Factors Associated with the Competency of School Students in Using CEHRD Learning Portal for Mathematics

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Abstract

This study explores the factors influencing school students' competency in using the Center for Education and Human Resource Development (CEHRD) learning portal for mathematics learning in Nepal. The cross-sectional survey design was utilized in the research among 836 school students of Kathmandu. Frequency, percentage, Mann-Whitney U, Kruskal-Wallis H tests as well as path analysis were the major statistical techniques applied to this research. The results indicate that students with regular access to both mobile phones and laptops, and those who spend more than one hour daily using them for mathematics, demonstrate higher competency in using the CEHRD learning portal. While the school type and the study level influence competency indirectly through device access, gender differences are found minimal. The findings from scatter plots and path models underscore that time of usage mediates the effect of device access, and access mediates the impact of school-related variables. The study highlights the significance of equitable digital access and structured engagement in promoting the effective use of the learning platforms. The findings have important implications for policymakers, educators, and platform designers in enhancing digital equity and optimizing the portal use for improved mathematics learning outcomes.

***Keywords*:** CEHRD learning portal, competency, digital devices, mathematics learning, Nepal

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Introduction

Globally, the rapid expansion of ICT has been impacted by a number of technologies, including mobile computers, tablets, smartphones, and many other electronic gadgets. Mobile devices are becoming increasingly popular worldwide as their costs come down and their support services grow. Numerous studies highlight that the use of digital devices such as mobile, tablet, and laptop/computer is beneficial for students' multitasking (Kay & Lauricella, 2016) such as note-taking, access to academic software, collaboration, organizational skills, engagement and focus (Hyden, 2005), as well as their ability to follow multimedia-based lectures (Debevec et al., 2006). Additionally, the widespread use of technology has affected day-to-day tasks such as finding, analyzing, communicating, or creating information for work or personal use (Hatlevik et al., 2015) justifies the integration of online learning platforms, and has become an essential component of effective teaching and learning processes. Hence, every mathematics teacher and student is required to possess skills in using various digital tools (Joshi et al., 2023) such as video conferencing, collaboration platforms, subject-specific software, visualization tools, and LMS (Khanal, Joshi, & Chapai, 2022).

Digital resources play a significant role in enhancing mathematics learning by allowing for the customization of courses, tasks, and activities to accommodate diverse learner needs, thereby improving the overall educational experience (Keane et al., 2023). Their integration with online forums, digital storytelling, and multimedia further enriches the learning process (Meletiadou, 2022). Additionally, digital devices such as smartphones, desktops, laptops, and tablets have become essential tools for both classroom and independent learning (Bowles, 2024; Florenthal, 2019), offering improved access to educational resources and learning aids, which in turn positively influence student engagement and the retention of mathematical concepts (Shatri & Shala, 2022).

Recognizing the need to enhance access to quality education, the Government of Nepal, through the Center for Education and Human Resource Development (CEHRD), has developed and implemented a learning portal to support students across various subjects, including mathematics. Studies show that the use of digital resources and self-efficacy are higher among students from high-income nations than among those from upper-middle-income and lower-middle-income countries (Joshi, Khanal, et al., 2025). However, in all economic circumstances, digital feedback tools and instructional software continue to be underutilized.

Mathematics, as a core subject in school curricula, often presents significant challenges to students due to its abstract concepts and procedural demands. With the advancement of technology most of the students have digital devices, and the level of digital awareness is high (Khanal et al., 2020). Technology can play a vital role in mathematics by making it critical, popular, enjoyable and easy, hence new innovation and technology should be integrated into it (Chapai, 2022). The experimental study conducted by Fabian et al. (2018) show that students using mobile tablets exhibit improved attitudes towards mathematics and higher achievement scores in secondary level students compared to those receiving traditional instruction. The systematic review conducted by Tang et al. (2023) analyzes 52 empirical studies on mobile learning in mathematics education from 2008 to 2021and shows that mobile learning is useful for learning design and favored technology for curriculum development, and teaching strategies which develop positive attitude for student engagement and achievement. In this context, the CEHRD portal can bridge educational gaps, particularly in rural and under-resourced areas, and complement traditional classroom instruction with digital resources.

The attitude of both teachers and students toward the use of ICT in teaching and learning mathematics is generally found positive. However, they encountered challenges in integrating ICT effectively in areas such as algebra, statistics, vectors, geometry, and analysis (Chapai, 2023; Joshi et al., 2022). The use and efficacy of such devices in the classroom is influenced by a variety of factors, such as students' family background, school performance, cultural capital and language integration at home (Hatlevik et al., 2015), the nature of the course material, student motivation, leadership, teaching and learning strategies (Khadka et al., 2024; Awwad et al., 2013), and classroom management (Aguilar-Roca et al., 2012). In the context of Nepal, quality, opportunity, relevance, and support play a significant role in using online and distance learning (Upadhayaya et al., 2021). The lack of the internet, support, the cost of the internet, ICT training, and availability of digital devices are also factors associated with digital learning (Adhikari et al., 2022). In the same way, Khanal et al.'s (2022) findings indicate that teaching figures and curves were the major challenges in the online mode of instruction. In this context, digital platforms like the CEHRD learning portal should offer interactive and engaging resources which can support conceptual understanding and skill development. However, the effective utilization of such digital platforms depends largely on students' competencies for navigating and using the tools provided. The PISA result (2022) shows that the time of using digital resources for learning mathematics and using such resources out of school were the strong predictors of mathematics

achievement (Joshi, Chapai, et al., 2025). Competency in this context refers not only to technical skills but also to the ability to effectively engage with content, utilize learning features, and integrate portal usage into regular study habits.

Despite the potential benefits of the learning portal and use of ICT, there are growing concerns regarding the disparities in students' competency levels in using online resources effectively for mathematics learning. These disparities may be influenced by various factors including students' level of study, gender, type of school (public or private), and access to digital devices. Most existing research focuses on the benefits of using digital tools in learning mathematics. However, little is known about how well school students in Nepal can actually use the CEHRD learning portal for learning mathematics. The portal was created to support both students and teachers, but the factors that affect students' ability to use it effectively for mathematics learning are still unclear. Hence this study aims to fill these gaps. In Nepal, especially regarding the CEHRD portal, there is a lack of such studies. Therefore, this study will explore the factors that affect students' skills in using the CEHRD portal for learning mathematics. To meet this goal, the study focuses on the following research questions:

i. What is the status of school students' competencies in using CEHRD learning portal in mathematics learning?
ii. How do students' study level, gender, and school types affect the competency of using CEHRD learning portal?
iii. What is the role of access to digital devices with the students in shaping competency of using CEHRD learning portal in mathematics learning?
iv. What is the role of time of using digital devices for mathematics learning in shaping competency of using the CEHRD learning portal?

Literature Review

Digital competency among students has become an essential factor in evaluating the effectiveness of educational technology integration. Several studies have examined how demographic variables such as educational level, gender, and school type influence students' digital skills. Hatlevik et al. (2015) found that students' family background, school performance, cultural capital and language integration at home have a positive prediction of digital competence. Rubach and Lazarides (2021) reported that the acquisition of digital competence is influenced more by access and exposure than by the educational level, suggesting that curriculum exposure at both primary and secondary levels provides comparable opportunities for digital skill development. In terms of gender, however, disparities exist. Hatlevik and Christophersen (2013) found that male students generally demonstrate higher confidence and skills in using

ICT tools, potentially due to societal stereotypes and differing engagement patterns with technology. Furthermore, studies by Siddiq et al. (2016) affirm that digital literacy and competency differs across main subjects but not across gender groups. He and Zhu (2017) found that significant differences between female and male learners exist in terms of trouble shooting and organizing and connecting textual and visual data. However, the other sub-scales of digital competency of visual literacy, understanding technical concept, information searching, respects to others and stay safe online were found non-different between female and male learners. Maon et al. (2021) found no significant difference in technological, cognitive and communication dimensions of digital competency exist between male and female learners.

Upadhayaya et al. (2021) explored the perception of online and distance learning among postgraduate students in Nepal and found that quality, opportunity, relevance, and support play a significant role in using the learning portal across their residences. However, there was no significant difference in their views across the variables gender, ethnicity, school type, and device use in relation to the other criteria. Khanal et al.'s (2022) findings point out that gender, number of devices available, institute types, teaching levels, ICT training, and types of job are explanatory factors determining the challenges of mathematics teachers in online teaching. Lin et al. (2023) evaluate the effectiveness of tablet-based digital games in enhancing mathematics learning among students and found that integrating digital games into math instruction significantly improves students' learning performance and engagement. Fabian et al.(2018) suggest that students' perceptions of the use of mobile technology did not vary in gender case. Similar mobile learning studies in mathematics (Deater-Deckard et al., 2014; Tsuei et al., 2013) show that gender is not a contributing factor of students' evaluation of mobile learning activities. The amount of time students spend using digital devices for mathematics learning also affects their competency in using the learning portal. Joshi, et al. (2025) found that the use of digital resources both within the school environment and beyond, including during the leisure time, serves as a significant predictor of improved mathematics achievement. Kayumova et al. (2021) and Lemke and Schifferstein (2021) also identified a positive association between digital resource utilization and students' performance in mathematics.

Methodology

Within a quantitative research framework, this study employed a cross-sectional survey design among school students in Kathmandu district, Nepal. As reported by the Ministry of Education (MoE, 2016), Kathmandu hosts 883

schools, with a student population of 75,021 in grades eight and ten (MoEST, 2020). The target population included all students enrolled in these grades. A sample size of 384 was determined using a 95% confidence level, 5% margin of error, and 50% population proportion, with a 5% adjustment for non-responses, resulting in 404 participants per category. Based on the average enrollment of 58 students per community school and 39 per institutional school (MoEST, 2020), the researcher employed the random number table method to select 13 schools (five community and eight institutional) whereas students were selected randomly. Following school selection, 42 students (21 female and 21 male) from grades eight and ten were chosen from community schools, and 26 students (13 female and 13 male) from the same grades were selected from institutional schools. Adjustments were made during the sampling process to account for decimal approximations. Moreover, considering contextual attendance and response rates, a 67% participation rate was assumed (GoN & UNICEF, 2019). Thirteen schools were randomly selected, yielding 836 responses. After excluding 164 cases with incomplete data, the final sample for analysis comprised 672 students, representing diverse demographics across Kathmandu district.

Variable Information

This study consisted of ten variables focusing on demographic variables, access of digital resources, time of using digital resources for mathematics learning and competency of using the CEHRD learning portal. The gender, school types, and study level were considered under demographic variables whereas gender had two categories- boys and girls; school types had two categories, namely, institutional and community, and study level also had two categories - basic and secondary. The access to digital resources had three variables - access to android mobile, tablet, and laptop/computer which were measured in 'yes' and 'no' forms. Similarly, time of using digital devices for mathematics learning had two variables - time of using mobile and laptop/computer for mathematics learning which were measured in a five-point scale comprising time given, < 1 hour, 1-2 hours, 2-3 hours, and > 3 hours. Finally, the competency of students in using the CEHRD learning portal was measured in a four-point rating scale including highly competent (can use without support), somewhat competent (can use with partial support), low competent (can use with full support), and not competent (cannot use).

Data Collection and Analysis

The data were collected face-to-face from October 2024 to January 2025 using the research tool translated in Nepali. The participant consent was

obtained in written form. Descriptive and inferential statistics were used to analyze the data. The school students' competency of using the CEHRD learning portal is visually presented in a pi-chart. The Mann-Whitney U test was used to find the significant results on competencies in using the CEHRD learning portal based on sample characteristics such as gender, types of school, and study level as well as access to digital devices as android mobile, tablet, and laptop. Similarly, the significant difference was measured in competency of using the CEHRD learning portal while using digital devices such as mobile and laptop/computer for mathematics learning by using the Kruskal-Wallis H test. Additionally, the path analysis model under the structural equation model was used to find the effect of sample characteristics and access to digital resources in the competency of using the CEHRD learning portal with a mediating role of time of using digital devices in mathematics learning. Finally, Flexplot was used to find the categorical effect of the sample characteristics, access to digital devices, and time of using digital devices in mathematics, and student's competency in using the CEHRD learning portal.

Results

Figure 1 illustrates the perceived competence levels of school students in using the CEHRD learning portal. The figure shows that a majority of the students (55.6%) were not competent in using the learning portal, which indicates a significant lack of students' confidence. An additional 16.1% considered the competence to be low, while 17.6% believed they were (?) somehow competent, suggesting some recognition of partial capability. Only 10.7% of the respondents perceived a high level of competence, making it the least represented category.

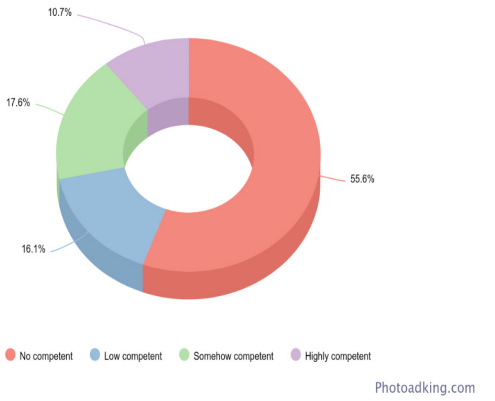

Figure 1

Competency of School Students in Using CEHRD Learning Portal

Table 1 presents the influence of study level, gender, and school type on students' competency in using the CEHRD learning portal, based on a sample of 672 students. The results show no significant difference in competency based on the study level (p=0.70), with both basic and secondary level students having similar mean ranks (339.00 and 333.72, respectively). However, gender appears to play a significant role (p=0.01), with boys (Mean Rank=354.49) showing higher competency than girls (Mean Rank=316.59). The most notable difference is observed in school type (p=0.00), where students from community schools (Mean Rank=374.12) outperformed those from institutional schools (Mean Rank=304.67), indicating a statistically significant relationship between school type and competency in using the portal.

Table 1

Role of Study Level, Gender, and School Types of the Students in Shaping Competency of Using CEHRD Learning Portal (n=672)

Variables	Frequency	Percentage	Mean rank	p-value
Study level				
Basic	354	52.7	339.00	0.70
Secondary	318	47.3	333.72	
Gender				
Boys	353	52.5	354.49	0.01
Girls	319	47.5	316.59	
School types				
Community	308	45.8	374.12	0.00
Institutional	364	54.2	304.67	

Table 2 displays the impact of access to digital devices relating to students' competency in using the CEHRD learning portal. The results show a statistically significant difference in competency based on the access to Android mobile phones (p=0.02), with students who had access (Mean Rank =346.36) demonstrating a higher competency than those who did not (Mean Rank=309.33). In contrast, access to tablets (p=0.53) and laptops (p=0.15) does not show a statistically significant effect on competency, although students with access to laptops had a slightly higher mean rank (346.12) compared to those without it (326.82).

Table 2

Role of Access of Digital Devices with the Students in Shaping Competency of Using CEHRD Learning Portal

Variables	Frequency	Percentage	Mean rank	p-value
Access of android mobile				
No	179	26.6	309.33	0.02
Yes	493	73.4	346.36	
Access of Tablet				
No	559	83.2	334.58	0.53
Yes	113	16.8	346.01	
Access of Laptop				
No	335	49.9	326.82	0.15
Yes	337	50.1	346.12	

Table 3 depicts how the amount of time students spent using digital devices for mathematics learning affected their competency in using the CEHRD learning portal. The results indicate a statistically significant relationship for both mobile device use (p=0.01) and computer/laptop use (p=0.00). For the mobile use, students who spent less than 1 hour or 1–2 hours showed a higher competency (Mean Rank=357.81 and 353.02, respectively), while those who gave no time or used it for more than 3 hours had the lowest competency (Mean Rank=294.57 and 296.08). Similarly, for the computer/laptop use, students who used it for 1–2 hours had the highest competency (Mean Rank=400.21), followed by those using it for less than 1 hour (Mean Rank=371.96), while those who gave no time showed a significantly lower competency (Mean Rank=315.89). These findings suggest that moderate and consistent use of digital devices for mathematics learning is positively associated with a greater competency in using the CEHRD portal, whereas either no use or excessive usage may be less effective.

Table 3

Role of Time of Using Digital Devices for Mathematics Learning in Shaping Competency of Using CEHRD Learning Portal

Variables	Frequency	Percentage	Mean ranks	p-value
Time of using mobile for mathematics learning				
No time given	213	31.7	294.57	0.01
< 1 hour	318	47.3	357.81	
1-2 hours	108	16.1	353.02	
2-3 hours	21	3.1	377.31	
> 3 hours	12	1.8	296.08	
Time of using computer/laptop for mathematics learning				
No time given	433	64.4	315.89	0.00
< 1 hour	152	22.6	371.96	
1-2 hours	66	9.8	400.21	
2-3 hours	13	1.9	312.19	
> 3 hours	8	1.2	292.00	

Figures 2_a and 2_b illustrate the path models analyzing the relationships between access to digital devices, student characteristics, and their competency in using the CEHRD learning portal, with mediating variables included. In Figure 2_a, the model examines how access to digital devices (mobile, tablet, and laptop/computer) influences students' competency in using the CEHRD learning portal, mediated by time spent using these devices for mathematics learning. Access to laptops/computers shows a notable positive effect on the time of use (Beta=0.32), which in turn has a small positive effect (Beta=0.12) on competency. Mobile access also slightly influences time use (Beta=0.13) and directly contributes to a weak negative effect (Beta=-0.06) to competency. Tablet access has minimal influence on both time use and competency. So, as the figure suggests, laptop/computer access, combined with moderate usage time, is more positively associated with student competency than the other devices are.

Similarly, Figure 2_b discloses the effect of school type, gender, and study level on competency in using the CEHRD portal through the mediating role of digital device access. Here, the school type shows a positive relationship with

mobile access (Beta=0.21) and competency (Beta=0.04), suggesting that school infrastructure might impact access and skills. Gender is weakly related to device access (e.g., negatively to laptop use at Beta=−0.16), while the study level appears to have a small influence across all device types. However, the direct paths from gender, study level, and school type to competency are weak, indicating that access to digital devices plays a stronger mediating role in shaping students' portal competency than the background characteristics alone.

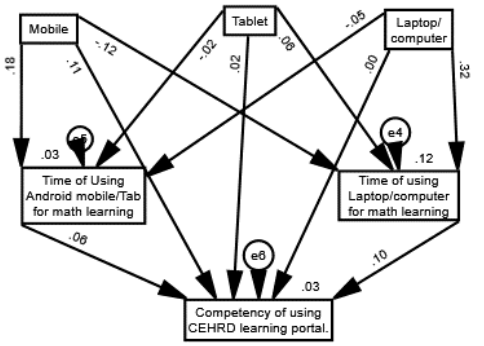

Figure 2_*a*

Effect of Access of Digital Devices on Competency of Students in CEHRD Learning Portal with Mediating Role of Time of Using Mobile and Laptop in Mathematics Learning

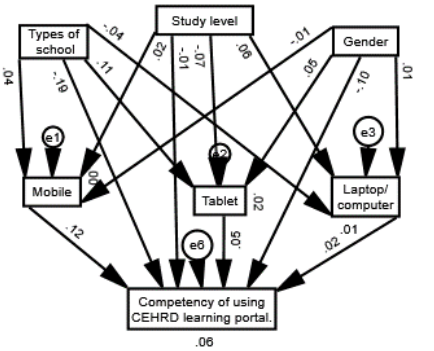

Figure 2_*b*

Effect of School Type, Gender, and Study Level of Students on Competency of Students in CEHRD Learning Portal with Mediating Role of Access of Digital Devices

Figure 3_a shows a scatter plot comparing levels of community orientation (no competent, low competent, somehow competent, high competent) across the two school types (community and institutional), two school levels (basic and secondary), and gender (boys and girls). Each point represents a data observation, with red circles for boys and blue triangles for girls, and the size of the points likely representing a measure such as frequency or weight. Across both school types and levels, there is a spread of community orientation from NC to HC, suggesting a range of competent levels among students. There is no clear pattern indicating a strong gender difference in community orientation. However, both boys and girls appear to have relatively higher clustering in the SC and HC categories compared to LC and NC, especially in secondary school settings. This could suggest that students in secondary education exhibit somewhat stronger community competent. The patterns are fairly consistent across school types, implying that institutional context might not strongly influence community orientation by gender or school level.

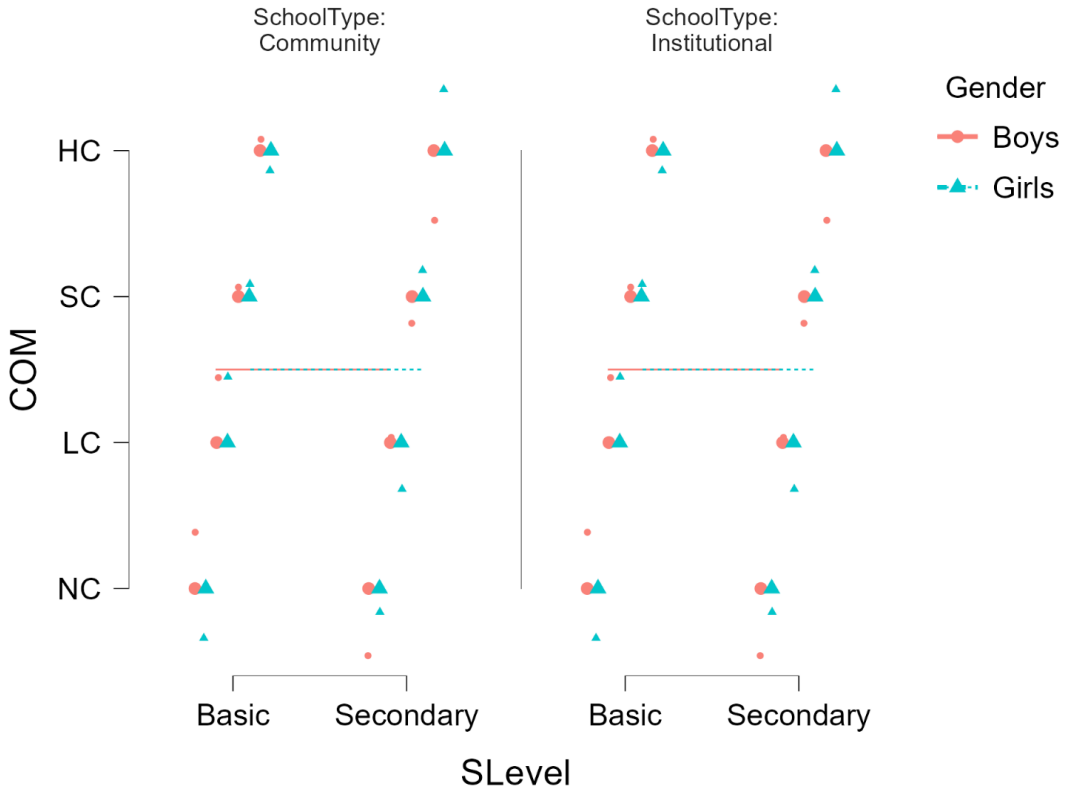

Figure 3_*a*

Category Wise Effect of Gender, School Type and Study Level on Competency in CEHRD Learning Portal

Figure 3_b explores the relationship between students' digital access (laptop and mobile) and their time spent on mathematics learning, and their perceived competence using the CEHRD learning portal, categorized from no competent to high competent. Across most combinations, a consistent trend emerges: students with access to both laptops and mobile phones generally report higher competence levels (more SC and HC responses) compared to those without such access. This is especially evident in conditions where students spent more time on using mobile and laptop/computer for mathematics learning (TFAMM and TFLCM >1 hour). In contrast, students with limited or no digital access tended to cluster more in the LC and NC categories. The association between device access and competence is less pronounced in low time categories (e.g., "No time given" or "< 1 hour"), suggesting that digital access amplifies the benefits of the extended learning time.

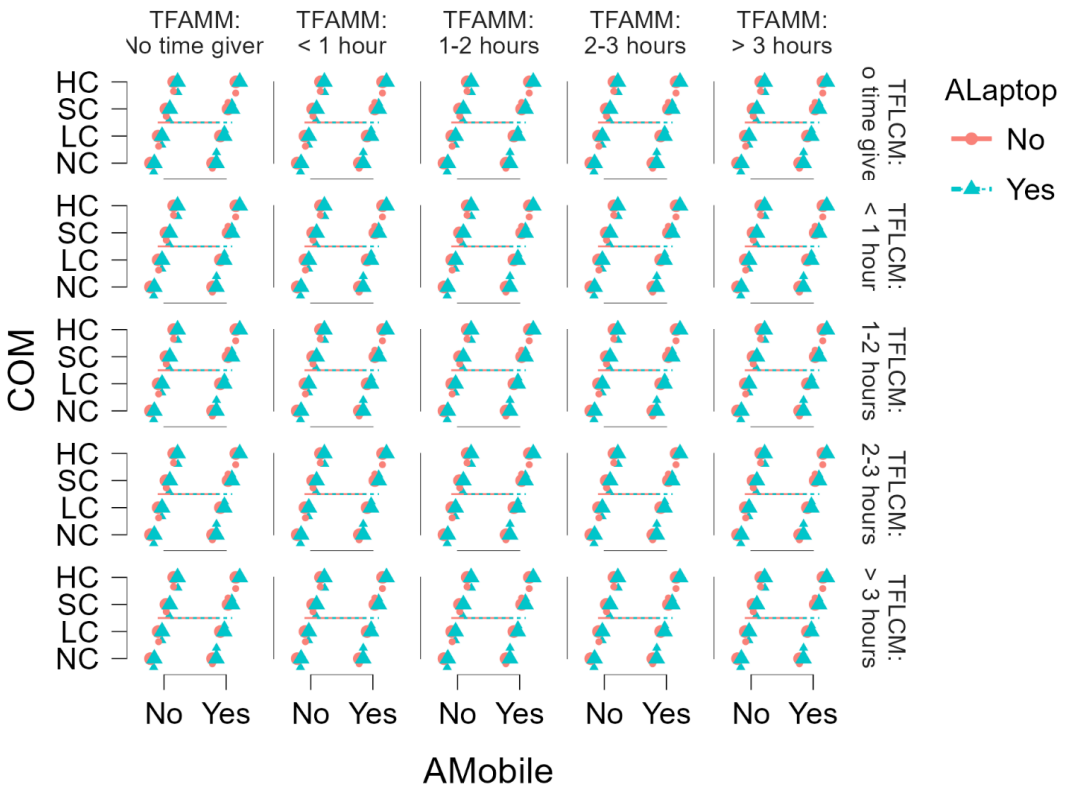

Figure 3_*b*

Category Wise Effect Access and Time of Using Digital Devices in Mathematics Learning on Competency in CEHRD Learning Portal

Discussion

The aims of the research were to measure the effect of sample characteristics, access and use of digital devices in confidence in using the CEHRD learning portal in mathematics learning. The learning portal of CEHRD was developed for the learning support of school students in Nepal by the authorized body of the Government. However, still a majority of the students (55.6%) were no competent in using the learning portal for mathematics learning while only 10.7% of the respondents perceived a high level of competence. Since the data were mostly collected from urban areas, mainly Kathmandu, so we can imagine the condition in the rural part of the country. Therefore, the Government should have some special program of awareness for using this portal for school level students. The findings reveal a complex interplay of factors influencing students' competency in using the CEHRD learning portal for mathematics

learning. Notably, access to digital devices and the time spent using them for mathematics learning emerged as significant predictors of digital competency of using the portal, aligning with prior research (Joshi, Chapai et al., 2025; Adhikari et al., 2024; Kayumova et al., 2021; Lemke & Schifferstein, 2021). However, the focus of these studies were digital competencies only.

The positive effect of access to mobile phones and laptops on students' portal usage competency, with the time spent on these devices acting as a mediating variable. This trend illustrates that the students with access to both mobile and laptop/computer and who spend more than one hour per day using them for mathematics are more frequently represented in the "somehow competent" (SC) and "highly competent" (HC) categories. These observations are consistent with different studies emphasizing the role of digital devices in supporting multitasking, collaboration, and access to academic content (Joshi, Khadka, Adhikari, et al., 2024; Joshi, Khadka, Khanal, et al., 2024; Joshi, Neupane, et al., 2024; Kay & Lauricella, 2016; Debevec et al., 2006; Hyden, 2005). Further, the importance of time investment aligns with PISA findings, which show that using digital resources both in and out of school significantly predicts mathematics achievement (Joshi, Chapai et al., 2025). However, students without access to digital devices or those spending limited time on learning activities with them tend to cluster in the "low competent" (LC) and "not competent" (NC) groups. This reinforces earlier assertions by Hatlevik et al. (2015) and Adhikari et al. (2022), who noted that lack of digital infrastructure, internet access, and ICT training are major barriers to effective digital learning, especially in lower-middle-income countries like Nepal. These disparities highlight the need for inclusive strategies that extend beyond mere device distribution to include structured learning time and support mechanisms.

The findings further emphasize the role of school type, gender, and study level in influencing competency in using CEHRD learning portal, with digital access serving as a key mediator. Institutional school students and those in secondary grades displayed higher digital competency, largely due to greater access to digital devices. This aligns with the literature indicating that while educational level provides exposure, it is access and usage that significantly shape digital competence (Rubach & Lazarides, 2021). Similarly, Upadhayaya et al. (2021) and Chapai (2022) advocate that enhancing the quality, opportunity, and support in digital environments is crucial for ensuring equitable access to online learning platforms in Nepal.

The results offer a broader view of competency distribution across gender, school type, and level. While both boys and girls are represented across all

competency categories, no significant gender-based pattern emerges, with both showing higher representation in the SC and HC categories in secondary school contexts. This supports findings by Fabian et al. (2018), Deater-Deckard et al. (2014), and Tsuei et al. (2013), who also found no significant gender differences in students' evaluation or use of mobile learning tools. However, some studies offer a nuanced view. Hatlevik and Christophersen (2013) and He and Zhu (2017) report gender-based differences in confidence and specific digital competencies such as troubleshooting and organizing multimedia data. Conversely, Maon et al. (2021) found no gender difference in technological and cognitive competencies, suggesting that such disparities may be context-specific and mitigated by equitable access and usage. Although school type (community vs. institutional) appeared initially to influence competency, its effect diminished once access to digital devices was accounted for, suggesting that institutional context may only indirectly influence portal competency. This observation is supported by Khanal et al. (2022), who reported challenges in online mathematics teaching linked to factors such as ICT training, device availability, and school resources.

Collectively, these findings support the integration of digital tools in mathematics learning (Keane et al., 2023; Meletiadou, 2022; Bowles, 2024; Shatri & Shala, 2022), especially in enhancing student engagement, retention, and conceptual understanding. However, as Tang et al. (2023) emphasize, mobile learning must be guided by thoughtful design and equitable implementation strategies to be effective. In the context of Nepal, platforms like CEHRD hold significant promise for bridging learning gaps—particularly in under-resourced areas—provided that access, training, and structured engagement are ensured.

Conclusion

This study explored the factors associated with school students' competency in using the CEHRD learning portal for mathematics learning in Nepal. The results reveal that access to digital devices—particularly, mobile phones and laptops—and the time spent using them for learning mathematics are strong predictors of students' competency with the portal. Additionally, school type, study level, and gender have indirect effects mediated by digital access. Students in secondary schools and institutional settings demonstrated a relatively higher competence, while gender differences appeared minimal. These findings align with international and national studies that underscore the importance of digital access, structured use time, and exposure in developing students' digital skills and fostering effective engagement with online learning platforms. Notably, students with consistent access to both mobile and laptop/computers

and who used them regularly for academic purposes reported higher levels of competency, indicating that both availability and usage behavior matter in shaping digital learning outcomes.

Despite these meaningful insights, the study has several limitations. First, the analysis is based on cross-sectional data, limiting the ability to infer causality. Second, the study relies on self-reported measures of competence and time usage, which may be influenced by personal biases or recall inaccuracies. Third, while the research includes major demographic variables such as school type, gender, and study level, other potential influencing factors such as teacher support, parental involvement, internet quality, and students' prior digital experience were not extensively examined. Additionally, the findings are context-specific to the CEHRD learning portal and mathematics learning in Nepal, which may limit generalizability to other platforms or subjects.

The study offers several practical and policy-level implications. For policymakers and education stakeholders in Nepal, these findings stress the urgent need for improving an equitable access to digital devices, particularly in public and rural schools. Providing devices alone is insufficient; students must also be supported in developing purposeful usage habits through digital literacy training and curriculum integration. Furthermore, digital learning platforms like CEHRD should design learning portals to accommodate diverse learners by ensuring they are user-friendly, engaging, and are aligned with students' study levels and learning needs. Schools and teachers should be encouraged to foster consistent digital engagement among students, especially by incorporating digital tools into regular classroom practices. Finally, for future research, longitudinal studies that explore how sustained access and digital habits impact learning outcomes over time would provide more robust evidence to guide national education technology strategies.

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Data Availability

The data will be available with reasonable request of first author (Principal Investigator of the project).

Declaration of Generative AI in Scientific Writing

While preparing this manuscript, the authors employed OpenAI's ChatGPT to enhance the language. Subsequently, they carefully reviewed and revised the content to maintain its integrity, taking full responsibility for the publication's substance. Notably, no generative AI was used in the original composition of the paper.

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