



HIGH-SCHOOL LEARNING INFRASTRUCTURE AND ITS RELATIONSHIP WITH ACADEMIC AND CO-CURRICULAR OUTCOMES IN HIGHER EDUCATION

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ABSTRACT

The present study investigated the correlation between the engineering university students' academic and co-curricular outcomes and the infrastructure of their high-school training. The quantitative cross-sectional design method was used, and the sample consisted of 209 respondents obtained from an anonymous secondary survey dataset. The overall infrastructure score was found to be moderate ($M = 3.12$, $SD = 0.48$) with the highest domain ratings given for the laboratory and library facilities. Outcomes of higher education ranged from good, average, and sufficient, with the highest scores for current CGPA, academic confidence, and preparedness for engineering studies, and the lowest scores for physical activity, leadership, teamwork, public speaking, social integration, and academic-social balance. There was no significant association of the high-school infrastructure with the current CGPA, yet a positive association with engineering preparedness and academic confidence. The regression analyses were subsequently adjusted and revealed strong relationships with preparedness and confidence, but no significant relationships with overall infrastructure for the composite co-curricular outcome. The findings indicate that high school learning environments matter more for students' learning perceptions and confidence than for their formal or co-curricular involvement in the future. Longitudinal and multi-institutional research for the purposes of clarifying these relationships over time is recommended.

1. Introduction

The learning infrastructure of secondary schools has a significant impact on students' learning experiences, engagement, and readiness for further education. Classrooms, laboratories, libraries, computer facilities, sports areas, and basic facilities are all part of the general learning environment. Studies show that the state of and access to school facilities have an impact on a student's educational outcomes and classroom experiences (Ali et al., 2020). School investment has also been linked to better school performance, specifically regarding the effective implementation of learning processes (Belmonte et al., 2020). In addition to physical resources, the overall quality of the school environment also impacts students' motivation, perceptions, and learning outcomes (Edgerton et al., 2025). Resources in schools are thus part of a larger educational system that helps shape students' future learning pathways (Hofflinger & Von Hippel, 2020).

This is a significant change because students coming to universities are not all the same in academic readiness, confidence, or previous educational experiences. However, the evidence shows that training in high school and prior learning can be transferable to academic performance in the first years of tertiary education (Chigbu & Nekhwevha, 2021).

High-school learning infrastructure comprises learning structures that support students' development as well as academic structures. If designed properly, classrooms offer the right conditions for concentration, communication and instructional engagement, and science laboratories allow students to gain experience and conduct experiments. Access to digital information and ICT-supported learning is further enhanced through computer labs, internet facilities and ICT resources. Independent study and access to academic materials can be found in libraries, while safe school surroundings, sanitation, electricity and ventilation make for a conducive learning environment (Chen et al., 2021).

Physical environments are not just structural resources, but facilitate meaningful participation in learning; learning spaces also shape students' interaction and engagement (De Borba et al., 2020). Likewise, learning areas that are flexible and appropriately designed enhance students' interaction and engagement in learning activities. Sports grounds, activity rooms, auditoria and co-curricular spaces are also crucial as they provide opportunities for students to grow outside of the classroom.

Metrics for academic performance in higher education include CGPA, academic confidence, preparation, and involvement in the university's learning. Student engagement and well-being are therefore linked to the wider higher-education journey and shift during students' time at university (Boulton et al., 2019). Students' relationships with faculty and academic pursuits can also be influenced by learning environments (De Borba et al., 2020).

Co-curricular outcomes are also significant, as they are also part of a university's development, but beyond academic grades. There are also benefits to extracurricular involvement, which can differ based on the activities and the student's characteristics (Balaguer et al., 2020). Sport has also been linked to positive academic and student outcomes (Chen et al., 2021). The relationships between physical activity and educational and well-being outcomes can be complex among young university students (Babaeer et al., 2022). Extracurriculars can also foster team-building skills, scholastic growth, and Student Motivation (Chigbu & Nekhwevha, 2021; de Prada Creo et al., 2021; Ginosyan et al., 2020). Another critical aspect of university adjustment is social belonging, which comes into play when students' sense of belonging affects their academic and social experiences in higher education (Ahn & Davis, 2020).

While some previous studies have focused on single aspects of school infrastructure, such as academic achievement, physical activity, learning environments, or engagement in extracurricular activities, there is only limited research that examines the relationship between students' high school school architecture and both academic and co-curricular outcomes in higher education. Existing studies often concentrate on either school achievement or on the involvement of students in university extracurricular activities, but do not link these two stages. This requires further research into the relationship between previous educational experiences and subsequent achievements in the university academic sphere, self-confidence, physical activity, university leadership, teamwork, presentation and social engagement.

This study aims to investigate the correlation of high school learning infrastructure with academic learning and co-curricular for engineering students at the university. Specifically, the study aims to

measure the reported high-school learning infrastructure, to examine the high-school students' academic outcomes, to evaluate their co-curricular outcomes, to see how they relate to the high-school students' academic outcomes, and to see how they relate to the co-curricular outcomes in higher education.

2. Materials and Methods

2.1 Research Design

The quantitative, cross-sectional survey design was employed in this study to identify the relationship between high-school learning infrastructure and academic and co-curricular outcomes among university engineering students. The secondary data were analyzed using an anonymized survey dataset that was gathered using a self-administered questionnaire. The survey was a retrospective evaluation of the high-school infrastructure experiences of students and compared it with their current higher education results (Sattyam & Sheikh, 2026). Since it was an observational design, the research concentrated on statistical correlations, not causal influences.

2.2 Study Participants

The sample size was 209 undergraduate engineering students of various years in a university. Gender, age, current year of study, current CGPA and type of high school attended were the demographic and educational variables. Students of all types of schools, such as private, public/government, cadet and others were represented in the sample. The dataset was filtered prior to analysis, with implausible age entries being filtered only in age-specific analysis but the rest of the valid responses were kept.

2.3 Dataset and Study Variables

High-school learning infrastructure was the main independent variable and it was measured through items that encompassed conditions in the classroom, science laboratories, computer and internet facilities, library resources, basic amenities, sports facilities, co-curricular space, school security, maintenance, electricity reliability and overall learning environment. Dependent variables were the current academic and co-curricular outcomes in higher education. Academic performance was CGPA, academic confidence, and readiness to study engineering. Co-curricular outcomes were physical activity, participation in sports, oratory, leadership, teamwork, club activities, social integration and balance between academic and non-academic activities. Other variables of high-school participation were stored as contextual measures wherever applicable.

2.4 Measurement and Data Preparation

The responses to questions were assigned numeric codes where the greater the code, the better the infrastructure conditions, the stronger the agreement, and the greater the participation. The majority of perception-based items were five-point ordered response scales. Analysis was done after verifying the dataset to eliminate missing values, coding inconsistencies, and implausible answers. The corresponding infrastructure items formed a composite high-school infrastructure score and domain-specific scores were computed for classrooms, laboratories, ICT resources, libraries, amenities, sports and co-curricular facilities, and the overall school environment where this was appropriate. Multi-item scales underwent an internal consistency test using Cronbach's alpha, and a score of about 0.70 or higher is deemed to be satisfactory.

2.5 Statistical Analysis

The characteristics of the participants, variables of the infrastructure and academic and co-curricular results were summarized by descriptive statistics. Categorical variables were reported as frequencies and percentages whereas composite measures were reported as means and SD. Ordinal variables were analyzed using the Spearman rank correlation and Pearson correlation was used approximate continuous composite scores where necessary. The relationship between the scores on infrastructure and academic confidence, preparedness, and co-curricular outcomes was analyzed using multiple regression analysis. Ordinal regression was used for categorized CGPA. The differences between groups of various school types or university years were analyzed with analysis of variance or appropriate non-parametric alternatives. The level of statistical significance was 0.05.

3. Results

3.1 Characteristics of the Participants

The research involved 209 engineering students of the university. Age-dependent calculations were made after removing two unrealistic age records, the mean age of the 207 valid respondents was 22.84 years with a standard deviation of 1.13 years and a range of 20 to 25 years. The sample was mostly male (92.3%), and over half of the sample was in their third year of study (54.5%). Respondents were of various high school backgrounds with 28.2% being from private, 27.8% from public/government, 23.9% from cadet and other schools. Regarding current academic performance, 30.6% reported a CGPA of 3.50–3.79 and 23.0% reported a CGPA of 3.80–4.00. Thus, 53.6% of the students had a current CGPA of at least 3.50. Table 1 shows the detailed features.

Table 1. Characteristics of the study participants (N = 209)

Characteristic	Category/Statistic	n	%
Age	Mean $\pm$ SD	22.84 $\pm$ 1.13	—
Gender	Male	193	92.3
	Female	16	7.7
Year of study	1st Year	2	1.0
	2nd Year	60	28.7
	3rd Year	114	54.5
	4th Year	33	15.8
High-school type	Private	59	28.2
	Public/Government	58	27.8
	Cadet	50	23.9
	Other	42	20.1
Current CGPA	Below 2.50	23	11.0
	2.50–2.99	24	11.5
	3.00–3.49	50	23.9
	3.50–3.79	64	30.6
	3.80–4.00	48	23.0

Note: Age statistics were calculated from 207 valid age observations.

3.2 High-School Learning Infrastructure Profile

The overall score for the learning infrastructure within the high school was 3.12 ± 0.48 , with a moderate overall assessment of the previous high school learning infrastructure. The highest domain score was for laboratory infrastructure ($M = 3.31$) followed by library facilities ($M = 3.20$) and basic amenities ($M = 3.13$), as shown in Figure 1. The mean scores for ICT infrastructure, school environment and sports/co-curricular infrastructure were 3.09, 3.08 and 3.05 respectively. The mean score for classroom infrastructure was the lowest, but near the middle value on the scale ($M = 3.03$). As a whole, the variations between infrastructure domains were fairly small.

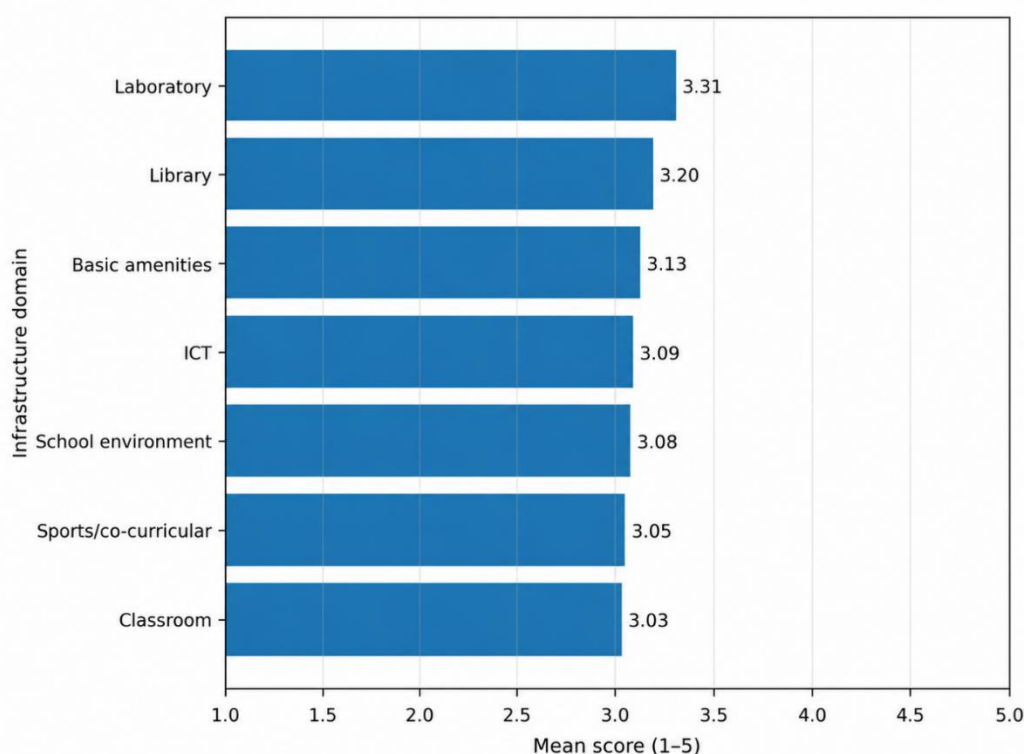


Figure 1. Mean scores of high-school learning infrastructure domains

3.3 Reliability and Descriptive Properties of Infrastructure Measures

The reliability and descriptive statistics of the infrastructure measures are summarized in Table 2. The complete 28-item infrastructure measure had a Cronbach's alpha of 0.697 which was close to the conventional 0.70 and thus was retained as the principal composite infrastructure measure. The individual domain-specific scales, in contrast, had comparatively low internal consistency, ranging from 0.147 to 0.403. Thus, descriptive interpretation was largely used for the domain scores and the overall infrastructure score was highlighted in the principal correlation and regression analyses.

Table 2. Descriptive statistics and reliability of high-school infrastructure measures

Infrastructure dimension	Items	Mean	SD	Cronbach's α
Classroom facilities	5	3.03	0.72	0.403
Laboratory facilities	4	3.31	0.83	0.205
ICT resources	3	3.09	0.86	0.147
Library facilities	3	3.20	1.05	0.380
Basic amenities	3	3.13	0.92	0.254
Sports/co-curricular facilities	4	3.05	0.82	0.294
School environment	6	3.08	0.69	0.372
Overall infrastructure	28	3.12	0.48	0.697

3.4 Academic Outcomes in Higher Education

There was a wide range of current academic performance within the sample. Figure 2 illustrates that the largest group of students had a CGPA between 3.50 and 3.79 (30.6%), followed by 3.00–3.49 (23.9%) and 3.80–4.00 (23.0%). Only 11.0% reported a CGPA below 2.50. The perceived preparedness for engineering studies on the 5-point scale was on average 3.09 ± 1.45 and the academic

confidence with respect to the previous school learning environment was on average 3.00 ± 1.48 . Overall, 42.6% of respondents agreed or strongly agreed that the high school prepared them well for their studies in Engineering; while 42.1% agreed or strongly agreed that their academic confidence had improved due to the previous school learning environment. The distribution was skewed towards the middle and upper category of CGPA as illustrated in Figure 2

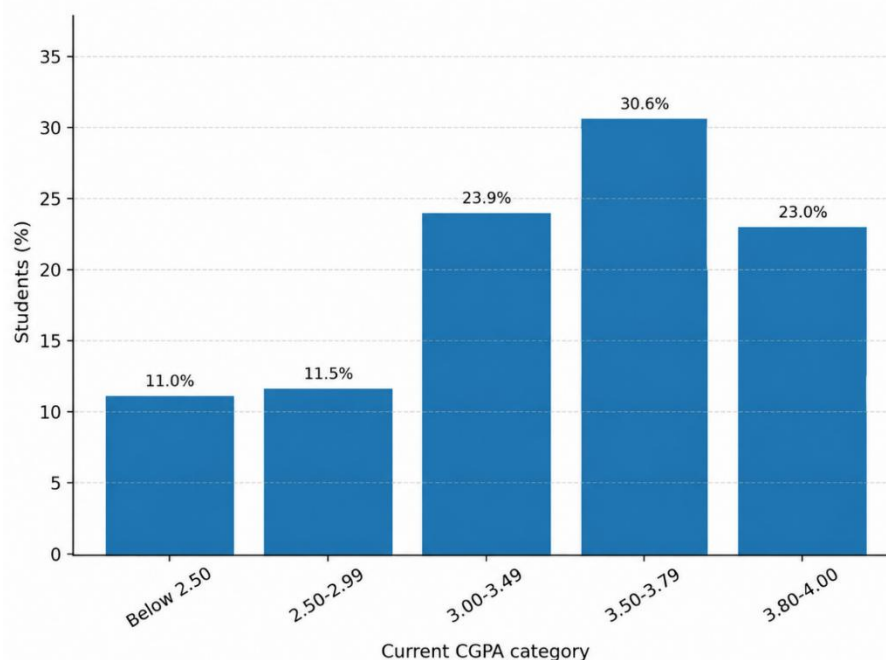


Figure 2. Distribution of current CGPA among university engineering students

3.5 Co-Curricular Outcomes in Higher Education

There was significant variation between students' physical, social, leadership and communication outcomes at present. Nearly one-third (32.6%) of the respondents indicated that they had none or less moderate-to-vigorous physical activity per week, while 24.4% were active on 5 or more days per week. The level of involvement in university sports was spread fairly evenly from none, to recreation, departmental teams, to inter-university competition. There was relatively high involvement with leadership (46.4% executive-member positions and 25.4% team leads). Table 3 indicates that the mean scores for presentation confidence and teamwork were near the scale midpoint, while the mean score for social integration was the highest of the four Likert-type developmental outcomes.

Table 3. Current co-curricular and developmental outcomes

Outcome	Category/Statistic	n / Mean	% / SD
Physical activity	0 days	67	32.1
	1–2 days/week	56	26.8
	3–4 days/week	35	16.7
	≥5 days/week	51	24.4
Sports involvement	No involvement	55	26.3
	Recreational	55	26.3
	College/department team	44	21.1
	Inter-university athlete	55	26.3
Public-speaking forums	No participation	63	30.1

	Occasional participation	74	35.4
	Regular participation	72	34.4
Leadership	No role	59	28.2
	Team lead	53	25.4
	Executive member	97	46.4
Presentation confidence	Mean $\pm$ SD	3.01	1.42
Teamwork effectiveness	Mean $\pm$ SD	3.02	1.35
Social integration	Mean $\pm$ SD	3.23	1.55
Academic-social balance	Mean $\pm$ SD	2.89	1.40

3.6 Relationship Between High-School Infrastructure and Academic Outcomes

There were varying relationships between high-school infrastructure and the three academic outcomes. However, the overall infrastructure score was not significantly related to the current CGPA (Spearman's $\rho = -0.026$, $P = .712$) as shown in Figure 3. However, a positive correlation was found between perceived high school infrastructure and preparedness for engineering study ($\rho = 0.228$, $p < .001$) and academic confidence ($\rho = 0.189$, $p = .006$).

Adjusted regression analyses confirmed these findings. Adjusting for gender, university year and high-school type, overall infrastructure significantly predicted perceived engineering preparedness ($\beta = 0.814$, 95% CI [0.406, 1.222] $p < .001$) and academic confidence ($\beta = 0.717$, 95% CI [0.302, 1.133] $p = .001$). The variance of the outcome was accounted for by the respective models to about 10.8%. The results of ordinal regression were not significant for the association between overall infrastructure and current CGPA (OR = 1.03, 95% CI [0.62, 1.72], $p = .911$).

Exploratory domain-level analyses revealed that laboratory facilities ($\beta = 0.285$, $p = .032$) and library facilities ($\beta = 0.228$, $p = .024$) were positively associated with preparedness and that classroom facilities were associated with academic confidence ($\beta = 0.450$, $p = .003$). However, caution should be used in interpreting these domain-level findings as they have comparatively lower internal consistency.

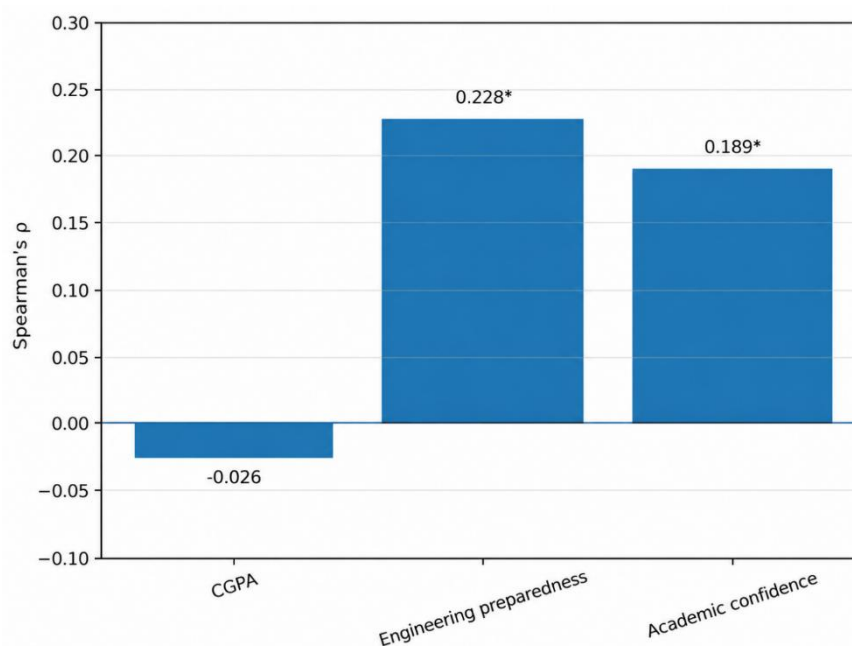


Figure 3. Correlations between overall high-school infrastructure and academic outcomes

3.7 Relationship Between High-School Infrastructure and Co-Curricular Outcomes

Correlations between high school infrastructure and present co-curricular results were generally weak. However, as demonstrated in Table 4, there was no significant relationship between overall infrastructure and physical activity, sports involvement, physical fitness, presentation frequency, participation in public speaking, leadership, presentation confidence, teamwork or academic – social balance. There was a weak negative correlation with social integration ($\rho = -0.159$, $p = .021$). But, the composite co-curricular outcome was not significantly correlated with infrastructure ($r = 0.022$, $p = .748$).

The adjusted regression model also failed to demonstrate a statistically significant relationship between the composite score for co-curriculum and overall high-school infrastructure ($\beta = 0.020$, 95% CI $[-0.139, 0.179]$, $p = .806$), accounting for just 1.1% of the observed variance. Therefore, the infrastructure of the high school was consistently associated with its perceived academic preparedness and confidence level, rather than with students' current co-curricular involvement.

Table 4. Relationship between overall high-school infrastructure and current co-curricular outcomes

Co-curricular outcome	Spearman's ρ	p
Physical activity	0.111	.109
Sports involvement	-0.019	.788
Physical fitness	-0.015	.826
Presentation frequency	-0.060	.388
Public-speaking forums	0.002	.976
Leadership	0.085	.223
Presentation confidence	0.003	.961
Teamwork effectiveness	-0.090	.194
Social integration	-0.159	.021
Academic-social balance	0.078	.261

Note: The composite co-curricular score showed $r = 0.022$, $p = .748$. Adjusted regression: $\beta = 0.020$, $p = .806$.

3.8 Comparative Analysis by Educational Background

The overall infrastructure score was compared by high-school type to find evidence that students' experiences with the infrastructure were different on a systematic basis depending on their type of educational setting. The mean for infrastructure score was highest for students from private schools, followed by cadet schools, other schools, and public/government schools, as shown in Figure 4. These differences were not significant; however, $F(3, 205) = 1.216$, $p = .305$.

However, infrastructure scores did not differ across the four university years, $F(3, 205) = 0.381$, $p = .767$. The analysis of these results indicates that neither current university year nor high school type accounted for a significant amount of variance in the infrastructure ratings observed in this sample. The confidence intervals were quite large and overlapping among school categories (Figure 4), which provided support for no statistically significant difference among the categories.

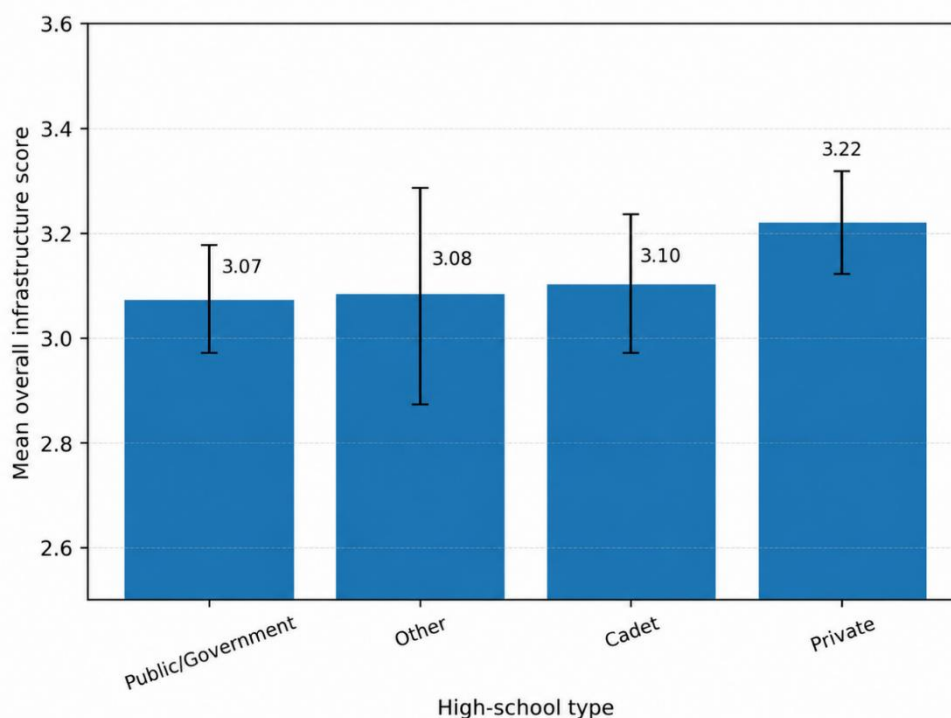


Figure 4. Mean overall high-school infrastructure score according to high-school type

4. Discussion

The results indicated that the high school learning infrastructure was generally rated as moderate, with the laboratory facilities and library facilities having relatively higher scores than the other facilities such as classroom, info-communication technology, sports, and co-curriculum facilities. The overall infrastructure was found to be strongly related to students' perceived readiness for engineering studies and academic confidence, but not to their current CGPA. Likewise, overall infrastructure score did not have a significant relationship with most current co-curricular outcomes such as sport participation, leadership, teamwork, public speaking or balance of academic/social life. The results indicate that the past school environment is more likely to be correlated with perceived readiness and confidence than with school-related performance or current co-curricular activities.

There is a positive correlation between the high school infrastructure and academic preparedness, suggesting that there may be a link between good learning infrastructure and the readiness of learners to meet the university's academic requirements. Designing and flexibly arranging learning spaces can foster interaction, collaboration, and active engagement that can enhance learning experiences before higher education (Kariippanon et al., 2019). Beyond the immediate impact on the well-being of students, school climate and educational conditions have also been associated with academic achievement and student behavior (Longobardi et al., 2022). The lack of association with current CGPA, however, indicates that other factors besides previous infrastructure play a role in university academic performance, such as student engagement, institutional experiences, study practices, and adaptation to higher education.

Low levels of correlation between high school infrastructure and current co-curricular experiences, outcomes indicate that current high school experiences have a greater influence in predicting participation in leadership, teamwork, sports and public speaking experiences. In higher education, co-curricular involvement has been found to foster competency-building and student communication of transferable skills (Kanar & Heinrich, 2024). Extracurricular activities can also be part of socially responsible leadership development and structured undergraduate leadership experiences also enhance development and career readiness for postsecondary (Kim, 2022; Peter Kuchinke et al., 2022). Likewise, school experiences of leadership roles can shape future educational goals and career trajectories (Meyer & Rinn, 2022).

The results of the present study are partially consistent with the results from other studies which have

found that extra-curricular involvement is a factor in students' overall development. Jackson and Bridgstock found that employability is a result of different contributions from curricular, co-curricular, extracurricular and work-based experiences (Jackson & Bridgstock, 2021). Evidence also suggests that participation in employability building activities is not equal across all student cohorts and relates to students' future outcomes (Jackson & Dean, 2023). Furthermore, students' participation in employability-oriented activities has been correlated with their development as graduates and their career outcomes (Jackson et al., 2024). The benefits of extracurricular and university experiences have also been demonstrated in terms of employability development (Jackson & Tomlinson, 2022). However, weak direct relationships seen in the present study might be due to differences in the earlier school infrastructure and the current participation of universities.

The findings suggest that enhancing high-school facilities can make a significant impact on students' academic self-confidence and enrollment in college. Investment in laboratory, library, ICT, classroom facilities, and a supportive learning environment can assist students to acquire better academic readiness for entry to university. Meanwhile, universities should also offer chances for leadership, teamwork, sport, communication, and other out-of-classroom activities, as these could be important to the student's development on their own. For college students, extracurricular involvement is associated with academic and psychological outcomes (Knifsend et al., 2020), and a sense of belonging can positively influence motivational, behavioural, social-emotional and academic outcomes (Korpershoek et al., 2020).

Several limitations of the study should be taken into account. The cross-sectional nature of the data precludes conclusions about causation, and the survey of high school facilities may be influenced by retrospective recall bias. It is limited to university engineering students, therefore, results cannot be generalized across other disciplines or institutions. Longitudinal and multi-institutional designs are needed along with objective measures of school facilities to collect data and a closer look at mediating factors including engagement, belonging, motivation, and participation in university activities in future studies. These offer more concrete evidence of the link between earlier educational contexts and later academic and co-curricular outcomes.

5. Conclusion

The study analyzed the correlation between high school learning infrastructure and academic and co-curricular outcomes for university engineering students. The results indicated that, overall, the students had moderate rating of high school infrastructure, with comparatively high ratings for the facilities regarding laboratory and library as compared to classroom, ICT, sports and co-curricular facilities. High-school infrastructure was found to be significantly and positively correlated with perceived preparedness for engineering studies and academic confidence indicating that students' preparedness for university learning may be enhanced by having better educational environments at the secondary level. The result, however, showed there was no significant relationship between overall infrastructure and current CGPA, implying that other factors that are personal, institutional, and contextual play a bigger role in academic performance at higher education. In the same vein, the majority of co-curricular outcomes were not significantly associated with past infrastructure, such as sports and leadership involvement, teamwork, public speaking, or academic/social balance. As such, the findings indicate that high-school infrastructure can have an impact on students' confidence and preparedness for college, but that experience in the university may have more impact on students' academic success and co-curricular involvement in the years that follow. Ensuring a better classroom, laboratory, library, ICT provision, sports facilities and co-curricular areas continues to be relevant to the development of students. Further studies across the years and across institutions should further explore the school infrastructure and its interaction with motivation, engagement, and learning setting at the university level over time. mechanisms that foster sustainable inclusive teaching practices in various educational contexts.

References

1. Ahn, M. Y., & Davis, H. H. (2020). Four domains of students' sense of belonging to university. *Studies in Higher Education*, 45(3), 622–634.

- <https://doi.org/10.1080/03075079.2018.1564902>
2. Ali, N., Khan, A. B., & Ahmad, T. (2020). Effects of school building on academic achievement of secondary school students in Southern KP, Pakistan. *Global Educational Studies Review*, 5(2), 28–34.
 3. Babaeer, L., Stylianou, M., Leveritt, M., & Gomersall, S. (2022). Physical activity, sedentary behavior and educational outcomes in university students: A systematic review. *Journal of American College Health*, 70(7), 2184–2209. <https://doi.org/10.1080/07448481.2020.1846047>
 4. Balaguer, Á., Benítez, E., Albertos, A., & Lara, S. (2020). Not everything helps the same for everyone: Relevance of extracurricular activities for academic achievement. *Humanities and Social Sciences Communications*, 7(1), 79.
 5. Belmonte, A., Bove, V., D’Inverno, G., & Modica, M. (2020). School infrastructure spending and educational outcomes: Evidence from the 2012 earthquake in Northern Italy. *Economics of Education Review*, 75, 101951.
 6. Boulton, C. A., Hughes, E., Kent, C., Smith, J. R., & Williams, H. T. (2019). Student engagement and wellbeing over time at a higher education institution. *PloS One*, 14(11), e0225770.
 7. Chen, S., Li, X., Yan, J., & Ren, Z. (2021). To be a sportsman? Sport participation is associated with optimal academic achievement in a nationally representative sample of high school students. *Frontiers in Public Health*, 9, 730497.
 8. Chigbu, B. I., & Nekhwevha, F. H. (2021). High school training outcome and academic performance of first-year tertiary institution learners-Taking ‘Input-Environment-Outcomes model’ into account. *Heliyon*, 7(7). [https://www.cell.com/heliyon/fulltext/S2405-8440\(21\)01803-X](https://www.cell.com/heliyon/fulltext/S2405-8440(21)01803-X)
 9. De Borba, G. S., Alves, I. M., & Campagnolo, P. D. B. (2020). How Learning Spaces Can Collaborate with Student Engagement and Enhance Student-Faculty Interaction in Higher Education. *Innovative Higher Education*, 45(1), 51–63. <https://doi.org/10.1007/s10755-019-09483-9>
 10. de Prada Creo, E., Mareque, M., & Portela-Pino, I. (2021). The acquisition of teamwork skills in university students through extra-curricular activities. *Education+ Training*, 63(2), 165–181.
 11. Edgerton, E., McKechnie, J., & Maltby, J. (2025). Developing a psychological understanding of students’ perceptions of their school environment and the relationship with academic achievement. *Journal of Environmental Psychology*, 102862.
 12. Ginosyan, H., Tuzlukova, V., & Ahmed, F. (2020). An Investigation into the Role of Extracurricular Activities in Supporting and Enhancing Students’ Academic Performance in Tertiary Foundation Programs in Oman. *Theory and Practice in Language Studies*, 10(12), 1528–1535.
 13. Hofflinger, A., & Von Hippel, P. T. (2020). Does Achievement Rise Fastest with School Choice, School Resources, or Family Resources? Chile from 2002 to 2013. *Sociology of Education*, 93(2), 132–152. <https://doi.org/10.1177/0038040719899358>
 14. Jackson, D., & Bridgstock, R. (2021). What actually works to enhance graduate employability? The relative value of curricular, co-curricular, and extra-curricular learning and paid work. *Higher Education*, 81(4), 723–739. <https://doi.org/10.1007/s10734-020-00570-x>
 15. Jackson, D., & Dean, B. A. (2023). Employability-related activities beyond the curriculum: How participation and impact vary across diverse student cohorts. *Higher Education*, 86(5), 1151–1172. <https://doi.org/10.1007/s10734-022-00966-x>
 16. Jackson, D., Lambert, C., Sibson, R., Bridgstock, R., & Tofa, M. (2024). Student employability-building activities: Participation and contribution to graduate outcomes. *Higher Education Research & Development*, 43(6), 1308–1324. <https://doi.org/10.1080/07294360.2024.2325154>
 17. Jackson, D., & Tomlinson, M. (2022). The relative importance of work experience, extra-

- curricular and university-based activities on student employability. *Higher Education Research & Development*, 41(4), 1119–1135. <https://doi.org/10.1080/07294360.2021.1901663>
18. Kanar, A. M., & Heinrich, B. (2024). The impact of university co-curricular activities on competency articulation proficiency: A mediated model. *The Career Development Quarterly*, 72(3), 231–242. <https://doi.org/10.1002/cdq.12358>
 19. Kariippanon, K. E., Cliff, D. P., Lancaster, S. J., Okely, A. D., & Parrish, A.-M. (2019). Flexible learning spaces facilitate interaction, collaboration and behavioural engagement in secondary school. *PloS One*, 14(10), e0223607.
 20. Kim, J. (2022). The empirical study of extracurricular activity on socially responsible leadership. *Journal of Leadership Education*, 21(1), 1–17.
 21. Korpershoek, H., Canrinus, E. T., Fokkens-Bruinsma, M., & De Boer, H. (2020). The relationships between school belonging and students' motivational, social-emotional, behavioural, and academic outcomes in secondary education: A meta-analytic review. *Research Papers in Education*, 35(6), 641–680. <https://doi.org/10.1080/02671522.2019.1615116>
 22. Longobardi, S., Pagliuca, M. M., & Regoli, A. (2022). School climate and academic performance of Italian students: The role of disciplinary behaviour and parental involvement. *Statistical Methods & Applications*, 31(5), 1355–1373. <https://doi.org/10.1007/s10260-022-00632-7>
 23. Meyer, M. S., & Rinn, A. N. (2022). School-Based Leadership Talent Development: An Examination of Junior Reserve Officers' Training Corps Participation and Postsecondary Plans. *Journal for the Education of the Gifted*, 45(1), 4–45. <https://doi.org/10.1177/01623532211063937>
 24. Peter Kuchinke, K., Ardichvili, A., Wocken, L., Seo, J., & Bovornusvakool, W. (2022). Leadership development for undergraduate students at U.S. universities: The case for HRD research and practice†. *Human Resource Development Quarterly*, 33(4). <https://doi.org/10.1002/hrdq.21309>
 25. Sattyam, & Sheikh. (2026). High School Infrastructure and Academic Performance Survey Dataset. <https://doi.org/10.5281/zenodo.22065799>