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Effect of Academic Motivation and Demographics on Engineering Students' Program Learning Outcomes

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Abstract:

Academic motivation is essential for achievement of program learning outcomes (PLOs) in every field of education. Present study was conducted to find out the effect of academic motivation and demographics on engineering students' PLOs achievement. Surveys were conducted on 1425 engineering students of public sector universities for academic motivation and PLOs having a part of demographics. Data analysis revealed that academic motivation had statistically significant effect on students' PLOs achievement. Study also yielded higher PLOs achievement by male than female. No difference between the achievement of PLOs by Urban and Rural, day scholar and hostel residing. Engineering teachers are recommended to keep their students motivated to attain better achievement of PLOs. Engineering students are also recommended to use different strategies to make them academically motivated for effective achievement of PLOs.

Key words: *Academic motivation, demographics, program learning outcomes PLOs, engineering education, rural and urban, day scholar and hotel residing*

Introduction

Program learning outcomes (PLOs) are the written statements indicating what the graduate is expected to perform after the completion of a program. PLOs give a clear idea for the success and failure of any program. Learner and teacher both can come on a page by reviewing the stated PLOs. These PLOs function like a navigation tool as GPS. Once a desired or decided destination is given or fed in GPS, that device helps and guides the driver throughout the way. It helps to reach the decided destination without the fear of losing the way. Whenever or wherever the rout is missed, tool helps to join the way leads the decided destination. Similar function is done by PLOs and students' learning outcomes (SLOs) for joining any program or course of study (Wang & Chen, 2025). They work as way or rout for teachers and students to reach the destination.

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Program learning outcomes should be stated clearly in measureable active verbs. Their clear statement mentioned in any program removes the risk of students' time wasting, reduce over stress, have clear idea of their performance required at the end of a course (Warkad et al., 2025). These helpful for teachers equally to plan lesson, arrange teaching materials effective for their achievement, select strategies effective for teaching the content and ideas, avoid extra and unnecessary instruction creating complexity for learners (Yan et al., 2025). PLOs should be designed following the facts that learners should remember the facts well before its understanding, understanding of ideas is necessary before applying in the actual field of life, application should be before the evaluation of ideas (Uzorka & Odebiyi, 2025).

Various factors affect the achievement of students' PLOs. One of them selected for this study is academic motivation. Students academically motivated may have higher academic achievement. When a student is active to learn their academic subjects and want to have higher achievement of students and program learning outcomes by the end of the program or course is defined and comprehended as academic motivation (Thangaraj et al., 2025). It also includes students' self-efficacy, resilience, and determination in their academic learning process.

Students' academic motivation is composed of state motivation and trait motivation (Uzorka & Odebiyi, 2025). State motivation is students' attitude towards a course or subject they are enrolled in. On the other hand, trait motivation is the general tendency of a student towards his learning process. State motivation also strengthens trait motivation. State motivation is affected by the availability of learning facilities, teachers' attitude, their demographics, nature of subject, and its social value etc. (Teferi et al., 2025). A student motivated as per his attitude towards the course studying, would how high academic motivation which ultimately would result higher achievement of program learning outcomes.

Twenty 1st century focuses on outcome based education OBE rather than objectives oriented. Field work and students performance is more demanding component of education rather than what a teacher wants to teach a student. OBE is now the target of education. It must be achieved by adopting different strategies and methodologies. Curriculum and exams along with teaching process must be OBE oriented. OBE can be made successful if a teacher keeps focus on course learning outcomes CLOs and PLOs. Other than teacher's instructional strategies, there are many other factors that have significant role and effect on the achievement of PLOs. In present study academic motivation and demographics which included gender, residence location, day scholars and hostel residing have been selected to find out their effect on the achievement of PLOs by the engineering students. Engineering level education due to its practical significance for the solution of field and practical problems must be OBE. Therefore engineering level of education has been selected in this study.

Review of Literature

Motivation is defined as special ways and acts a person behaves in special circumstances. Motivation is combined function a person's abilities and aspects of personalities as congition, biological traits, and social forces (Susanta et al., 2025). Teferi et al. (2025) state that the term motivation has the origin from the word "motive" which means needs, forces of wants, acts of desires and drives which guide and regulate human acts and behaviors. This is force that enables and drives a person to get something desired and wanted. The driving force behind an action may

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be desire of success, gaining money, getting recognition, achieving job satisfaction; team work etc. Thangaraj et al. (2025) have suggested three steps to be adopted in the process of motivation. At first, it is considered as the need and desire which is felt and derived. Second, this is desire and need which push a person to act in specific way. This action later changes into behavior. The third step is achievement of goals which gives satisfaction to the person who tried for it (Shoaib et al., 2025).

Types of Motivation

It is a state of commitment to achieve goals and get rewards to satiate ones desire is defined as motivation (Shoaib & Ullah, 2026). There are internal and external forces which motivates a person to act specifically for the achievement of desired goal (Shao et al., 2025). It is motivation that enables a person to keeps on struggling for the achievement of goals. The sources from where a person gets motivation are known as types of motivation. If motivation is received from internal motives, it is known as internal motivation. Internal motivation is received when a task is aligned with ones core values and needs. Internal derives are the major sources of internal motivation because internal derives make a person act specifically and without any external incentives (Santos et al., 2025). Intrinsic motivation motivates a person on the basis of self-rewarding factor. For example, a person having motive of cleanliness will keep his surroundings clean and tidy. Having a motive of games person will enjoy games without receiving any rewards. A person enjoys what he has motives. He does not need any reward for that act. Book lovers enjoys reading without getting any external reward and problem solvers will play with puzzles because he has the motive to solve problems (Salari et al., 2025).

When a person is inspired to do outstanding performance in a task to earn award or avoid any type of punishment is type of extrinsic motivation (Mahrishi et al., 2025). Extrinsic motivation is not because you are interested in something but it is because of some award and reward or avoiding some unpleasant thing (Maceiras et al., 2025). Reading specific book to get good grades in exams, cleaning house to avoid reprimand of family members, putting puzzles together to win a prize are all examples of extrinsic motivation (Köse, 2025).

Task completion with accuracy and efficiently needs intrinsic and extrinsic motivation. It is factor that defines type of motivation. If factors are intrinsic, the motives would be intrinsic and if factors belongs to external rewards, the motivation as a result would be extrinsic. Intrinsic motivation is purely internal in nature and extrinsic motivation is external in nature because it depends upon external rewards and benefits (Khan & Sarkar, 2025). Intrinsic motivation is durable and long term. It does not deviate in the way until a person gets the decided results. Internal factors play stronger and effective for the development of motivation rather than just rewards or awards only (Kamberi, 2025). There are some tasks which need intrinsic and extrinsic motivation. These cannot be accomplished without other. Therefore, a person should be motivated intrinsically and extrinsically for effective accomplishment of any task. A student may be motivated extrinsically by giving him grades and intrinsically by clearing the importance of education for his career and profession (Hanik et al., 2025). Hence, in teaching and learning both external and internal factors are important to motivate a student. Motivated students may play their constructive role in the society and become successful in their career. Motivated students might have effective and long life learning which would be beneficial for student and society.

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The factors which motivate a student to learn should be controlled and manipulated for students' effective learning so that they may be effective members of the society and bear good moral and character.

Concept of Outcome Based Education (OBE)

Outcome based education (OBE) is a theory and model that support the idea of student-centered teaching where end of instructional process is focused rather than the previously acquired knowledge. It is against traditional approach of what school is to provide to the students (Kamberi, 2025) rather it requires students to demonstrate what they know. OBE emphasizes setting clear and measurable outcomes of instructional programs (Hanik et al., 2025). Competencies, benchmarks, standards, and student learning outcomes (SLOs) are the basic terms used in OBE (Firdausih & Aslan, 2025). Outcomes are complex statements of knowledge, primary skills, abilities, attitudes, and proficiencies that a student should possess at the end of a specific course of study.

Traditional education system focuses on the resources/content available and provided to the students as an input. On the contrary, OBE focuses on what student can perform in real world. Students' performance in real world is termed as output of what they learnt (Eltahir & Alsalhi, 2025). Outcomes define destination, tools, and methods for reaching the decided destination. Teachers can customize their instructional methods and activities responsive to the distinct needs and requirements of the learners (Chidakwa, 2025). Outcome based education enables students to transform their learning in action to solve real world problems (Brindha, 2020). Assessment process is designed in OBE to measure students' knowledge and ability to perform in actual situation by targeting the standards stated in curriculum (Cao & Huo, 2026). Input in form of hours spent in school, classes taken by the learner, and textbook provided and studied are not the intent of OBE. Rather it focuses outcomes which are measured against the set criterion. Outcomes are concrete and measurable terms as "a student can write 15 lines in a minute" instead "a student enjoys engineering class" (Bahri et al., 2025).

Complete system of outcomes in OBE usually includes everything but mere recalling facts and defining figures, enlist five principles of natural sciences (Chidakwa, 2025). Its performance covers complex analysis and interpretation of situation i e. analyze and solve complex engineering problems. Each educational agency like school, college, and university is responsible to set its measurable and quantifiable learning outcomes which may include skills rather than inputs like field trips, teaching style, or arrangement of any day etc.

Approach of OBE to reporting, grading, promotion is external rather than relative achievements. Students' performance is assessed against the set external criterion that is outcome (Cao & Huo, 2026). Traditional system of grading on curve is never appreciated and accepted in OBE because in curve system students on the top get high or good grades and worst students normally get failed even they know all the taught material. Others are distributed evenly on the curve have fair grades (At-tamimy & Eloy, 2025).

In OBE system of education student performance is evaluated against the absolute term. For example, student can interpret results and find out valid solution of complex engineering problems. OBE system suggests that if a student meets the said standard level, it is predicted that he/she possess the skill and ability to perform at that standard in real world situation. After such

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evaluation, student under OBE system is promoted to the next grade level which is his achievement (Bahri et al., 2025). This system of education gives more accurate and standard information to the school, students, and parents regarding the skills, competencies, performance, and weaknesses of a learner.

Objectives

The present study was conducted to:

1. Find out the effect of engineering students' academic motivation on their program learning outcomes.
2. Find out the effect of engineering students' demographic – area of residence on their program learning outcomes.
3. Find out the effect of engineering students demographic – gender on their program learning outcomes.
4. Find out the effect of engineering students' demographic – student ship on their program learning outcomes.

Hypotheses

Study endeavored to test the following null hypotheses:

Ho1: There is no statistically significant effect of engineering students' academic motivation on their program learning outcomes.

Ho2: There is no statistically significant effect of engineering students' demographic – area of residence on their program learning outcomes.

Ho3: There is no statistically significant effect of engineering students' demographic – gender on their program learning outcomes.

Ho4: There is no statistically significant effect of engineering students' demographic – student ship on their program learning outcomes.

Methodology

Current study was conducted through survey. It falls in quantitative research paradigm which suggests that reality can be measured through numbers only. A survey was developed to collect data for engineering students' academic motivation and their demographics. Survey consisted on two sections. First section was on engineering students' demographics and second was on their academic motivation. Academic motivation survey was developed on five-point rating scale having 28 statements measuring engineering students' intrinsic, extrinsic, state and trait motivation. The survey was validated by the two experts having expertise in psychology and research. Pilot testing also revealed .90 reliability measures which was recommended for strong reliability of any survey or research tool.

Second survey was conducted for the measurement of Program Learning Outcomes (PLOs). This survey was developed focusing twelve Graduates Attributes (GAs) which were the targeted program learning outcomes stated in manual of accreditation by Pakistan engineering council. Survey was of five point Likert scale. Its validity report yielded .80 measures which were recommended as good for a research survey.

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The population of the study was engineering students from public sector universities of the province of the Punjab, Pakistan. Fourteen hundred and twenty-five students of 1st and 4th semesters in different engineering disciplines like chemical, electrical etc. were the sample of the study.

Collected data were analyzed by applying ANOVA and independent samples t-test. The detail of data analysis and its inferences are presented in the section of data analysis given below.

Data Analysis

Data analysis has been presented in the following tables along with their inferences. Following statistical values reveal the mean based comparison of variables to test the research hypotheses.

Ho1: There is no statistically significant effect of engineering students' academic motivation on their program learning outcomes.

Table 1

Paired Samples t-test Comparison of Academic Motivation and Program Learning Outcomes of Engineering Students

Groups	Mean	SD	t	df	Sig(2.tailed)
Academic Motivation(AM)	3.60	.549	14.051	1413	.000
Program Learning Outcomes (PLOs)	3.89	.523			

Note: n=1414, p=0.05

Table 1 comprises on statistical values resulted from paired samples t test mean comparison of academic motivation and program learning outcomes of engineering students. Comparison shows that academic motivation has statistically significant effect on engineering students' program learning outcomes as (mean=3.89, SD=.523) than academic motivation as (mean=3.60, SD=.549) conditioned t(1413)=14.051, p=.000). So, the hypothesis "Ho1: There is no statistically significant effect of engineering students' academic motivation on their program learning outcomes" is failed to support and an alternate hypothesis is stated as "H_1: There is no statistically significant effect of engineering students' academic motivation on their program learning outcomes". It is inferred that engineering students' academic motivation leaves positive effect on their program learning outcomes. Academically more motivated engineering students, show higher achievement in PLOs.

Table 2

Demographics-Area of Residence (Urban/Rural) Based Comparison of Engineering Students' Program Learning Outcomes (PLOs)

Area of Residence	N	Mean	SD	SS	df	F	Sig.
Urban	857	3.90	.51				
Rural	568	3.88	.53				
Between Groups				.092	1	.33	.562
Within Groups				390.15	1423		

Note: n=1425, p=.05

Table 2 is for the statistical values gained from one-way ANOVA test conducted to measure the effect of engineering students' demographics-area of residence on their program learning outcomes. Statistics reveals that area of residence (urban or rural) does not have

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statistically significant effect on engineering students PLOs attainment at the p>.05 with the condition [F(1, 1423) = .33, p = .562]. Engineering students belonging urban locality do not differ statistically significantly (M = 3.90, SD = .51) than the engineering students living in rural area as (M = 3.88, SD = .53) for the attainment of PLOs. So the hypothesis "Ho: There is no statistically significant effect of engineering students' demographic – area of residence on their program learning outcomes" is supported and concluded that engineering students either living in urban area or rural show equal performance for the attainment of PLOs.

Table 3
Demographics-Gender Based Comparison of Engineering Students' Program Learning Outcomes (PLOs)

Groups	Mean	SD	SS	df	F	Sig.
Male	3.92	.52				
Female	3.76	.48				
Between Groups			4.96	1	18.34	.000
Within Groups			385.27	1423		

Note: n=1425, p=.05

Table 3 shows that one-way ANOVA was calculated to compare the effect of demographics-gender on engineering students' program learning outcomes (PLOs). There is statistically significant effect of engineering students' demographics-gender on their program learning outcomes at the p<.05 for the conditions [F(1, 1423) = 18.34, p = .000]. Analysis of Variance revealed that male gender was statistically different (M=3.92, SD=.52) from female as (M =3.76, SD= .48). Together these statistical results suggest that there is effect of demographics-gender of engineering students on their program leaning outcomes (PLOs).It is summarized that male engineering students have higher achievement of PLOs than female engineering students. So, the hypothesis "Ho: There is no statistically significant effect of engineering students' demographic – gender on their program learning outcomes" failed to support and an alternate hypothesis "H_1: There is no statistically significant effect of engineering students' demographic – gender on their program learning outcomes" is supported and concluded that male and female engineering students gain PLOs.

Table 4
Demographics-Studentship (Day scholar/Resident of Hostel) Based Comparison of Engineering Students' Program Learning Outcomes (PLOs)

Academy Coaching	N	Mean	SD	SS	df	F	Sig.
Day Scholar	680	3.87	.51				
Resident of Hostel	745	3.91	.53				
Between Groups				.688	1	2.513	.113
Within Groups				389.55	1423		

Note: n=1425, p=.05

Table 4 is about the values taken from one-way ANOVA statistics for the measurement of effect of demographics- studentship (Day scholar/Resident of Hostel) on engineering students' PLOs attainment. Values yield that there is no statistical significant effect of demographics-studentship (Day scholar/Resident of Hostel) on engineering students' PLOs achievement at the

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p>.05 with the condition [F(1, 1423) = 2.513, p = .113]. Studentship either day scholar or resident of hostel does not have a different effect on engineering students' PLOs attainment as day scholar (M = 3.87, SD = .51), from resident of hostel (M = 3.91, SD = .53). So, the hypothesis "Ho: There is no statistically significant effect of engineering students' demographic – student ship on their program learning outcomes" is supported and concluded that studentship (day scholar or resident of hostel) does not have different effect on engineering students' PLOs attainment. Engineering students either are day scholar or resident of hostel show equal performance for the attainment of PLOs at engineering level of education. It does not matter either engineering student resides in hostel or comes from his/her home on daily basis. Both, day scholar and resident of hostel, have equal PLOs' achievement at engineering level of education.

The above results can be summarized as below:

1. Engineering students' academic motivation has statistically significant effect on their program learning outcome PLOs. Highly motivated students have higher achievement of program learning outcomes.
2. As per area of residence, no difference between their achievements of program learning outcomes PLOs was found. Both rural and urban residing engineering students have the same achievement in program learning outcomes PLOs.
3. Gender revealed difference in the program learning outcomes' achievement. Male engineering students showed higher achievement as compared with female engineering students. The statistical results showed statistically significant difference between male and female engineering students PLOs achievement.
4. Another finding of the study is that both day scholar and resident of hostel have statistically non-significant difference in the achievement of their achievement of engineering level program learning outcomes.

Discussion

Study was aimed to find out the effect of academic motivation and demographics on engineering students program learning outcomes. Students' academic motivation is vital for learning. There is no learning without motivation. Motivation at all level of education plays significant role in students' learning. Other important thing which affects students learning and achievement is their demographics. Teacher should control students' demographics at their maximum level for higher program learning outcomes' achievement.

Study results "students' academic motivation has statistically significant effect on the achievement of engineering students' program learning outcomes" are consistent with Cao and Huo (2026) and Bahri et al. (2025). Similarly, Eltahir and Alsalhi (2025) have recommended the academic motivation for higher academic achievement. Another finding of the study "male engineering students' have higher program learning outcomes' achievement" is supported by Firdausih and Aslan (2025) and Eltahir and Alsalhi (2025). This finding is also supported by the studies Hanik et al. (2025) and Shebani et al. (2025) that suggested the findings as male students had increased natural abilities to solve the complex engineering problems than female engineering students.

At the same time the finding of this study that engineering students have no difference in their program learning achievement due to their area of residence. Urban and rural students have

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the same level of PLOs achievement. Similar findings were reported by Shoaib and Ullah (2026), Shoaib et al. (2025), and Susanta et al. (2025).

Two type of scholars study in universities. The first type is of those who commute university on daily basis from their homes. Second type of scholars is of those who reside in university hostel. Study findings revealed that both day scholars and hotel residing had equal PLOs achievement. This finding is supported and reported by Teferi et al. (2025) and Thangaraj et al. (2025). There is no effect of commuting on engineering students' PLOs achievement.

Previous studies have reported strong relationship between students' demographics and their academic achievement. Uzorka and Odebiyi (2025) reported that students area of residence or area of belonging, socio-economic position, parental level of education, gender and status of disability have statistically significant effect on their program learning outcomes' achievement. Similar results were reported by Wang and Chen (2025) and Warkad et al. (2025). On the other hand, Yan et al. (2025) reported that students' demographics have significant effect on students' academic achievement.

Students' academic motivation is also related to their academic achievement. Susanta et al. (2025) reported that students' academic motivation influences their achievement and modification of behavior. Teachers should use strategies which motivate students to learn and achieve their program learning outcomes. No learning can take place without motivation. Considering the fact, students should be motivated for learning. Effective learning may be ensured by developing students' academic motivation and controlling their demographics.

Conclusion

The findings are concluded that academic motivation is required for higher program learning outcomes' achievement. Engineering students should be motivated academically for better PLOs achievement. Their interest should be developed in their courses of study. Students should be given clear vision and destination about the set program learning outcomes. It is further concluded that students either residing in urban or rural area have equal achievement in program learning outcomes. Their residence does not have any effect on the achievement of their PLOs at engineering level of education. Therefore, students' residing location (urban/rural) should not be given any extra privilege. Both should be given equal prestige in teaching learning process at engineering level of education. Findings of the study reveal that gender has significant difference in program learning outcomes achievement. Male gender is higher than female in the achievement of PLOs. Gender inequality because of natural abilities must be kept in mind at engineering level of education. Both male and female engineering students cannot perform equally in the attainment of PLOs. On the other hand day scholars and hostel residing have no difference in their achievement of program learning outcomes. So, the engineering students may reside in hostel or commute on daily basis from their homes will have equal achievement of PLOs.

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Recommendations

Recommendations for the present study are stated as following:

1. Teachers teaching at engineering level are recommended to use strategies to motivate their engineering students academically to have higher achievement of their program learning outcomes.
2. Students of engineering programs are recommended to adopt such strategies which may be helpful to motivate them academically for higher achievement in program learning outcomes.
3. University administration is recommended to provide equal opportunities to both urban and rural residing engineering students. None should be given more privilege because both have the equal performance in the achievement of program learning outcomes.
4. Female students naturally are less competent enough to solve complex engineering problems. Their natural ability must be kept in mind during teaching learning process at this level. Female students need to be encouraged to carry on at their natural pace of learning.
5. On the basis of higher achievement of program learning outcomes male students should be given more privilege for higher and competitive opportunities and female engineering students should be encouraged to have higher achievement by adopting various effective strategies. Engineering teachers are recommended not to let female engineering students consider themselves inferior in the achievement of PLOs. They should be advised and supported as per their need and requirement to have higher academic achievement.
6. Day scholars – coming from their homes on daily basis and hostel residing engineering students should be treated equally for providing them higher opportunities because both have the same academic achievement. No difference should be observed between day scholars and hostel residing engineering students.

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