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JOURNAL INDUSTRIAL SERVICESS

journal homepage: http://jurnal.untirta.ac.id/index.php/jiss

eISSN 2461-0631

Original research article

Enhancing engineering student retention at Indonesian private university through improved interpersonal interactions and social integration

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ARTICLE INFO

Article history:
Received 18 November 2024
Received in revised form 12 March 2025
Accepted 23 March 2025
Published online 11 April 2025

Keywords:
Binary logistic regression
Commitment
Engineering
Interpersonal interaction
Private university
Social integration

Editor:
Bobby Kurniawan

Publisher's note:
The publisher remains neutral concerning jurisdictional claims in published maps and institutional affiliations.

ABSTRACT

The high dropout rate among engineering students in Indonesia, particularly at private universities, sets the stage for this research. We explored how interpersonal interaction and social integration influence students' commitment to finishing their degrees. To do this, we collected data through a questionnaire distributed to engineering students at a private university, focusing specifically on those who had just completed their first semester. In total, we gathered 101 responses. Our analysis, using binary logistic regression, revealed two key factors that positively impact student commitment: CSIMILAR, representing a sense of similarity or connection among peers, and CORGPROG, indicating involvement in program-level activities such as student associations, comparative studies, or new student orientations. Further analysis using crosstabulations and correspondence analysis helped clarify the relationship patterns between these factors and other variables. Based on these findings, we recommend that engineering faculty and study program management actively develop various activity groups and organize a diverse range of student events, as these efforts should help strengthen students' commitment to completing their studies.

1. Introduction

A country's progress depends heavily on its people, especially the active role of young individuals who apply and develop diverse knowledge and skills. That's why higher education plays a crucial role in preparing youth—the nation's most asset—to drive development [1]. As a developing nation, Indonesia relies significantly on its young people to transition into a developed country. Like many nations, Indonesia's growth demands a blend of sciences and skills, with engineering standing out as a key field. High school students in Indonesia show strong interest in pursuing engineering, ranking it fourth among preferred fields of study. However, 18.34% of these students drop out, making engineering the third-highest field for dropouts [2]. Private universities contribute the most to this rate, accounting for 8%, compared to just 2% at state universities [2]. This gap exists because state universities are often seen as superior in educational quality and industry recognition. Many students turn to private universities only after failing to get into public ones, and some even reapply to their dream public university the following year if rejected initially [3]. As a result, engineering faculties at private universities in Indonesia face significant challenges in ensuring their students complete their degrees.

Talar and Gozaly's research, conducted at engineering faculties of a private university in Indonesia, shows that student retention depends on satisfaction with close social relationships among peers and GPA [3]. In their study, they categorized retention into four groups: Persisters (students who follow the curriculum as planned), Slow-Downs (students who continue but take fewer courses), Stop-Outs (students who take a break but intend to return), and Leavers (students who drop out permanently). Achieving a Persister category requires balancing satisfaction with peer relationships and GPA; low satisfaction with these social bonds often leads to students becoming Leavers [3]. These findings align with Tinto's research, which delves deeply into student retention in higher education and highlight academic and social integration as key factors [4].

This study is based on [3], focusing on the socialization process of engineering students at private

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http://dx.doi.org/10.62870/jiss.v11i1.29673

universities. Its main goal is to help faculty leaders strengthen students' social relationships with peers, boosting their commitment to completing their degrees. The research adopts Weidman's conceptual model of Organizational Socialization of Students in Higher Education, which examines the Input-Environment-Socialization Output framework [5]. In Weidman's model, Input refers to prospective students' attributes, such as family background, beliefs, values, and prior academic preparation. Environment reflects the organizational structure and normative context of higher education institutions, shaping students through socialization processes—specifically interpersonal interactions and social integration—and learning, which ties them to the core academic setting. Socialization Outcomes capture the changes in students' knowledge, skills, and character during their college years.

Following the findings from [3], this study narrows its scope to the Environment, specifically the socialization process within private university engineering faculties, focusing on interpersonal interactions, social integration, and their impact on students' commitment to graduating. Learning is excluded here, as it pertains to student-program or faculty relationships, which isn't our focus. Students' commitment to finishing college is assessed using Pascarella and Terenzini's [6] Institutional and Goal Commitment factors, which evaluate dedication to graduating, confidence in their choices, and related aspects. This framework aligns closely with Talar and Gozaly's work on improving retention [3], aiming for timely graduation from engineering programs with strong GPAs.

Research has been conducted on the influence of student socialization processes on university retention and has provided mixed results. Research by [7] shows that Social Integration has a direct influence on commitment. The socialization process that occurs between students in a learning community has been proven to significantly influence GPA, student retention, and academic performance of first-year students [8]. Socially healthy students (for example active in organizations) have higher GPA scores than students who are not active in organizations [9]. However, research conducted by Ishitani [10] shows that for first-year students, social integration (student activity in various non-academic clubs on campus) does not significantly influence the student's persistence in the second year, while academic integration (student participation in group work activities, the relationship between students and faculty/study programs/lecturers) has a significant influence. Various factors can encourage student social integration, namely through interactions between faculty and students, interactions with peers, extracurricular activities, campus life, and social networking sites [11].

Although plenty of prior research has explored how the student socialization process affects retention, no study has examined its impact on the commitment of engineering students at private universities in Indonesia, which differ significantly from public universities in their characteristics.

This research is essential to assist leaders of engineering faculties at private universities in Indonesia in boosting students' commitment to graduating on time with strong GPAs, enhancing the sustainability of these faculties, and ultimately contributing to the education of young people driving Indonesia's development.

2. Material and method

2.1. Research model

The model used in this research is shown in Fig. 1. This study builds on [3] findings that retention among engineering students at private universities in Indonesia is influenced by satisfaction with close peer relationships and GPA. Therefore, this research focuses solely on how variables from the Interpersonal Interaction and Social Integration dimensions affect the Commitment dimension of these students. Based on research by [3], it is hypothesized that variables from the Interpersonal Interaction dimension and the Social Integration of students will positively influence the Commitment of engineering students at private universities in Indonesia. The hypothesis structure used in this study is as follows:

H_{01} : The Interpersonal Interaction dimension indicators do not have a significant effect on Commitment.

H_{a1} : The Interpersonal Interaction dimension indicators have a significant effect on Commitment.

H_{02} : The Social Integration dimension indicators do not have a significant effect on Commitment.

H_{a2} : The Social Integration dimension indicators have a significant effect on Commitment.

2.2. Research variables

This research examines how Interpersonal Interaction and Social Integration variables affect student commitment, using independent and dependent variables. The independent variables include indicators from Interpersonal Interaction (student-to-student interaction questions) and Social Integration (questions on academic and campus social integration). Indicators from the Commitment dimension are the dependent variables that measure students' commitment to completing college. The indicators of the Commitment dimension and Interpersonal Interaction dimension used for this research were measured using several questions adapted from the Institutional Integration Scale (IIS) compiled by Pascarella and Terenzini [6]. The Interpersonal Interaction dimension indicator, as an independent variable, measures how students perceive their social relationships with their peers.

Table 1.
Interpersonal Interaction dimension indicator (independent variables)

Variable name	Statement
CPERSONALREL	Since studying at the engineering faculty at X University, I have built close personal relationships with other students.
CSATREL	I feel satisfied with the friendships with other fellow students that I have built.
CSTUINFCHAR	My relationships with peers have positively shaped my personal development, behavior, and character.
CSTUINFINT	My relationships with fellow students have had a positive influence on my intellectual development and interests.
CEASYREL	I easily make friends with other fellow students.
CHELP	When I have personal problems, there are many fellow students that I know who will listen and help me.
CSIMILAR	Many students at X University have similar characteristics and behavior to me.
CGOODTIME	Generally, I had a fun time with my fellow students.
CHELPSTUDY	My fellow students and I often help each other with lectures.

Table 2.
Social Integration dimension indicator (independent variables)

Variable	Statement
CEXT	Student participation in extracurricular activities on campus.
CORGPROG	Student involvement in study program activities (e.g., associations, comparative studies, new student orientation).
CORGFAC	Student involvement in faculty-level activities (e.g., sports week, new student orientation).
CORGUNIV	Student involvement in university-level activities (e.g., campus introduction).
CACAD	Student involvement in academic activities beyond lectures (e.g., competitions, practicum or teaching assistants).
CAVGSTUDY	Average frequency of studying together outside of class with other students (in 1 week).

Table 3.
Commitment dimension indicator (dependent variables)

Variable	Statement
CRIGHTDEC	I am confident that I made the right decision in choosing to study at the engineering faculty of X University.
CGRAD	It is important for me to graduate from the engineering faculty of X University.
CONTIME	Graduating college on time is important to me.
CGRADE	Getting good grades is important to me.

Table 4.
Respondents' profile

Variable	Statement
CGENDER	Gender (Male/code 1, Female/code 2)
CYEAR	Year (2016 and previous/code 1, 2017/code 2, 2018/code 3, 2019/code 4, 2020/code 5, 2021/code 6, 2022/code 7)
CGPA	GPA (do not have GPA/code 0, GPA < 2.00/code 1, GPA: 2.01 – 2.75/code 2, GPA: 2.76 – 3.50/code 3, GPA > 3.50/code 4)

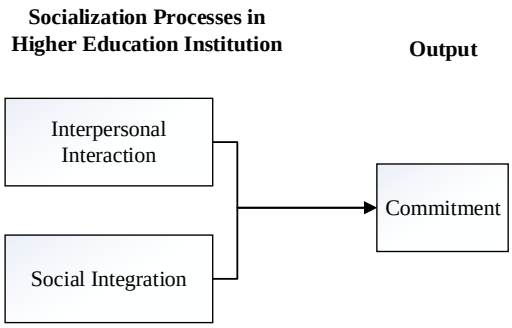

Figure 1. Research model

The quality of interpersonal interactions among students in college is recognized as one of the key factors contributing to student satisfaction and success throughout the learning process [12], [13]. Interpersonal Interaction dimension indicators can be seen in Table 1. To evaluate the Interpersonal Interaction dimension, student respondents were asked to select the most fitting response based on their experiences interacting with peers, using a Likert Scale for measurement. The scale includes four options: Strongly Disagree (weighted 1), Disagree (weighted 2), Agree (weighted 3), and Strongly Agree (weighted 4).

To assess the Social Integration dimension, respondents were asked to select the most appropriate answer based on their current experiences. The measurement for the CEXT, CORGPROG, CORGFAC, CORGUNIV, and CACAD variables uses the Guttman Scale: "Doesn't follow" (weight 0) and "Follows" (weight 1). Meanwhile, the CAVGSTUDY variable is measured with options: Rarely (code 1), 1-2 times (code 2), 3-4

times (code 3), 5-6 times (code 4), and Not Sure (code 5). Commitment to the institution reflects employees' resilience, motivation, and interest in working for the organization [14]. In this study, student commitment to the university is demonstrated by their determination to graduate on time with strong grades. The Commitment dimension, as the dependent variable, is detailed in Table 3.

To assess the Commitment dimension indicator, respondents were asked to select the most appropriate answer based on their feelings, using a Likert Scale for measurement. This scale includes four options: Strongly Disagree (weight 1), Disagree (weight 2), Agree (weight 3), and Strongly Agree (weight 4). In addition to the dependent and independent variables mentioned earlier, this study also includes several questions about the respondents' profiles, detailed in Table 4.

2.3. Data collection and processing

The data for this research was collected through a questionnaire. Questionnaires were distributed using a purposive sampling technique, targeting students from each study program at the engineering faculty of X University (Civil Engineering, Electrical Engineering, Industrial Engineering, and Computer Systems) who had completed at least one semester.

Data collected through questionnaires is processed using several data processing methods, as follows:

1. Preparing data, namely removing data outliers, and testing validity and reliability.
2. Descriptive statistical processing for profile data, independent variables, and dependent variables.
3. In this research, Binary Logistic Regression Analysis processing is used to look for the influence of independent variables on the dependent variable, because the dependent variable is on a non-metric scale, while the independent variables are on a metric and non-metric scale [15], namely:
   - Student Commitment Indicator (COMCAT) as the dependent variable (non-metric).
   - Indicators of the Interpersonal Interaction (metric), Social Integration (non-metric), and Student Profile (non-metric) dimensions as independent variables.
4. Crosstabulations processing to look for significant relationship patterns between independent variables that influence Commitment (based on Binary Logistic Regression Analysis processing) and other variables.
5. Mapping the relationship pattern of Crosstabulation results using Correspondence Analysis [15].

3. Results and discussions

3.1. Data preparation

Questionnaires were collected from 101 students in the Civil Engineering, Electrical Engineering, Industrial Engineering, and Computer Systems study programs.

Table 5.
Variables in the equation

Step	Variable	B	S.E.	Wald	df	Sig.
1[a]	CORGPROG(1)	3.166	.586	29.182	1	.000
	Constant	-.799	.401	3.958	1	.047
2[b]	CSIMILAR	1.273	.513	6.151	1	.013
	CORGPROG(1)	3.495	.675	26.841	1	.000
	Constant	-4.091	1.440	8.074	1	.004

a. Variable(s) entered on step 1: CORGPROG.
b. Variable(s) entered on step 2: CSIMILAR.

Before the main processing, is carried out, the independent and dependent variables are prepared first, namely cleaning of outlier data, validity, and reliability testing is carried out. This data preparation resulted in 2 data being deleted, namely data from respondents 5 and 9. Thus, the data that could be processed further was 99 respondents.

3.2. Binary logistic regression processing

Binary logistic regression processing is used to find independent variables that have a significant effect on the dependent variable, with non-metric dependent variables and metric/non-metric independent variables. In this research, the independent variables consist of Interpersonal Interaction, Social Integration, Gender, Class, and GPA. The dependent variable is obtained from the average of the four student Commitment indicator variables, then the average Commitment data is grouped into two categories, namely the high and low commitment categories.

The results of Binary Logistic Regression processing show that of the 24 independent variables processed, only 2 variables have a significant effect on Commitment Category (COMCAT), as shown in Step 2 in Table 5. Based on the Step 2 Model, the independent variables that significantly influence the Commitment Category are:

- CSIMILAR: Many students at X University have similar characteristics and behavior to me.
- CORGPROG: Participation in student activities at the study program level (e.g. student associations, comparative studies, new student orientation at the study program level, etc.).

The B coefficient value in Model Step 2 shows that these two variables positively affect Commitment. This means that the more students feel their peers share similar characteristics and behaviors, and the more they participate in study program-level activities, the stronger their commitment to graduating becomes. The Logistic Regression analysis in this study supports the research model, confirming that the Interpersonal Interaction dimension (represented by the CSIMILAR indicator) and the Social Integration dimension (represented by the CORGPROG indicator) significantly influence student commitment. Among these, CORGPROG has a stronger impact on commitment than CSIMILAR, as evidenced by its lower significance value in Table 5.

Table 6.
Model summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	76.875[a]	.313	.457
2	69.728[b]	.361	.527

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Tabel 7.
Classification table[a]

	Observed		Predicted		
			COMCAT		Percentage correct
			LOW COMMITMENT	HIGH COMMITMENT	
Step 1	COMCAT	LOW COMMITMENT	20	6	76.9
		HIGH COMMITMENT	9	64	87.7
	Overall Percentage				84.8
Step 2	COMCAT	LOW COMMITMENT	20	6	76.9
		HIGH COMMITMENT	8	65	89.0
	Overall Percentage				85.9

a. The cut value is .500

Table 8.
Significant relationship between CSIMILAR and other variables

Independent variables	Profile	Crosstabulations	Relationship Pattern from Corresspondence Analysis
CSIMILAR	GPA	Eta = 0.284	Students who feel that their colleagues have similar characteristics, and behavior will have a higher GPA, namely above 2.75.
	CEASYREL	Pearson Chi Square = 0.017*	The relationship that occurs is the opposite, namely the more students feel that their colleagues have similar character and behavior, the more difficult it is for students to form friendships with these colleagues.

Note: * significant at $\alpha = 0.05$

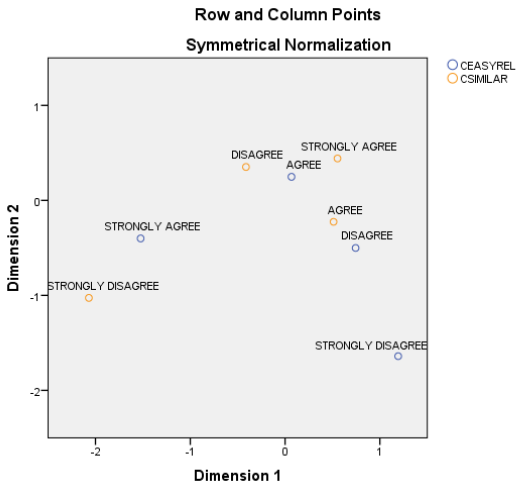

Figure 2. Perceptual map pattern of relationship between CMILAR dan CEASYREL

The critical role of student involvement in campus activities has been widely studied and proven; students active in organizations show higher retention rates than those who aren't [16]. While students may not fully realize how extracurricular activities affect their graduation, these organizations play a key role in connecting them to university life [17]. This study's findings—that greater similarity in peer characteristics and behavior boosts commitment to graduating with a good GPA—align with Sher et al.'s [18] research on study habits and academic performance, which highlights a strong link between consistent habits and better grades. Grouping students with peers who share similar study habits can enhance academic outcomes.

CSIMILAR and CORGPROG explain 52.7% of Commitment and show a high classification accuracy of 85.9%, as presented in Tables 6 and 7. This high accuracy indicates that the Binary Logistic Regression model developed in this study is reliable. By understanding students' perceptions of how similar their peers' characteristics and behaviors are, combined with data on their participation in study program activities, we can predict with 85.9% accuracy whether a student has high or low commitment to graduating on time with good grades. The strongest commitment emerges when a student is active in study program activities and perceives their peers' characteristics and behaviors as like their own.

Data processing was continued with Crosstabulations and Correspondence Analysis to determine the pattern of relationships between the CSIMILAR and CORGPROG variables and other variables. By understanding these patterns, proposals for engineering faculty leaders can be more specific.

Table 9.
Significant relationship between CORGPROG and other variables

Independent variables	Profile	Sig. Contingency Coefficient	Relationship Pattern from Corresspondence Analysis
CORGPROG	CEXT	0.000132*	All students who are not active in student activities at the study program level are also not active in extracurricular activities.
	CORGFAC	0.000038*	All students who are not active in student activities at the study program level are also not active in student activities at the faculty level.
	CORGUNIV	0.000038*	All students who are not active in student activities at the study program level are also not active in student activities at the university level.
	CACAD	0.000006*	All students who are not active in student activities at the study program level are also not active in academic activities other than studying.

Note: * significant at $\alpha = 0.05$

Table 10.
Descriptive Statistics

Variable	Descriptive Statistics
COMCAT	Modus = 2 (Freq = 73), means High Commitment
CSIMILAR	Mean = 2.5253
CORGPROG	Modus = 2 (Freq = 70), means Aktif

3.3. Crosstabulations and corresspondence analysis

Crosstabulations are used to find out statistically whether there is a relationship between 2 variables. The variables that will be processed by Crosstabulations are 2 independent variables that significantly influence Commitment, namely CSIMILAR, and CORGPROG. Correspondence Analysis is used for further processing of Crosstabulations, namely variables found to be related to Crosstabulations, mapped in a perceptual map so that researchers can get a visual picture of the pattern of relationships that occur. An example of a perceptual map is shown in Fig. 2. Fig. 2 shows an inverse relationship between the CSIMILAR and CEASYREL variables, namely that the more a student feels that his colleague has similar character and behavior, the more difficult it is for him to form friendships with that colleague.

The crosstabulation and correspondence analysis results in Table 8 show relationships between CSIMILAR, CORGPROG, and other variables. The Eta statistic (range: 0–1) measures association strength between the metric variable CSIMILAR and categorical variable GPA, yielding a value of 0.284—indicating a weak but significant positive relationship where students perceiving peer similarity tend to have slightly higher GPAs [19]. Pearson's Chi-Square tests further reveal statistically significant associations ($p < 0.05$), notably between CSIMILAR and CEASYREL ($p = 0.017$), though with an inverse trend: greater perceived peer similarity correlates with more difficulty in forming friendships.

Table 8 reveals that students who perceive their peers as having similar characteristics and behaviors tend to achieve higher GPAs and demonstrate stronger commitment to completing their studies, yet paradoxically struggle to form friendships—a finding that contrasts with prior research [20, 21], where peer similarity typically facilitates friendship formation. This discrepancy warrants further investigation into potential variations across faculties or cultural contexts. Friend selection is critical, as social interactions significantly impact GPA: structured behaviors enhance academic performance [22, 23], whereas risky behaviors diminish it [24].

The Contingency Coefficient, which measures associations between categorical variables, identifies significant relationships in Table 9 (Sig. < 0.05). A lower Sig. value indicates a stronger relationship; here, CORGPROG and CACAD show the strongest linkage, suggesting that students inactive in program-level activities are also less likely to engage in academic pursuits beyond their coursework.

Table 9 reveals that students who don't actively participate in study program-level activities also show low involvement in other activities (extracurriculars, faculty- and university-level student events, and academic tasks beyond lectures), correlating with reduced commitment to completing their studies. This study's findings align with prior research indicating that participation in various student activities positively impacts academic success [25]–[27] and that engagement in organizations boosts academic achievement [28]. Campus activities, especially within the study program, enhance students' social engagement, helping them avoid antisocial tendencies. Antisocial behavior increases the risk of dropping out [16], a concern heightened since the COVID-19 pandemic, which has worsened psychological issues and isolation among students [29].

3.4. Descriptive statistic

Table 10 presents descriptive statistics for the Commitment variable and its influencing factors. The data reveals that most students demonstrate high commitment to graduating on time with good grades (COMCAT mode = 2). While this is positive, further improvement remains possible. Among the significant predictors of Commitment, CSIMILAR shows particular concern with its low mean score of 2.5253 (scale max = 4). In contrast, most students actively participate in program-level student activities (CORGPROG mode = 2).

3.5. Suggestions

The current mean score of the CSIMILAR variable (2.5253 on a 4-point scale) indicates room for improvement in peer similarity perceptions. To enhance student commitment, we recommend increasing this metric through strategic interventions. First, engineering faculties and program leaders should establish diverse student organizations that allow students to self-select into groups matching their personalities, thereby facilitating connections with similar peers. Second, these groups should collaborate on joint activities (e.g., photography clubs partnering with outdoor clubs) to address the counterintuitive finding that students struggle to befriend behaviorally similar peers. This dual approach creates communities of similar-character students while maintaining exposure to diverse peers through collaborative events. Additionally, students should be encouraged to form friendships beyond their immediate circles by participating in cross-disciplinary activities, which research shows benefits social integration and academic performance [22]. These coordinated efforts can simultaneously strengthen peer similarity perceptions while preserving valuable diversity in students' social networks.

University, faculty, and study program leaders must develop a thorough understanding of student interests, needs, and the types of organizations required to support them [17]. Current research indicates that many leaders underestimate the crucial role student organizations play in improving retention rates, suggesting a need for greater awareness of their importance [30].

To boost student participation in program-level activities, engineering faculty and program leaders should actively encourage campus engagement. Effective implementation requires collaboration between academic departments, faculties, and student organizations. Support should encompass four key areas: facilitating beneficial student activities, providing financial assistance, actively promoting events, and recognizing organizing committees. When possible, these activities should include participation from lecturers and staff—for example, through interdepartmental sports competitions. Program leaders working with student organizations should establish a regular schedule of academic and social events each semester to sustain student motivation and facilitate new friendships [30].

Early intervention proves particularly crucial. Participation encouragement should begin during students' first year, with special attention given to those who enrolled at the institution as a secondary choice, as this group demonstrates higher attrition risks [31, 32]. The proposed initiatives—establishing diverse activity units and organizing regular events—will work synergistically to strengthen student commitment to completing their degrees.

This study acknowledges important limitations regarding sample representation. All participants came from a single engineering faculty at a private Indonesian university, which may affect the generalizability of findings. Future research should expand the sample to include multiple engineering faculties across different Indonesian regions to provide more comprehensive insights.

Several promising directions emerge for future research. First, investigating GPA enhancement strategies warrants attention, given its demonstrated significant influence on engineering student retention at private Indonesian universities [3]. Second, applying Rusbult's Investment Model could yield valuable insights by examining commitment through its three constituent factors: satisfaction levels, quality of alternatives, and investment magnitude [33, 34]. Finally, cross-cultural comparisons of friendship formation patterns merit exploration, as this study's counterintuitive finding—students struggling to befriend behaviorally similar peers—contradicts established literature.

4. Conclusions

This research aims to increase the retention of engineering faculty students at private universities in Indonesia, with a case study of the engineering faculty of a private university in Bandung, Indonesia. The variables used in this research are focused on student social relationships, namely student Interpersonal Interaction and Social Integration, and their influence on student commitment to completing studies on time with good grades. The results show that the variables that significantly influence student commitment are CSIMILAR (Many students at X University have similar characteristics and behavior to me) and CORGPROG (Participation in student activities at the study program level (for example, student associations, comparative studies, new student orientation at the study program level, etc.)), where these two variables have a positive effect on student commitment. The proposal given to the engineering faculty and study program leaders to increase students' commitment to completing their studies on time with good grades is to establish various activity units and organize various student activities.

Declaration statement

Yulianti Talar: Conceptualization, Methodology, Writing-Original Draft. Grace Vania: Collecting data. Jimmy Gozaly: Writing-Review & Editing

Acknowledgement

The authors would like to thank Maranatha Christian University for funding this research.

Disclosure statement

The author declares that this manuscript is free from conflict of interest and is processed by applicable

journal provisions and policies to avoid deviations from publication ethics in various forms.

Funding statement

The research was funded by Maranatha Christian University. The funding body had no role in the design of the study, data collection, analysis, or interpretation of the results.

Data availability statement

The authors confirm that the data supporting the findings of this study are available within the article or its supplementary materials.

AI usage statement

This manuscript utilizes generative AI and AI-assisted tools to improve readability and language. All AI-generated content has been reviewed and edited by the authors to ensure accuracy and scientific integrity. The authors take full responsibility for the content and conclusions of this work and disclose the use of AI to maintain transparency and comply with publisher guidelines.

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