CTEVT
प्राविधिक शिक्षा तथा व्यावसायिक तालीम परिषद्
Council for Technical Education and Vocational Training

RESEARCH REPORT

No. 2079/080-02

Factors Affecting Students' Educational Achievement in the Diploma Level Engineering Programs of CTEVT

Milan Shrestha

July 2023

This research report is the product of professional research. It has been prepared by the consultant for the purpose of providing insights and recommendations to Council for Technical Education and Vocational Training (CTEVT). The findings, interpretation and conclusions expressed in this work do not necessarily reflect the views of CTEVT. The analysis and interpretation made herein are based on the consultant's expertise in the field of study. CTEVT does not guarantee the accuracy, entirety, or currency of the information contained in this work and holds no responsibility for potential errors, omissions, or inconsistencies in the data.

Publisher:

Research and Information Division

Council for Technical Education and Vocational Training (CTEVT)

Madhyapur Thimi Municipality – 2, Sanothimi, Bhaktapur, Nepal.

Telephone no. +977-1-6630408, 6630769

Email: research@ctevt.org.np

Website: www.ctevt.org.np

Acknowledgements

The research team expresses its gratitude to the CTEVT for entrusting us with this crucial assignment of researching the Factors Affecting Students' Educational Achievement in the Diploma Level Engineering Programs of CTEVT. Special thanks are extended to Mr. Khagendra Prasad Adhikari, Vice Chairperson of CTEVT, and Er. Mahesh Bhattarai, For Member Secretary of CTEVT, for their invaluable input and kind support in conducting this study. We are indebted to Mr. Binod Badal, Director of the QualiTY Project and Former Director of Research and Information Division, and Mr. Bhuvaneshor Dhungana, Director at the Research and Information Division, CTEVT, for their valuable input and guidance throughout the research process.

Our gratitude extends to all the members of the Research Management Committee (RMC), with special mention to Ms. Durga Kandel, Under Secretary, Ministry of Education, Science and Technology (MoEST), Mr. Prakash Kumar Poudel, a PhD scholar from Kathmandu University School of Education, and Mr. Eka Raj Adhikari, Deputy Director and Information Officer, Research and Information Division, CTEVT. Their contributions in a series of consultative meetings were praiseworthy and became vital in developing the study instruments and writing the final report.

The successful completion of the study was made possible by the dedicated work of our field enumerators: Mr. Megh Raj Phuyal (Koshi Province), Er. Sushil Kumar Ray (Madhesh Province), Er. Sangam Gautam and Ms. Sima Shrestha (Bagmati Province), Er. Susan K.C. (Gandaki Province), Er. Amar Adhikari (Lumbini Province), Mr. Ishwor Rimal (Karnali Province), and Mr. Prabhakar Sharma Neupane (Sudurpashchim Province). Their unwavering support is greatly appreciated.

We extend our deep gratitude to all the respondents and research participants for their valuable responses and insights during the field survey and interactions. Lastly, we thank all the contributors, both direct and indirect, who played a crucial role to successfully complete this study.

Milan Shrestha[1]

---

[1] Research Consultant. ORCID: https://orcid.org/0000-0001-7506-3004

Executive Summary

Educational achievement is the outcome of teaching and learning activities that take place in schools. It is primarily indicated by the results obtained from exams, which determine the status of pass or fail among students. The examination results of students in the context of CTEVT, particularly in the engineering stream, are not satisfactory. According to CTEVT, overall, 67.85%, 61.50%, 66.02%, 62.66%, 52.58%, and 41.07% of students consecutively failed in the first to sixth semesters within the period of 2075-2079 B.S. regarding the civil engineering stream. With such a high failure rate among students, this study aims to explore the reasons for low educational achievement among students from the diploma-level civil engineering program of CTEVT. To achieve this purpose, this study employed both quantitative cum qualitative approaches. A cross-sectional survey was used to identify the reasons for low educational achievement, while qualitative data were employed to explain the identified reasons.

This study employed a survey questionnaire to collect data from 524 respondents, who were the fifth-semester students of the Diploma in Civil Engineering, particularly those who had failed in the third-semester exam. Additionally, qualitative data were collected through semi-structured interviews with 4 students, 4 school coordinators, 2 curriculum developers, 1 officer from the Curriculum Development Division, and 1 officer from the Office of the Controller of the Examinations.

From the collected data, this study found that more students failed in their first semesters than in their final semesters. Specifically, the majority of students failed their first (67.85%), second (61.50%), and third (66.02%) semester exams due to the

difficulty of general and applied science courses. However, a majority of them passed the sixth-semester exam (58.93%) because it focused on pure engineering courses, which are more practical in nature. These students struggled with general science-related subjects such as physics, chemistry, and math in their first (89.28%) and second (93.3%) semesters, as well as applied sciences like mathematics, mechanics, and hydraulics in the third semester (68%) due to their inadequate preparation and weak foundation in mathematics. Similarly, these students cited multifactorial reasons for their failure, including (i) self-related factors (student factors), (ii) curriculum-related issues, (iii) school-related problems, and (iv) exam-related reasons. Overall, 39.50% of students failed exam due to self-related factors, which encompass issues such as poor language and mathematical competencies, class absences, demotivation, carelessness, and a lack of focus on their studies. In addition, curriculum related factors accounted for 18.53% of student failure, as they struggled with the demanding syllabus, extensive courses, and numerical and theory laden courses. Furthermore, 21.54% of students failed due to school-related factors, such as unclear instructions from instructors, subpar educational quality, difficult-to-follow classes, online learning challenges, incomplete courses, teacher absenteeism, a shortage of competent and trained teachers, and high teacher turnover. Moreover, 20.44% of students failed their exams due to exam-related factors. These factors included misunderstandings regarding question errors, issues with copy-checking, very strict invigilators in the exam halls (tight exam), and inappropriate exam centers. These misunderstandings demotivated students, causing them to approach the exam carelessly and perform poorly, ultimately leading to unsatisfactory examination results.

In general, various factors related to students, curriculum, school, and exam collectively influence whether students pass or fail their exams. Failing an exam

represents a significant setback not only for the students themselves but also for schools, families, and the entire country. Therefore, it is imperative to address and mitigate these issues to achieve higher academic standards. To tackle the challenges of low educational achievement among students pursuing a Diploma in Civil Engineering, it requires collaborative efforts from all stakeholders. Some of these efforts include:

1. Students should focus on their studies with care, honesty, and diligence. They are also to be encouraged to enhance their language and numerical skills.
2. Schools should ensure timely completion of courses, improve the skills of their teachers, and motivate students through counseling and guidance. To meet course deadlines, schools should also minimize student absenteeism by developing and implementing an academic calendar with the guidelines provided by CTEVT.
3. The curriculum should be revised and updated to incorporate new technologies, making the course more aligned with job market's requirements. In the process of revising the curriculum, it is essential to include the continuous assessment system to gauge students' educational progress.
4. The Office of the Controller of Examinations (OCE) should revise the examination model by establishing well equipped examination centers and copy checking centers. It should expedite the re-totaling process. Additionally, the development and implementation of question banks and specification grids are necessary. The OCE should also make all schools aware about the provision to revise students' internal marks until the final exam. Furthermore, the OCE should orient schools and students about the examination process to clarify any misconceptions about errors in the examination and the evaluation

of answer sheets. These efforts will help to build trust in the OCE among students.

However, the mitigating strategies related to curriculum and examination fall under the purview of CTEVT. Beyond these strategies, CTEVT should reconsider the provisions for providing affiliation to conduct the DCE program. It should adopt the policy of merging schools to improve the overall situation. Operating only the required number of schools leads to the selection of students rather than the collection of students. In the state of selection, the students' results will be improved. CTEVT also needs to develop and strictly implement the academic calendar ensuring at least 90 working days for teaching learning activities in each semester before conducting the final exam. Moreover, CTEVT should inform schools about the provision of using the Nepali language as the medium of instruction and writing during exams. These collaborative efforts involving all stakeholders, including students, schools, and CTEVT, may help reduce the number of students failing their exams.

Table of Contents

List of Tables

List of Figures

List of Boxes

Acronyms

BE	Bachelor of Engineering
BS	Bikram Sambat
CAS	Continuous Assessment System
CTEVT	Council for Technical Education and Vocational Training
DCE	Diploma in Civil Engineering
FGD	Focus Group Discussion
GPA	Grade Point Average
KII	Key Informants Interview
MHPSS	Mental Health Psycho-Social Support
MOEST	Ministry of Education, Science, and Technology
NDS	Nepal Demographic Survey
NR	Non-Response Rate
OCE	Office of the Controller of Examinations
OECD	Organization for Economic Co-operation and Development
OJT	On-the-job Training
PCL	Proficiency Certificate Level
QualiTY	Quality TVET for Youth
SEE	Secondary Education Examination
SLC	School Leaving Certificate
SPSS	Statistical Package for the Social Sciences
TECS	Technical Education in Community School
TITI	Training Institute for Technical Instruction
TSLC	Technical School Leaving Certificate
TSSP	TVET Sector Strategic Plan (2023-2032)
TVET	Technical and Vocational Education and Training
UN	United Nations
VET	Vocational Education and Training

Chapter I

Introduction

1.1 Background of the Study

Nepal has designed a TVET sector strategic plan (2023- 2032) to produce competent, skillful, and effective human resources through high-quality technical and vocational education for the social and economic transformation of the nation (Ministry of the Education, Science, and Technology [MOEST], 2022). This is possible by encouraging young people to pursue technical education and vocational training (Shrestha, 2021). To equip young people with occupational skills, Technical and Vocational Education and Training (TVET) is an essential component. It offers a prospect to learn occupation-related skills and acquire the information, abilities, and competencies needed to start a certain kind of professional employment (Organization for Economic Co-operation and Development [OECD], 2012). TVET is, therefore, crucial in assisting human resources to become technical professionals and obtain employment.

In the context of Nepal, Council for Technical Education and Vocational Training (CTEVT) is the apex body for designing, developing and implementing TVET programs. CTEVT is also responsible for developing rules, specifications, and guidelines for organizing, coordinating, accrediting, overseeing, and monitoring TVET programs in Nepal (CTEVT, 2019). Considering its aims, the CTEVT has launched curricula for short-term skill-based training courses as well as pre-diploma (formerly known as Technical School Leaving Certificate [TSLC]) and diploma/certificate level courses. More specifically, the CTEVT introduced diploma-level courses from 2054 BS, and now it runs 49 diploma-level courses (CTEVT,

2022). Among these diploma-level courses, 14 are related to engineering trade, and this trade accounts for about 26,299 students who enrolled in the last three consecutive years as 2076-77, 2077-78, and 2078-79 B.S. (CTEVT, 2020-22). These data show that there are many students enrolled in the diploma level, particularly in the engineering trade. The academic success of these students is based on many factors such as completing the course with high marks, their employment opportunities, dashing earnings, and high gratitude to their subject of studies from society (Shrestha, 2021). The examination results are more likely related to the educational achievements of students within the institution.

Educational achievement refers to the sum of all students' learning that is attained through the teaching and learning process (Dangol & Shrestha, 2019). It denotes the efficacy of the educational process that is carried out in schools through both indoor and classroom activities. It relies on the results of the class exams (Magnus & Peresetsky, 2018), which are also the replica of the academic performance of students (Steinmayr et al., 2015). Moreover, educational achievement shows the extent to which a student has accomplished particular objectives mentioned in the curriculum at the end of the academic year. It means that when accomplishing the course, students can perform the actions which are anticipated in the curriculum. Concerning it, educational achievement is one of the crucial things for educational institutions, which portrays their performance (Mukherjee, 2017) and organizational success (Fisher, 2010). For this reason, most educational institutions want to achieve high educational achievements among their students. However, it is not so easy task to achieve high examination results for their students. Achieving high educational results are hindered by many factors referred to as the causes of low educational achievement among students.

The educational achievements of students were mainly affected by student-related causes, their parents (Farooq et al., 2011) and school associated environment (Bishara, 2017), and larger and societal climatic factors (Sakar, 2021). Firstly, the student-related causes are known as the micro-system factors (Bertolini et al., 2012), which mention the personal reasons of the students for low educational achievement. Some of the personal reasons identified by Bertolini et al. (2012) were student resiliency (Benard, 2004), personal capabilities, developmental differences, health and attendance, and social and moral development. Secondly, the parent and school-related causes are referring to the mesosystem as interactive experiences. This interactive experience includes school climate as a safe learning environment, parent training and partnering, professional (Bertolini et al., 2012), and capacity (Blankstein et al., 2010) development for teachers, teacher evaluation, and peer culture and achievement. Thirdly, the larger and societal climatic factor is defined as exo as well as macro-system factors, which incorporate socio-economic disparities, racism or classism, abuse, and unhealthy lifestyle (Bertolini et al., 2012). Overall, these all factors play crucial roles to lower educational achievement among students as a form of failure in their exam results.

1.2 Statement of the Problem

The examination results of each student reflect their educational achievement (Ghaicha, 2016), and overall high results of students signify the academic success of each TVET institution (Baraki & Kemenade, 2013). Similarly, high educational achievement is the reflection of the quality of education (Baraki & Kemenade, 2013) which is provided to each student from the TVET institutions. Contrary to it, the low exam results of students determine the organizational failure (Al-Zoubi & Younes, 2015) of TVET institutions and the entire TVET education of the nation. Moreover, it

is the main cause of student dropout (Sahin et al., 2016) and the possibility of their low employability due to having low occupational skills (Tentama & Abdillah, 2019). This scenario of low employability further effects on income generation of employees (Acs & Nichols, 2007) and the economic growth and prosperity of the nation (Pologeorgis, 2022). So, the prosperity of the nation, economic growth, employability, and income generation of employees, all are related to the quality education (Sultana et al, 2009) within TVET sectors in the forms of their exam results. For instance, in the context of TVET institutions, low exam results are not only an issue within developing countries. It is also seen in developed countries like South Africa, where 60% of students completed their TVET programs (Khuluvhe & Mathibe, 2021). But, the issue of low educational achievement in TVET institutions is more prevalent in Nepal than in South Africa. In Nepal, only 23.01%, 25.91%, 19.61%, 43.46%, 35.14%, and 54.20% of students pass their first, second, third, fourth, fifth, and sixth-semester exams, respectively, in diploma-level civil engineering program of CTEVT in the year 2076 BS (CTEVT, 2023).

Connecting this low percentage of educational achievement in Nepal's TVET sector, particularly in the engineering programs under CTEVT, raised a couple of concerns: What is the trend of educational achievement among students of diploma level engineering program of CTEVT? Why were students more likely to fail in engineering than in other streams? What is the role of CTEVT in the educational achievement of students from the engineering trade? What are the causes of low educational achievement among diploma level engineering students of CTEVT? What are the approaches for increasing the educational achievement of diploma level engineering students at CTEVT? Concerning these inquiries, this study addressed

only the reasons of low educational achievement among students of diploma level civil engineering program of CTEVT.

1.3 Rationale for the Study

There is a high prevalence of low educational achievement among students of CTEVT, particularly related to the diploma level of engineering program (CTEVT, 2020; 2021; 2022). However, the causes of the low educational achievement are unknown. Without knowing the causes of low educational achievement, there is difficult to launch policies and plans to mitigate this issue, and design and implement programs to increase the educational achievement of students (Hanberger, 2001) within CTEVT. In this context, the mitigating approaches to increase educational achievement are not effective, efficient, and productive. So, this low educational achievement hinders the organizational success (Cuban, 2022) and ruins the reputation of CTEVT. Moreover, the CTEVT is a leading organization to provide TVET and prepare skillful human resources for different occupations (Acharya, 2011). So, the low educational achievement of students leads to a status of multiple loss like waste of time and money, and socio-mental disturbance among students. It also affects CTEVT in various ways such as financial loss by losing students due to dropout, and defaming the institution due to the high failure rate of students. In addition, the low educational achievement affects the entire nation by lacking sufficient number of qualified human resources. This eventually leads to difficulty in infrastructure development, employment, economic growth and prosperity, living standard, and many more (Hanushek et al., 2008). So, it is important to identify the causes of low educational achievement among students of diploma-level civil engineering stream within CTEVT.

1.4 Purpose of the Study

The main purpose of this study was to explore the reasons for low educational achievement among students from diploma-level civil engineering program of CTEVT.

1.5 Research Questions

To achieve the purposes of this study, the following research questions were developed:

1) What is the trend of educational achievement among students of diploma level civil engineering program?
2) What are the reasons for poor educational achievement among students in diploma level civil engineering program?
3) How can CTEVT improve the educational achievement of students?

1.6 Limitations of the Study

The study was confined to study the diploma level civil engineering program only. In this study, the sample was taken only from the fifth-semester students who got failed in their third-semester results. Similarly, the educational achievement of students was confined to the exam results. Thus, the term low educational achievement in this study refers to the high failure percentage of students in their exam results. Furthermore, this study is limited to the level of student personal (microsystem) and interactive experiences (mesosystem) as reasons for low educational achievement.

Chapter II

Review of Literature

This chapter reviews the literature which deals with educational achievement and causes of low educational achievement.

2.1 Educational Achievement

Educational achievement refers to students' performance results (Lindholm-Leary & Borsato, 2006), which indicate how well they achieved specified educational goals through pre-determined assignments from the classroom teaching-learning process (Cole, 2016). In the context of the TVET education, the educational achievement of students is also measured by obtained competency and skill among students (Liu & Clayton, 2016; Yusop, 2022). Whatever, general or TVET education, the most essential indication of educational achievement is considered the educational success of students. Educational achievement is the symbol of the entire organizational success or failure of the school, particularly its educational process (McLaren, 1999). Moreover, high educational achievement was regarded as student success (Sulaiman & Mohezar, 2010) in achieving the pre-determined goals of teaching-learning activities, whereas poor educational achievement is a disaster for both students and the school (Finn & Rock, 1997), which was regarded as a societal problem.

In the context of Nepal, a substantial proportion of youth do not complete their schooling (MOEST, 2023), which indicates Nepal's low educational success. For instance, 1,348,680 children enrolled in class 1 in 2012 and after 10 years in 2022, only 36% of them appeared in the SEE exam (MOEST, 2023). Among these SEE-appeared students, only half of them achieved C and above grades in their exam

results (MOEST, 2023). According to this data, the majority of students did not complete their SEE requirements which is an example of low educational results of school education. This context of educational achievement of school education is similar to the CTEVT, particularly in the diploma level of engineering programs. Connecting to it, 6903 students enrolled in the diploma level first semester in the engineering sector at CTEVT in 2019-20, and among those students, 6132 appeared in the sixth-semester exam, and only 3768 were able to pass their exams (CTEVT, 2023). It means that only about 54 percent of students pass their exams. This data demonstrates that 46% students were dropped out and failed their exams, which reflects students' low educational achievement. The low educational achievement among students is not caused by only a single factor (Calsyn & Kenny, 1977). It is determined by multidimensional factors, which cover wide areas relating from students themselves to their parents, teachers, and societal climate (Bertolini et al., 2012).

2.2 Causes of Low Educational Achievement

Educational achievement is synonymous with the excellent exam results of students. All students want to pass their exam with the highest possible score (Cohen-Schotanous, 2009). For achieving this aim of getting high marks in the exams, many of them work hard, prepare a lot, and study plenty of time. As a result, they also achieve good marks in their exams. This scenario of achieving good marks in the exam point out that the student factor is the prime cause of high educational achievement (Tagliacollo et al., 2010). Concerning the student factor, mainly insufficient labor to study leads to failure in the exams (Covington & Omelich, 1981). However, doing more effort, some students receive lower grades or even flunk an

exam (Ewjik, 2011). In this context, doing sufficient study but achieving poor results signifies that other important factors also affect students' educational achievement.

Silas (2013) states the multiple reasons for poor marks on exams of students as environmental factors (e.g., family environment, school or college environment, and individual experiences), learning methods, differing interests, faulty study habits, ineffective memorizing methods, and health matters. Similarly, Jerrim (2022) mentions poor time management, lack of preparation, distractions, low self-esteem, over or low confidence, lack of strategy, ignoring important things and doing unnecessary things, lack of practice, procrastination, ignoring the importance of mocks, seeking too much advice, and trying to cover too many books are the crucial reasons of failure in the exams among students. Moreover, Hayatu and Abubakar (2019) also illustrate that distractions, low self-esteem, poor time management, inadequate preparation, neglecting key ones and doing useless things, over or under-confidence, lack of a strategic plan, inadequate practice, seeking excessive counsel, procrastination, neglecting the importance of mocks, and attempting to read many books are the crucial reasons of fail in the exams among students. Based on these reasons for poor exam results, Bertolini et al. (2012) and Bronfenbrenner (1979) further categorized the causes of low educational achievement of students into three broad categories: student personal (microsystem), interactive experiences (mesosystem), larger community and climate (exosystem and macrosystem) respectively in the Bio-ecological Model.

2.2.1 Student personal (Microsystem)

The micro-system factors incorporate the students' traits and the direct interactions of students with the teachers and others. Bertolini et al. (2012) enlist student resiliency, individual abilities, health and attendance, developmental

differences, and social and moral development. Firstly, students need resiliency at the time of the exam to cope with stress, fear, and frustration and build motivation for concentrating on their study. It is the ability to be self-righteous in the face of adversity (Benard, 2004). So, being resilient strengthens the inner mental power (Nygren et al., 2010) that helps students to develop positivity in them and further increases readiness for their studies (Shi, 2022). Secondly, individual abilities incorporate cognitive and metacognitive elements that influence a student's capacity to learn and, more significantly, critically comprehend how to effectively grasp and process knowledge (Benard, 2004). Thirdly, health and attendance represent physical and affective factors (Bertolini et al., 2012) that motivate students to study. In ill conditions, somehow students lose their resilience, concentration, motivation, and readiness to study which hampers their exams. Fourthly, developmental differences are related to the student's readiness for learning and skill development (Blankstein, 2010). The developmental differences incorporate differential teaching styles for students (Tomlinson & McTighe, 2006), cooperative learning (Marzano et al., 2001), reframing success through diverse assessment, summative, formative, and diagnostic assessments (Blankstein, 2010), and student tutoring their peers (Benard, 2004). These factors make each student different than others by developing their potential in unique ways. Fifthly, social and moral development is ingrained in both community and family culture (Bertolini et al., 2012). However, the fostering of social and moral development of individuals also affects the habit and patterns of learning. Overall, these all causes within the personal level of individual students are the crucial reasons for the low educational achievement.

2.2.2 Interactive Experiences (Mesosystem)

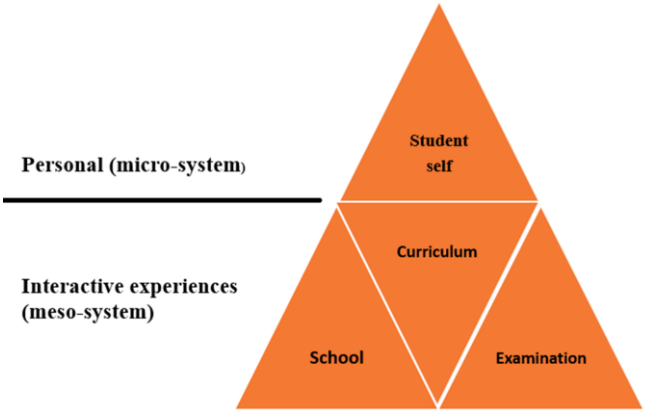
Meso-level advocates the interactions that take place around each student have a direct influence on their educational progress (Bertolini et al., 2012). The following factors have been recognized as critical in boosting student achievement. They are school climate, parent training and parenting, professional development of teachers, teachers' evaluation, development of leadership capacity among teachers, and peer culture (Bertolini et al., 2012). Firstly, school climate means a pleasant and secure learning environment for students by ensuring a supportive and protective atmosphere within the school (Cornelius-White & Harbaugh, 2010). These features of school climate create a motivating environment and increase school readiness among students, which helps them for better learning. Secondly, parenting and parent training are outreach programs for parents to develop better connections with their children (Benard, 2004). It develops an excellent understanding of children to their parents regarding their studies. Thirdly, von Frank (2008) explains that the professional development of teachers is done by providing them with personalized and teacher-driven training, establishing learning communities, and strengthening their relationship with all stakeholders of the school. This opportunity for professional development enhances their capacity and improves the way of transferring learning to their students. Fourthly, teacher evaluation includes a mentor system, support communities, and a shared decision-making environment which improves the evaluation system of students (Bertolini et al., 2012). Fifthly, developing leadership capacity in teachers refers to the process of redefining school leadership and their administrators for sustainable leadership (Blankstein et al., 2010). Sixthly, peer culture incorporates the activities like focus group discussions for students, upholding collaborative and democratic classroom expectations among students, and

communicating with students about the institution's vision (Blankstein, 2010). Overall, these school and family-related factors facilitate a sound learning environment at home and school for better learning among students, which encourages students for high achievement in their exams.

2.2.3 Larger Community and Climate (Exo-system and Macro-system)

This layer is distinguished by societal and systemic elements that influence student learning (Bertolini et al., 2012). While the causes exist on a macro-system, changes in the meso-system may be made to deal with the specific circumstances that each learner is facing. Concerning it, many of those components described in the micro and meso-systems enhance the associated risk factors, which are discrepancies in the socioeconomic status of students, prejudice or class discrimination (Bertolini et al., 2012), and maltreatment of students, unhealthy lifestyle (Cornelius-White & Harbaugh, 2010) of students. Firstly, a student from low-income communities does worse than students from more wealthy ones (Owens, 2017). Secondly, students who face discrimination, exploitation, harassment, maltreatment, and abuse also encounter disturbances in their learning process (Orom, 2013). Thirdly, students with unhealthy lifestyles have more chances of diseases (Steptoe & Wardle, 2001), which reduces

Figure 1. *Factors of Low Educational Achievements*



Note: Idea modified from Bertolini et al. (2012) and Bronfenbrenner (1979)

their performance regarding studies and learning. All these factors related to societal elements play crucial roles to determine the status of learning achievement among students.

On the basis of the literature so far from Bertolini et al. (2012) and Bronfenbrenner (1979), this study categorized the reasons behind low educational achievement among students of diploma level civil engineering program into four broad categories: (i) student-self, (ii) curriculum, (iii) school, and (iv) examination, respectively. As shown in Figure 1, student-self refers to the personal (microsystem) factors, whereas the interactive experiences (mesosystem) incorporate school, curriculum, and examination related factors.

Chapter III

Methodology

This study followed both Quantitative and Qualitative approaches to explore the reasons of low educational achievement among students of diploma level engineering program.

3.1 Quantitative Methods

This research employed a survey technique by using a standardized questionnaire for the quantitative component. The questionnaire is developed by the study team following the study's purposes and priorities. By evaluating data about reasons for the low educational achievement of students. Similarly, the existing database of the CTEVT is also used to analyze the trend of educational achievement of students who were studying in the diploma level civil engineering program of CTEVT.

3.2 Qualitative Methods

This study also utilized qualitative approaches to explore the reasons for low educational achievement among students of diploma level civil engineering program of CTEVT. Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) were employed to obtain in-depth understanding of the phenomenon.

3.3 Population and Unit of Analysis

The population of this study was confined to the entire number of students who got failed in the third-semester exam (N=4929). Those students were studying in the fifth semester of diploma in civil engineering program (CTEVT, 2023). Similarly, the unit of analysis constituted all the individual students who failed the third

semester exam and studying in the fifth semester of the diploma level civil engineering program under the CTEVT.

3.4 Sampling and Participant Selection

The sampling and participant selection procedures of this study were based on both quantitative and qualitative approaches. These procedures have been discussed below.

3.4.1 Sample and Sampling Procedure

The sample size of this study is determined by employing Yamane's formula (Yamane, 1967) at a 95% confidence limit with 0.5 proportion of success, 1.25 design effect, and 5% non-response rate (United Nations [UN], 2008) in equation 1.

$$n = \left[\frac{N}{1+Ne^2} \times deff \times NR\right] \ldots\ldots\ldots (1)$$

Then, 524 students are identified as a sample size of this study. After identifying the sample size, this study employed multi-stage stratified cluster sampling in five stages. More specifically, in the first stage, we categorized the obtained sample size into 7 groups according to the population of this study across 7 provinces as given in Annex 1.

In the second stage, each province is further categorized into 4 sub-groups according to the type of schools (i.e., private, partnership, constituted, and TECS) within CTEVT (in Annex I). Then, in the third stage, the list of schools within each subgroup is prepared, and randomly picked each school from all sub-groups. In the fourth stage, a list of schools was prepared consisting of students who got failed in the third-semester exam of the diploma level civil engineering program. Finally, from the prepared list, the schools were picked randomly by executing lottery methods. However, when the required number of the sample was not fulfilled from the selected school within each sub-groups, then this study took the nearby school from the

previously selected school. This process of sampling was continued until the required number was met.

3.4.2 Participant Selection

This study purposively identified the participants for the qualitative study. The participants were the students who failed in the third semester exam and their school coordinators. Similarly, curriculum developers of diploma level civil engineering program, officials from the Curriculum Development and Equivalence Division, and officials from the Office of the Controller of Examinations (OCE), CTEVT. The number of participants was as follows: 4 students, 4 program coordinators, 2 curriculum developers, 1 curriculum officer and 1 exam officer. Altogether there were 12 participants in the study. The number of participants was determined by the saturation of qualitative data.

3.5 Sources of Data

This study combined both primary and secondary sources of data. More specifically, this study gathered primary information from respondents via a survey as well as the participants through Focus Group Discussion (FGD) and Key Informants Interview (KII) to investigate the causes of low educational achievement. In addition to these primary sources, we also leveraged an existing database as a secondary source of data to map out the trend of students' low educational achievement.

3.6 Instruments

In this study, two sets of data-collection tools were developed. They were survey questionnaire and interview schedules for the quan- and qual-strands, respectively.

3.6.1 Instruments for the Quan Approaches: Survey Questionnaire

The core research team worked with experts to develop the survey questionnaire in English version. At that time, the questionnaire was translated into a Nepali version with the assistance of Nepali language experts for contextualizing it in the context of Nepal. Then, the questionnaire in the Nepali form was back-translated into English to confirm the retention of the intended meaning of the earlier questionnaire. After developing the questionnaire, it was further aligned with the Kobo tool for data collection purposes, which was in both English and Nepali versions (in Annex II).

3.6.2 Instruments for the Qualitative Approaches

In this study, the Key Informants Interview (KII) through Interview Schedule (in Annex III) and Focus Group Discussion (FGD) were used for the qualitative approaches. More specifically, KII was employed to explore the reasons for the poor educational achievement of students from curriculum developers, curriculum officers and exam officers. However, FGD was used among students and coordinators to search for the factors responsible behind the poor examination results.

3.7 Data Collection Process

The quantitative data were collected by enumerators, which were appointed by the research team. Before collecting data, the research team provided virtual workshops and training about data collection to all appointed enumerators. In the workshop, the researcher instructed enumerators about installing the KoBo collect app in their smart phones and trained them to download the survey form. Then, all enumerators were trained to collect data and upload those collected data via the KoBo collect app. After the workshop, the research team sent all enumerators to the selected schools of this study. All the enumerators of this study also took permission from the

school principal to collect data, and also sought help from the management to prepare the list of sample students. After getting the list of sample students, enumerators approached those students and explained the purpose of this study by seeking their verbal consent for collecting data. Subsequently, getting consent from sample students, enumerators collected data via the survey form within the KoBo collect app, and they uploaded all the collected data.

After the completion of quantitative data collection, the research team identified research participants and briefly explained them the purpose of the research along with the findings from the quantitative approach. Then, the researcher took their consent to collect qualitative data through interviews. Subsequently, getting consent, the researcher started the interview with simple conversations about their daily life and jobs to build rapport. From that movement, the researcher asked the questions from interview guidelines and probing questions to get reasons for the high failure of students in their exams until their answers were not saturated. The researcher started this qualitative data collection process from students, their school coordinators, and curriculum and examination officers, and ended by conducting interviews with curriculum developers. After the completion of the interviews, the researcher thanked all participants for providing their information and finally moved towards the data analysis process.

3.7 Data Analysis and Interpretation Process

In the quantitative approach, after completion of the field process, we transformed the quantitative survey data from KoboCollect into an Excel file. Then, the Statistical Package for the Social Sciences (SPSS) was used to create a database and edited the collected data by using code and cleaning procedures. Then, we created tables and charts to present the obtained findings. In the qualitative approach, we

categorized and organized the collected data into the appropriate themes. Then, the information was grouped into many sub-themes for providing further details about the identified themes. The information is then triangulated and interpreted into paragraphs.

Chapter IV

Data Analysis and Interpretation

This chapter includes the results about the reasons for low educational achievement of students from the diploma-level civil engineering program within CTEVT. Additionally, it also includes the reasons for failure in the exams relating to semesters and subjects. However, before analyzing the educational achievement of students, the researcher briefly mentions the demographic characteristics of respondents.

4.1 Demographic Attributes of Respondents

This sub-section incorporates the information about age, gender, caste and ethnicity, educational qualification of fathers and mothers, and the main income source of the respondent's family.

4.1.1 Age of Students

Most of the respondents (*f*=179, %=34.2) of this study were 19 years old, which is followed by 20 years (*f*=141, %=26.9) and 18 years old (*f*=87, %=16.6), respectively. Their maximum and minimum age were recorded as 17 and 26 years old. More specifically, the average year of these students is 19.56 years old.

4.1.2 Caste and Ethnicity across Gender of Students

On the first hand, the caste and ethnicity of respondents are categorized into 7 groups (e.g., Hill high caste, Hill janajati, Hill dalit, Tarai high caste, Tarai Dalit, Tarai Janajati, and Muslim) in this study according to Nepal Demographic Survey (NDS, 2014). The Hill high caste and Tarai high caste groups incorporate Brahmin, Chhetri, Thakuri, and Sanashi of Hill and Tarai, respectively. However, Tarai middle caste like Vaishya is also incorporated in the Tarai high caste groups due to being few in numbers.

Similarly, Hill dalit and Tarai dalit are the low caste groups who are defined as untouchable caste groups respectively from Hill and Tarai. Moreover, Hill and Tarai janjati are the indigenous groups of people from Hill and Tarai, respectively. On the other hand, this section only listed male and female as the gender of students in Table 1.

Table 1. *Caste and Ethnicity across Gender of Students*

Gender		**Caste/Ethnicity**							**Total**
		Hill high caste*	**Hill Janajati**	**Hill Dalit**	**Tarai high caste****	**Tarai Dalit**	**Tarai Janjati**	**Muslim**	
Female	*f*	66	29	8	23	1	7	0	134
	%	25.9	40.3	38.1	22.8	4.8	13.7	0	25.6
Male	*f*	189	43	13	78	20	44	3	390
	%	74.1	59.7	61.9	77.2	95.2	86.3	100	74.4
Total	*f*	255	72	21	101	21	51	3	524
	%	100	100	100	100	100	100	100	100
*Hill Brahmin/Chhetri/Thakuri/Sanashi **Tarai Brahmin/Chhetri/Sanashi/Vaishya									

Table 1 illustrates that the majority of students were male (*f*=390, %=74.4) and the remaining 25.6% (*f*=134) were female. Considering the caste and ethnicity of these students, nearly the majority of students were from Hill high caste (*f*=255, %= 48.7) which is followed by Tarai high caste (*f*=101, %=19.3). These two high-caste groups altogether comprised more than two third numbers (58%) of respondents. Contrary to it, students from Muslim were fewest in numbers (*f*=3, 5=0.6%) than other caste and ethnic groups. Similarly, Dalit caste and Janjati ethnic groups from Hill and Tarai jointly accounted for 8% and 23.4% which are fewer than higher caste groups in this study. More specifically, while cross-sectioning caste and ethnicity with

the gender of students, males were more in numbers than females in all caste and ethnic groups of students.

4.1.3 Educational Qualifications of Parents

This part mentions the educational qualification of parents of students as their father and mother in Table 2.

Table 2. *Father and Mother's Educational Qualification of Students*

Educational Qualification	**Father**		**Mother**	
	f	**%**	***f***	**%**
Illiterate	80	15.3	191	36.5
Below SEE	184	35.1	222	42.4
SEE or SLC	106	20.2	57	10.9
10+2 or PCL	103	19.7	40	7.6
Bachelor Degree and above	51	9.7	14	2.7
Total	524	100.0	524	100.0

The educational qualification of both father and mother was categorized into five groups illiterate, below SEE, SEE or SLC, plus two or PCL, and Bachelor degree and above, respectively. Among these educational qualifications, the majority of parents both father and mother were from the below SEE or SLC, which accounts for 50.4% and 78.9%, respectively. However, few of the parents (father=9.7 % and mother=2.7%) held Bachelor or above degrees among male and female students.

4.1.4 Main Income Sources of Family

The major income sources of the family were enlisted in five categories of occupation: business, daily wages, service, foreign employment, and agriculture as presented in Table 3.

Table 3. *Main Income Sources of Family across Gender of Students*

Main Income Sources of Family		**Gender**		**Total**
		Female	**Male**	
Business	*f*	18	58	76
	%	13.4	14.9	14.5
Daily Wages	*f*	8	30	38
	%	6	7.7	7.3
Service	*f*	20	51	71
	%	14.9	13.1	13.5
Foreign Employment	*f*	20	35	55
	%	14.9	9	10.5
Agriculture	*f*	68	216	284
	%	50.7	55.4	54.2
Total	*f*	134	390	524
	%	100	100	100

The majority of students (54.2%) from both genders, males and females, stated that their major source of income was agriculture which accounted for 55.4% and 50.7%, respectively. It was followed by business and service sectors as the main income sources of families within 14.5% and 13.5% of students. However, 7.3% of student's family depended on daily wages as their main income source.

4.1.5 Types of School across Provinces

Entire schools of CTEVT were categorized into four types: private, partnership, constituted, and TECS. These types of schools were located within all seven provinces of Nepal: Koshi, Madhesh, Bagmati, Gandaki, Lumbani, Karnali, and Sudhur-Paschim as illustrated in Table 4.

Table 4. *Types of Schools across their Located Province*

Type of the School	**Statistics**	**Province located by School**							**Total**
		1	**2**	**3**	**4**	**5**	**6**	**7**	
Private	*f*	12	8	29	4	30	0	7	90
	%	13.3	8.9	32.2	4.4	33.3	0	7.8	100
Partnership	*f*	23	11	12	3	0	9	0	58
	%	39.7	19	20.7	5.2	0	15.5	0	100
Constituted	*f*	11	13	21	10	8	11	13	87
	%	12.6	14.9	24.1	11.5	9.2	12.6	14.9	100
TECS	*f*	35	29	65	24	47	41	48	289
	%	12.1	10	22.5	8.3	16.3	14.2	16.6	100
Total	*f*	81	61	127	41	85	61	68	524
	%	15.5	11.6	24.2	7.8	16.2	11.6	13	100
* 1=Koshi, 2=Madhesh, 3=Bagmati, 4=Gandaki, 5=Lumbani, 6=Karnali, 7=Sudhur-paschim									

Table 4 reveals that more students were located in the Bagmati province (24.2%) which is followed by Lumbani province (16.2%). However, fewer students (7.8%) were from technical schools from Gandaki province. Beyond it, in the context of school types, the majority of students (f=289, %=55.15%) who failed exams studied in TECS schools. Contrary to this, partnership schools (f=58, %=11.08) consisted of fewer students who failed exams than other types of schools.

4.2 Trend Analysis of Exam Results

This section included the overall trend of the pass and fail of students, pass percentage of students across semesters, school-wise pass percentage, and province-wise pass percentage of students.

4.2.1 Overall Results of Students across Academic Years

The overall results of students are the average percentage of pass and fail from the first to the sixth semester from 2075 to 2079 B.S. in Figure 2.

Figure 2. *Pass and Fail Percentage of Students across Academic Years (in B.S.)*

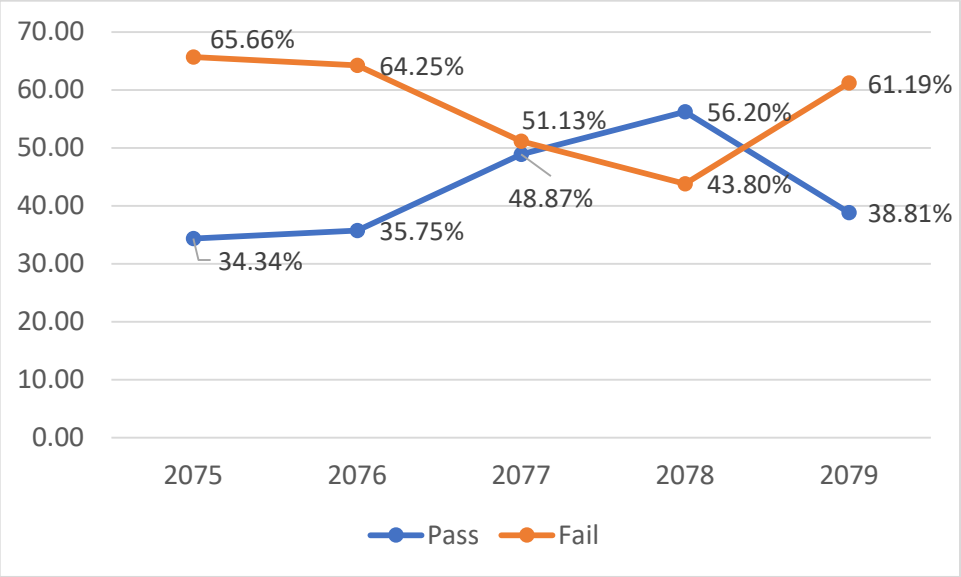


Figure 2 illustrates that the overall fail percentage was higher than the pass percentage of students during all consecutive academic years from 2075 B.S. to 2079 B.S. except in 2078 B.S. In 2078 B.S., the pass percentage was higher than the fail percentage of students. In this context, school coordinators and students claimed that in all academic year except 2078 B.S., CTEVT provided exam centers in those schools which were far away from their schools. It created discomforts in students as they had to to spend a significant amount of time in travelling to reach the exam

Box 1. *Reasons for More Students' Failure in Exams Except in 2078 B.S.*

Except in 2078 B.S., our exam center was far from our school, completely in the new environment. In the exam center, exam supervisors were also not familiar and helpful. They need to provide information about errors in the test items. However, they didn't provide such information. They also refused to clarify the questions even when I asked them. The act of invigilators affected my exams. Due to having some erroneous test items, I was not able to attempt all the questions, which reduced my marks in the exam. As a result, my educational achievement became low due to the negligent behavior of invigilators. However, when CTEVT notified our own school as the exam center (home center) in 2078 B.S., I felt more comfortable siting in the exams than in other school settings. The invigilators clarified the confusing test items and they informed us in time about the errors in the test items. So, I was able to attempt all the questions, even if the question contained errors without wasting any time. And my exam results were satisfactory in that academic year.

- One of the students from a private school

centre. In addition, they also did not get clarification about confusing or erroneous test items in the early hours of the exam. These incidents affected the educational achievement of students. Beside this, in 2078 B.S., due to the COVID-19 pandemic, CTEVT provided the home center[2] for all students, and it resulted in good educational achievements among students. This higher pass percentage of students was also seen as a common phenomenon in 2078 B.S. within most semesters except first, fourth, and sixth (see Figure 3).

Figure 3. *Fail Percentage of Students across Semesters*

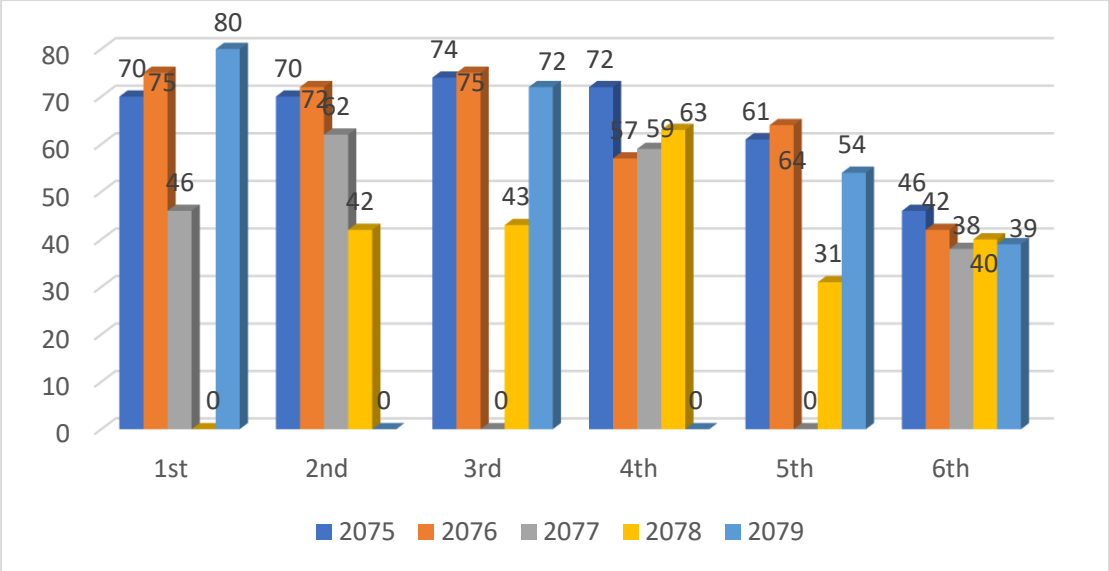


Figure 3 sketches the failure percentage of students in exams across all semesters from 2075 BS to 2079 BS. The higher percentage of failed students in the first (80%), second (72%), third (75%), fourth (72%), and fifth (64%) semesters were in 2079, 2076, 2076, 2075, and 2076 respectively. Besides these semesters, there was the lowest fail rate in the second semester (42%), third semester (43%), and fifth semester (31%) in 2078 B.S., respectively. In Figure 3, the value 0 indicates that there was a schedule delay due to the COVID-19 pandemic in the respective semesters. The

[2] Home center refers to the exam center where students sit their final exams in their own institutes.

schedule is delayed mainly in 2078 B.S. (first semester), 2079 B.S. (second and fourth semester), and 2077 B.S. (third and fifth semesters), respectively. In this context of the delayed schedule of exams regarding semesters, one of the officers from the Office of the Controller of Examinations (OCE) said,

> *Due to the Covid-19 pandemic, we extended our duration of courses to more than 9 months in some semesters. This extension of duration hampered the whole academic schedule of CTEVT. Then CTEVT had to re-adjust the schedule, and for this purpose, we also conducted exams of some semesters within four months to fix the academic calendar disturbed by the Covid-19, particularly in 2079 B.S.*

Due to these reasons, there was no data on exams of some semesters from 2077 to 2079 B.S.

4.2.2 Status of Pass and Fail among Students across Semesters

This study obtained the average (mean) percentage of pass and fail of all semesters by calculating all values of pass and fail from 2075 to 2079 B.S. (in Figure 4).

Figure 4. *Pass and Fail Percentage of Students across Semesters*

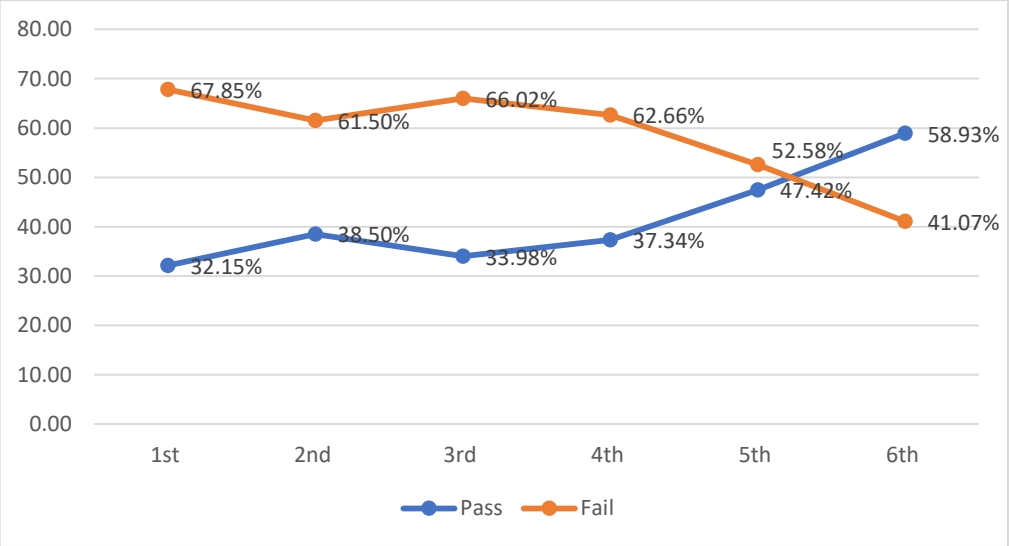


Figure 4 shows that the majority percentage of students failed their exams in comparison to the passing percentage in all semesters except the sixth semester. For instance, the highest percentage of students failed in the first semester (67.85%), followed by the third semester (66.02%). On the contrary, in the sixth semester, the lowest percentage of students were failed in the exam. Considering it, all the school

Box 3. *Reasons for Failure in the First and Second Semester*

On the first hand, science subjects in the diploma level civil engineering program were taken from the PCL level of engineering course of the Institute of Engineering (IoE), Tribhuvan University (TU). A few years ago, CTEVT revised these courses, but the experts added some subject matters from the Bachelor's level. So, science subjects like physics, chemistry, and math has become difficult for students. Secondly, these science subjects are also taught in Grade 11 and 12, where students study them in 2 years. But the students of diploma civil engineering need to complete them in one year. However, the contents and depth of these subjects remain almost the same in both programs. These two reasons make science-related subjects like physics, chemistry, and math difficult for students, and they fail in the exam.

- A curriculum developer

coordinators accepted that in the first semester, students had to study science-related subjects. These science-related subjects contain highly theoretical as well as

Box 2. *Reasons from Students: Failed in the First, Second, and Third Semester?*

Our first and second semester subjects were more theoretical. So, we had to memorize the concepts, which is very tough for us. I tried to memorize them, but in exams, I forgot all the memorized contents. So, I was unable to write in the exams. As a result, I failed in physics, chemistry, and math in the first, second, and third semester.

- A student from a private school

numerical contents. Because of the tough nature of subjects, many students were not able to pass the first-semester exam. In this context, students, and curriculum developers also argued in similar ways (in Box 2 and 3).

After the results of the first semester, the results of the second semester seemed slightly improved (Box 4) because the second semester is the continuation of the first semester. It means that the second semester also contains a similar nature of subjects such as physics, chemistry, and math. The students feel that they are a bit

familiar with those subjects. As a result, the students felt a little easier, which is seen in the results of the second semester as a slight decrease in the percentage of failed students.

Box 4. *Improvement in Second Semester*

I feel that I am a bit familiar with these subjects like physics, chemistry, and math in the second semester because I already studied them in the first semester. As a result, I feel a little relaxed, which is seen in my results. I can pass the second-semester exam.

- A student from a TECS school

Similarly, students also failed in the third semester because the third semester contains applied science subjects such as Fluid Mechanics and Hydraulics, Surveying, and Engineering Mathematics. Regarding this, one of the students claimed, "*The third semester subjects were new for us, and they had more numerical contents, so they were hard to understand. Therefore, I failed in the third-semester final exams.*" However, curriculum experts claimed that these subjects only had simple numerical contents. In this connection, the coordinator from a constituted school argued that many students failed in the third-semester final exam due to high absence in the class. The students missed the sessions and were unable to cover the contents. These students were not able to write answers in the exam because of their absence in the school/institute.

Furthermore, the sixth semester contains solely engineering-related subjects, so many students passed the exam as stated by school coordinators and curriculum developers. The school coordinator from a private school argued, "*In the last semester, many of the failed students already drop from the school. So, the remaining students are studious, and the subjects in the sixth semester are more practical oriented and occupational.*" In these premises, this study obtained that most of the students, who were in the sixth semester, were motivated to study their course. Similarly, due to being professional and practical in nature, the subjects in the sixth semester of diploma civil program were comparatively easier than the subjects of

other semesters. Therefore, the majority of students passed their exam in the sixth semester.

4.2.3 Status of Fail in Exam across School Types

The overall failure percentage of students from different types of schools (i.e., private, partnership, constituted, and TECS) is presented in Figure 5.

Figure 5. *School-wise Average Fail Percentage of Students*

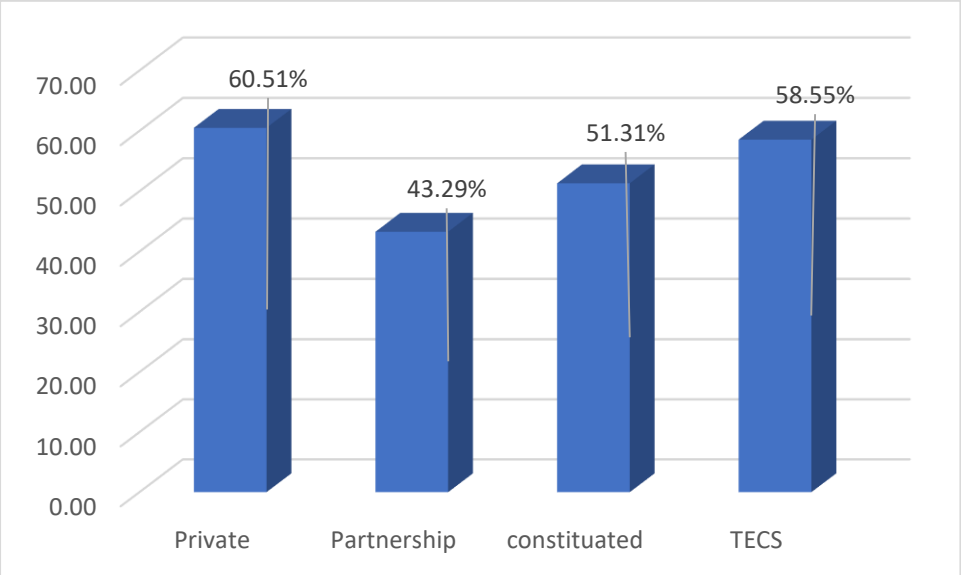


Figure 5 portrays that the majority of students failed in exams except the partnership schools. The highest percentage of students failed in private institutions (60.51%) followed by TECS schools (58.55%). Contrary to this, partnership school accounts lowest percentage (43.29%) of students who failed in their final exams. Considering the highest percentage of students who failed in private students, school coordinators from other types of school claimed that most of the private and TECS schools were not well equipped with laboratory and workshop materials for conducting practical exercises (in Annex IV, Table B). So, the students from private and TECS schools got failed in the exam in greater numbers than the students from constituted and partnership schools.

In this context, one of the officers from the Office of the Controller of the Examinations, CTEVT argued,

> *Many private and TECS schools do not have sufficient and trained teachers. They hire temporary teachers to teach in their schools who are only concerned with finishing their courses rather than delivering the contents in an understandable manner to the students. So, the poor quality of instruction in private and TECS schools leads to the student's failure in the final exam.*

Furthermore, an exam officer explained that poor availability of lab and quality teachers also prevailed in newly established constituted schools, especially in remote areas of Nepal. Thus, the major causes for the high failure of students in the exam from private schools were lack of well-equipped labs, poor quality workshops, and insufficiency of quality and experienced instructors in the school.

4.2.4 Status of Fail in Exam across Province

The overall failure percentage of students in provinces (Koshi, Madhesh, Bagmati, Gandaki, Lumbani, Karnali, and Sudurpaschim) is in Figure 6.

Figure 6. *Province-wise Average Fail Percentage of Students*

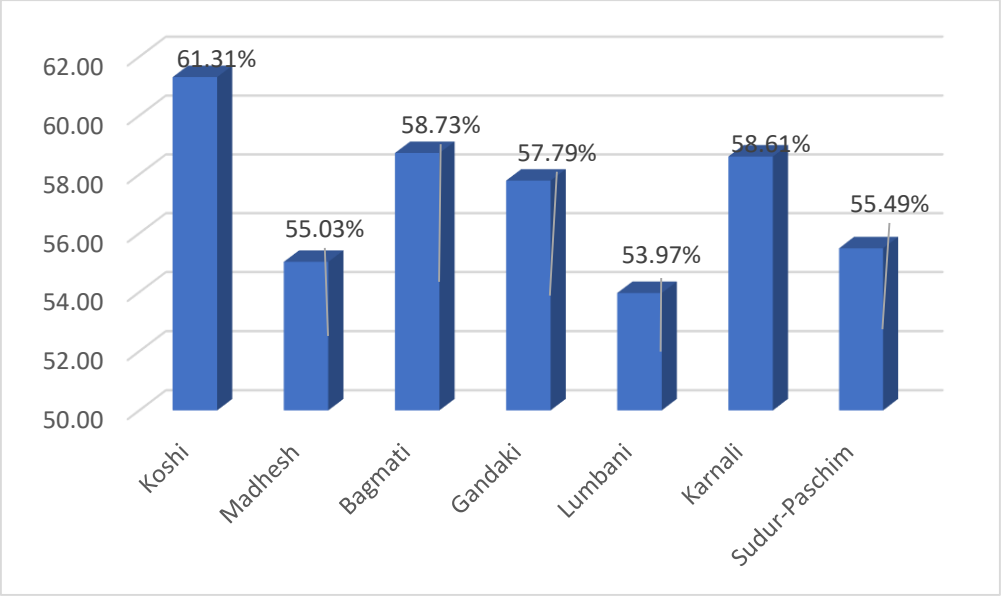


Figure 6 projects that the Koshi and Madhesh province have the lowest and highest percent of pass students than other provinces. It means that more students from Koshi province failed the exam (61.31%) than students from other provinces. However, Madhesh province has a low percentage of failure among students. In this connection, the Madhesh province has a better level of educational facilities (in Annex IV, Table A) than Koshi province. Educational facilities like the sufficiency of trained teachers, laboratory facilities, survey tours, workshops, and infrastructure play a vital role in enhancing the educational achievement of students. Due to having insufficient facilities in the schools, Koshi province has the highest percentage of failure in comparison to other provinces in the diploma civil engineering program.

4.3 Perceived Adequacy of Facilities among Students

This section incorporates infrastructure, lab facility, quality classroom instruction, outreach activity, survey tour, and sufficiency of workshop as the perceived adequacy of facilities of school among students. This perception about the adequacy of facilities is labeled into three categories (Khan, 1977 as cited in Shrestha & Dangol, 2020) based on their obtained mean values as bad (1.00-2.33), moderate (2.34-3.66), and Good (3.67-5.00), respectively in Table 5.

Table 5. *Perceived Facilities Provided by Schools*

Student's Perception	**Mean**	**Std. Deviation**	**Level of Adequacy**
Perceived infrastructure of school	3.55	.874	Moderate
Perceived lab facility of school	3.26	1.043	Moderate
Perceived quality of class instruction in the school	3.62	.910	Moderate
Outreach activity like survey tour	2.76	1.237	Moderate
Perceived sufficiency of workshop	3.00	1.209	Moderate

Table 5 illustrates that students perceived a moderate level[3] of facilities which are provided by their schools regarding infrastructure, lab facilities, quality classroom instruction, outreach activity, survey tours, and sufficiency of workshops. Comparing these perceived facilities, students perceived the highest and lowest level of mean values towards quality classroom instruction (mean=3.62) and outreach activity (mean=2.76), respectively. In this context, students from private and TECS schools said that they were not well exposed to the survey tour (Box 5), quality workshop, and real work setting. Considering real work settings, there is no provision for doing internship or on-the-job training (OJT) in the industry (Personal Communication with a curriculum developer). Besides, a curriculum developer of the diploma in civil engineering course claimed that there needed to be the introduction of new technology and devices for the students in the laboratory and workshop. However, this was not happening in all schools (Box 6). Due to the lack of new technology, devices, and sufficient practices in the schools, many schools didn't provide the

Box 5. *Least Exposure in the Real Field*

Our school took us on the survey tour only once near our school. We reviewed the road construction by taking its measurements. Except this survey tour, we didn't get the opportunity to visit another site of engineering project. So, without sufficient exposure to surveying and other engineering projects, we didn't gain much experience in surveying which resulted with poor marks in the Surveying subject in the final exam.

- A student from a private school

Box 6. *Least Update about New Technology!*

Some of the schools still take practical classes with outdated technologies and devices which are no longer in use in the job market. For example, in the market, PVC and fiberglass pipes are being used. But some schools still teach about outdated GI pipes which are rarely used in the world of work.

- A curriculum developer

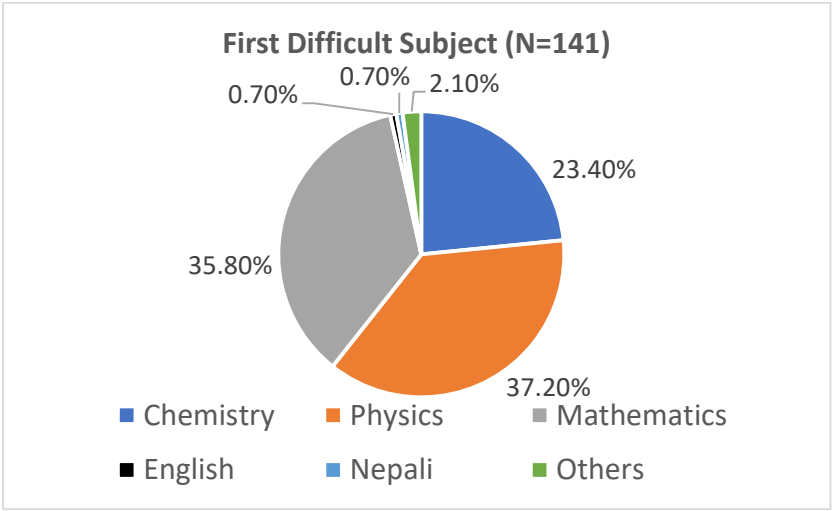
[3] A moderate level of facilities refers to the availability of those materials and facilities for students, which was neither in a profuse amount nor sufficient for quality education.

hands-on experience with new technology to the students of engineering. This lack of practice also hampered the theoretical conceptualization among students, which negatively affected the student's learning.

4.4 Perceived Difficult Subjects among Students

Students perceived physics, chemistry, and math as the difficult subjects in the first (Figure 7) and second (Figure 8) semesters. In addition, engineering mathematics, and fluid mechanics and hydraulics as the difficult subjects in the third semester (Figure 9).

Figure 7. *Perceived Difficult Subjects among Students in the First Semester*



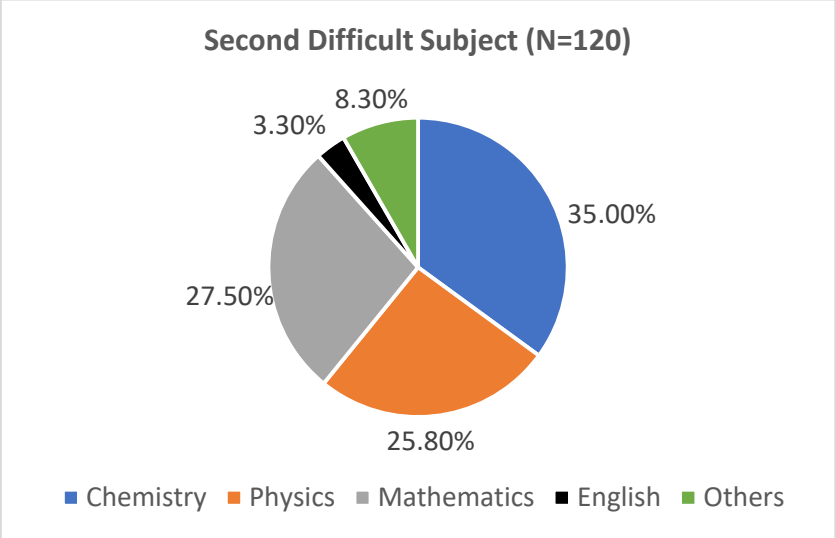
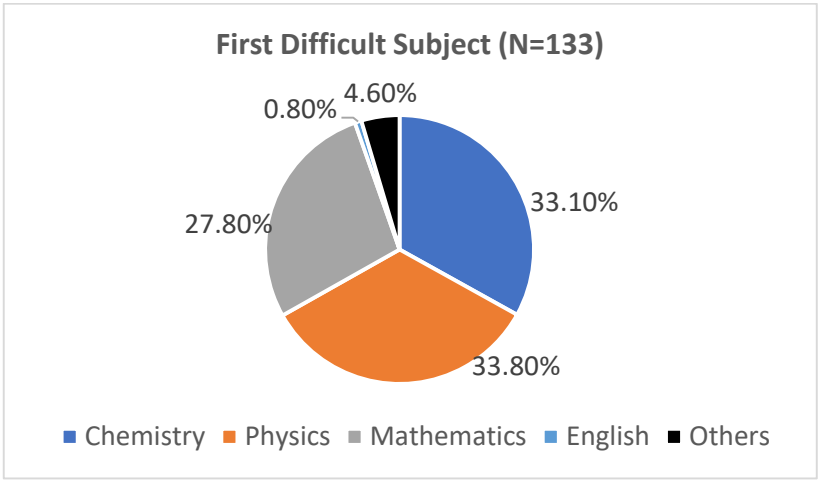


Figure 8. *Perceived Difficult Subjects among Students in the Second Semester*



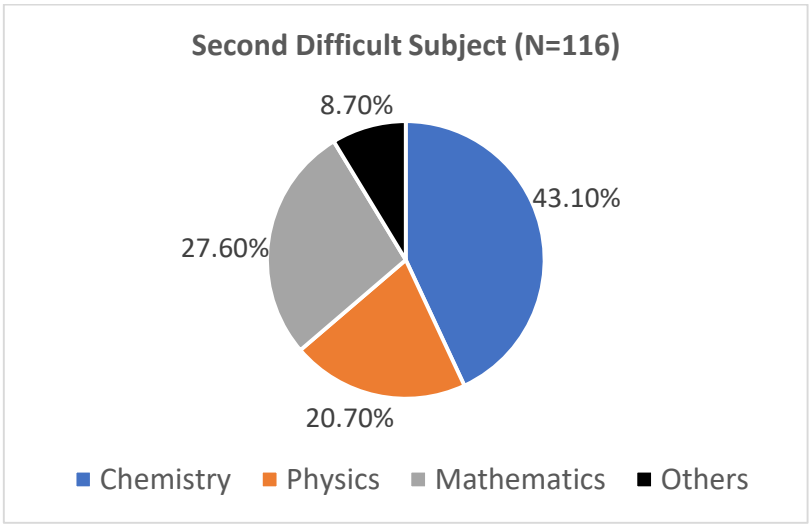
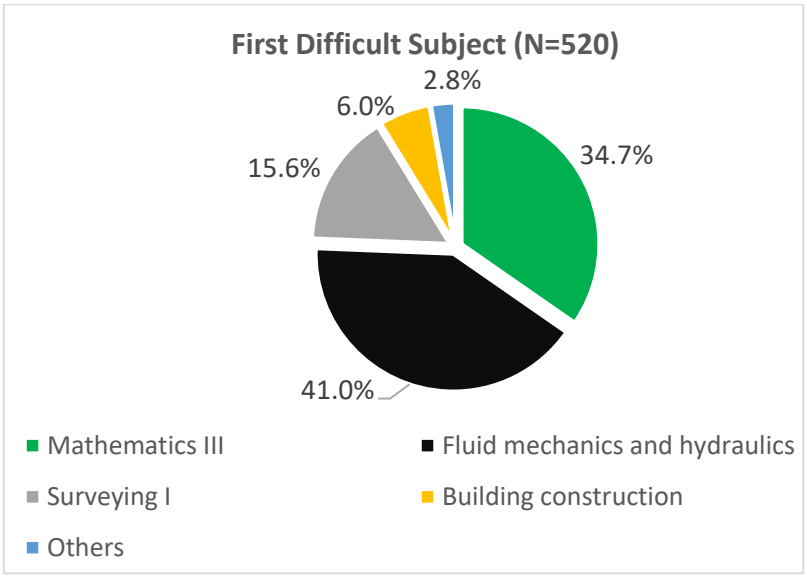


Figure 9. *Perceived Difficult Subjects among Students in the Third Semester*



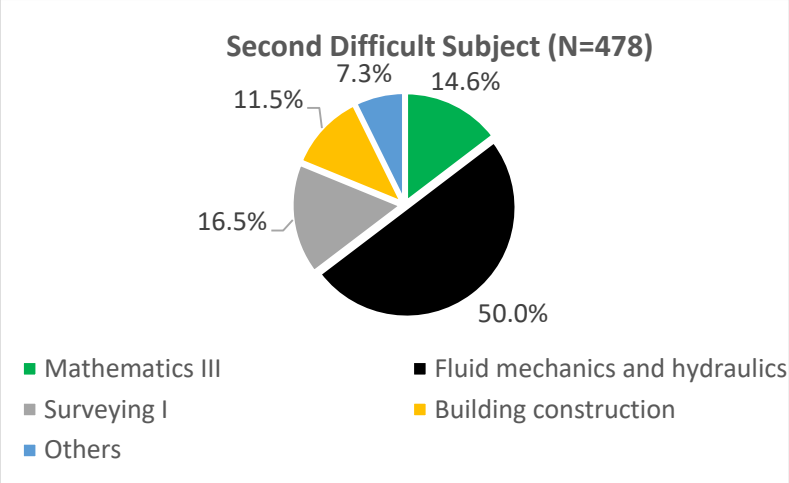


Figure 7 and 8 illustrates that 95 and 94 percent of students jointly perceived physics, chemistry, and mathematics as the most difficult subjects in the first and second semesters. In the third semester (Figure 9), 85 percent of students accepted that engineering mathematics III, and fluid mechanics and hydraulics as their first difficult subjects. These students perceived physics, chemistry, and mathematics in the first and second semesters, and math, and fluid mechanics and hydraulics of the third-semester contain a vast amount of theoretical and numerical contents, which makes these subjects more difficult than other subjects (Box 7-9).

Box 7. *Weak Base and Extensive Numerical Problems regarding Mathematics*

We have found that many subjects have similar depth of contents between Bachelor of Engineering (BE) and Diploma in Civil Engineering (DCE) courses. However, in BE, the minimum requirement for student enrollment is the completion of Grade XII, but in the DCE level, only obtaining 1.6 GPA in SEE is sufficient to enroll in the program. The DCE level course is equivalent to Grade XI and Grade XII courses. Our students have been forced to study a higher-level course rather than their level. So, they get failed in general science-related subjects as well as in some applied subjects.

- A school coordinator from a private school

Box 9. *Causes of Difficulty: Theoretical and Numerical Problems*

In the first and second semesters, there are general science subjects like physics, chemistry, and mathematics. These subjects are very vast and include difficult contents. These subjects have incorporated many theoretical concepts and numerical problems. We need to study it in only one semester, which is one year course in Grade 11 and 12. So, due to the short duration of time, hard and vast, and equipped with more numerical and complex theoretical concepts, it's very difficult for us to understand these subjects. We also do not have sufficient time to study these subjects. These things led us to failure in the science-related subjects in the first and second semester exams. Then, in the third semester, there are new subjects that are applied in nature like mathematics, fluid mechanics and hydraulics, surveying, etc. These subjects have also incorporated concepts of general science with numerical calculations. In our school, these subjects are mostly taught theoretically by the lecturers. There are very few practical classes in these subjects. So, more theoretical concepts and numerical problems make these subjects very hard for us. So, we got failed in the third semester.

- A students from a private school

Box 8. *Level of Difficulty of Subjects not Compatible with Level of Students*

The subjects in our stream contain a high level of derivation. But in my case, I didn't study the optional math at the school level. So, the mathematics and physics were new for me. My base was weak. But in our school, our instructors didn't teach us the mathematics of the school level. So, without understanding the basic math, I was unable to understand the advanced level of numerical contents in science-related subjects in the first and second semesters. This weakness in the first and second semesters related to mathematical problems led me again to the difficulty in understanding the applied level subjects of the third semester like fluid mechanics and hydraulics, and engineering mathematics.

- A student from a TECS school

4.5 Numbers of Subjects Failed in Each Semester

This section elucidates the number of subjects that students got failed in each semester as shown in Table 6.

Table 6. *Numbers of Subjects Failed by Students in Each Semester*

No. of subjects	First Semester		Second Semester		Third Semester	
	f	**%**	***f***	**%**	***f***	**%**
1	65	46.1	67	50.4	189	36.0
2	41	29.1	44	33.1	123	23.4
3	28	19.9	13	9.8	89	17.0
4	5	3.5	6	4.5	75	14.3
5	2	1.4	3	2.3	31	5.9
6	0	0.0	0	0.0	17	3.2
Total	141	100.0	133	100.0	524	100.0

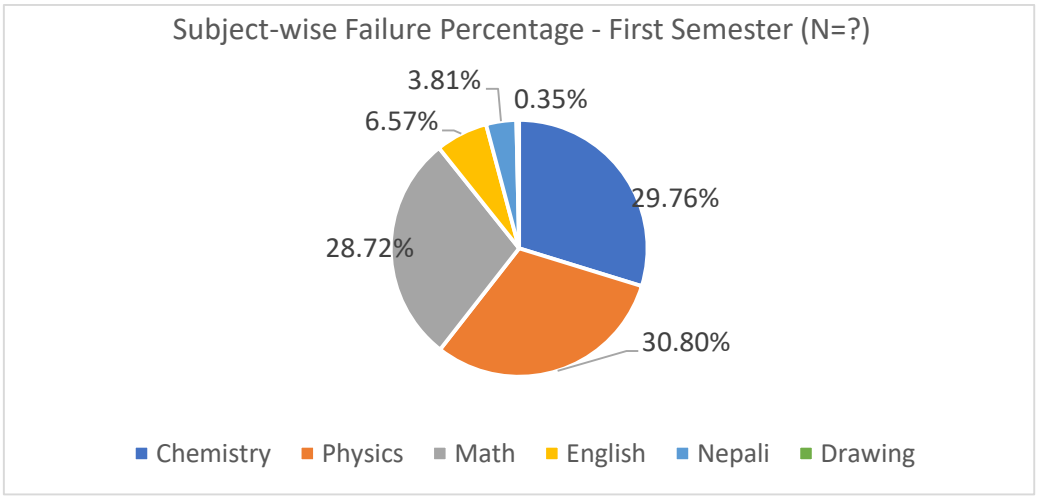
The larger numbers of students who failed in one subject in all semesters are 46.1%, 50.4%, and 36%, respectively in the first, second, and third semesters. It is followed by 2 subjects in all semesters, however, there are only a few students who failed in six subjects 3.2% only in the third semester. The number of students who failed in the six subjects is seen only in the third semester because the sample was taken from those students who failed in the third semester. Some of these students 27% (N=141) and 25% (N=133) also failed in the first and second semesters, respectively.

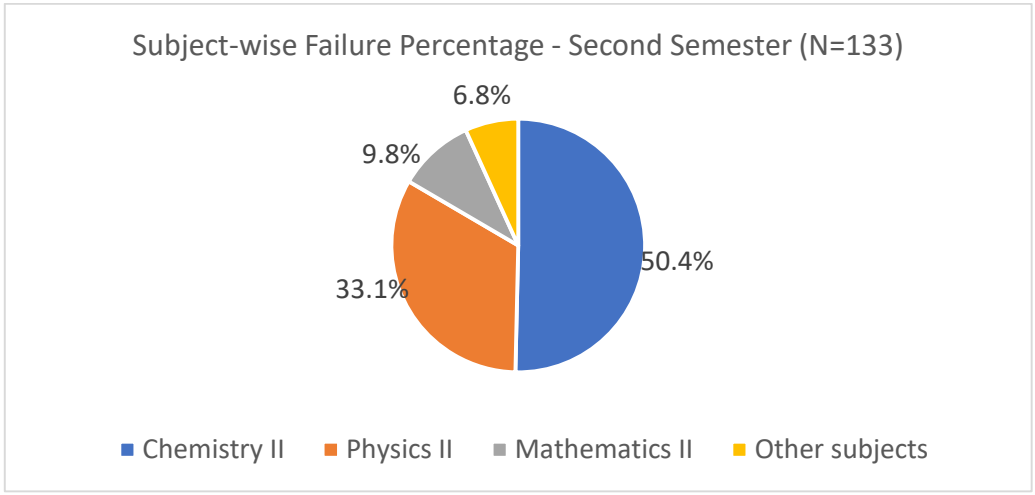
4.6 Subject-wise Failed Students in Each Semester

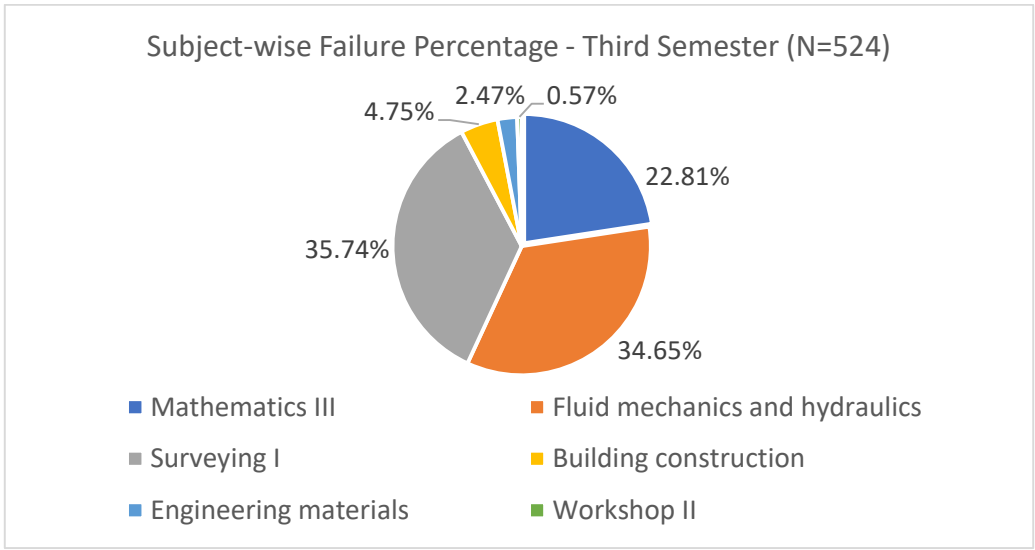
There are seven, six, and six subjects in the first, second, and third semesters within the Diploma level Civil Engineering course (CTEVT, 2021). In the first semester, applied Nepali, applied English, mathematics I, chemistry I, physics I, drawing I, and computer application have been prescribed for the students. Similarly, mathematics II, chemistry II, physics II, drawing II, mechanics, and workshop I are the subjects within the second semester. However, engineering-related subjects like fluid mechanics and hydraulics, surveying I, building construction, engineering

materials, workshop II, and engineering mathematics III as the subjects in the third semester of the Diploma in Civil Engineering program (in Figure 10).

Figure 10. *Percent of Failed Students in Each Subject in Semesters*







Figures 10 illustrates that physics, chemistry, and mathematics are the major subjects in which students received failed status mainly in the first and second semesters. These subjects collectively accounted for about 89.28% and 93.3%, respectively in the first and second semesters of their studies. However, in the third semester, many students failed in engineering-related subjects like surveying, and fluid mechanics and hydraulics which altogether account for about 68% of total students. This information provides an insight that in the first and second semesters, more students failed in general science subjects, whereas engineering-related subjects in the third semesters. Considering it, students from all types of schools explained that extensive numerical problems (Box 8) in the courses and weak base of students led them to get failed in the first, second, and third semester final exams. Similarly, curriculum developers and school coordinators explained that courses in the diploma level of engineering were adopted from the university level courses. So, the contents included in this course was tough and it made students feel difficulty in understanding the subjects such as physics, chemistry, and mathematics. On the other hand, the students enrolled in the program were not compatible with studying this stream compared to the difficulty of subjects, which is the prime reason for students getting failed in the exams (Box 9). These thoughts related to difficulty in the content and vast nature of subjects were accepted by the curriculum developers. They reasoned the inclusion of general science-related subjects in the diploma in civil engineering to ensure their capability to study at the university level in future.

4.7 Reasons for Failure in the Exam in Each Semester

This study elucidates the reasons for failure in exams in each of the three semesters, which has been summarized in Table 7.

Table 7. *Reasons for Failure in Each of the First Three Semester Final Exams*

Factors	**Reasons**	**1st (N=141)**	**2nd (N=133)**	**3rd (N=524)**
		***f*(%)**	***f*(%)**	***f*(%)**
Student Self	Forgetting text/Hard to remember	2(1.42)	1(0.75)	1(0.19)
	No focus on study	3(2.13)	1(0.75)	13(2.48)
	Weak base	20(14.18)	22(16.54)	17(3.24)
	Less study and careless in study	25(17.73)	20(15.04)	84(16.03)
	No practice	6(4.26)	1(0.75)	10(1.91)
	Language barrier	2(1.42)	3(2.26)	6(1.15)
	Low confidence	0(0)	0(0)	1(0.19)
	Absent frequently	0(0)	0(0)	8(1.53)
	Home problem	0(0)	0(0)	15(2.86)
	Health issues	6(4.26)	2(1.50)	31(5.92)
	Overall student self	*64(45.39)*	*50(37.59)*	*186(35.50)*
Curriculum	Tough syllabus/curriculum	13(9.22)	9(6.77)	(8.21)43
	Vast course	2(1.42)	1(0.75)	4(0.76)
	More numerical	5(3.55)	16(12.03)	41(7.82)
	More theory	1(0.71)	3(2.26)	11(2.10)
	Overall curriculum	*21(14.89)*	*29(21.80)*	*99(18.89)*
School	No clear instructions from instructor	2(1.42)	5(3.76)	17(3.24)
	Online class	13(9.22)	3(2.26)	4(0.76)
	Course not completed	7(4.96)	5(3.76)	27(5.15)
	Difficult to understand in class	8(5.67)	8(6.02)	51(9.73)
	No quality education	1(0.71)	1(0.75)	3(0.57)
	Lack of good teachers	1(0.71)	0(0)	21(4.01)
	Teacher turnover	0(0)	0(0)	8(1.53)
	Teacher absenteeism	0(0)	0(0)	2(0.38)
	Overall school	*32(22.70)*	*22(16.54)*	*133(25.38)*
Examination	Copy checking	17(12.06)	24(18.05)	72(13.74)
	Difficult test items	4(2.86)	7(5.26)	10(1.91)
	Questions not understandable	1(0.71)	0(0)	1(0.19)
	Out of course	2(1.42)	1(0.75)	5(0.95)
	Change in pattern of questions	0(0)	0(0)	4(0.76)
	Tight exam hall	0(0)	0(0)	13(2.48)
	Inappropriate exam center	0(0)	0(0)	1(0.19)
	Overall examination	*24(17.02)*	*32(24.06)*	*106(20.23)*
Total		141 (100)	133(100)	524(100)

Table 7 states least effort and carelessness in the study (17.73%), and weak base (14.18%) are the two prominent reasons for failure in the first-semester exam

among students of CTEVT. Beside these reasons, a great number of students believed that they failed the first semester exam due to an error in their copy checking by evaluators from CTEVT (12.03% students). In addition, they also failed due to the tough curriculum, ineffective online classes, hard-to-understand class lectures, and lack of completing courses accounting for 9.22%, 9.22%, 5.67%, and 4.96%, respectively. Then, in the second semester, students perceived those errors in copy checking (18.5%), weak base (16.54%), least effort and carelessness in the study (15.04%), and numerical nature of courses (12.03%) as the main reasons for failure which altogether accounts the majority of entire students. Furthermore, Table 8 divulges the multiple reasons for failure in the third semester among students. A larger number of students identified reasons for their failure in the exam of the third semester as carelessness in the study, error in copy checking, difficulty in understanding lectures in class, and tough curriculum 16.03%, 13.74%, 9.73%, and 8.21%, respectively. Some respondents blamed their failure on school-related factors such as lack of good teachers (4.01%), tight exam hall (2.48%), and incomplete courses (5.15%), respectively. However, they also accepted that their weak base, lack of study, and lack of focus on study altogether account for 7.8% were their reasons for failure in the exam.

4.8 Factors in Poor Exam Results

Overall, while scrutinizing all the reasons of failure in the first, second, and third-semester exams (Table 7), the main reasons can be further classified into four factors; student self, curriculum, school (curriculum implementation site), and examination, respectively (Table 8).

Table 8. *Factors of Low Educational Achievement among Students*

Factors	1st (N=141)		2nd (N=133)		3rd (N=524)		Overall mean % of 1st, 2nd, and 3rd semester
	f	%	*f*	%	*f*	%	
Student-self	64	45.39	50	37.59	186	35.50	39.49
Curriculum	21	14.89	29	21.80	99	18.89	18.53
School	32	22.70	22	16.54	133	25.38	21.54
Examination	24	17.02	32	24.06	106	20.23	20.44
Total	141	100	133	100	524	100	100

In Table 8, the researcher obtained the mean percent of all factors (student-self, school, curriculum, and examination) using their percent of first, second, and third semesters. Considering these four factors of failure in the exams within students, the student-self plays the most crucial role (39.49%) and the least role by the curriculum, which accounts for 18.53%. Besides these two factors, school and examination determine 21.54% and 20.44% roles in the status of failure among students.

4.8.1 Student Factors

Box 10. *Selection vs. Collection of Students!*

We didn't select students in the entrance exam to enroll in the DCE. Very few candidates applied to enroll in the civil engineering program. Due to this, we had to enroll all students who are either fit or not in this program. So, we collected students instead of selecting genuine students. This weakness in the selection process allowed the enrolment of weak students. This problem of enrolling weak students in the program is the main cause of high rate of failure among students in the exam.

- Coordinator from a partnership school

Student factors (Box 10) incorporate difficulty in remembering, lack of focus on the study, weak base (Box 8), least study and careless in the study, no practice, language barrier (Box 11), low confidence, health issues, home problems, and absent in the class which altogether accounts about 45%, 37%, and 35% in first, second, and

third semester, respectively. Overall, 39.49% of students failed in the exam due to their personal (student-related) reasons.

Box 11. *Language Barrier among Students*

We have come from remote parts of Nepal. There we had studied in the Nepali medium at school. So, our command in the English language is poor. However, in our engineering class, our instructors taught us in the English medium, and we also had to write exam papers in the English medium. We knew what was expected by the test items in the exam. But due to having poor English, we were not able to write properly. So, we failed the exam despite knowing the subject matter.

- A student from a private school

Box 8 and 11 illustrate that the poor base of students in solving numerical problems along with the language barrier is the main reason behind the students' poor educational achievement. This poor base is also the cause of demotivation, loss of confidence, recklessness, absenteeism in class, and least effort in studying courses, which ultimately leads to failure in the exams. Students having a weak base thought that their poor background led them to failure in the exam (Box 12).

Box 12. *Why did I Get Failed in the Exam?*

Physics and chemistry like subjects contain many theories and concepts. They need to be memorized. So, I read a lot to memorize it, but I can't! In the exam, I forgot all. That's why, I failed the exam. Failure in the exam despite exhibiting a lot of efforts made me frustrated and also decreased my confidence level. Then, I started to be careless in my studies and also became absent in the class. This lack of focus in the study made me weaker in the study.

- A student from a TECS school

4.8.2 Curricular Factor

Curricular factors encompass tough syllabus, vast course, more numerical contents (derivatives) (Box 13), and theoretical courses (Box 14), which altogether constitute 14.89%, 21.80%, and 18.89% in the first, second, and third semester,

respectively. Overall, 18.53% of students failed in the exam due to curriculum related reasons.

The curriculum of diploma in civil engineering, particularly the first, second, and third semester holds more theoretical portions than practical in the curriculum.

Box 13. *Mathematics and Numerical Contents: Do they Pose a Burden?*

Firstly, some of our students who enroll in the DCE program are not from a sound mathematical background. These students are weak in mathematics. However, mathematics and other subjects at the diploma level incorporated numerical problems. So, the students from non-mathematical background show discomfort towards such subjects at the diploma level. Next, all mathematical contents, which are included in the DCE program, are not equally applicable in the future occupations of our students. Some of the contents in the math and numerical problems from other subjects are not useful to our students. That's why many of our students take these numerical problems as a burden and are not ready to learn. As a result, they didn't perform well in mathematics and numerical problems of other subjects in their exams.

- School coordinator from a TECS school

Box 14. *Theory: Questions of Applicability*

One of the prime components of DCE program is theory. For example, physics-like subjects include a lot of concepts and laws. These concepts and laws are considered as theories. Now, understanding these theories is a big deal for our students. We teach these theories mainly through the lecture methods, where our teachers give speeches about these theories and distribute notes to students. But only these things are not enough for students to understand. If they don't understand the concept, then they need to memorize it. Memorization of theory is not a solution because after some days students will forget it. Instead of these approaches to teaching theories, we can teach theory by linking them with the engineering profession or daily tasks. Students will easily understand them and be able to write them in the exam. Another important thing is that detailed approaches of pedagogy about teaching theory or concept are not incorporated into our curriculum. This gap in the curriculum development has affected the quality instruction and students' achievement.

- School coordinator from a constituted school

More specifically, theoretical portions accounts 510, 340, and 500 marks within first, second, and third semester of diploma in civil engineering programs, which full marks were 700, 600, and 875, respectively (CTEVT, 2021). So, the curriculum of diploma in civil engineering program is more theoretical as well as academic in nature rather

than being practical-oriented or technical. Due to these features of the curriculum, students felt the DCE program hard and vast, which is one of the main reasons behind the low success rate in the exam**.**

4.8.3 School Factor

Box 15. *Online Class: Low Level of Effectiveness*

During the time of Covid-19 pandemic, we started online classes for our students. At that time, many students were not able to attend online classes due to the lack of internet facilities, low connectivity, and computer or smartphone-like devices. In addition, our teachers also taught numerical contents in online classes and many students didn't understand what the teacher was teaching to them. During the time of online classes, many students were absent. This scenario resulted in poor understanding of subject matter among students.

- Coordinator from a partnership school

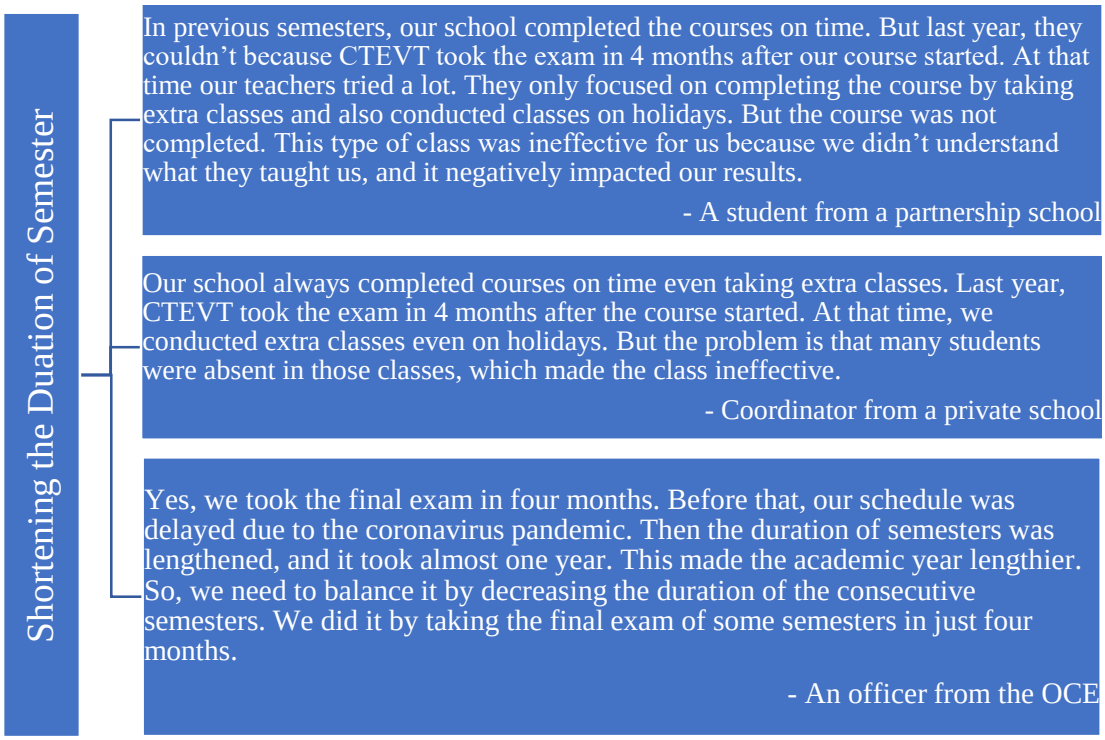
School factors as one of the causes for failure in the exam among students incorporated online class (Box 15), lack of quality of education, hard to understand in class, lack of clear instruction from instructors (Box 16), incomplete course (Figure 11), teacher absenteeism, lack of competent teacher, and teacher turnover altogether account 22.70%, 16.54%, and 25.38% in the first, second, and third semester, respectively. Overall, 21.54% of students failed in the exam due to school related reasons.

Box 16. *Poor Delivery from Part-time Teachers*

Generally, schools appoint part-time teachers to teach pure science-related subjects like physics, chemistry, and math. These teachers need to go to many schools for their job. They mainly focus on the completion of their assigned course in a fixed schedule. So, they are always in a hurry to finish their job and sometimes ignore students' questions. In addition, these teachers are also not trained teachers. Due to these reasons, part-time teachers didn't effectively deliver subject matters to students.

- Coordinator from a constituted school

Figure 11. *Incomplete Courses as One of the Reasons*



Considering the influence of school factors on student's results, the incomplete courses were mainly due to shortening semesters by CTEVT, which also resulted in poor-quality classes. This entire scenario of incomplete courses with shortened semesters is one of the reasons for the poor educational achievements of students. On the other hand, the availability of quality teachers in terms of both sound content and delivery is the biggest challenge faced by schools, and if they (teachers)

Box 17. *Competent Teachers and their Turnover*

Many of our instructors in the school were MSc graduates. They also got training from CTEVT about how to instruct students. But some of our teachers didn't get teacher training. Their delivery of contents to students was not satisfactory though they were competent in the subject matter. Considering this, some of our students complain about these teachers. That's why I sent them to teacher training program conducted by CTEVT/TITI. After the completion of that training course, one of our instructors resigned from the post because he got a permanent job in a government agency. Before that, he had been working at our school on service contract basis.

- Coordinator from a constituted school

were available, then another challenge would be to retain them in the school (Box 17).

4.8.4 Exam Related Factors

Exam related factors as a cause of failure in the exam included an error in copy checking (Box 18), hard questions in the exam, not understanding the question in the exam, tight exam hall, questions out of the syllabus, changes in the pattern of questions, and inappropriate exam center which altogether constituted 17.02%, 24.06%, and 20.23% in the first, second, and third semester, respectively. Overall, 20.44% of students failed in the exam due to exam related reasons.

Box 18. *Suspecting Error in the Copy Checking*

I passed both semester exams, first and second with good marks, but I failed in one subject in the third semester. In that subject, I attempted all questions with correct answers. I expected good marks in that subject, but unfortunately, I got failed in that subject. Why did I get failed in that subject? Of course, the answer is there was an error in copy checking.

- Student from a private school

With regard to the error in copy checking, tight examination hall, and developing the questions, there is a misunderstanding among students and even among teachers and school coordinators. This type of misunderstanding was obtained due to the lack of information about the process of copy-checking, roles and responsibilities of invigilators and center chiefs in the exam hall, and designing question papers. More specifically, in the copy-checking process, some students and school coordinators thought there was no system of coding the answer sheets of the examinees. The thought that the evaluator knows about the student and their school. According to them, due to lack of anonymity, the evaluators become biased in their evaluation by providing good marks to the students of their favorable school and low marks to those students who are from their inimical or unfamiliar schools (personal communication with school coordinators and

students). This perspective towards copy-checking among students and school coordinators reveals that there is misunderstanding about the examination process among them. In contrast to their perspectives towards copy checking, in reality, there is a system of copy coding to ensure the anonymity of students and schools while evaluating the answer sheets of students. In this context, one of the officers from the OCE claimed,

> *We hired experienced teachers from the schools to evaluate the answer sheets of students. These teachers need to come to our office to evaluate the answer sheets of students. We only provide a limited numbers of copies per day to them for the evaluation process. During copy checking, we always strictly ensure the anonymity of students and their school to avoid biasness while evaluating answer sheets of students. So, there is no chance of biasness or errors while checking the answer sheets, but there is a slight chance of committing an error while totaling the secured marks in the answer sheet. To correct this error, we have got the provision of re-totaling marks for the students.*

Box 19. *Tight Exam Hall with not Understandable Questions*

I am weak in the English language, but I understand all the learning contents that is taught to us in the class. However, in the exam hall, we couldn't ask with the invigilator, what the question was about. They didn't allow us to ask even with our friends. No one communicated the real meaning of the question. Had we asked those invigilators, they would threaten us and also take our copy for half an hour as a punishment. This type of action demotivated us as well as killed our precious time in the exam hall.

- A student from a TECS school

Similarly, the perspectives about tight exam halls among students (Box 19) reveal that they are more likely to expect a loose exam hall where they can easily inquire about hard questions with their classmates and invigilators. This expectation of students regarding loose exam hall is against the rule of conducting exams, which

can never happen because it is also a form of mass cheating and affects on quality of education. Moreover, this perspective of students supports that some of the students appeared in the exam with the hope of cheating. The perspective against tight exam hall is not favorable to scoring good marks among students because this perspective hinders them to not doing adequate study for attempting exams.

Box 20. *Questions out of the Syllabus*

Last year, particularly in the third-semester exam, out of questions were asked in the paper of Surveying. Surveying is taught in the third, fourth and fifth semesters. They asked some of the questions from the fifth semester course to the third semester students. So, how can our students attempt those kinds of question? It is one of the reasons for many students' failure in the surveying.

- Coordinator from a TECS school

Furthermore, students and school coordinators believed that occasionally some questions were asked out of the syllabus (Box 20). In this context, one of the officers from the Office of the Controller of the Examinations clarified,

> *We have no question bank in DCE. For developing questions, we hire subject-matter experts as well as the teachers of respective subjects from some of the selected schools. They do their job best. However, there is a rare chance of mistakes by those experts when they construct questions for the final exam.*

It means that this type of error in question development does not usually happen, but may happen rarely due to lack of the question bank. This type of mistake has also increased the chances of failure among students.

Overall, students get failed in the exam due to various reasons. The major factors responsible for low level of educational achievement among DCE students are mainly related to the student, curriculum, school, and exam. These all have contributed for the failure of students in the semester final exam.

Chapter V

Findings and Conclusions

5.1 Major Findings

The findings section is organized into six sub-sections: trend analysis, availability of facilities, perception about hard subjects, subject-wise failure among students in each semester, reasons for failure among students, and factors of poor exam results, respectively.

5.1.1 Findings from Trend Analysis

1. The majority of students failed in all academic years except 2078 B.S. In 2078 B.S., majority of students (56.20%) succeeded in the exams due to having a home center. According to the participants in the qualitative study, when having their school as the exam center, students were more confident about the exam, and also, erroneous questions were corrected in the early hours of the exam. These facilities in the home center made them able to attempt all questions asked in their exam, and as a result majority of students got passed in 2078 B.S.
2. The majority of students got failed mainly in the exam of first (67.85%), second (61.50%), and third semesters (66.02%) due to the hardness of general and applied science courses. However, a majority of them passed the sixth semester exam (58.93%) due to having a pure engineering course, which is more practical/technical.
3. The highest percentage of students failed was in private institutions (60.51%) followed by TECS schools (58.55%) due to the lack of well-equipped lab and workshop along with the availability of trained full-time teachers.

5.1.2 Findings Related to Availability of Facilities

1. Schools provided a moderate level (mean score = 3.0) of learning facilities like infrastructure, lab facilities, quality classroom instruction, outreach activities like survey tours, and sufficiency of workshops to their students, which were not sufficient for students learning. They got the least opportunity to experience newly developed technology in the field of civil engineering and real work settings.

5.1.3 Findings about Perceived Difficult Subjects among Students

1. Almost all students from the first and second semesters perceived physics, chemistry, and mathematics as their difficult subjects. Similarly, 85 percent of students from the third semester informed that applied mathematics, and fluid mechanics and hydraulics as their tough subjects. These subjects are tough for students due to the fact that they are loaded with theories of science and difficult numerical problems.

5.1.4 Findings about Subject-wise Failed Students in Each Semester

1. Physics, chemistry, and mathematics were the major subjects in which students received failed status, mainly in the first (89.28%) and second (93.3%) semesters. However, in the third semester, many students failed in engineering-related subjects (68%) such as surveying, fluid mechanics and hydraulics. These subjects were difficult subjects that needed rigorous study and a strong base to pass the exams. However, schools enrolled some students from a weak base who had not studied optional mathematics in the school level education.

5.1.5 Findings Related to Reasons for Failure in the Exam

1. Doing least effort and carelessness in the study (17.73%), and weak base (14.18%) were the two prominent reasons for failure in the first-semester exam among students of CTEVT. The poor base among students caused demotivation,

loss of confidence, recklessness, absenteeism in class, and the least effort in studying courses ultimately driving them to failure in the exam.

2. Students perceived that errors in copy-checking (18.5%) made them fail in the second semester. They misunderstood that the examiner gave marks on their subjective judgments while checking the answer sheets of students.
3. Reasons for failure in the third-semester exam among students were carelessness in the study (16.03%), error in copy checking (13.79%), difficulty in understanding lectures in class (9.73%), and vast curriculum (8.21%). These reasons signify problems in the students themselves, curriculum, school, and examination system, which altogether drove students towards failing the exam of the third semester.

5.1.6 Findings Related to Factors for Poor Exam Results

1. Student factors, altogether accounted for about 45%, 37%, and 35% in the first, second, and third semesters, respectively. According to the participants in the qualitative study, reasons for failure in the exam within student factors were related to poor base regards language and mathematical competency leading to demotivation, low confidence, carelessness and lack of focus towards study, and absence in the class.
2. The curricular factors encompassed the reason for failure in the exam as vast syllabus, tough courses, and more numerical and theoretical contents, which altogether constituted 14.89%, 21.80%, and 18.89% in the first, second, and third semesters, respectively. Due to the theoretical as well as academic nature of the curriculum, students felt the DCE program as hard and vast, which is one of the main reasons behind the low success rate in the exam**.**

3. School factors accounted for 22.70%, 16.54%, and 25.38% in the first, second, and third semesters, respectively as the causes of failure among students in their exams. The school factors incorporated lack of clear instruction from instructors and quality of education, difficult-to-understand classes, online classes, incomplete courses, teacher absenteeism, lack of competent and trained teachers, and teacher turnover as the reasons for the poor educational achievements of students.
4. Exam factors weighted 17.02%, 24.06%, and 20.23% in the first, second, and third semesters, respectively, as the causes of poor educational achievements among students. Qualitative inquiry explored that there are some misunderstandings among students about errors in designing test items and copy checking, tight exam halls, and inappropriate exam centers as they mentioned these as the reasons for their failure in the exam. The misunderstanding misled them and demotivated them in their study, causing carelessness and poor attempts in the exam, ultimately driving them to achieve poor examination results.

5.2 Conclusions

Low educational achievement among students is a burning issue for all educational institutions and also for the CTEVT. Low educational achievement is assessed through the examination results of students and is evident if the majority of students fail the exam. In the DCE program, many students failed mainly in the initial semesters and passed the subjects in the sixth semester. These students failed in general science-related subjects like physics, chemistry, and math, as well as subjects related to applied sciences like fluid mechanics and hydraulics, engineering mathematics and surveying. These students failed their semester final exams due to multifactorial reasons: student, curriculum, school, and examination.

Students also accepted that they failed due to their self-related reasons like least effort and carelessness in the study, weak base, numerical phobia, and lack of motivation and confidence, which drove them towards failure in their exams. The second most defective factor for students' failure in the exam is referred to as curriculum factors where the curriculum is tilted towards more academic and theoretical features rather than being more technical and practical in nature. These features of the curriculum make students perceive subjects such as physics, chemistry, and mathematics as tough as well as vast, and it leads many students to a state of failure in the exam. The third factor for student's failure in the exam is school-related factors where the delivery of subject matters to the students was not satisfactory, and the laboratory/workshop was also not updated with new technology. The fourth is the exam-related factor, where there is an absence of question banks to construct question papers and errors in copy checking.

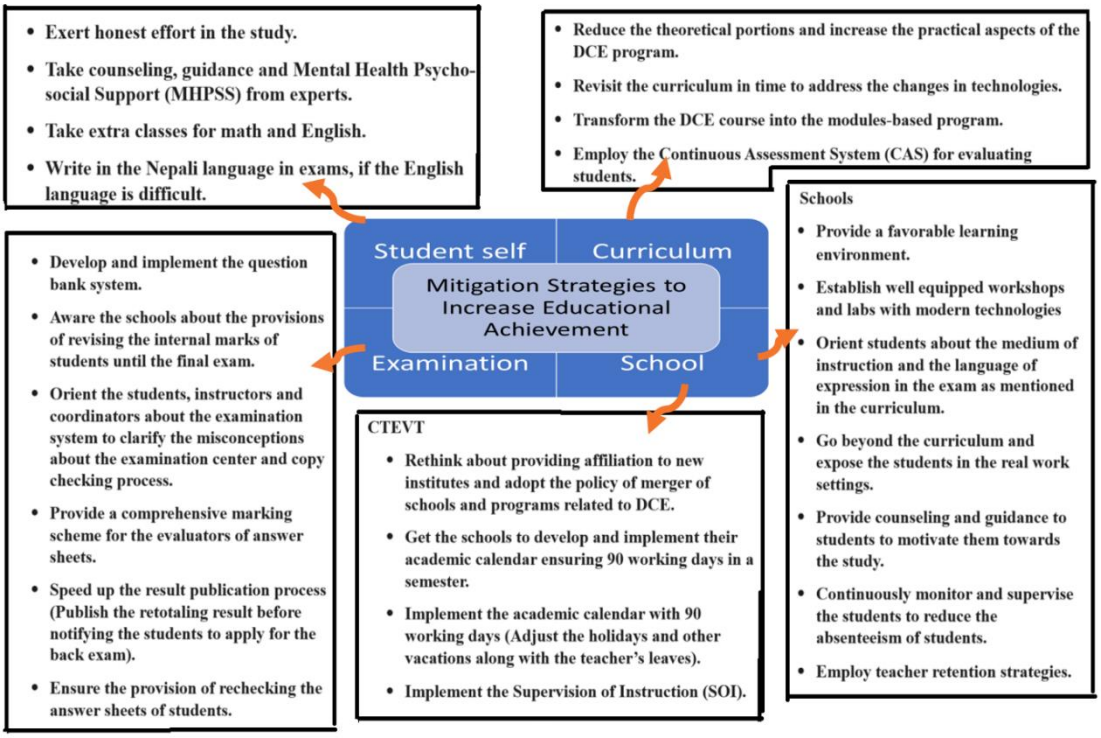
Overall, these anomalies related to student, curriculum, school, and exam factors collectively determine the status of failure in exams among students. The student's failure in the exams is a big loss for the student self as well as for other stakeholders like institutions, families, and the entire nation. So, the anomalies related to these factors need to be mitigated to get high educational achievement.

Chapter VI

Mitigating Strategy for Improving Exam Results

The mitigating strategies need to be carried out separately within each factor related to low educational achievement. So, this chapter deals with mitigating strategies for improving the exam results concerning the students, curriculum, school, and exams (Figure 12).

Figure 12. *Mitigation Strategies to Increase Educational Achievement*



6.1 Mitigating Strategies for Students

The educational achievement among students depends on their efforts toward study. Students are the major stakeholders of exam results. This study found that the poor results among students were due to the lack of confidence, low motivation, carelessness, and least effort in their studies. So, they need to perform consistently and exert honest efforts in the study. For these purposes, they need learning readiness,

high motivation, carefulness, and attention towards study. To ensure these tasks, they can also take counseling, guidance services, and Mental Health Psycho-Social Support (MHPSS) from the experts. Furthermore, students who did not take optional math at the secondary level education, as well as those weak in numerical problems need to take extra support classes. Similarly, the students who believed that they were weak in the English language were also required to take language support classes to enhance their writing skills in the English medium. Beside this, students also need to know that they are also allowed to write their answers in the Nepali medium except in English subject in their exams. However, many students were unaware of the provision of Nepali as the medium of expression in the exam. So, they also need to be aware of the medium of writing. By employing these strategies, students can improve their educational achievement.

6.2 Mitigating Strategies about Curriculum

Curriculum developers and officers from the Curriculum Division at CTEVT need to revisit the courses to make them more technical and market-oriented rather than making them more academic or theoretical. For this purpose, curriculum developers need to study TVET courses run by polytechnics in other countries. While revising the courses of DCE, contents from general sciences need to be reduced and more practical-oriented contents need to be incorporated. It means that the curriculum developers need to reduce the theoretical portion and increase the practical portions of the course. Moreover, curriculum developers need to employ a Continuous Assessment System (CAS) for evaluating students.

6.3 Mitigating Strategies for School

The mitigating strategies for schools are further categorized into two levels: the first is for technical schools, and the second is for CTEVT.

6.3.1 Mitigating Strategy for Technical Schools

School is one of the places for implementing curriculum to provide technical and vocational education and training. So, the school has huge responsibilities towards students regarding their educational achievement. Thus, schools should provide a favorable learning environment to the students to enrich their professional skills. To achieve these purposes, the schools need to be well-equipped with workshops and labs having modern technologies. Furthermore, schools also need to orient their students that the Nepali language is also allowed as the medium of instruction and for writing in the exams. Many students and even instructors were found unaware that they could use the Nepali language while teaching students and writing exam papers. In addition, they also need to go beyond the curriculum and introduce their students to newly developed technology related to civil engineering in the real work setting. Moreover, the TVET school also needs to counsel and guide students to enhance their motivation level towards their studies. These schools also need to continuously monitor and supervise students to reduce the absenteeism of students in the class. The trend of absenteeism of students is one of the main causes of low educational achievement among students.

To address these issues of absenteeism among students, schools need to strictly consider the attendance of students as part of internal evaluation. They also need to utilize the provision of revising internal marks of students till the final. To make it clearer, there is a provision for submitting internal marks of students to the OCE while submitting the exam forms by the schools. The submitted internal marks

can be revised by those TVET schools until the time of final exams. However, many of the schools were unaware of this provision. Due to this unawareness of the provisions, some of the students became absent from the class and neglected their school after submission of their forms by the schools. Beside student absenteeism, teacher turnover also ruins student achievement. To ensure low teacher turnover, the school also needs to develop policies to retain experienced and competent teachers in the school by providing them with extra facilities, incentives, and a working environment. Ensuring these measures for retaining instructors also motivates and inspires them to perform their jobs (e.g., classroom delivery, facilitation, proper instruction and guidance, and demonstration) effectively. Effective instruction is the key essence of the teaching-learning process to ensure high educational achievements among students. These strategies will help to develop confidence level among students and will also be useful for them to achieve success in the exam.

6.3.2 Mitigating Strategies for CTEVT

CTEVT is the governing body for all its affiliated schools and institutes. CTEVT formulates policies, programs, rules, and regulations to implement them within its organization and affiliated schools and institutes. Among its many functions, CTEVT also provides affiliation to the schools for running programs like Diploma in Civil Engineering on a demand basis. However, many schools were suffering from low numbers of student enrollment. This low number of student enrollment has led the schools to the state of collection instead of selection of the students. It has ultimately deteriorated the quality output of the DCE program. Collection rather than the selection of students has yielded a low pass percentage of students in the DCE program. So, CTEVT needs to rethink about providing new

affiliations to run the DCE program. It should adopt the policy of merger of schools and programs to improve the situation.

Moreover, CTEVT also needs to impose schools to develop their academic calendar according to the calendar of CTEVT. In their academic calendar, schools need to ensure 90 working days for teaching learning activities in each semester before conducting the final exam. However, in the context of the CTEVT administrative bylaws, the teachers can get summer/winter leave for 45 days in a year. In addition, they can get other kinds of leave such as casual, home, and sick leave. As well as, they got the Dashain holiday, Tihar holiday, and other national holidays. Due to these provisions about leave and holidays, it is very difficult to engage teachers for at least 90 working days in each semester. Because of these contradictory provisions, it is tough to complete the course in time. It might have affected the student's educational achievement, so the CTEVT needs to consider its total days of holidays and teacher leaves in its calendar to ensure 90 working days.

CTEVT has to fulfil the vacant positions regularly so that the competent instructors are recruited in permanent positions and feel job security. It will help to reduce the existing rate of teacher turnover.

6.4 Mitigating Strategies for Office of the Controller of Examinations

The Office for the Controller of the Examinations (OCE) has the overall responsibility for managing the examination system of CTEVT. More specifically, the conduction of the exam and publishing the results is the major responsibility of the OCE. During this process, some of the technical issues also slightly influence the results of students. The OCE adopts rigorous approaches in the examination process, especially in identifying the exam center, constructing the test items, conducting exams, checking answer sheets, publishing the results, and retotaling the answer

sheets. Despite its rigorous process of examination, the OCE needs to continuously revise and update its activities to make the process more effective and efficient. For this purpose, firstly, OCE needs to build a questions bank to avoid the issue of asking questions that are outside the curriculum. It also helps to minimize the errors in the question paper and maintain a balance between the difficult, moderate, and easy test items for the exam. The question bank also facilitates OCE for minimizing the chances of asking only theoretical kinds of questions. The question related to the practical (application) level decreases the chances of cheating among students in the exam.

Likewise, the OCE also needs to aware schools about the provision of revising the internal marks of students until the final exam. In addition, while checking the answer sheets of students, there is a high possibility of subjective judgment of evaluators. As a result, the score obtained by students may vary from one evaluator to another. To minimize this subjective judgment, the OCE needs to provide a comprehensive marking scheme to the evaluators, which helps to reduce errors while checking the answer sheets. Moreover, after publishing the results, the OCE needs to adopt a rapid process for retotaling. The rapid retotaling process saves time for students and increases belief in the examination conducted by the OCE. For example, there is a provision of 21 days to apply for retotaling after the date of result publication. This can be shortened to 7 days as students and the concerned institutes can immediately check the results online. Now, they do not have to wait days and even weeks for the result. Moreover, the students also don’t need to visit the province office or OCE to apply for the retotaling, they can apply for it online.

Finally, there are a lot of misconceptions about errors in the examination and evaluation of answer sheets among students and even in the schools. So, the OCE

needs to employ a transparent mechanism of examination and evaluation process by launching an orientation program for schools and the students. The OCE even needs to employ the provision of rechecking answer sheets if students doubt their obtained marks and request for rechecking their answer sheets. These efforts of awareness about the examination and copy-checking process can build trust towards the OCE and CTEVT among students. It also helps to enhance the confidence level among students towards the examination system and boosts them to do rigorous study, which is one of the best options to increase the academic performance of students.

References

Acharya, T. (2011). *A study of technical education and vocational training programs in Nepal*. General Federation of Nepalese Trade Unions. https://www.gefont.org/assets/upload/downloads/A_study_of_Technical_Education_and_Vocational_Training_Programs_in_Nepal.pdf

Acs, G., & Nichols, A. (2007). *Low-income workers and their employers: Characteristics and challenges*. The Urban Institute. https://www.urban.org/sites/default/files/publication/46656/411532-Low-Income-Workers-and-Their-Employers.PDF

Al-Zoubi, S. M., & Younes, M. A. b. (2015). Low academic achievement: Causes and results. *Theory and Practice in Language Studies, 5*(11), 2262-2268. http://dx.doi.org/10.17507/tpls.0511.09

Baraki, A. H., & Kemenade, E. v. (2013). Effectiveness of technical and vocational education and training (TVET): Insights from Ethopia's reform. *The TQM Journal, 25*(5), 492-506. https://doi.org/10.1108/TQM-11-2012-0099

Benard, B. (2004). *Resiliency: What we have learned*. WestEd

Bertolini, K., Stremmel, A., & Thorngren, J. (2012). *Student achievement factors*. South Dakota State University. https://files.eric.ed.gov/fulltext/ED568687.pdf

Bishara, S. (2017). School effectiveness and student achievement. *International Journal of Contemporary Research and Review, 8*(2), 20171-20188. http://dx.doi.org/10.15520/ijcrr/2017/8/02/123

Blankstein, A. M., Hargreaves, A., & Fink, D. (2010). Principle 6: Building sustainable leadership capacity. In A. M. Blankstein (Ed.), *Failure is not an*

option: 6 principles for making student success the only option (2nd ed.) (pp. 208-216). Corwin.

Bronfenbrenner, U. (1979). Beyond the deficit model in child and family policy. *Teachers College Record, 81*(1), 95-104.

Calsyn, R. J., & Kenny, D. A. (1977). Self-concept of ability and perceived evaluation of others: Cause or effect of academic achievement? *Journal of Educational Psychology, 69*(2), 136–145. https://doi.org/10.1037/0022-0663.69.2.136

Cohen-Schotanous, J. (2009). Student assessment and examination rules. *Medical Teacher, 21*(3), 318-321. https://doi.org/10.1080/01421599979626

Cole, N. (2016). Conceptions of educational achievement. *Educational Researcher, 19*(3), 2-7. https://doi.org/10.3102/0013189X019003002

Cornelius-White, J. H. D., & Harbaugh, A.P. (2010). *Learner-centered instruction: Building relationships for student success*. Sage Publications.

Council for Technical Education and Vocational Training. (2019). *Parbidhik shikshya tatha babashiyeka talim parishadh: Barshika partibedhan 2075/2076* [Council for Technical Education and Vocational Training: Annual Report 2075/2076]. Author. http://ctevt.org.np/public/uploads/kcfinder/files/Final%20CTEVT%20%20Annual%20Report%202076%20Thursday_reduced.pdf

Council for Technical Education and Vocational Training. (2020). *Parbidhik shikshya tatha babashiyeka talim parishadh: Barshika partibedhan 2076/2077* [Council for Technical Education and Vocational Training: Annual Report 2076/2077]. Author. http://ctevt.org.np/public/uploads/kcfinder/files/Final%20CTEVT%20%20Annual%20Report%202076%20Thursday_reduced.pdf

Council for Technical Education and Vocational Training. (2021). *Parbidhik shikshya tatha babashiyeka talim parishadh: Barshika partibedhan 2076/2077* [Council for Technical Education and Vocational Training: Annual Report 2076/2077]. Author. http://ctevt.org.np/public/uploads/kcfinder/files/Annual%20Report%202077.pdf

Council for Technical Education and Vocational Training. (2021). *Curriculum: Diploma Civil Engineering (Three-year program-semester system).* Author. http://ctevt.org.np/uploads/docs/2023-07-12_diploma_in_civil_engineering_revised_2021.pdf

Council for Technical Education and Vocational Training. (2022). *Parbidhik shikshya tatha babashiyeka talim parishadh: Barshika partibedhan 2077/2078* [Council for Technical Education and Vocational Training: Annual Report 2077/2078]. Author. http://ctevt.org.np/public/uploads/kcfinder/files/Annual%20Report%20-20781.pdf

Council for Technical Education and Vocational Training. (2023). *Final all pass/fail count report*. Author. http://itms.ctevt.org.np:5580/itmsAdmin/final_all_count_report

Covington, M. V., & Omelich, C. L. (1981). As failures mount: Affective and cognitive consequences of ability demotion in the classroom. *Journal of Educational Psychology, 73*(6), 796–808. https://doi.org/10.1037/0022-0663.73.6.796

Cuban, L. (2022). How schools change reforms: Redefining reform success and failure. *Teachers College Records: The Voice of Scholarship in Education, 99*(3), 453-477. https://doi.org/10.1177/016146819809900301

Dangol, R., & Shrestha, M. (2019). Learning readiness and educational achievement among school students. *International Journal of Indian Psychology, 7*(2), 467-476. https://doi.org/10.25215/0702.056

Ewjik, R. v. (2011). Same work, lower grade? Student ethnicity and teachers' subjective assessments. *Economics of Education Review, 30*(5), 1045-1058. https://doi.org/10.1016/j.econedurev.2011.05.008

Farooq, M. S., Chaudhry, A. H., Shafiq, M., & Berhanu, G. (2011). Factors affecting students' quality of academic performance: A case of secondary school level. *Journal of Quality and Technology Management, 7*(2), 1-14.

Finn, J. D., & Rock, D. A. (1997). Academic success among students at risk for school failure. *Journal of Applied Psychology, 82*(2), 221–234. https://doi.org/10.1037/0021-9010.82.2.221

Fisher, Y. (2010). Measuring success: Evaluating educational programs. *US-China Education Review, 7*(6), 1-15. https://files.eric.ed.gov/fulltext/ED511288.pdf

Ghaicha, A. (2016). Theoretical framework for educational assessment: A synoptic review. *Journal of Education and Practice, 7*(24), 212-231. https://files.eric.ed.gov/fulltext/EJ1112912.pdf

Hanberger, A. (2001). What is the policy problem? Methodological challenges in policy evaluation. *Evaluation, 7*(1), 45-62. http://dx.doi.org/10.1177/13563890122209513

Hanushek, E. A., Jamison, D. T., Jamison. E. A., & Woessmann, L. (2008). Education and economic growth. *Education next: A Journal of opinion and Research, 8*(2), 62-70.

Hayatu, N. G., & Abubakar, B. B. (2019). Causes of examination failure among the students of tertiary institutions in Nigeria: A review. *International Journal of Research and Innovation in Social Science, 3*(7), 381-384.

Jerrim, J. (2022). Test anxiety: Is it associated with performance in high-stakes examinations? *Oxford Review of Education, 49*(3), 321-341. https://doi.org/10.1080/03054985.2022.2079616

Khuluvhe, M., & Mathibe, R. (2021). *Fact sheet: Throughput rate of TVET college students (National certificate vocational) for the period 2016 to 2018*. Higher Education and Training.

Lindholm-Leary, K., & Borsato, G. (2006). Academic achievement. In F. Genesee, K. Lindholm-Leary, W. M. Saunders, & D. Christian (Eds.), *Educating English Language Learners: A synthesis of Research Evidence* (pp. 176-222).

Lui, G., & Clayton, J. (2016). Measuring technical vocational education and training (TVET) efficiency: Developing a framework. *Journal of Open, Flexible and Distance Learning, 20*(2), 45–54. https://files.eric.ed.gov/fulltext/EJ1120877.pdf

Magnus, J. R., & Peresetsky, A. A. (2018). Grade expectations: Rationality andoverconfidence. *Frontiers in Psychology, 8*(11), 1-10. https://doi.org/10.3389/fpsyg.2017.02346

Marzano, R. J., Pickering, D., & Pollock, J. E. (2001). *Classroom instruction that works: Research based strategies for increasing student achievement*. Association for Supervision and Curriculum Development.

McLaren, P. (1999). *Schooling as a ritual performance: Toward a political economy of educational symbols and gestures*. Rowman & Littlefield Publishers, Inc.

Ministry of Education Science and Technology. (2022). *TVET sector strategic plan (2023-2032 AD)*. Author.

Ministry of Education Science and Technology. (2023). *Shaishik Suchana 2078* [Educational Information, 2078]. Author.

Mukherjee, U. (2017). Examining the dimensions of organization performance management and its indicators in education institutions. *MITS International Journal of Business Research, 4*(1), 44-55.

National Planning Commission. (2017. *National review of sustainable development goals.* http://sdg.npc.gov.np/media/resources/items/19/bNational_Review_of_Sustainable_Development_Goals.pdf

Nygren, B., Aléx, L., Jonsén, E., Gustafson, Y., Norberg, A., & Lundman, B. (2005). Resilience, sense of coherence, purpose in life and self-transcendence in relation to perceived physical and mental health among the oldest old. *Aging & Mental Health, 9*(4), 354-62. https://doi.org/10.1080/1360500114415

Organization for Economic Co-operation and Development. (2012). *Equity and Quality in Education: Supporting Disadvantaged Students and Schools*. OECD Publishing. http://dx.doi.org/10.1787/9789264130852-en

Orom, H., Semalulu, T., & Underwood, W. (2013). The social and learning environments experienced by underrepresented minority medical students: A narrative review. *Academic Medicine, 88*(11), 1765-1777. https://doi.org/10.1097/ACM.0b013e3182a7a3af

Owens, A. (2018). Income segregation between school districts and inequality in students' achievement. *Sociology of Education, 91*(1), 1–27. https://doi.org/10.1177/0038040717741180

Pologeorgis, n. A. (2022). *Employability, the labor force, and the economy*. Investopedia. https://www.investopedia.com/articles/economics/12/employability-labor-force-economy.asp

Sahin, S., Arseven, Z., & Kihc, A. (2016). Causes of student absenteeism and dropouts. *International Journal of Instruction, 9*(1), 195-210. https://files.eric.ed.gov/fulltext/EJ1086967.pdf

Sakar, C. (2021). Educational and sociological factors influencing students' academic achievements: The United States of America example. *International Journal of Education and Language, 1/2*(2021), 12-21.

Shi, Y. (2022). Assessment of effect of perceived social support on school readiness, mental wellbeing, and self-esteem: Mediating role of psychological resilience. *Frontiers Psychology, May 2022*(13), 911841. https://doi.org/10.3389%2Ffpsyg.2022.911841

Shrestha, M. (2021). *A study of the low enrollment and dropout on pre-diploma in the culinary art of Pokhara technical school*. Pokhara Technical School.

Shrestha, M., & Dangol, R. (2020). Conscientiousness and motivator factors: Can they contribute to each other among teachers from technical and vocational education and training of Nepal? *Journal of Interdisciplinary Studies in Education, 9*(1), 117-137. https://doi.org/10.32674/jise.v9i1.1898

Silas, E. (2013). *6 reasons why students perform poorly in examinations?* Careerfutura. https://blog.careerfutura.com/students-performed-poorly-in-examinations/

Steinmayr, R., Meiβner, A., Weidinger, A.F. & Wirthwein, L. (2015). *Academic achievement*. Oxford Bibliographies. http://www.oxford biliographies. com/view/ document

Steptoe, A., & Wardle, J. (2001). Health behaviour, risk awareness and emotional well-being in students from Eastern Europe and Western Europe. *Social Science & Medicine, 53*(12), 1621-1630. https://doi.org/10.1016/S0277-9536(00)00446-9

Sulaiman, A., & Mohezar, S. (2010). Student succuss factors: Identifying key predictors. *Journal of Education for Business, 81*(6), 328-333. https://doi.org/10.3200/JOEB.81.6.328-333

Sultana, N., Yousuf, M. I., Naseer, M., & Rehman, S. (2009). The higher the quality of teaching: The higher the quality of education. *Contemporary issues in education research, 2*(3), 59-63. https://files.eric.ed.gov/fulltext/EJ1056905.pdf

Tagliacollo, V. A., Volpato, G. L., & Junior, A. P. (2010). Association of student position in classroom and student position. *Educational Research, 1*(6), 198-201.

Tentama, F., & Abdillah, M. H. (2019). Student employability examined from academic achievement and self-concept. *International Journal of Evaluation and Research in Education, 8*(2), 243-248. https://files.eric.ed.gov/fulltext/EJ1220573.pdf

Tomlinson, C. A., & McTighe, J. (2006). *Integrating differentiated instruction + understanding by design: Connecting content and kids*. Association for Supervision and Curriculum Development.

United Nations. (2008). *Designing household survey samples: Practical guidelines*. Author. https://unstats.un.org/unsd/demographic/sources/surveys/Series_F98en.pdf

von Frank, V. (Ed.) (2008). *Finding time for professional learning*. National Staff Development Council.

Yamane, T. (1967). *Elementary sampling theory*. Prentice-Hall.

Yusop, S. R. M., Rasul, M. S., Mohamad, Y. R., Hashim, H. U., Jalaludin, N. A. (2022). An assessment approaches and learning outcomes in technical and vocational education: A systematic review using PRISMA. *Sustainability, 14*(9):5225. https://doi.org/10.3390/su14095225

Annex I: Sample Plan

Sample Plan according to Provinces and Types of School

Province	Private			Partnership			Constituted			TECS			Sub-Total			adj n
	N	w	n	N	w	N	N	w	n	N	W	n	N	w	n	
Koshi	109	14.42	12	214	28.31	23	104	13.76	11	329	43.52	35	756	15.34	80.52	81
Madhesh	73	12.61	8	107	18.48	11	123	21.24	13	276	47.67	29	579	11.75	61.47	61
Bagmati	274	22.97	29	110	9.22	12	197	16.51	21	612	51.30	65	1193	24.20	127.07	127
Gandaki	39	9.87	4	31	7.85	3	95	24.05	10	230	58.23	24	395	8.01	41.07	41
Lumbini	277	34.97	30	0	0.00	0	73	9.22	8	442	55.81	47	792	16.07	84.56	85
Karnali	0	0.00	0	85	14.78	9	101	17.57	11	389	67.65	41	575	11.67	61.24	61
Sudur-paschim	63	9.86	7	0	0.00	0	125	19.56	13	451	70.58	48	639	12.96	68.06	68
Total	835		90	547		58	818		87	2729		289	4929		524.00	524

Annex II: Survey Questionnaire

Factors Affecting Students' Achievement in the Diploma Level Civil Engineering Program of CTEVT

I. **Personal Information of Student**

1	Name:	2	Province: Koshi /Madesh /Bagmati/ Gandaki/ Lumbini/ Karnali/ Sudur-paschim
3	District:		
4	Sex: Male/Female/Others	5	Locale: Rural / Urban
6	Geographical Regions: Mountain/Hill/Kathmandu Valley/Bhitri Madesh/Tarai		
7	Caste/Ethnicity: Hill Brahman/ Hill Chhetri / Hill Thakuri/ Hill Sanyasi/ Hill Janajati/ Hill Dalit/ Tarai Brahman/ Tarai Chhetri/ Tarai Vaisya/ Tarai Dalit/ Tarai Janajati/ Others (Please specify) …….		
8	Religion: Hindu/Buddhist/Islam/Christianity/Others (Please specify) …		
9	Age:	10	Family Structure: Nuclear / Joint
11	Mother Tongue: Nepali/ Bhojpuri/ Maithali/ Tharu/ Urdu/ Doteli/ Bajhangi/ Achhami/ Baitadeli/ Others (Please specify) ….		
12	Marital Status: Single/ Married / Separated / Divorced/ Widow		

II. **Information of Parents and Family:**

13	Educational Qualification of Father: PhD/Master's Degree/ Bachelor's Degree/ 10+2/ SEE/ Below SEE/ Illiterate
14	Educational Qualification of Mother: PhD/Master's Degree/ Bachelor's Degree/ 10+2/ SEE/ Below SEE/ Illiterate
15	Highest Educational Qualification of Sibling/s: PhD/Master's Degree/Bachelor's Degree/10+2/SEE/Below SEE/Illiterate/NA
16	Main Income Sources of Family: Service/Business/Foreign Employment/Agriculture/Daily Wages/Others
17	Average Annual Income of Family: Less than 100,000/100,000-500,000/500,000-1,000,000/Above 1,000,000
18	Annual Family Investment in your Education and living Expenses: Less than 50,000/50,000-100,000/100,000-200,000/Above 200,000

III. **Information of School Attributes:**

19	Location of School: Urban/Rural
20	Province Located by School: Koshi/ Madhesh/ Bagmati/ Gandaki/ Lumbini/ Karnali/ Sudur-paschim
21	Perceived Infrastructure of School:

22	Perceived Lab Facility of School:
23	Perceived Quality of Class Instruction in the School:

IV. **Information about Educational Background of Students:**

24	Highest educational qualification: Bachelor's Degree and above/10+2/SEE
25	Achieved Grade or Percent in the SEE/SLC:

26. **Status of Educational Achievement in Each Semester: Pass or Fail**

Semester	**Status of Educational Achievement**		
	Pass	**Fail**	**NA**
First			
Second			
Third			

27. **How many and which subject did you get failed in the first three semesters?**

Semester	**No. of subject failed in semester**	**Subjects you got failed**		
		First	**Second**	**Third**
First				
Second				
Third				

29. **What are the main reasons for getting failure in the semester final exam?**

Semester	**Main Reason for Failure**
First	
Second	
Third	

30. **Mention two most difficult subjects from each semester and why that subject is so tough for you?**

Semester	First difficult subject		Second difficult subject	
	Subject	Reason for toughness	Subject	Reason for toughness
First				
Second				
Third				

Annex III: Interview Guidelines

Factors Affecting Students' Achievement in the Diploma Level Civil Engineering Program of CTEVT

Major Issues	Guiding Questions	Whom to ask?*					Remarks
		SS	CS	OCE	CDS	CDE	
Low pass rate in DCE program	What are the reasons behind low pass rate of students in DCE program?						
	Why was the result slightly improved in 2078?						
	Why is the fail rate comparatively higher in the private institutes?						
	Why were comparatively more students passed in the Madhesh Province and more students failed in the Koshi Province?						
Low pass out rate in the 1st, 2nd and 3rd semesters	Why do many students fail in the 1st, 2nd and 3rd semester? • Error in copy checking • Hard syllabus/curriculum • Subjects are more numerical in nature • Hard questions in the exam • Weak base • Health issues • Least efforts and careless in study • Least efforts and careless in study • Online class • Course incomplete • Classroom instruction not clear • Language barrier • Others (personal, familial, institutional, curricular, exam related)……						
Many students failed in Physics, Chemistry, Surveying and Mathematics	Why do many DCE students get failed in Physics and Chemistry in the 1st and 2nd semester?						
	Why do many students get failed in Surveying and Mathematics in the 3rd semester?						
	Why do many students find Physics and Mathematics as difficult subjects in the 1st and 2nd semester?						
	Why do many students find Mathematics, Applied Mechanics, and Hydraulics as difficult subjects in the 3rd semester?						
Improving the educational achievement of students	How can we improve the educational achievement of students?						

*SS = Students; CS = Coordinators; OCE = CTEVT OCE Personnel; CDS = Curriculum Developers (External Experts); CDE = Personnel from Curriculum Development and Equivalence Division, CTEVT

Note: The tick mark (✓) indicates that the guiding question is relevant to ask with the respondent. The cross mark (✗) indicates that the guiding question is NOT relevant to ask with the respondent.
One focus group discussion can be conducted with those students who failed in any DCE semester exam. Another focus group discussion can be conducted with CTEVT officials.

Annex IV: Additional Tables

Table A. *Overall Adequacy of Facilities within Schools across Provinces*

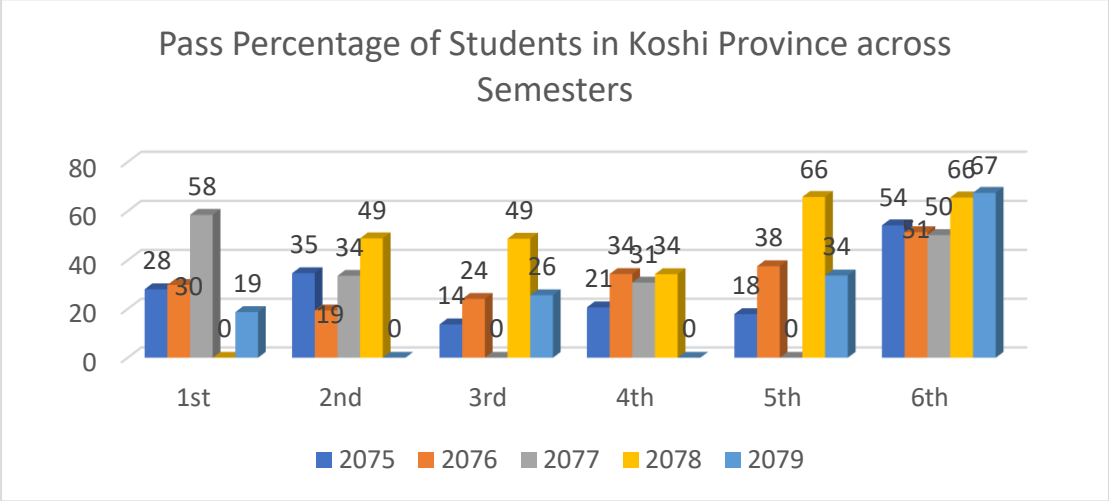
Overall adequacy *f*(%)	**Province located by School**							**Total**
	Koshi	**Madhesh**	**Bagmati**	**Gandaki**	**Lumbani**	**Karnali**	**Sudhur-Paschim**	
Bad	24	0	2	7	9	27	4	73
	29.6%	0.0%	1.6%	17.1%	10.6%	44.3%	5.9%	13.9%
Moderate	57	16	63	28	53	26	51	294
	70.4%	26.2%	49.6%	68.3%	62.4%	42.6%	75.0%	56.1%
Good	0	45	62	6	23	8	13	157
	0.0%	73.8%	48.8%	14.6%	27.1%	13.1%	19.1%	30.0%
Total	81	61	127	41	85	61	68	524
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

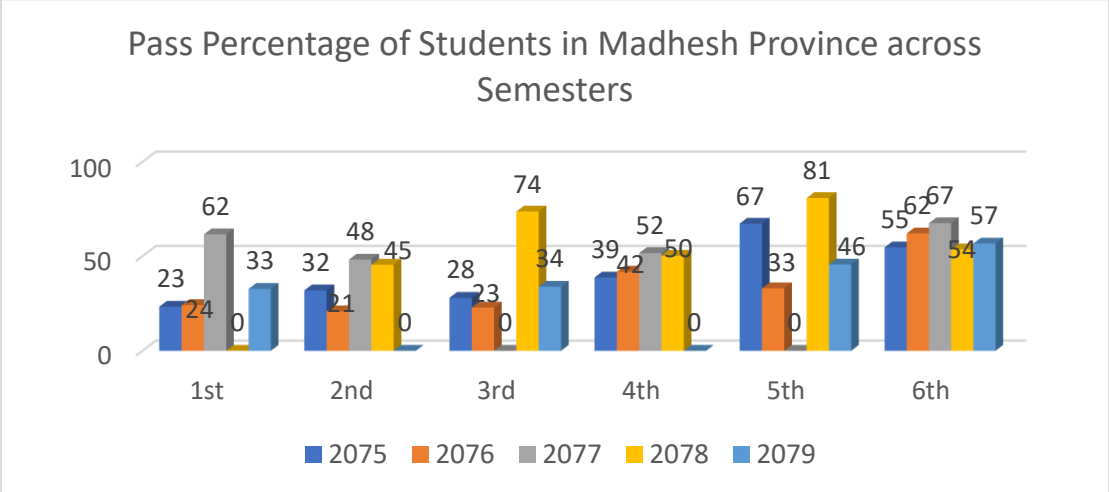
Table B. *Overall Adequacy of Facilities across Types of School*

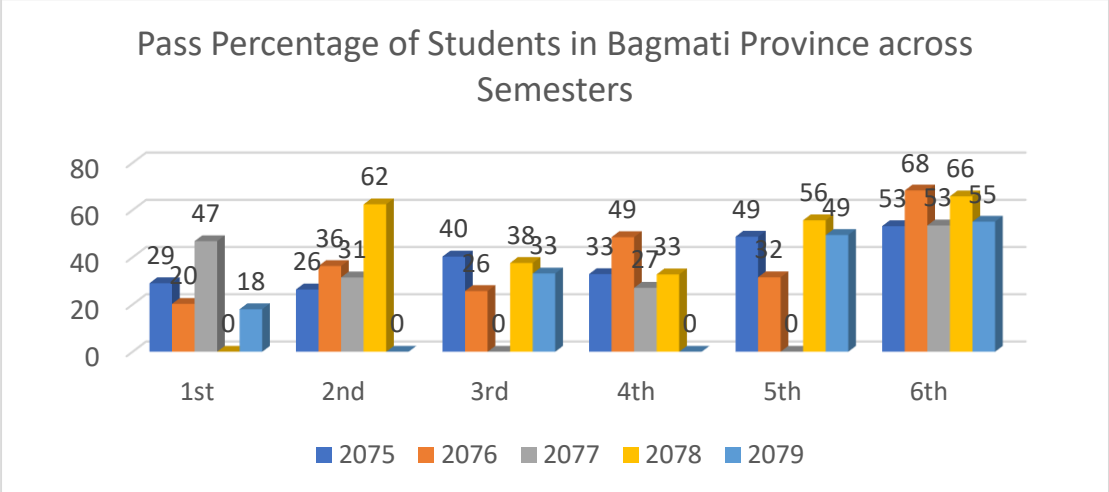
Overall adequacy *f*(%)	**Type of the School**				**Total**
	Private	**Partnership**	**Constituted**	**TECS**	
Bad	2	21	8	42	73
	2.2%	36.2%	9.2%	14.5%	13.9%
Moderate	55	15	48	176	294
	61.1%	25.9%	55.2%	60.9%	56.1%
Good	33	22	31	71	157
	36.7%	37.9%	35.6%	24.6%	30.0%
Total	90	58	87	289	524
	100.0%	100.0%	100.0%	100.0%	100.0%

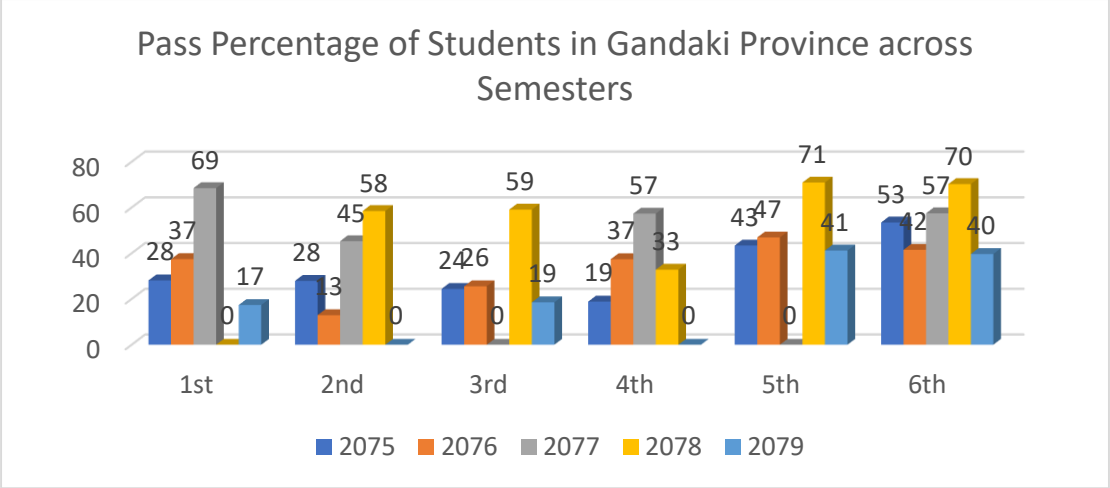
Annex V: Additional Figures

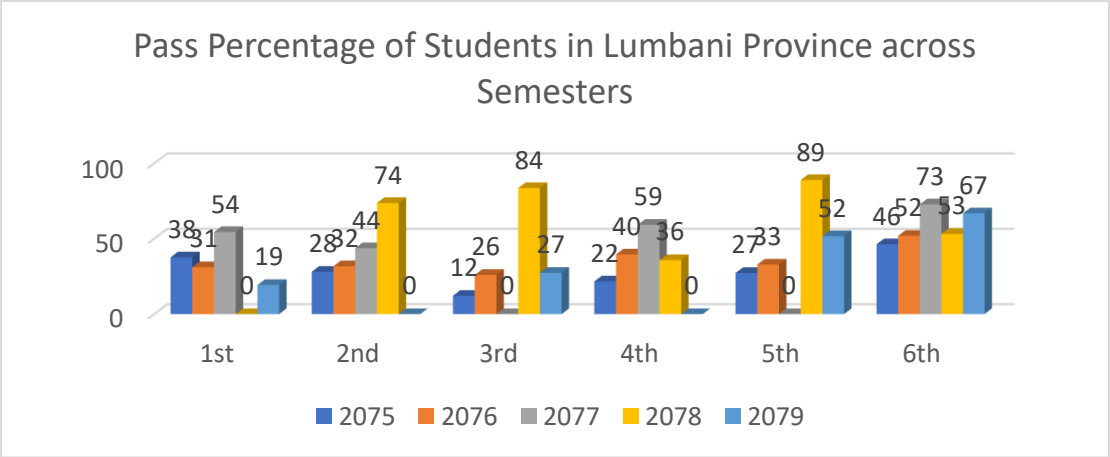
Semester-wise Pass Percentage of Students in Provinces (in %)

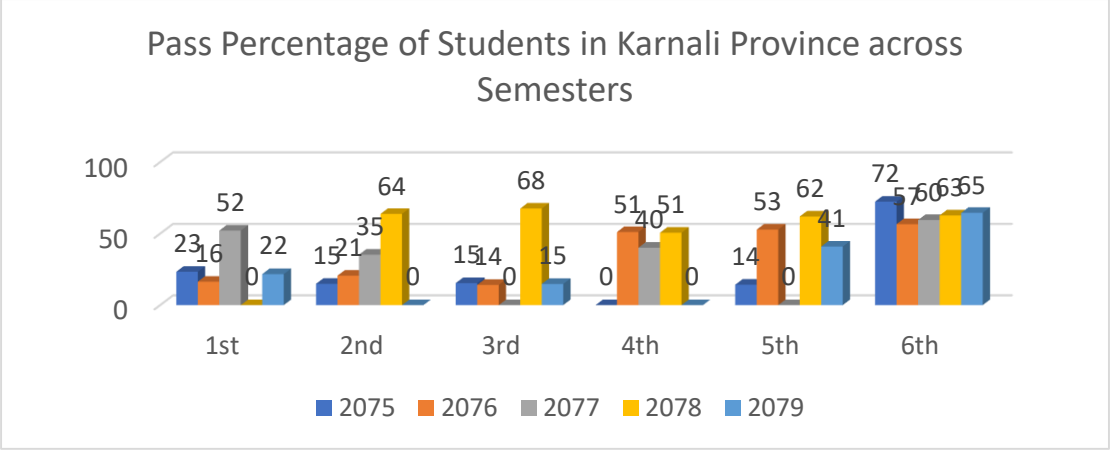


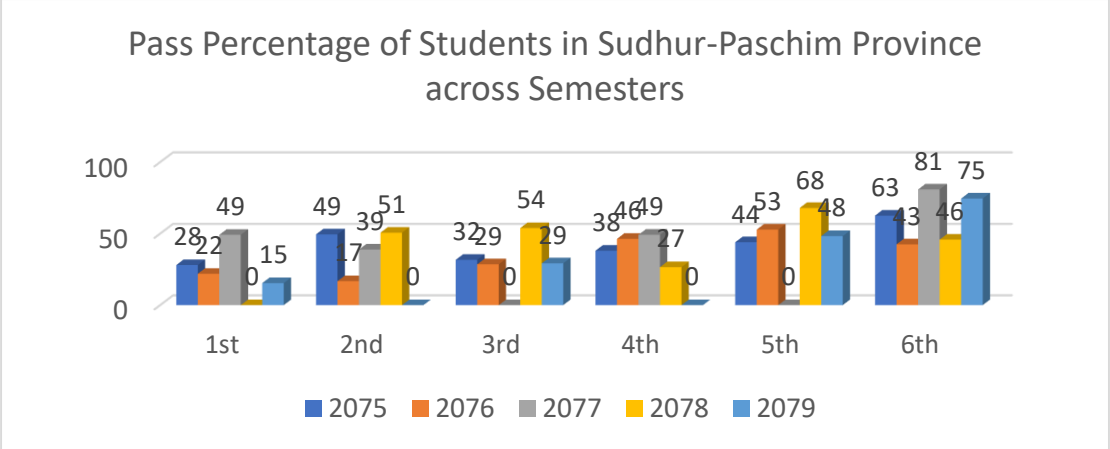




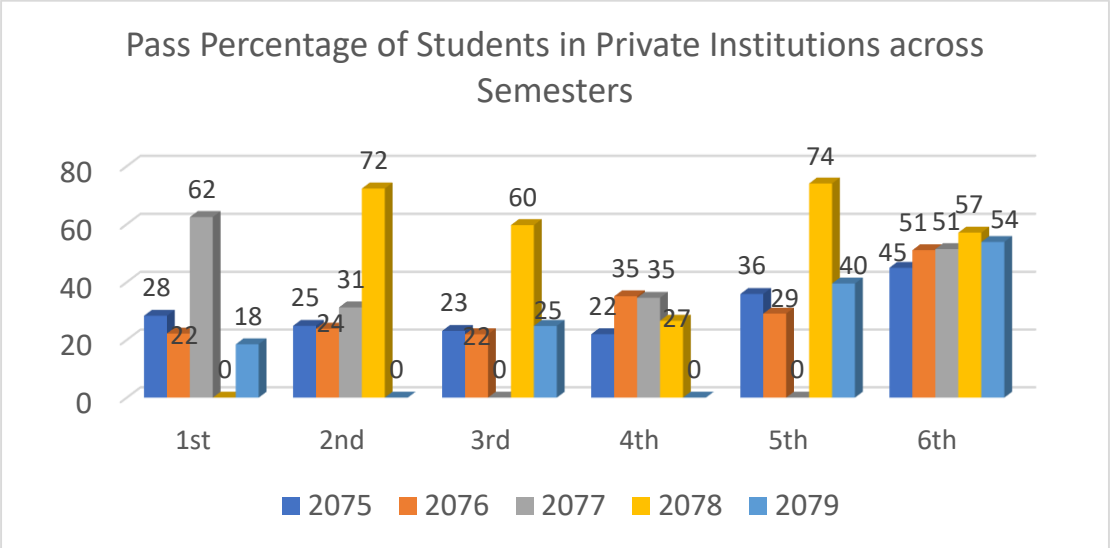

Pass Percentage of Students in Gandaki Province across Semesters
80
60
40
20
0
1st
2nd
3rd
4th
5th
6th
2075
2076
2077
2078
2079

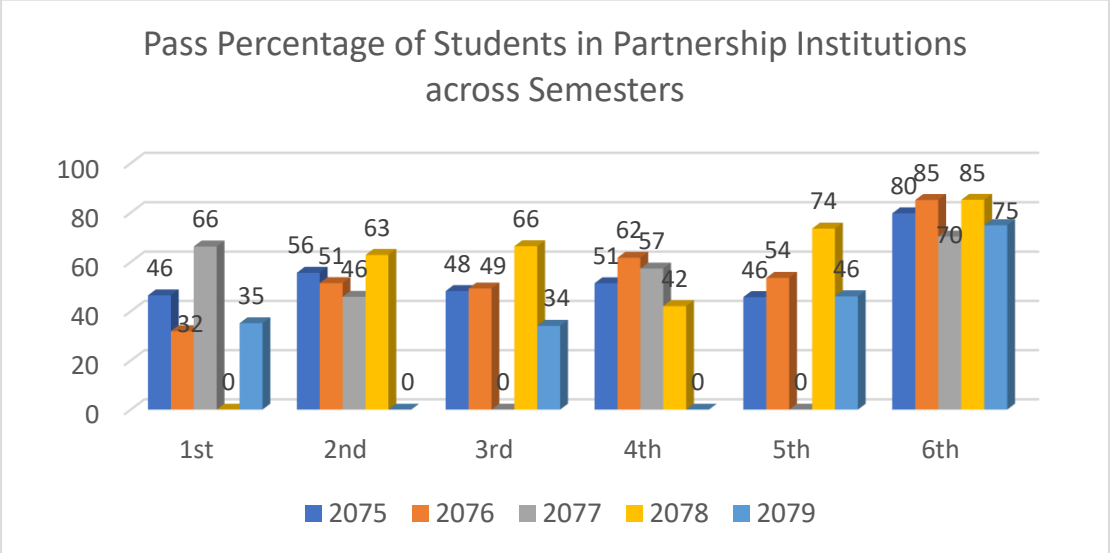

Pass Percentage of Students in Lumbani Province across Semesters
100
50
0
1st
2nd
3rd
4th
5th
6th
2075
2076
2077
2078
2079

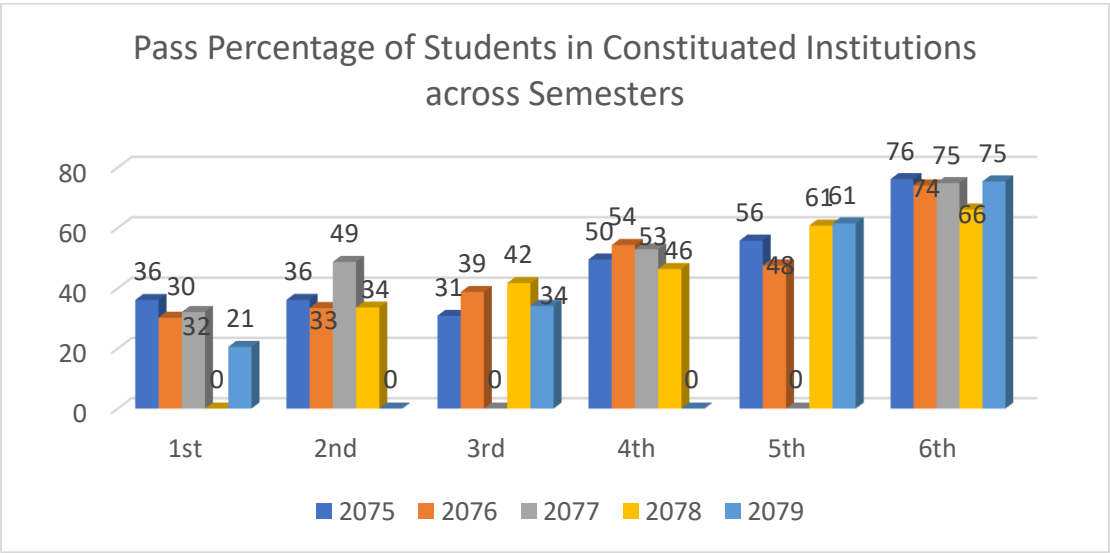

Pass Percentage of Students in Karnali Province across Semesters
100
50
0
1st
2nd
3rd
4th
5th
6th
2075
2076
2077
2078
2079

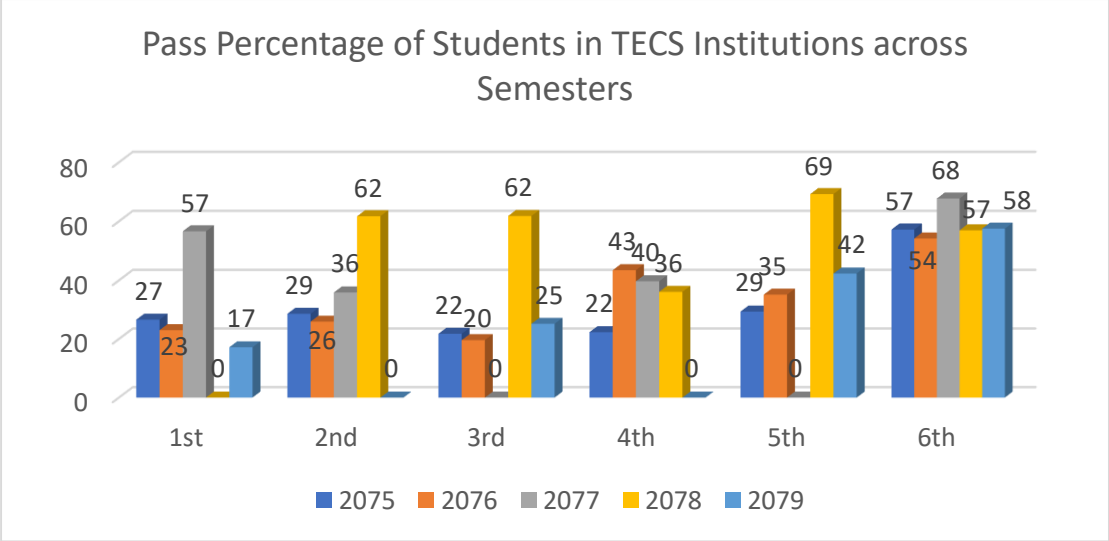

Pass Percentage of Students in Sudhur-Paschim Province across Semesters
100
50
0
28
22
49
0
15
49
17
39
51
0
32
29
0
54
29
38
46
49
27
0
44
53
0
68
48
63
43
81
46
75
1st
2nd
3rd
4th
5th
6th
2075
2076
2077
2078
2079

Semester-wise Pass Percentage of Students according to Types of Schools (in %)

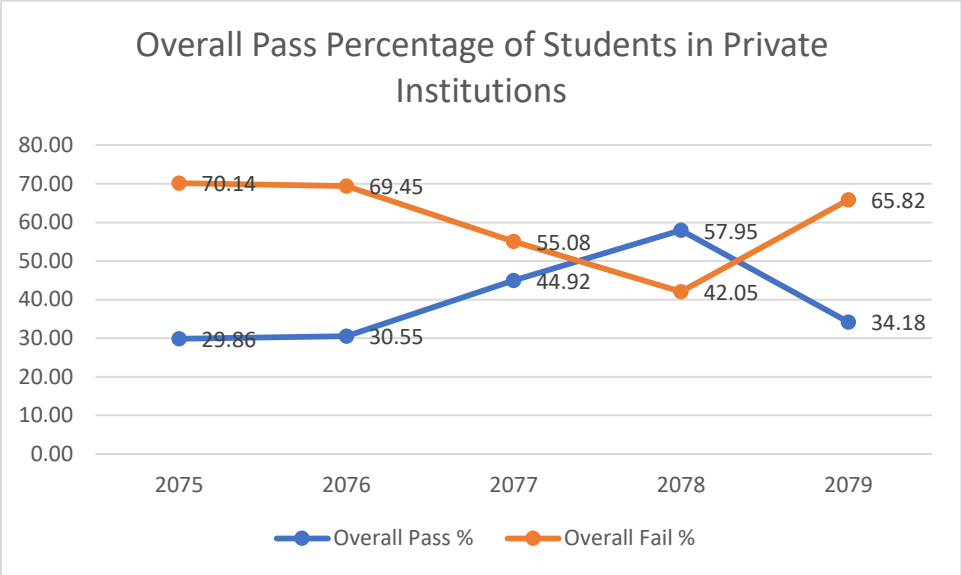


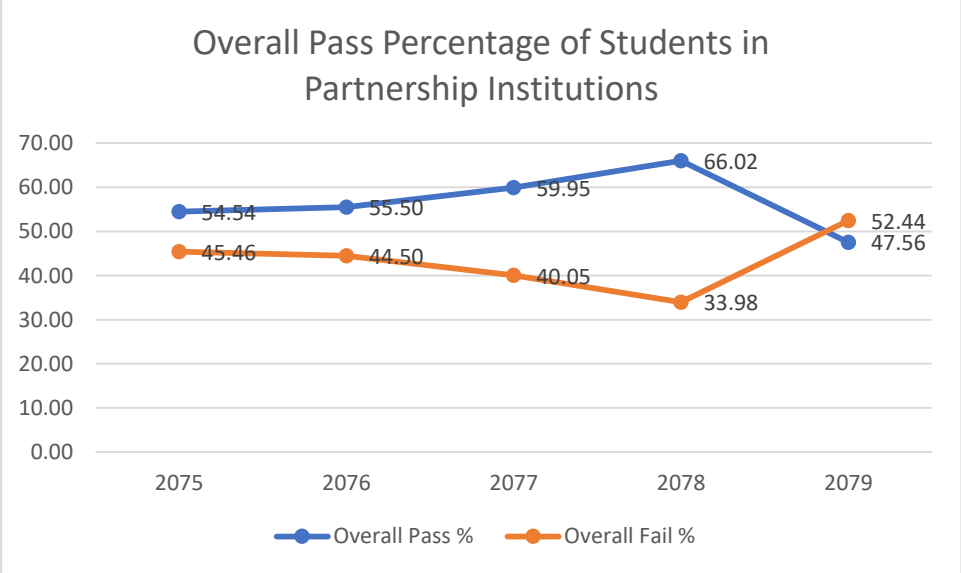


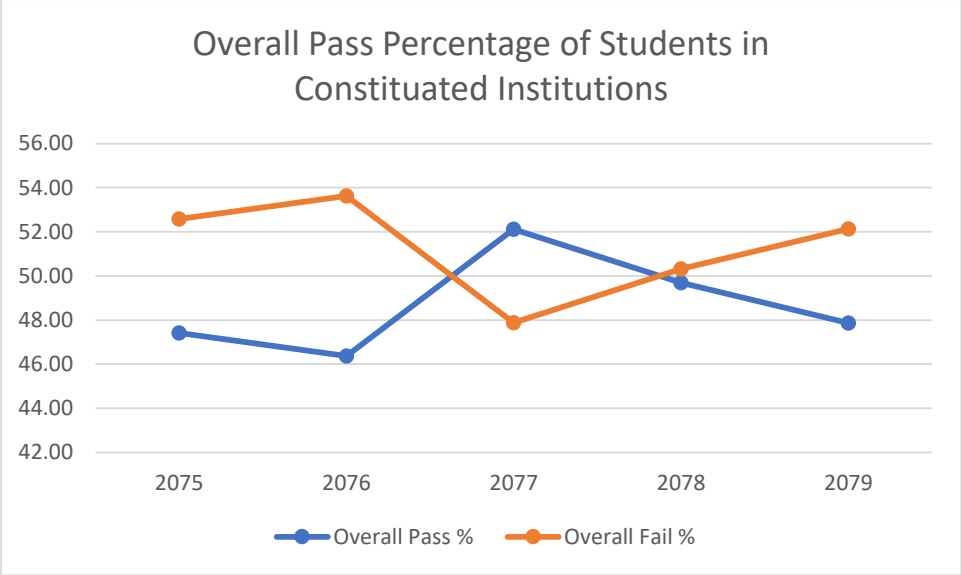


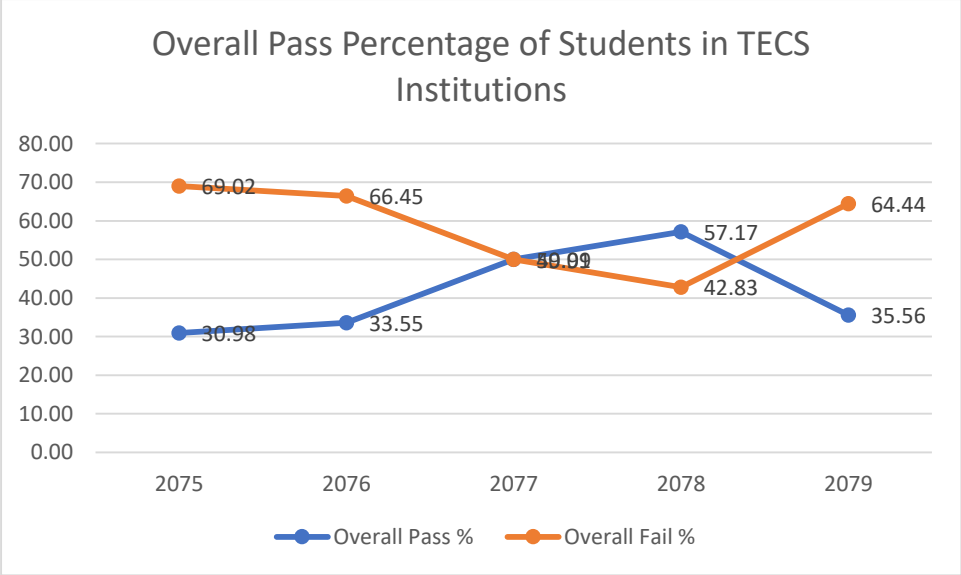

Pass Percentage of Students in TECS Institutions across Semesters
80
60
40
20
0
27
23
57
0
17
29
26
36
62
0
22
20
0
62
25
22
43
40
36
0
29
35
0
69
42
57
54
68
57
58
1st
2nd
3rd
4th
5th
6th
2075
2076
2077
2078
2079

Overall Pass Percentage of Students in according to Types of School (in %)

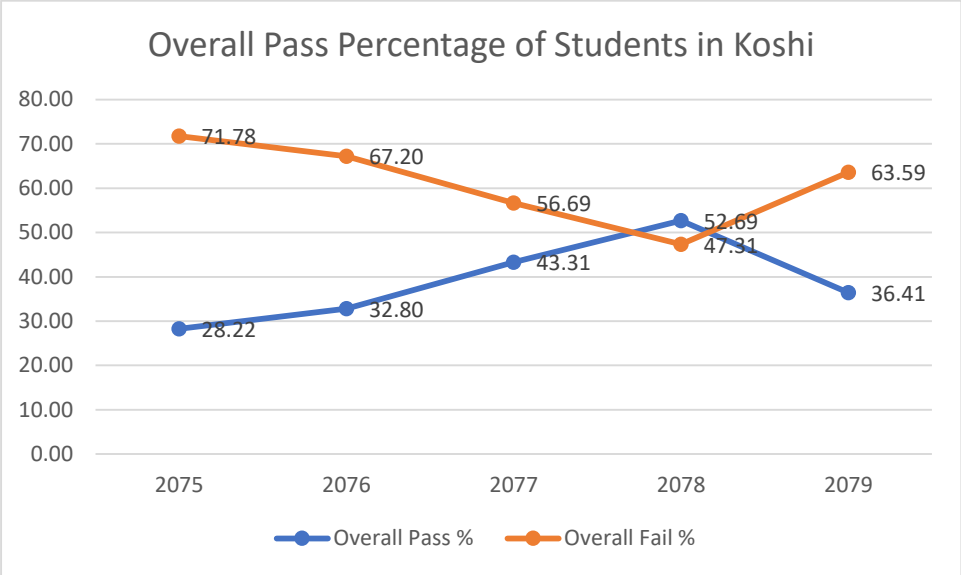


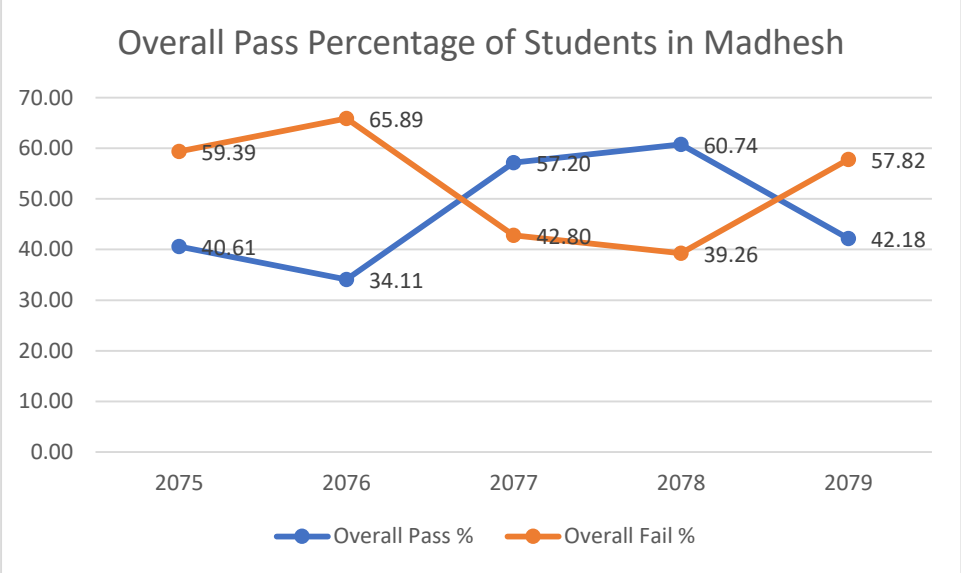


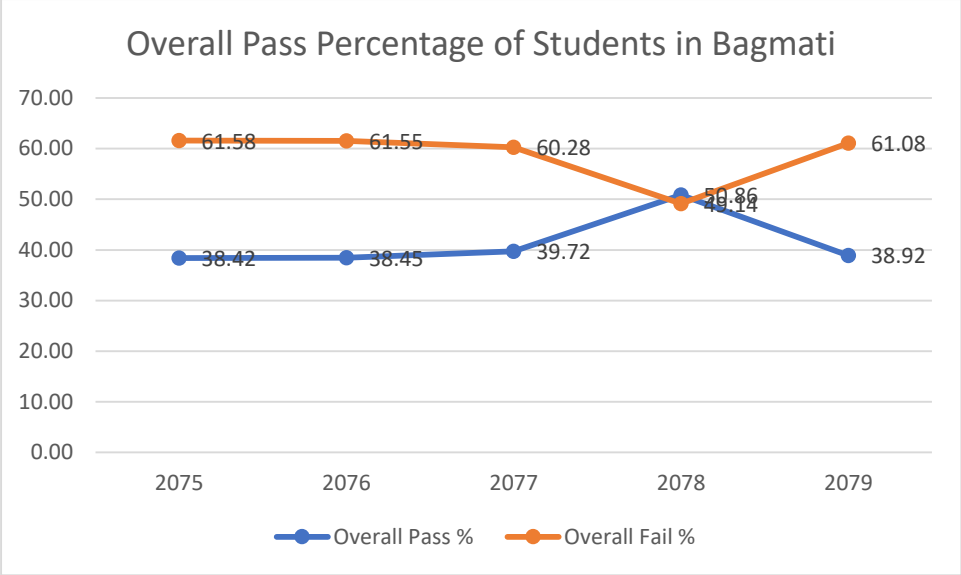

Overall Pass Percentage of Students in Constituated Institutions
56.00
54.00
52.00
50.00
48.00
46.00
44.00
42.00
2075
2076
2077
2078
2079
Overall Pass %
Overall Fail %

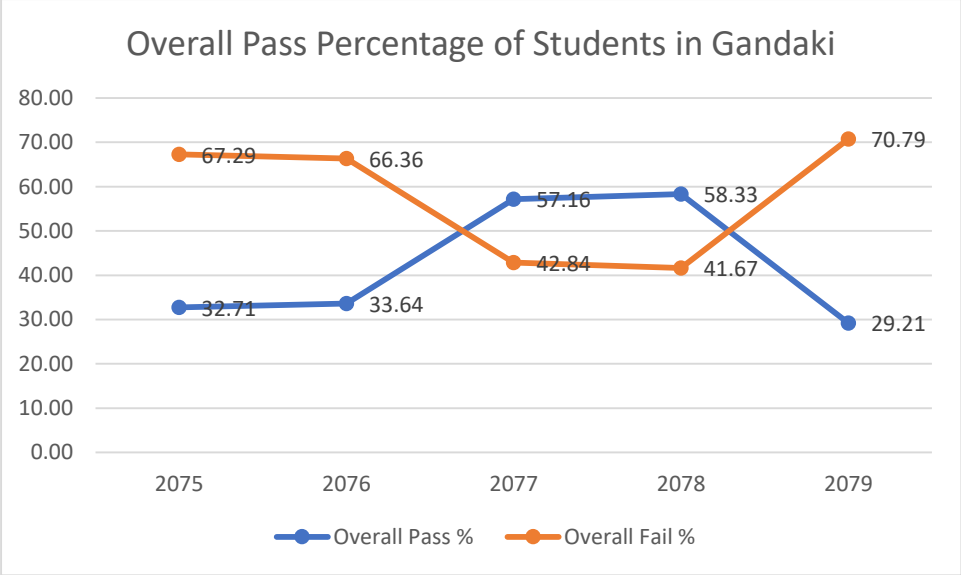

Overall Pass Percentage of Students in TECS Institutions
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
69.02
66.45
57.17
64.44
42.83
35.56
30.98
33.55
2075
2076
2077
2078
2079
Overall Pass %
Overall Fail %

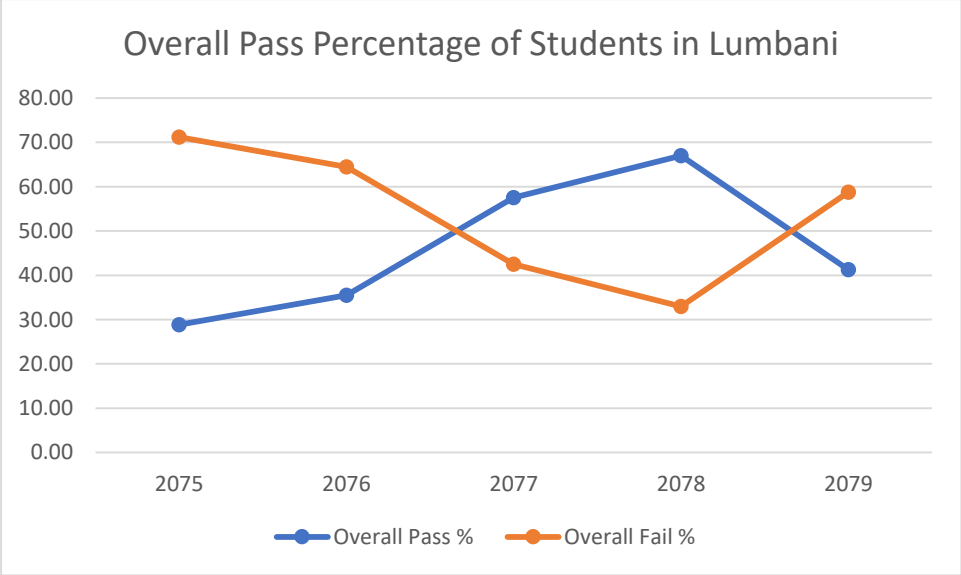
Overall Pass Percentage of Students in according to Provinces (in %)

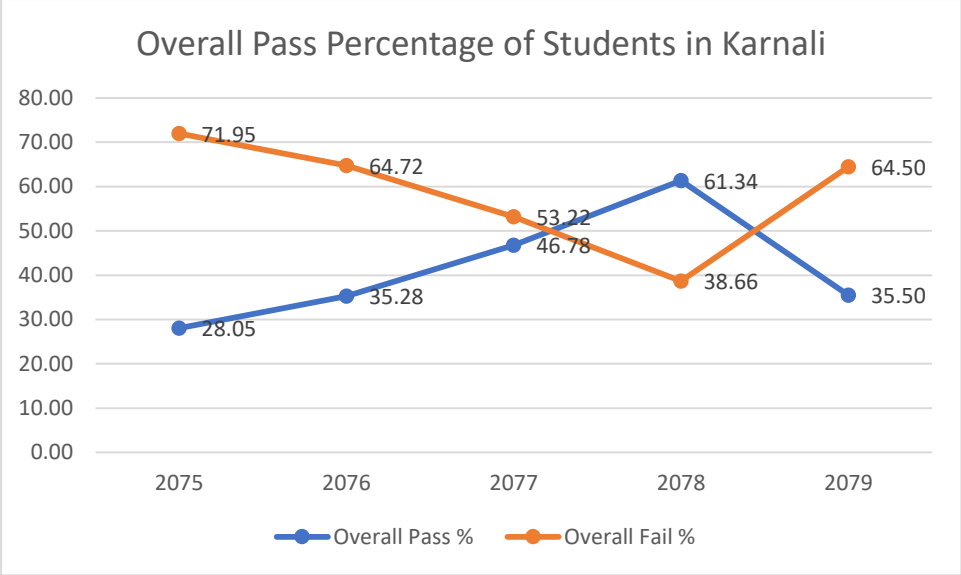


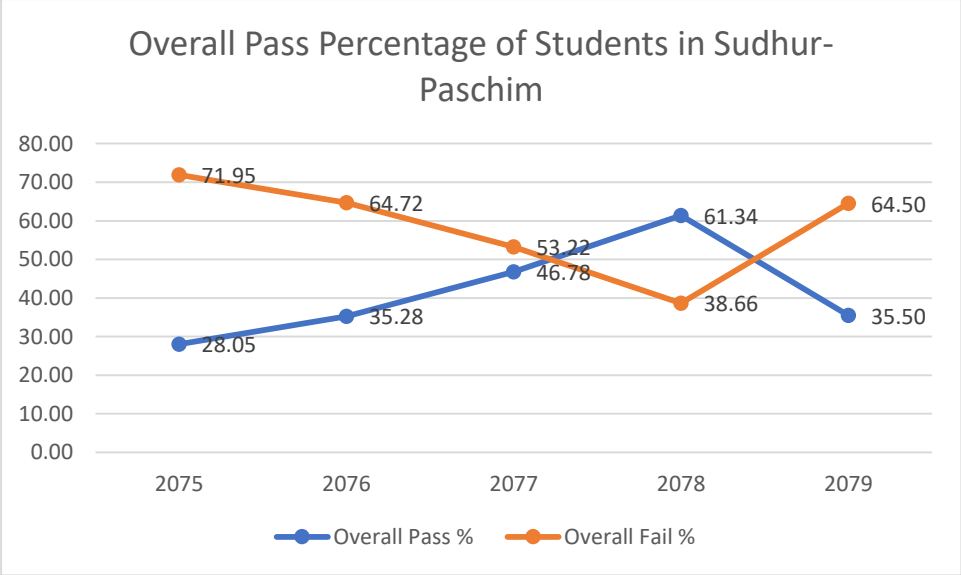



Overall Pass Percentage of Students in Bagmati
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
61.58
61.55
60.28
49.14
61.08
38.42
38.45
39.72
50.86
38.92
2075
2076
2077
2078
2079
Overall Pass %
Overall Fail %


Overall Pass Percentage of Students in Gandaki
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
67.29
66.36
57.16
58.33
70.79
42.84
41.67
32.71
33.64
29.21
2075
2076
2077
2078
2079
Overall Pass %
Overall Fail %


Overall Pass Percentage of Students in Lumbani
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
2075
2076
2077
2078
2079
Overall Pass %
Overall Fail %


Overall Pass Percentage of Students in Karnali
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
71.95
64.72
53.22
38.66
64.50
61.34
46.78
35.28
35.50
28.05
2075
2076
2077
2078
2079
Overall Pass %
Overall Fail %


Overall Pass Percentage of Students in Sudhur-Paschim
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
71.95
64.72
53.22
38.66
64.50
61.34
46.78
35.28
35.50
28.05
2075
2076
2077
2078
2079
Overall Pass %
Overall Fail %