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Secondary School Students' Preferences for STEM Subjects as University Study Options

Krishna Chandra Paudel
Nepal College of Information Technology
kcpaudel@trinitycollege.edu.np
https://orcid.org/0000-0003-3381-0248

Khageshyor Khanal
Nepal College of Information Technology
muskan.khanal@ncit.edu.np
https://orcid.org/0000-0003-3392-2725

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Abstract

Choosing a university course is an important and difficult decision for secondary level students, influencing their future careers and personal development. This study investigates the secondary level students' preferences of course selection for their future university study option. The quantitative research method was adopted; a survey of 150 science students of grades XI and XII in Kathmandu, Nepal was carried out to study the personal interests to opt higher study. The study revealed that, STEM disciplines are popular among students, with 82% interest at least one within the first three preference but only 30% of the respondents preferred it as first option. Significant gender differences were seen, with male students favoring STEM (except health science) and female students preferring non-STEM courses. The research highlights the need for targeted actions to promote STEM education, particularly among female students, and recommends gender-inclusive career advice services, early STEM exposure, and diversified career exploration that could result in a more balanced distribution of career aspirations.

Introduction

Secondary level is not only the academic degree but also it is the foundation for university level study. Deciding on a course of study at the university level is a momentous choice for secondary level students, as it profoundly influences their future professional trajectory and personal growth (Almukhambetova & Kuzhabekova, 2020). This decision is influenced by various elements, such as personal interests, professional objectives, academic strengths, and external influences including family, peers, and societal expectations. Comprehending these factors is essential for educators, legislators, and career counsellors who seek to direct students in making well-informed and fulfilling decisions.

Students' course selections are highly influenced by intrinsic characteristics such as their personal interest and perceived proficiency in a particular area (Sahin et al., 2020). Students tend to select courses in subjects where they possess a sense of competence and interest. Moreover, the potential for professional advancement significantly influences the process of making decisions. According to the Social Cognitive Career Theory proposed by Brown and Lent (2023), students' career interests and choices are influenced by their beliefs in their own ability to succeed i.e. self-efficacy and their expectations of the outcomes of their career choices. These beliefs and expectations are in turn shaped by the experiences they have and the support they receive.

External influences also exert a significant influence. Parental expectations and socioeconomic background can influence students' choice of academic disciplines. Vaughan et al. (2015) discovered that students from wealthier socioeconomic backgrounds have a greater tendency to choose courses in esteemed disciplines like medicine and law because of familial expectations and the perceived social standing associated with these sectors. Furthermore, the impact of peer influence should not be disregarded, as it frequently strengthens or questions the students' individual choices and perspectives (Liu et al., 2023).

University course selection is a crucial and challenging decision for secondary students, affecting their career and personal development. Despite the importance of this decision, the complex aspects that influence students' decisions are unknown. These include intrinsic factors like personal interests, perceived academic strengths, and professional aspirations and external influences like family expectations, peer pressure, and socioeconomic background (Aschbacher et. al. 2010). In this backdrop, this study aims to explores the current landscape of STEM education by investigate the interest of secondary level students on course selection for their further university study, particularly in the STEM (Physical Science, Technology, Engineering, and Mathematics). It is also aim to help educators, legislators, and career counsellors develop strategies to support students achieve their personal and professional goals.

Literature Review

Personal interests and perceived academic strengths are important elements that significantly influence students' choice of courses. Aschbacher et. al. (2010) discovered that students tend to select subjects in which they perceive themselves as skilled and enthusiastic. The presence of these inherent motives is essential for maintaining students' commitment and achievement in their selected academic disciplines. Gaining insight into these intrinsic motivators can assist educators and career counsellors in directing students towards academic pursuits that are in harmony with their aptitudes and interests. Similarly, Reis and Renzulli (2023) found that students' course choices are mostly influenced by their personal interests and perceived academic strengths. Students tend to prioritize selecting courses in subjects that they find enjoyable and in which they excel.

Empirical researches has consistently demonstrated that both internal and external influences have a substantial impact on the choices students make when selecting their courses. In a study by Aschbacher et. al. (2010), found that students' enthusiasm and

perceived skill in a particular subject significantly influence their decision to pursue related courses. Moote et al. (2020) revealed that students' decisions are significantly influenced by their socioeconomic standing and parental expectations. Moreover, External influences, such as the expectations of parents, the influence of peers, and the socioeconomic background, have a substantial impact on the academic decisions made by pupils. According to Moote et al. (2020), students from wealthy homes tend to opt for esteemed fields like medicine because of familial pressures and the perceived social standing linked to these occupations. Similarly, Li and Xie (2020) examined how family history and socioeconomic position impact students' educational decisions found that students from wealthier homes were more inclined to select prominent courses because of familial expectations and greater access to resources. In contrast, pupils from disadvantaged socioeconomic backgrounds frequently encountered restrictions that restricted their options. Lorenz et al. (2020) observed that peer influence could have either a positive or a negative impact on students' academic decisions, indicating the intricate interaction of social elements in the decision-making process.

Moe et al. (2021) investigated that male students exhibited a higher inclination towards selecting courses in STEM (Science, Technology, Engineering, and Mathematics) disciplines, whereas female students demonstrated a preference for courses in the humanities and social sciences. The gender imbalance in STEM areas is sometimes ascribed to social prejudices and gender conventions that link masculine with STEM and femininity with the humanities. In another study, Lazarides et al. (2021) investigated the influence of gender stereotypes on the educational decisions made by students. The study uncovered that girls frequently internalize societal messages that dissuade them from pursuing STEM disciplines, despite possessing the ability for these topics. On the other hand, boys may experience pressure to conform to societal expectations of achieving high levels of success in technical and scientific fields.

Polat and Ozdemir (2020) discovered that girls frequently exhibit diminished self-efficacy in STEM disciplines, leading to a detrimental impact on their inclination and selection of these courses. This discovery is consistent with Social Cognitive Career Theory which suggests that self-efficacy and outcome expectations are important factors in determining career interests and choices. Chen et al. (2023) also assessed the efficacy of programs targeting the reduction of gender gaps in STEM areas. The study revealed that mentorship programs and role models had a favorable effect on girls' belief in their own abilities and their interest in STEM topics; the study suggested that focused interventions could help to reduce the effects of gender stereotypes.

Research Methodology

This study used a descriptive research approach to examine the elements that impact the decision-making process of secondary level students studying Science in grades XI and XII in Kathmandu, Nepal. The study population consists of students who are currently enrolled in science program for the academic year 2022/2023. A sample of 150 students (97 male and 53 female) was selected using stratified random sampling to guarantee a broad representation of genders. The ethical requirements were strictly adhered to, which involved obtaining approvals from school administrators and subject teachers, preserving the confidentiality of participants, and obtaining informed consent. Data collection on students' perceptions of choice of further study and career was conducted through the development and administration of survey questionnaires in a supervised setting.

The gathered data were subjected to descriptive statistics: frequency and percentage to condense demographic information and questionnaire responses. Additionally, inferential statistics Chi-square test was employed to investigate associations between variables. The findings were analyzed to make inferences about gender difference on the choice of courses, offering valuable perspectives for educators, school teachers and career advisors to devise

tactics that facilitate students in attaining their individual and vocational aspirations. The study's findings seek to investigate the current pattern of course and career preference of secondary level science students.

Analysis and Findings

The findings of this study are divided into two parts, each relating to the research objectives serving as the foundation of the study. Each of the following subsections deals with the results of the data analysis related to the objectives and a summary of the results reported.

Table 1.

Career Choice of Students (First to Last Preferences)

Career Choice	**Choice I**	**Choice II**	**Choice III**	**Choice Subject (at least one choice)**
	Freq (%)	Freq (%)	Freq (%)	Freq (%)
Engineering, Math, Science, IT	45 (30.0)	73 (48.7)	50 (33.3)	123 (82.0)
Other Subjects	105 (70.0)	77 (51.3)	100 (66.7)	27 (18.0)
Total	150 (100.0)	150 (100.0)	150 (100.0)	150 (100.0)

An examination of career preferences among secondary school students in Kathmandu indicates a distinct pattern of choices at various stages of decision-making. At initially, 30.0% of students chose jobs in Engineering, Mathematics, Science, and IT as their top preference, whereas a substantial majority of 70.0% selected different courses. This distribution demonstrates that although STEM areas are widely favored, there is a diverse array of interests. However, when contemplating their alternative option, the inclination towards STEM disciplines significantly rises, with 48.7% of pupils opting for these areas, nearly equaling the 51.3% who selected different subjects. This change indicates a significant secondary inclination towards STEM disciplines among students who may have distinct

primary choices. In the third option, 33.3% of students continued to show a preference for Engineering, Mathematics, Science, and IT, while 66.7% favored other topics. This data emphasizes a sustained, albeit somewhat reduced, interest in STEM. In total, an impressive 82.0% of students demonstrated unwavering interest in STEM disciplines when considering all of their options together, leaving only 18.0% with a preference for courses outside of STEM. This extensive analysis reveals a significant preference for STEM careers among students, although the level of interest varies across different decision-making stages. This suggests that career choices are complex and that secondary school students in Kathmandu have diverse academic interests.

Table 2.

*Gender * Career Choice Crosstabulation*

Gender	STEM Subjects	Other Subjects	Total
Male	40	57	97
Female	5	48	53
Total	45	105	150

An examination of job preferences among secondary school students in Kathmandu indicates that the subjects of Engineering, Mathematics, Science, and IT are the most favoured, with a significant 82% (123 students) expressing interest in these domains. Conversely, a mere 18% (27 students) showed a preference for subjects other than the one being discussed. Further analysis of gender-specific preferences reveals a notable disparity: out of the male students, 40 selected Engineering, Mathematics, Science, and IT, whilst 57 opted for disciplines outside of this domain. Conversely, out of the female students, only five showed an inclination towards STEM disciplines, while a majority of 48 chose non-STEM subjects.

Table 3.

Chi-square test

		Value	df	Asymp. Sig.
Chi-square		16.507	1	.000048

A Chi-square test of independence was performed to examine the relation between gender and the choice of subject. The relation between these variables was significant χ^2 =16.507, ρ =.000048. The result is significant at ρ< .05 indicates male students were more likely to choose STEM for their further study subject than female. This gender discrepancy underscores the presence of varying career preferences and indicates the necessity for focused initiatives to promote a more equitable interest in different sectors.

Conclusion and Recommendation

The study highlights a strong overall preference for STEM fields among secondary school students in Kathmandu, with notable gender differences in these preferences. Male students are more inclined towards STEM fields, while female students show a stronger preference for non-STEM subjects. These results are consistence with the previous studies result (Moe et al., 2021; Polat & Ozdemir, 2020). Although the results were drawn from the small sample size and have a less scale of generalization of findings but the result has wide range of practical implications in policy level as well as implementation level.

To address the observed trends and disparities in career preferences among secondary school students in Kathmandu Firstly, there is a crucial need to promote STEM education through targeted initiatives aimed at raising awareness and fostering interest among students, educators, and parents. Additionally, gender-inclusive career guidance programs should be developed to provide tailored support for both male and female students, with a particular focus on encouraging female participation in STEM fields. Early exposure to STEM subjects

and career exploration activities, starting from basic school, can help ignite students' interest and curiosity. Furthermore, efforts should be made to diversify career options beyond traditional STEM and non-STEM fields, providing information on emerging career paths and interdisciplinary opportunities. Women's involvement in science, technology, engineering, and mathematics (STEM) is not only a matter of equality but also a key driver for peace, prosperity, and sustainability. As we endeavor to accomplish Sustainable Development Goal 5 – gender equality and empowerment of women and girls (United Nations Nepal, 2023) – we must give the effort on terminating the gender gap in STEM fields.

Teacher training and professional development programs are essential to ensure educators are equipped with the skills and knowledge to effectively teach STEM subjects. In order to achieve the Sustainable Development Goals, improve people's lives globally, and ensure that all people have access to a quality education, STEM education is essential. Whenever feasible, it need to be improved and expanded. Advocacy for policies supporting gender equity and diversity in STEM education, along with vigorous monitoring and evaluation mechanisms, will be critical in driving progress towards creating an inclusive environment that empowers all students to pursue their interests and aspirations.

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