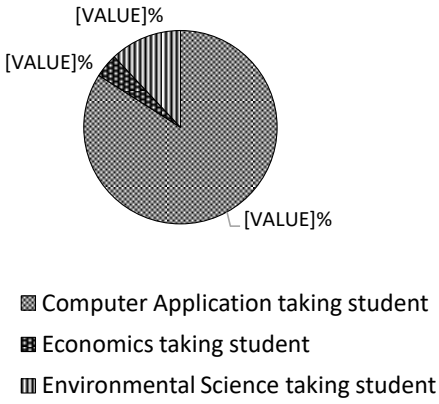

Figure 7: Perception of student on academic performance based on the optional subject taken

Irrespective of the option subject they take there were 40% of student who thinks they can perform better because the subject they take was scoring subject, 24% said they have interest in

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subject they take, 17% said the subject was easy, 3% of student said their teacher was good, 3% said they have good facilities or references, 1% each of student from the total student said they are intelligent, they can access information easily, they are more exposed to outside world and said it's because of the mode of examination, theory and practical examination (Figure 8).

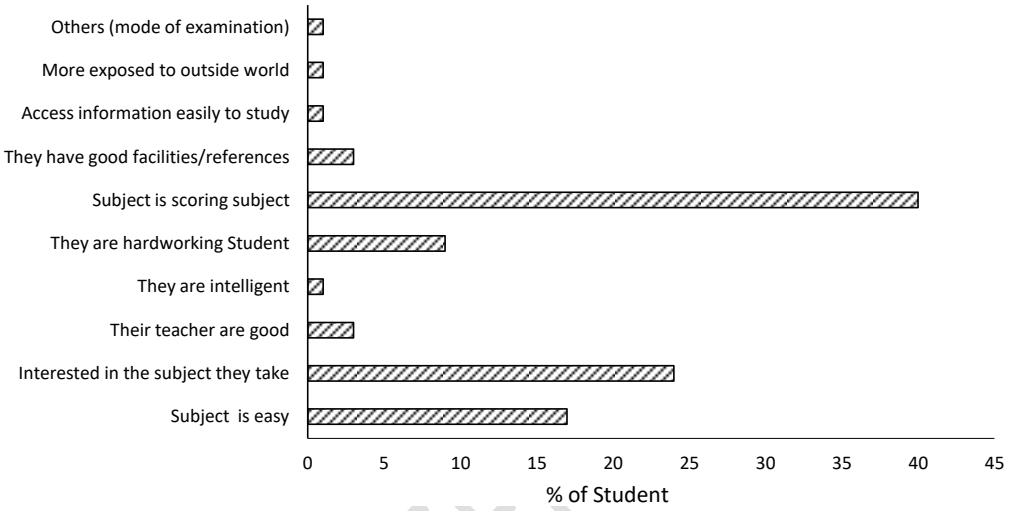

Figure 8: Reason for better performance

5.4.2 Box plot analysis of the performance of student based on the optional subject taken

The median mark of the student taking Computer Application and Economics optional subject was same but the median mark of Environmental science taking student was higher than that of Computer Application and Economic taking student. The maximum mark of the Economics taking student was higher than followed by Computer Application and Environmental Science taking student. The minimum mark of Economics taking student was higher compared to Computer Application and Environmental Science taking student. In general, in contrast to the perception of the students, economics taking student had performed better than the Computer Application and Environmental Science taking student.

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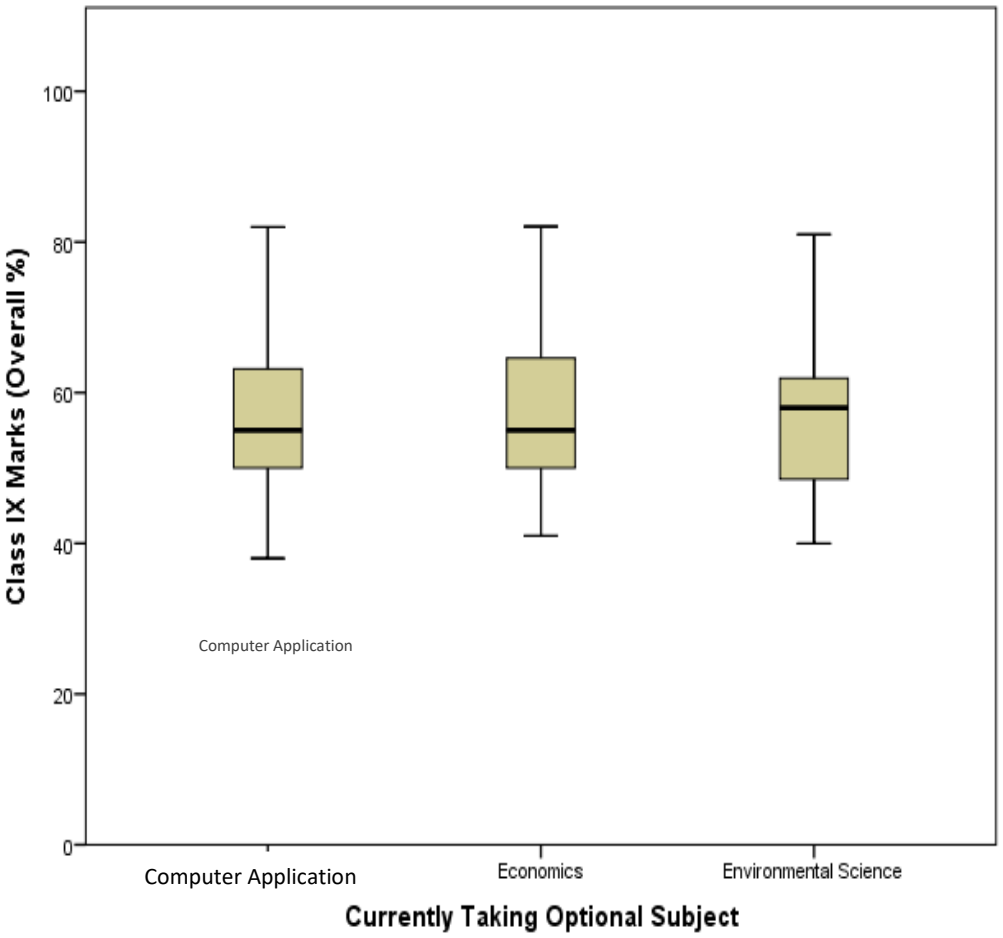

Figure 9: Performance of student based on the optional subject taken

4.5 Box plot analysis of performances of the student based on various factor

4.5.1 Performance of student based on gender

Median marks of male student were bit higher than the female student. The lowest mark scored by both female and male were in almost same range but the male student had the maximum mark scored better than the female student. Comparatively male students had performed better than the female students.

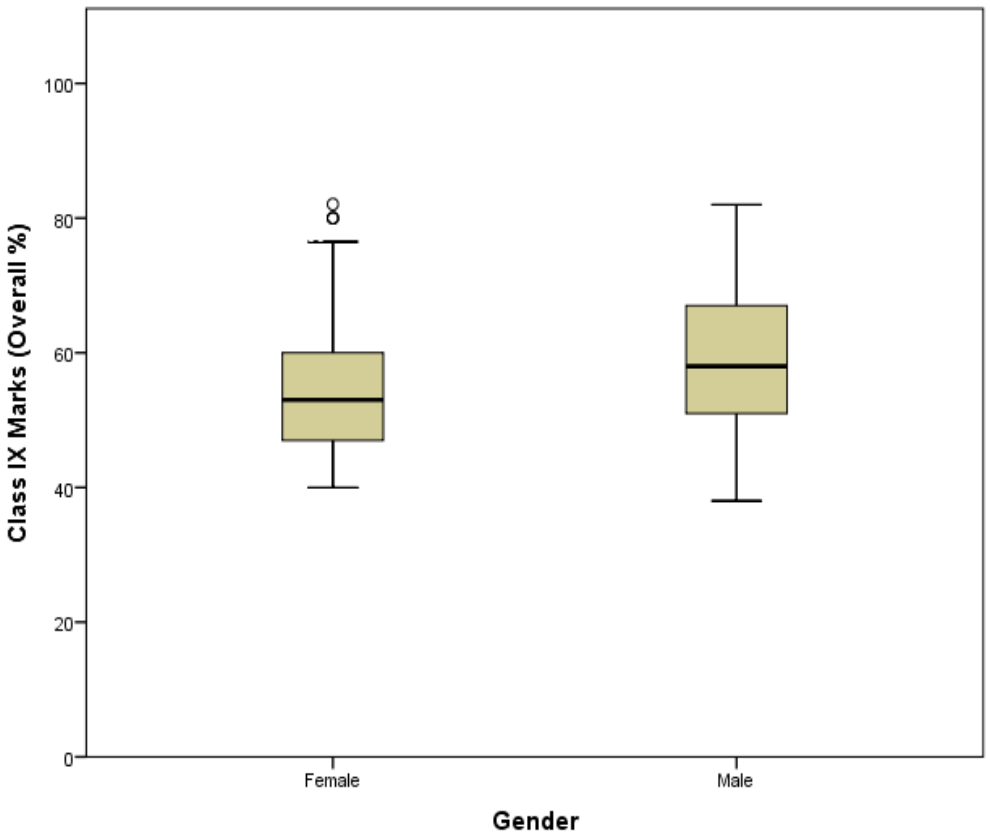

Figure 10: Performance of student based on gender

4.5.2 Performance of student based on student type

Boarding students performed better than the day scholar students. Median and maximum marks of the boarding students were higher compared to the day scholar students. The minimum marks of boarding students were bit lower than that of day scholar students.

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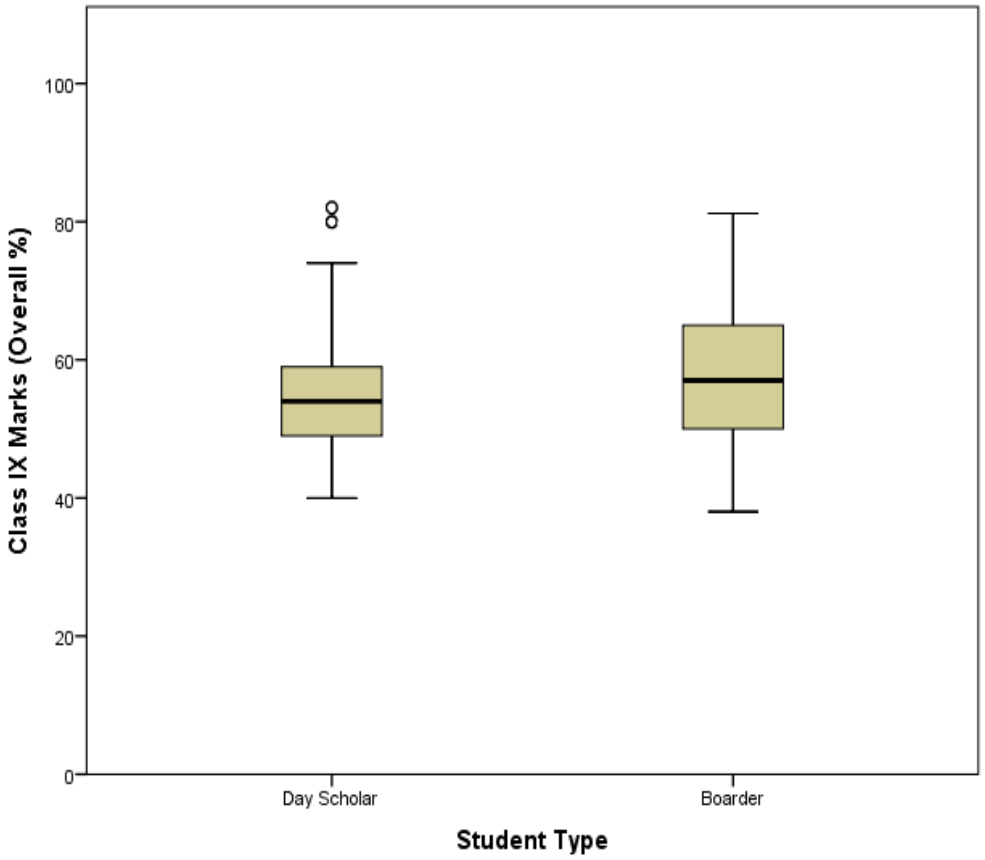

Figure 11: Performance of student based on student type

4.5.3 Performances of Student based on class VIII performances

The above average student performed better than below average student. The median and maximum mark of the above average students was higher compared to below average student. But the minimum marks of the below average student was higher compared to above average students.

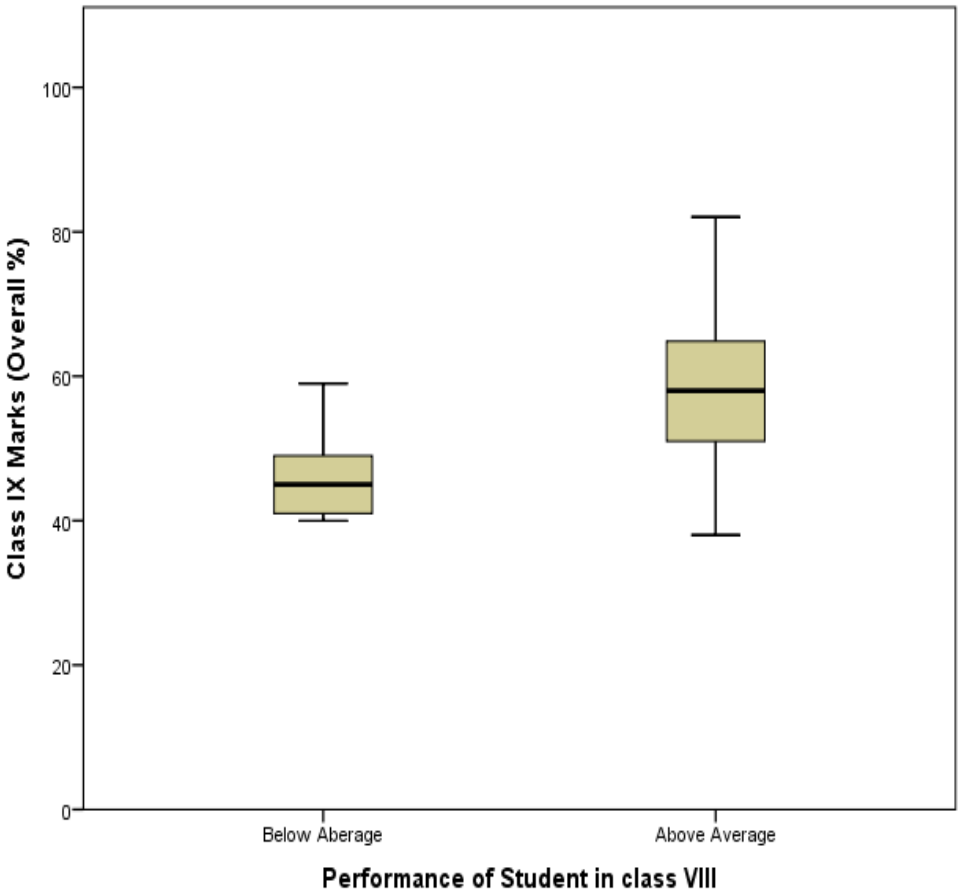

Figure 12: Performance of student based on class VIII performances of the student

4.5.4 Performance of student based on parents' involvement in academic matters

Students' with those parents who help them in their academic purposes performed better than those student's whose parent did not help them in their academic matters. The median and maximum marks of the students whose parent helped in their academic was higher compared to those students whose parents did not help. The minimum marks of both the student were in similar range.

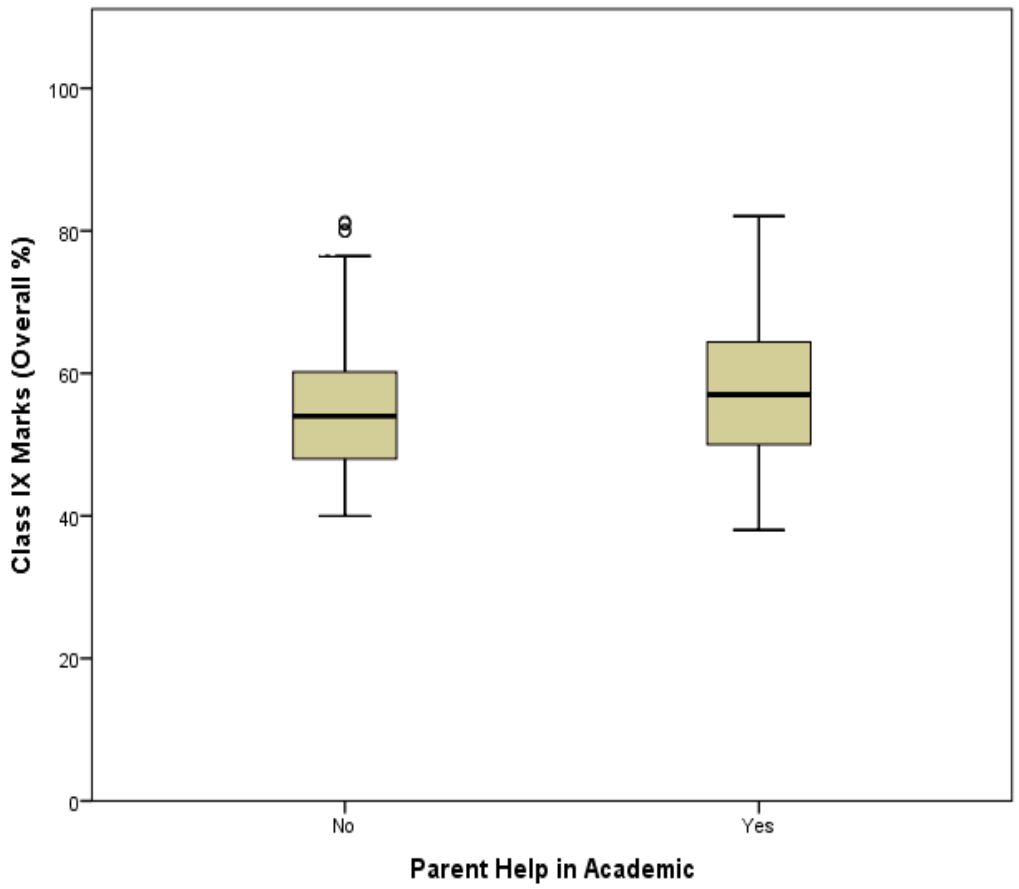

Figure13: Performance of student based on parent's involvement

4.5.5 Performance of student based on qualification of parent

The performance of the students whose parent were educated performed better than those students whose parents were uneducated. The median and maximum marks of students whose parents were educated was higher than those students whose parents were uneducated.

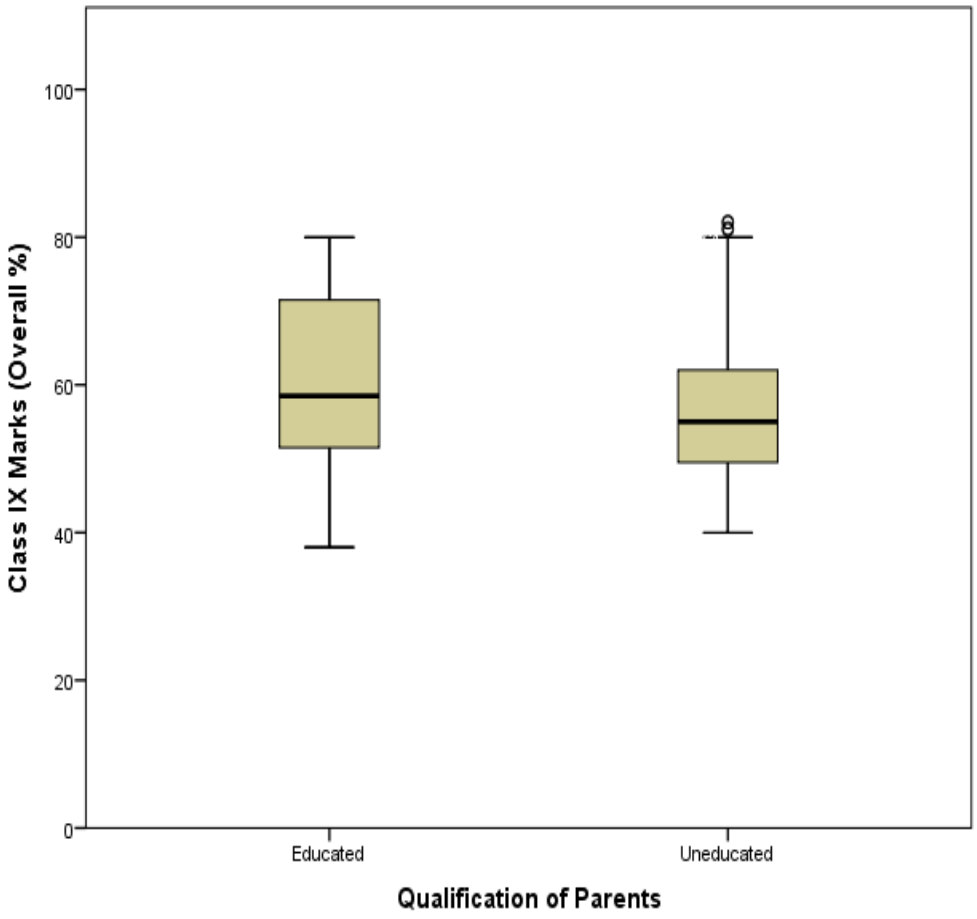

Figure 14: Performance of Student based on qualification of the parent

4.5.6 Performance of the student based on the occupation of the parent

Students whose parents were farmer performed better than the student whose parent was non-farmer (teacher, government employee, engineer, clerk, storekeeper). The median and the maximum marks of the students whose parent were farmer had higher marks than the student whose parent was non-farmer. The minimum marks of both the student were in same range.

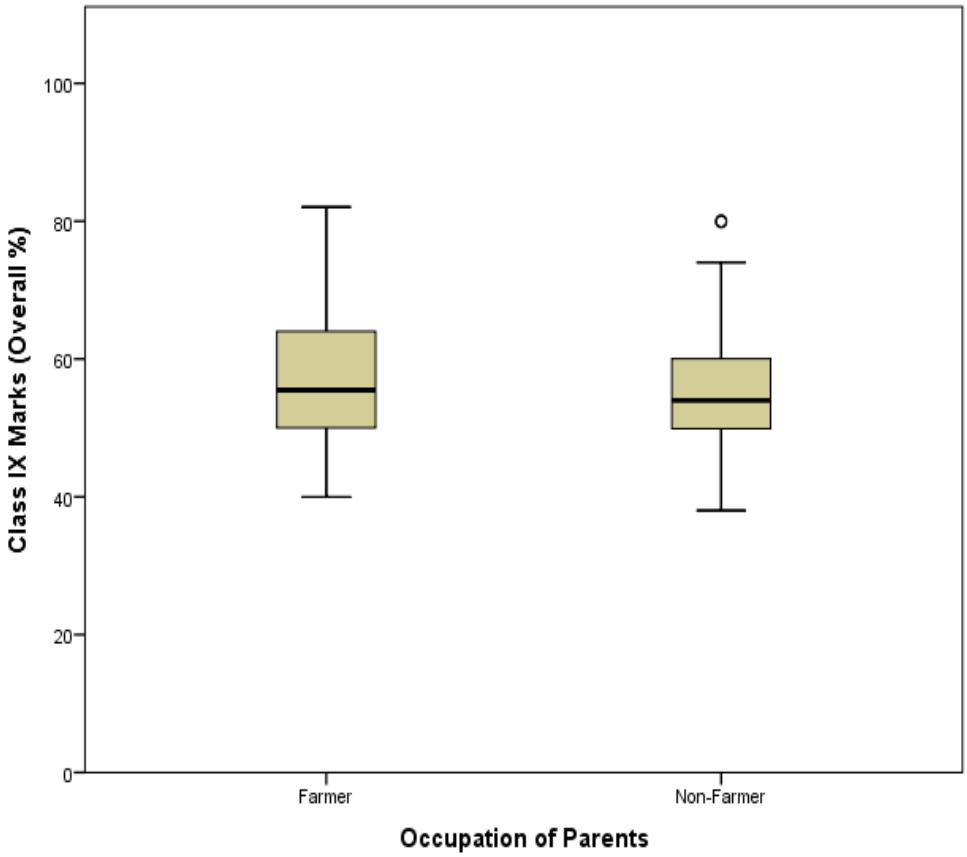

Figure 15: Performance of student based on the occupation of parent

4.5.7 Performance of student based on school type

There was three different type of school, namely Central school (Martshalla central school), day school (Phuntshothang Middle Secondary School) and boarding school (Karmaling Higher Secondary School). From the three different school, Boarding School student performed better than the two other school type. Median marks of the students from boarding school were comparatively higher than that of the students of central school and day school. The maximum marks of the student in boarding school were also higher than that of the student from central school and day school. Compared to central school and day school, the students from central school performed better than that of the student from day school.

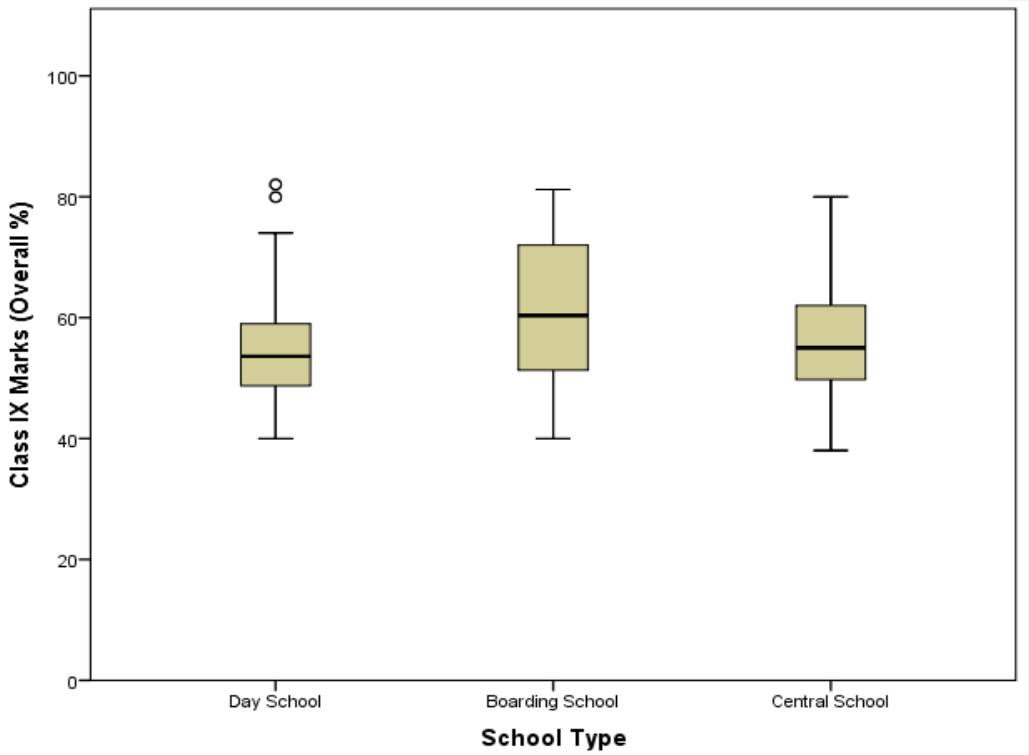

Figure 16: Performance of student based on school type

4.6 Moderation analysis of effect of the optional subject on academic performance

Before carrying out the moderation analysis, binary logistic regression was done to determine the variables (predictors or factors) to be controlled. Binary logistic regressions test showed that there was no significance (Annexure I) of any predictors (gender, student type, parents' qualification, an occupation of the parents, parents' involvement in academic, class VII performance level of the student and type of school) on the choice of the optional subjects. This indicates that the predictors (factors) are independent in determining the choice of the optional subjects.

4.6.1 Effect of Computer Application (CA) on predictor (factors) wise performance of student

The interaction effect of Computer Application subject on gender wise performance of the student was significant, b = 5.95, t (216) = 2.22, p = .03 (Table 4). The conditional effect of gender on overall marks for not choosing Computer Application subject, there was no significant effect, b = .01, t (216) = .01, p = .99. For choosing Computer Application, there was significant

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positive effect, b = 5.96, t (216) = 3.67, p < .001. This shows that compare to the female student every male student got 5.96 unit more in overall marks.

Y = Constant +.01 (gender) + -4.52 (Computer Application Optional) + 5.95 (Computer Application optional* Gender)

The interaction between Computer Application subject and student type on performance was significant, b = -11.65, t (216) = -3.80, p < .001 (Table 4). The conditional effect of student type on overall marks for not choosing Computer Application was significant, b = 9.59, t (216) = 4.18, p < .001. This means for every boarding student compare to day scholar by not choosing Computer Application subject, they got 9.59 units more in overall marks. But for choosing Computer Application subject there was no significant effect, b = -2.6, t (216) = -1.01, p = .31.

Y = Constant + 9.59(student type) + 4.73(Computer Application optional) + -11.65(Computer Application optional* Student type)

The interaction effect of Computer Application subject on day school student's performance was significant, b = 10.32, t (216) = 3.32, p = .001 (Table 4). The conditional effect of day school on overall marks for not choosing Computer Application subject was significant, b = -8.87, t (216) = -3.89, p < .001. This result shows there was a significant negative effect on performance due to the interaction of day school and not choosing Computer Application subject. This means day school student by not choosing Computer Application subject they lost 8.87 unit in overall marks compare to other school students. For choosing IT, there was no significant effect between day school student and performance, b = 1.45, t (216) = .69, p = .49.

Y = Constant + -8.88(Day School) + -5.99(Computer Application optional) + 10.32(Computer Application optional* Day School)

The interaction effect of Computer Application subject on central school student's performance was significant, b = -8.57, t (216) = -2.73, p = .007 (Table 4). The conditional effect of central school on overall marks for not choosing Computer Application subject was not significant, b = 4.34, t (216) = 1.70, p = .09. For choosing Computer Application subject, there was significant negative effect between central school student and performance b = -4.23, t (216) = -2.31, p = .02. This result indicates that there was a negative effect of choosing Computer Application subject by central school student on their performance. This means by choosing Computer Application subject student of central school lost 4.23 unit in overall marks compared to the student of other schools.

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Y = Constant + 4.34(Central School) + 2.54(Computer Application optional) + -8.57(Computer Application optional* Central School)

Table 4: Interaction of Computer Application (CA) and significant predictors on performance

	b	*SE B*	*t*	*P*
Gender*Computer Application				
Constant	51.48 [44.75,58.20]	3.412	15.09	$p < .001$
Gender (Male Vs Female)	0.01 [-4.18, 4.19]	2.124	0.005	$p = .996$
Optional (CA)	-4.52 [-8.03, -1.02]	1.778	-2.55	$p = .012$
Optional (CA) x Gender	5.95 [0.85 12.48]	2.679	2.22	$p = .027$
Note* R^2 =.283				
Student type*Computer Application				
Constant	53.41 [50.55, 56.26]	1.45	36.83	$p < .001$
Student Type (Boarder Vs Day scholar)	9.59 [5.07, 14.10]	2.293	4.18	$P < .001$
Optional (CA)	4.73 [0.25, 9.21]	2.273	2.08	$p = .038$
Optional (CA) x Student type	-11.65 [-17.69, -5.61]	3.065	-3.8	$p < .001$
Note* R^2 =.079				
Day School*Computer Application				
Constant	62.25 [58.87, 65.63]	1.713	36.34	$p < .001$
Day School (Vs others)	-8.88 [-13.37, -4.38]	2.279	-3.89	$p < .001$
Optional (CA)	-5.99 [-9.92, -2.05]	1.99	-2.99	$p = .003$
Optional (CA) x Day School	10.31 [4.19, 16.44]	3.106	3.23	$p = .001$
Note* R^2 = .068				
Central School*Computer Application				
Constant	56.01 [53.34, 58.68]	1.356	41.31	$p < .001$
Central School	4.34 [-0.69, 9.37]	2.552	1.7	$p = .090$
Optional (CA)	2.54 [-1.08, 6.16]	1.837	1.38	$p = .169$
Optional (CA) x Central School	-8.57 [-14.76, -2.39]	3.139	-2.73	$p = .007$
Note* R^2 = .038				

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The interaction effect of Computer Application subject on performance in class VIII wise performance of the student was not significant, $b = 1.62$, t (216) = .95, $p = .6$ (Table 5).
Y = Constant + 11.15(Class VIII performance) + -3.48(Computer Application optional) + 1.62(Computer Application optional* Class VIII performance)

The interaction effect of Computer Application subject on parent involvement wise performance of the student was not significant, $b = 1.50$, t (216) = .49, $p = .62$ (Table 5).
Y = Constant + 1.51(Parent help) + -1.52(Computer Application optional) + 1.50 (Computer Application optional* Parent help)

The interaction effect of Computer Application subject on parent's qualification wise performance of student was not significant, $b = -5.09$, t (216) = -1.48, $p = .10$ (Table 5).
Y = Constant + -1.87 (Parent qualification) + 2.18(Computer Application optional) + -5.09(Computer Application optional* Parent qualification)

The interaction effect of Computer Application subject on parent's occupational wise performance of student was not significant, $b = .14$, t (216) = .04, $p = .97$ (Table 5).
Y = Constant + -.81(Parent occupation) + -.62(Computer Application optional) + .14(Computer Application optional* Parent occupation)

The interaction effect of Computer Application subject on boarding school student's performance was not significant, $b = -4.62$, t (216) = -1.38, $p = .17$ (Table 5).
Y = Constant + 5.89(Boarding School) + -1.12(Computer Application optional) + -4.62(Computer Application optional* Boarding School)

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Table 5: Interaction of Computer Application (CA) and non-significant predictors on performance

	b	*SE B*	*t*	*P*
Class VIII performance*Computer Application				
Constant	49.88 [42.77, 56.99]	3.608	13.82	$p < .001$
Class VIII performance (Above average VS below average)	11.15 [5.42, 16.88]	2.906	3.84	$p < .001$
Optional (CA)	-3.48 [-10.65, 3.70]	3.641	-0.95	$p = .341$
Optional (CA) x Class VIII performance Note* $R^2 = .267$	1.62 [-5.85, 9.16]	3.821	0.95	$p = .671$
Parent Involvement*Computer Application				
Constant	56.29 [52.56, 60.03]	1.895	29.71	$p < .001$
Parent Involvement (Help Vs not help)	1.51 [-3.22, 6.24]	2.399	0.63	$p = .529$
Optional (CA)	-1.52 [-6.25, 3.21]	2.395	-0.63	$p = .527$
Optional (CA) x Parent help Note* $R^2 = .014$	1.50 [-4.52, 7.52]	3.054	0.49	$p = .624$
Parent Qualification*Computer Application				
Constant	46.42 [38.92, 53.93]	3.806	12.19	$p < .001$
Parent Qualification (uneducated Vs Educated)	-1.87 [-7.48, 3.75]	2.847	-0.65	$p = .513$
Optional (Computer Application)	2.18 [-4.12, 8.46]	3.188	0.68	$p = .495$
Optional (IT) x Parent Qualification Note* $R^2 = .274$	-5.09 [1.69, 22.94]	3.458	-1.48	$p = .103$
Parent Occupation*Computer Application				
Constant	57.40 [54.82, 59.99]	1.308	43.88	$p < .001$
Parent Occupation (non-farmer Vs farmer	-0.81 [-6.57, 4.96]	2.923	-0.28	$p = .782$
Optional (Computer Application)	-0.62 [-3.96, 2.72]	1.694	-0.37	$p = .715$
Optional Computer Application) x Parent Occupation Note* $R^2 = .002$	0.14 [-6.98, 7.26]	3.611	0.039	$p = .969$
Boarding School*Computer Application				
Constant	48.41 [42.9, 53.89]	2.783	17.39	$p < .001$
Boarding School	5.89 [-0.13, 11.92]	3.057	1.93	$p = .055$
Optional (Computer Application)	-1.13 [-4.21, 1.96]	1.564	-0.72	$p = .472$
Optional (Computer Application) x Boarding School Note* $R^2 = .279$	-4.62 [-11.22, 1.98]	3.347	-1.38	$p = .169$

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The Interaction result of Computer Application as moderator indicates that the Computer Application subject had an effect on gender, student type, day school and central school type wise performance of the student. By choosing Computer Application subject by a male student there was a difference (more by 5.96 unit) in overall marks compare to female. In comparison to day-scholars, by not choosing Computer Application subject by boarding student there was a difference (more by 9.59 unit) in overall marks. Day school students by not choosing Computer Application subject they lost 8.87 unit in overall marks compared to the student of other schools. Central school students by choosing Computer Application subject they lost 4.23 unit in overall marks compared to the student of other schools.

The interaction result of Computer Application subject on Boarding school type, class VIII performances level, parent's qualification, parents' involvement in academic and parent's occupation had no significant effect on performance. Boarding school student's whether they chose or not chose Computer Application subject, students will have no significant effect on their performance compared to other School. Whether student choose based on class VIII performances, there is no change in the performances of the student. For choosing or not choosing Computer Application by students, Computer Application had no effect on the performance of the student on the basis of parental qualification. Irrespective of whether the student chooses Computer Application optional subject, or not and whether the student's parent is non-farmer or farmer, there is no effect on student's performance.

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4.6.2 Effect of Economics on predictor (factors) wise performance of student

The interaction effect of Economics subject on parent help in academic of the student was significant, b = -7.91, t (216) = -2.11, p = .04 (Table 5). The conditional effect of parent help in academic of the student on overall marks for not choosing Economics subject was significant, b = 3.91, t (216) = 2.39, p = .02. This means for not choosing Economics subject there was 3.91 unit more in overall marks of those students whose parent helped in academic compared to those students whose parent did not help in academic. The conditional effect of parent help in academic of student on overall marks for choosing Economics subject was not significant, b = -3.99, t (216) = -1.18, p = .24.

Y = Constant + 3.91(Parent help) + 6.03(Eco optional) + -7.91(Eco optional* Parent help)

The interaction effect of Economics subject on the parent's qualification wise performance of the student was significant, b = 14.15, t (216) = 2.94, p = .004 (Table 5). The conditional effect of parent's qualification on overall marks of student not choosing Economics subject had significant negative effect, b = -7.13, t (216) = -3.61, p < .001. The result indicates that for not choosing Economics by the students whose parents are uneducated, got 7.13 unit less in overall marks compared to those students whose parents were educated. The conditional effect of parent's qualification on overall marks of student for choosing Economics was not significant, b = 7.02, t (216) = 1.52, p = .13.

Y = Constant + -7.13(Parent qualification) + -10.12(Eco optional) + 14.15(Eco optional* Parent qualification)

The interaction effect of Economics subject on central school student's performance was significant, b = 9.47, t (216) = 2.62, p = .009 (Table 5). The conditional effect of central school on overall marks for not choosing Economics subject was significant, b = -3.59, t (216) = -2.15, p = .03. This result indicates that there was a negative effect of not choosing Economic subject by central school student on their performance. This means by not choosing an Economics subject, the student of central school lost 3.59 unit in overall marks compared to the student of other schools. For choosing Economic subject, the conditional effect of central school on overall mark result showed non-significant effect, b = 5.88, t (216) = 1.83, p = .07.

Y = Constant + -3.59 (Central School) + -3.43(Eco optional) + 9.47(Eco optional* Central School)

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Table 6: Interaction of Economics and significant predictors on performance

	b	*SE B*	*t*	*P*
	Parent Involvement*Economics			
Constant	54.29 [51.76, 56.78]	1.269	42.79	$p < .001$
Parent Involvement (Help Vs not help)	3.91 [0.69, 7.14]	1.634	2.39	$p = .017$
Optional (Eco)	6.03 [0.76, 11.98]	3.019	1.99	$p = .04$
Optional (Eco) x Parent Help Note* $R^2 = .033$	-7.91 [-15.29, -0.51]	3.750	-2.11	$p = .036$
	Parent Qualification*Economics			
Constant	48.99 [42.67, 55.33]	3.211	15.26	$p < .001$
Parent Qualification (Uneducated Vs Educated	-7.13 [-11.02, -3.23]	1.975	-3.61	$p < .001$
Optional (Eco)	-10.12 [-19.23, -1.01]	4.622	-2.19	$p = .029$
Optional (Eco) x Parent Qualification Note* $R^2 = .296$	14.15 [4.65, 23.65]	4.818	2.94	$p = .004$
	Central School*Economics			
Constant	57.91 [55.95, 59.86]	0.992	58.37	$p < .001$
Central School	-3.59 [-6.88, -0.29]	1.672	-2.15	$p = .033$
Optional (Eco)	-3.43 [-8.49, 1.63]	2.568	-1.34	$p = .183$
Optional (Eco) x Central School Note* $R^2 = .037$	9.47 [2.34, 16.60]	3.617	2.62	$p = .009$

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The interaction effect of Economics subject on gender wise performance of the student was not significant, b = -4.93, t (216) = -1.44, p = .15 (Table 6).

Y = Constant + 4.60 (gender) + 4.36 (Eco optional) + -4.93 (Eco optional* Gender)

The interaction effect of Economics subject on student type wise performance of the student was not significant, b = 5.38, t (216) = 1.48, p = .14 (Table 6).

Y = Constant + 1.51(student type) + -1.28(Eco optional) + 5.38(Eco optional * Student type)

The interaction effect of Economics subject on performance in class VIII wise performance of the student was not significant, b = 1.16, t (216) = .24, p = .81 (Table 6).

Y = Constant + 11.74(Class VIII performance) + 1.59(Eco optional) + 1.16(Eco optional* Class VIII performance)

The interaction effect of Economics subject on parents' occupational wise performance of student was not significant, b = -2.04, t (216) = -.48, p = .63 (Table 6).

Y = Constant + -.36(Parent occupation) + 1.55(Eco optional) + -2.04(Eco optional* Parent occupation)

The interaction effect of Economics subject on day school student's performance was not significant, b = -3.88, t (216) = -1.06, p = .29 (Table 6)

Y = Constant + -2.01(Day School) + 3.03(Eco optional) + -3.88(Eco optional* Day School)

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Table 7: Interaction of Economics and non-significant predictors on performance

	b	*SE B*	*t*	*P*
	Gender*Economics			
Constant	49.11 [42.69, 55.54]	3.261	15.06	$p < .001$
Gender (Male Vs Female)	4.60 [1.77, 7.43]	1.437	3.20	$p = .002$
Optional (Eco)	4.36 [0.26, 8.46]	2.082	2.09	$p = .038$
Optional (Eco) x Gender Note* R^2 =.27	-4.93 [-14.33, 0.35]	3.417	-1.44	$p = .151$
	Student Type*Economics			
Constant	55.67 [53.03, 58.32]	1.342	41.47	$p < .001$
Student Type (Boarder Vs Day Scholar)	1.51 [-1.79, 4.81]	1.675	0.9	$p = .367$
Optional (Eco)	-1.28 [-6.39, 3.84]	2.596	-0.49	$p = .623$
Optional (Eco) x Student type Note* R^2 =.274	5.38 [-1.77, 12.52]	3.625	1.48	$p = .139$
	Class VIII performance*Economics			
Constant	49.24 [41.86, 49.23]	3.441	14.31	$p < .001$
Class VIII performance (Above average Vs below average)	11.74 [9.11, 17.12]	2.059	5.70	$p < .001$
Optional (Eco)	1.59 [-7.27, 10.02]	4.367	0.36	$p = .717$
Optional (Eco) x Class VIII performance Note* R^2 = .189	1.16 [-9.97, 8.67]	4.761	0.24	$p = .81$
	Parent Occupation*Economics			
Constant	56.73 [54.89, 58.55]	0.927	61.16	$p < .001$
Parent Occupation (non-farmer VS farmer	-0.36 [-4.14, 3.43]	1.922	-0.18	$p = .854$
Optional (Eco)	1.55 [-2.57, 5.68]	2.096	0.74	$p = .458$
Optional (Eco) x Parent Occupation Note* R^2 = .004	-2.04 [-10.35, 6.27]	4.215	-0.48	$p = .629$
	Day School*Economics			
Constant	57.33 [55.37, 59.28]	0.991	57.86	$p < .001$
Day School	-2.01 [-5.35, 1.34]	1.697	-1.18	$p = .239$
Optional (Eco)	3.03 [-1.89, 7.75]	2.393	1.27	$p = .207$
Optional (Eco) x Day School Note* R^2 = .022	-3.88 [-11.07, 3.31]	3.645	-1.06	$p = .289$

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The interaction effect of Economics subject had a significant effect on parent's involvement, qualification of the parent, and central school type wise performances of the student. In comparison to the student whose parent did not help in academic and whose parent help in academic, by not choosing Economics subject by student whose parent help in academic, their marks was 3.91 unit more in overall marks. By not choosing Economics subject by the students whose parent were uneducated, they lost 7.13 unit in overall marks compared to the student whose parents were educated. In the case of the central school, the student lost 3.59 unit in over marks compared to other schools by not choosing Economics subject.

Economics subject did not have a significant interaction effect on gender, student type, and performance level in class VIII, parent's occupation and day school type wise performance of the student. This means whether the student had chosen or not chosen the Economics subject, there was no significant difference in the overall marks of male or female, day scholar or boarder, below average or above average student, whether parents are non-farmer or farmer, day school or other school type students wise performances.

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4.6.3 Effect of Environmental Science (ES) on predictor (factors) wise performance of the student

The interaction effect of Environmental Science subject on student type wise performance was significant, b = 12.83, t (216) = 3.29, p = .001 (Table 7). The conditional effect of student type on overall marks for not choosing Environmental Science subject showed non-significant effect, b = .33, t (216) = .19, p = .85. The conditional effect of student type on overall marks for choosing Environmental subject was significant, b = 13.15, t (216) = 3.75, p < .001. This shows that every boarding student by choosing Environmental Science subject they got 13.15 unit more than day scholar student in the overall mark.

Y = Constant + .33(student type) + -4.06(ES optional) + 12.82(ES optional* Student type)

The interaction effect of Environmental Science subject on day school student's performance was significant, b = -12.58, t (216) = -3.22, p = .002 (Table 7). The conditional effect of day school on overall marks for not choosing Environmental Science subject was not significant, b = -.57, t (216) = -.33, p = .74. For choosing Environmental Science subject, there was significant negative effect between day school student and performance, b = -13.15, t (216) = -3.75, p < .001. This result shows there was a negative effect on performance due to the interaction of day school and choosing Environmental Science subject. This means day school student by choosing Environmental Science subject they lost 13.15 unit in overall marks compare to other school students.

Y = Constant + -.57(Day School) + 8.71(ES optional) + -12.58(ES optional* Day School)

The interaction effect of Environmental Science subject on boarding school student's performance was significant, b = 8.69, t (216) = 2.38, p = .02 (Table 7). The conditional effect of boarding school on overall marks for not choosing Environmental Science subject was not significant, b = 1.02, t (216) = .56, p = .58. The conditional effect of boarding school on overall marks for choosing Environmental Science subject was significant, b = 9.72, t (216) = 2.71, p = .007. This result shows, there was a positive effect on performance due to the interaction of boarding school and choosing Environmental Science subject. This means boarding school student by choosing Environmental Science subject they got 9.72 unit more in overall marks compared to other school students.

Y = Constant + 1.02(Boarding School) + -3(ES optional) + 8.69(ES optional* Boarding School)

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Table 8: Interaction of Environmental Science (ES) and significant predictors on performance

	b	*SE B*	*t*	*P*
	Student Type*ES			
Constant	56.65 [53.94, 59.35]	1.373	41.25	$p < .001$
Student Type (Boarder Vs Day Scholar)	0.33 [-2.97, 3.62]	1.67	0.19	$p = .845$
Optional (ES)	-4.06 [-8.80, 0.66]	2.41	-1.67	$p = .093$
Optional (ES) x Student type Note* R^2 =.061	12.83 [5.17, 20.49]	3.887	3.29	$p = .001$
	Day School*ES			
Constant	57.04 [55.21, 58.87]	0.928	61.46	$p < .001$
Day School	-0.57 [-3.97, 2.82]	1.721	-0.33	$p = .739$
Optional (ES)	8.71 [2.71, 14.71]	3.045	2.86	$p = .005$
Optional (ES) x Day School Note* R^2 = .062	-12.58 [-20.29, -4.88]	3.909	-3.22	$p = .002$
	Boarding School*ES			
Constant	49.55 [43.76, 55.34]	2.938	16.87	p < .001
Boarding School	1.02 [-2.59, 4.62]	1.829	0.56	p = .579
Optional (ES)	-3.00 [-7.29, 1.28]	2.174	-1.38	p = .168
Optional (ES) x Boarding School Note* R^2 = .284	8.69 [1.48, 15.91]	3.659	2.38	p = .018

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The interaction effect of Environmental Science subject on gender wise performance of the student was not significant, b = -3.78, t (216) = -1.14, p = .26 (Table 8).

Y = Constant + 4.25 (gender) + 2.03 (ES optional) + -3.78 (ES optional* Gender)

The interaction effect of Environmental science subject on performance in class VIII wise performance of the student was not significant, b = -2.55, t (216) = -.57, p = .57 (Table 8).

Y = Constant + 12.68(Class VIII performance) + 2.63(ES optional) + -2.55(ES optional* Class VIII performance)

The interaction effect of Environmental Science subject on parent involvement (help in academic of student) wise performance of the student was not significant, b = 5.44, t (216) = 1.44, p = .15 (Table 8).

Y = Constant + 1.41(Parent help) + -3.25(ES optional) + 5.44(ES optional* Parent help)

The interaction effect of Environmental Science subject on parent's qualification wise performance of student was not significant, b = -3.65, t (216) = -.89, p = .37 (Table 8).

Y = Constant + -4.05(Parent qualification) + 3.37(ES optional) + -3.65(ES optional* Parent qualification)

The interaction effect of Environmental Science subject on parent's occupational wise performance of student was not significant, b = 2.41, t (216) = .47, p = .64 (Table 8).

Y = Constant + -1.09(Parent occupation) + -.58(ES optional) + 2.41(ES optional* parent occupation

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Table 9: Interaction of Environmental Science (ES) and non-significant predictors on performance

	b	*SE B*	*t*	*P*
	Gender*ES			
Constant	47.89 [40.79, 54.99]	3.605	13.29	$p < .001$
Gender (Male Vs female)	4.25 [1.41, 7.09]	1.439	2.95	$p = .004$
Optional (ES)	2.03 [-2.47, 6.52]	2.282	0.89	$p = .376$
Optional (ES) x Gender Note* R^2=.264	-3.78 [-10.29, 4.26]	3.314	-1.14	$p = .256$
	Class VIII performance*ES			
Constant	47.53 [41.67, 49.18]	3.791	12.54	$p < .001$
Class VIII performance (Above average Vs below average	12.68 [9.34, 17.46]	2.037	6.23	$p < .001$
Optional (ES)	2.63 [-6.42, 9.89]	4.234	0.62	$p = .536$
Optional (ES) x Class VIII performance Note* R^2 = .26	-2.55 [-10.74, 7.12]	4.456	-0.57	$p = .568$
	Parent Involvement*ES			
Constant	55.99 [53.44, 58.44]	1.294	43.25	$p < .001$
Parent Involvement (Help Vs not help)	1.41 [-1.83, 4.65]	1.644	0.86	$p = .393$
Optional (ES)	-3.25 [-8.95, 2.46]	2.895	-1.12	$p = .263$
Optional (ES) x Parent Help Note* R^2 =.021	5.44 [-1.97, 12.86]	3.763	1.45	$p = .149$
	Parent Qualification*ES			
Constant	47.33 [55.63, 63.63]	3.73	12.69	$p < .001$
Parent Qualification (uneducated Vs educated)	-4.05 [-8.35, 0.25]	2.181	-1.86	$p = .065$
Optional (ES)	3.37 [-4.93, 10.99]	3.744	.89	$p = .369$
Optional (ES) x Parent Qualification Note* R^2 = .262	-3.65 [-11.69, 4.39]	4.08	-0.89	$p = .372$
	Parent Occupation*ES			
Constant	57.15 [55.31, 58.99]	0.935	61.12	$p < .001$
Parent Occupation of student	-1.09 [-4.73, 2.54]	1.845	-0.59	$p = .554$
Optional (ES)	-0.58 [-4.62, 3.46]	2.049	-0.28	$p = .77$
Optional (ES) x Parent Occupation Note* R^2 = .002	2.41 [-7.66, 12.48]	5.109	0.47	$p = .638$

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Environmental Science subject had an effect on student type, day school type, and boarding school type wise performances of the student. In comparison to day scholar, by choosing Environmental science subject by boarding student, there was a difference (more by 13.15 unit) in overall marks. In the case of choosing Environmental Science subject by day school student, they lost 13.15 unit in overall marks compared to other school students. Boarding school student by choosing Environmental Science subject they got 9.72 unit more in over marks compared to other schools.

Students by choosing or not choosing Environmental Science subject had no effect on gender wise performances of the student. Choosing or not choosing Environmental Science subject also made no difference in the performances whose parent help or did not help in academic. Student whether they are below average or above average student based on class VIII performances, by choosing or not choosing Environmental Subject did not affect their overall marks. Environmental Science subject had no significant effect for choosing or not choosing the subject, on the basis of parental qualification of students. There was also no significant interaction effect of Environmental Science subject on parent's occupational wise performance. Irrespective of whether the student chooses or not choose Environmental Science subject even if the parents are farmer or non-farmer there is no effect on performance.

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Conclusion and Recommendations

Class IX students generally opt for Computer Application subject the most. From the total of 220 sample, initially 139 students wanted to opt for Computer Application subject and 135 students took the Computer Application subject. The least preferred optional subject is Environmental science, initially, only 29 students wanted to opt but there was 41 student taking Environmental Science. There was 71% of student who based their choice on the interest of the subject, 14% of the students based their choice on a future career, 3% influence by seniors, 2% each of student influenced by teachers and schools respectively. This indicates that main factors that influence the student in the choice of optional subject are the interest they have on the subject followed by future career, an influence of seniors, teachers, and schools. Whichever optional subject the student has taken, the student was satisfied with the choices they made as there was 94% of student who said they were satisfied.

The male student, boarding students, students whose parents' help in academic, student whose parents' are educated, student whose parent are farmer, student who performed in above average category in class VIII, and student from boarding school perform better. This is because the box plot analysis shows their median marks, maximum and minimum marks comparatively higher. Among the different optional taking student, Economics student performs better than Computer Application and Environmental Science taking students. The box plot shows that the minimum and maximum marks of Economics taking student is comparatively higher than Economic and Environmental Science taking students. To make a concrete finding on which student perform better, a further statistical test is required.

There is a significant interaction effect of Computer Application subject on performance and gender (p = .03), student type (p < .001), Day school (p = .001) and Central school (p = .07). Economic subject has a significant interaction effect on performances and parent involvement in students' academic (p = .04), parents' qualification (p = .004), and Central school (p = .009). Environmental Science have a significant effect on performances and student type (p = .001), Day school (p = .002) and boarding school (p = .02). Three different optional subject has the significant interaction effect on variables or factors that influence the performances. Through this, we can conclude that optional subject effect the overall performance of the student in the examination. There is also further inquiry needed to include the factors like teachers, assessment mode, socio-economic factor and more to analyze the effect.

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Appendices

Annexure I

Table 9: Binary logistic regression result of significance

Covariates	Sig. (IT)	Sig. (Eco)	Sig. (ES)
Student Gender	.067	.167	.417
Student Type	.306	.278	1.000
Qualification of Parent	.843	.121	.102
Occupation of Parent	.101	.878	.05
Parent Involvement in Academic	.471	.100	.399
Class VIII Performance of Student	.785	.294	.403
Day School Type	.476	.241	.999
Boarding School Type	.586	.997	.996
Constant	.924	.166	.999

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