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Challenges for increasing the sustainability of engineering faculties: a case study in Indonesian private university

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Article Info

ABSTRACT

In Indonesia, the percentage of students dropping out from private universities is always much higher than that of public universities, and the second-highest number of dropouts comes from the engineering field. This study aims to improve the sustainability of engineering faculty in Indonesian private universities by obtaining variables that affect engineering student retention and finding the pattern for each category of student retention. Data was gathered through a questionnaire from 297 engineering faculty students. The questionnaire consists of 34 independent variables using academic performance, attitudes and satisfaction, academic engagement, social and family support, and four categories of student retention (persister, stop-out, slow-down, leaver) as dependent variables. According to discriminant analysis, grade point average (GPA) and student satisfaction in social relationships with fellow students influence engineering student retention. To increase engineering student retention, increasing student satisfaction in social relations with fellow students needs to be prioritized over GPA because the leaver and stop-out categories have a similar pattern, namely high GPA but low satisfaction with social relations with fellow students. Through this research, several efforts are proposed that need to be made by institutions to improve engineering student retention and the sustainability of engineering faculty in Indonesia.

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1. INTRODUCTION

The success of education is one of the most important things that support the progress of a nation. Countries in the world make various indicators that show the level of success of education. European countries measure the level of educational success in different ways, for example by retention rates, the proportion of higher education entrants who are still registered/still enrolled, drop-out rate, graduation rate, time-to-degree, and others [1]. Research on student retention originated from Tinto's research [2], and after that numerous researchers were interested in researching the topic. Student retention is a strategic issue for both the public and private universities. The level of completion of student studies is important for educational institutions, namely as one of the benchmarks for its success [3]. Students who do not complete school will have negative effects on themselves and their environment. Low student motivation to complete studies can be caused by bad grades, which cause the student to be unable to pass certain courses, and this failure results in student motivation getting worse [4].

Although student retention is widely studied in Europe and America, the topic that focuses on engineering student retention is very limited. There are very few studies that discuss the issue of engineering student retention comprehensively [5] so the documentation of experience, characteristics, and retention of engineering students is very lacking [6]. There is a very high probability that the characteristics of engineering and non-engineering students will be different. This has been proven by several studies comparing engineering and non-engineering students. Research shows that factors that affect the academic performance of engineering students are different from those of non-engineering students. The academic performance of engineering students is influenced by quantitative skills (ACT math, science test score, and placement test score), confidence in mathematics, and computer skills. Meanwhile, the academic performance of non-engineering students is influenced by all academic knowledge [7]. Learning styles that are suitable for engineering and non-engineering students are also different, namely both adopt the accommodator learning style, but engineering students also tend to adopt the diverger style (feel and watch), while non-engineering students lean towards the converger style (think and do) [8]. The strategy applied by the institution should not be applied equally to engineering and non-engineering students but adapted to the characteristics of students so that the strategies can be effective.

Indonesia is one of the biggest countries in Asia. The Indonesian Central Bureau of Statistics States that the total population of Indonesia in 2021 is 272,248,500 people. The organization of higher education in Indonesia consists of 4 groups of coaches, namely religious higher education institutions, government higher education institutions, public higher education, and private higher education. Of the four groups, 66.27% are private universities, and only 2.66% are public universities [9]. One of the parameters that measure the quality of universities in Indonesia is the accreditation rating. Although most universities in Indonesia are provided by the private sector, the results of accreditation show that public universities are considered to have significantly better quality than private universities [10]. The better quality of public universities than private universities and the small number of public universities cause intense competition among high school students who wish to continue their studies in public universities. Currently, what often happens in Indonesia is that students will prioritize admission to a public university, and those who fail to pass the public university entrance examination will study at a private university. It's common for students who have previously attended a private university to take the entrance examination at a public university the following year. If they pass the entrance examination for the public university, they may choose to continue their studies there and leave the private university. In the last 15 years, public universities have increased the proportion of income from students, one of the reasons for this is the decrease in the amount of allocation of funds provided by the government [10]. This condition made private universities feel heavier pressure because they are mostly financed by students through tuition and fees. Research about universities in Thailand and Indonesia shows that Thailand and Indonesia have the same problem, namely private universities are under heavier pressure due to competition with public universities, wherein both countries' public universities have a better reputation than private ones [11], [12].

Apart from competition from other universities, both public and private universities experience high dropout rates problem. Data containing the number of students who drop out in Indonesia can be located in the higher education statistics book published by the directorate general of higher education, ministry of education and culture. The book notes that in 2020, 7% of students did not continue their studies [9]. In previous years, the number of students dropping out of college was 8% in 2019 [13] and 3% in 2018 [14]. There is a big difference between the number of students dropping out nationally at public and private universities, namely 3% vs. 11% in 2020 [9] and 3% versus 12% in 2019 [13]. Furthermore, the second-highest number of dropouts comes from the engineering field group, which is 22.6% [9]. Engineering faculty at private universities have challenges in maintaining sustainability and educating the community more than public universities because the dropout rate at private universities is always far above that of public universities and the engineering dropout rate ranks second highest compared to other disciplines. About 65% of Scopus-indexed research entitled student retention was conducted by researchers located in the United States of America and the rest were conducted by researchers from the United Kingdom, Australia, or Canada. Although not as much as in these countries, the topic of student retention also appears in various non-English-language studies coming from Columbia, France, Norway, and others [15]. Research on student retention in Asia, particularly in engineering, is significantly limited compared to Europe and America. Private universities in Indonesia that have engineering faculty need research that focuses on engineering student retention at private universities so that the efforts and strategies obtained from research can solve the root of the problem.

This study adopted the student retention model from Atif *et al.* [16] and research by Jensen [17] regarding the factors that effect student retention in tertiary institutions. Factors that influence student retention consist of the individual level, institutional level, and social and external levels. The individual level consists of academic performance and attitudes and satisfaction, the institutional level consists of academic engagement, and the social and external level consists of social and family support [17]. Student retention behavior is divided into six categories, namely persister, stop-out, transfer, attainer, drop-out, and slow-down. These six categories of student retention have different behavioral descriptions [16].

The results of this research will enrich research on student retention in Asia, and specifically engineering student retention in Indonesia. Through data processing in this research, it is known the variables that affect engineering student retention at Indonesian private universities and the pattern for each category of student retention. This research also explores students' perspectives regarding the findings of this research. Through this research, several efforts are proposed that need to be made by institutions in order to improve engineering student retention and the sustainability of engineering faculty in Indonesia.

2. METHOD

2.1. Participant

Data in this study were gathered using a questionnaire distributed to engineering faculty students in a private university in Indonesia as a case study, who had attended lectures for at least five semesters so that their retention was able to be assessed to complete the study. Respondents answered 34 questions on the questionnaire. Then, an interview was conducted with several engineering faculty students regarding the findings of this research, to get thoughts from the students' perspective.

2.2. Instrument

This study adopted the student retention model from Atif et al. [16] and Jensen's research [17] which examines the factors influencing student retention in higher education. Factors that influence student retention consist of the individual level (consisting of academic performance and attitudes and satisfaction), institutional level (consisting of academic engagement), and social and external levels (consisting of social and family support) [17]. According to Atif et al. [16], student retention behavior is divided into six categories, namely persister/stayer/retained (students who continue to study until they finish their study), stop-out (students who leave the institution for a certain period and then return to continue their studies), transfer (students who start their studies at one institution and then move to another institution), attainer (students who leave before graduating, after achieving certain goals), drop-out/leaver (students who leave the institution and do not return to finish their studies), and slow-down/part-time (students who take only a few courses).

The research variables in the questionnaire used academic performance, attitudes and satisfaction, academic engagement, and social and family support as the independent variables, and the category of student retention as the dependent variable. This study uses a modification of the retention category from Atif et al. [16] as the dependent variable, whereas Atif's research uses six retention categories, while this research simplifies them into four retention categories. The retention categories are: persisters (students who focus on completing studies according to the study program curriculum), stop-out (students who leave college for a while but will return to complete their studies), slow-down (students who plan to complete their studies, but only contract a few courses per semester), and leaver (students who leave the current study program, either by moving to another study program or resigning).

The independent variable consists of 25 statements regarding: academic performance factor, namely grade point average (GPA), attitudes and satisfaction factors (consisting of attendance rate, student confidence to graduate on time, student confidence to graduate with a satisfactory GPA, student confidence to get a good career after graduation, student satisfaction with faculty/study program (for example satisfaction with opportunities to active engage in learning activities, satisfaction with opportunities to research with lecturers)), academic engagement factors (consist of student pride (as a student in the current study program, or a student at a related university), a sense of belonging to the campus and involvement in the campus community, and a sense of being needed by the campus), social and family support factors (consist of parents' education level, student satisfaction with social relationships, and family support (student satisfaction with family support/lecturers/staff, student satisfaction with social relationships with lecturers/staff/student colleagues)). Most of the questionnaires used a scale of 1 to 4 (1= very dissatisfied to 4=very satisfied or 1=strongly disagree to 4= strongly agree), except for some questions related to student profiles (gender, year of entering college, GPA, financial during college, the average time of attendance on campus, the average time of independent and group study per week, average time for non-academic activities).

2.3. Data collection and analysis

Questionnaires were collected from 297 engineering students. The discriminant analysis method is used to obtain independent variables that affect student retention as dependent variables. in processing discriminant analysis, the four retention categories as dependent variables use a nominal scale, namely persister: code 1, stop-out: code 2, slow-down: code 3, and leaver: code 4. before being processed using discriminant analysis, the GPA data, attendance rate, and parents' education level were processed first using the method of successive interval (MSI), to convert the scale of the three variables, which were previously ordinal scales to interval scales. In addition to the discriminant analysis method, correlation analysis, and descriptive processing were carried out to

obtain a more in-depth picture of the characteristics of retention categories by comparing the average score of the independent variables that have a significant effect on student retention. After that, interviews were conducted with several engineering faculty students regarding the findings of this research, to get thoughts from the students' perspective.

3.   RESULTS AND DISCUSSION
3.1. Preliminary processing results

Before the data from the distribution of the questionnaires were processed using the discriminant analysis method, the validity and reliability were tested first. Two variables are filtered from the validity test, namely the parents' education level and % attendance, while the results of the reliability test show high reliability (0.862). Classical assumption testing is carried out on the variables to be processed using the discriminant analysis method. The classical assumptions used in the discriminant analysis method are normality, linearity, homoscedasticity, and multicollinearity. The results of the classical assumption test leave 15 independent variables that can be further processed using the discriminant analysis method, namely: GPA, confidence to graduate on time (CONF_GRAD_ONTIME), confidence to graduate with a satisfactory GPA (CONF_GRAD_GOOD_GPA), confidence in getting a good career after graduation (CONF_CAREER), satisfaction for opportunities to collaborate and share experiences with other students (OPP_COLL_SHARE), satisfaction for opportunities to discuss with lecturers (opp_discuss), satisfaction with lecturer feedback regarding student progress (feedback), satisfaction for the benefits of course material being taught (COURSE_BENEFIT), satisfaction with the function of supporting work units on campus (for example: student units, extracurriculars, etc) (SUPPORT_UNIT), satisfaction with family support so that students finish college (FAM_SUPPORT), satisfaction with the support from lecturers and all study program staff so that students finish college (LECT_STAFF_SUPPORT), satisfaction with social relations with fellow students (SOCIAL_REL_STUDENTS), proud as a student at a related university (proud_students_univ), a sense of belonging to the campus (SENSE_BELONG_CAMPUS), and a sense of involvement to the campus community (SENSE_INVOLVE_COMMUNITY).

3.2. Discriminant analysis processing results

In this study, discriminant analysis was used to find a unique profile that distinguishes between categories of student retention. From the 15 independent variables that were further processed using discriminant analysis, not all of them are unique profiles that distinguish between categories of student retention. Variables that show unique profiles between categories of student retention are obtained through the first stage of discriminant analysis. Table 1 (test of equality of group means) below shows the results of the first stage of processing discriminant analysis. Unique profiles are indicated by the value of Sig. which is <0.05 in Table 1. Table 1 shows that the variables that show a unique profile so that they will be processed further to the second stage of discriminant analysis consist of 5 independent variables, namely GPA, CONF_GRAD_ONTIME, CONF_CAREER, FAM_SUPPORT, SOCIAL_REL_STUDENTS. The other ten independent variables were not processed in the second stage because they did not show a unique profile that distinguishes between categories of student retention.

Table 1. Test of equality of group means

Variables	Wilks' lambda	F	df1	df2	Sig.
GPA	.922	8.221	3	293	.000
CONF_GRAD_ONTIME	.934	6.923	3	293	.000
CONF_GRAD_GOOD_GPA	.977	2.299	3	293	.078
CONF_CAREER	.971	2.963	3	293	.032
OPP_COLL_SHARE	.990	.966	3	293	.409
OPP_DISCUSS	.982	1.791	3	293	.149
FEEDBACK	.994	.610	3	293	.609
COURSE_BENEFIT	.993	.734	3	293	.533
SUPPORT_UNIT	.997	.248	3	293	.863
FAM_SUPPORT	.974	2.657	3	293	.049
LECT_STAFF_SUPPORT	.977	2.300	3	293	.077
SOCIAL_REL_STUDENTS	.953	4.781	3	293	.003
PROUD_STUDENTS_UNIV	.987	1.266	3	293	.286
SENSE_BELONG_CAMPUS	.986	1.396	3	293	.244
SENSE_INVOLVE_COMMUNITY	.999	.118	3	293	.950

The second phase of discriminant analysis aims to obtain the independent variables which are a unique profile and affect categories of student retention. Table 2 (structure matrix) is one of the results of the second stage of discriminant analysis processing, which shows the correlation value between the independent variables and the

discriminant function formed. Discriminant function is a function formed in discriminant analysis processing, which shows a linear combination of independent variables that separate categories of student retention (as dependent variable) [18]. In this research, two discriminant functions were formed, namely functions 1 and 2.

The independent variable that significantly affects student retention as the dependent variable is the variable that does not have a "b code" in its variable name, namely GPA and SOCIAL_REL_STUDENTS. The other three independent variables (CONF_GRAD_ONTIME, CONF_CAREER, and FAM_SUPPORT) do not significantly affect student retention. It can be seen in Table 2 (structure matrix) that the variables GPA and SOCIAL_REL_STUDENTS have a strong correlation with the discriminant function formed (correlation above 0.4), and variables with "b code" have a weak correlation. The results of discriminant analysis processing in Table 2 show that only 2 independent variables significantly affected student retention, namely GPA (from individual level, academic performance factor) and satisfaction with social relationships with fellow students (from social and external levels, factors social and family support). In this study, the attitudes and satisfaction factor (from the individual level) and the academic engagement factor (from the institutional level) did not significantly affect student retention.

Table 2. Structure matrix

Variables	Function	
	1	2
GPA	.919[*]	-.393
CONF_GRAD_ONTIME[b]	.350[*]	-.073
SOCIAL_REL_STUDENTS	.498	.867[*]
CONF_CAREER[b]	-.140	.269[*]
FAM_SUPPORT[b]	.144	.209[*]

Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions
Variables ordered by absolute size of correlation within function.
*. Largest absolute correlation between each variable and any discriminant function
b. This variable is not used in the analysis.

Table 3 (Wilks' lambda) below shows the results of the significance of the discriminant function formed. Sig. values in Table 3 (Wilks' lambda) is the significance value of the discriminant function hypothesis testing obtained individually and overall. Both Sig values in Table 3 below are 0.05, which is close to the values 0 and 0.007, which means that the discriminant function formed in this study is significant so that the results of the discriminant analysis processing can be trusted.

Table 3. Wilks' lambda

Test of function(s)	Wilks' lambda	Chi-square	df	Sig.
1 through 2	.884	36.017	6	.000
2	.967	9.885	2	.007

3.3. Correlation analysis

Correlation analysis is used to assess the strength of the relationship between two independent variables that significantly effect student retention. In this study, the correlation value used is the eta value, which indicates the strength of the relationship between the nominal scale variable (student retention) and the interval (independent variable). The value of eta correlation can be seen in Table 4 (eta value between independent variables and student retention). The higher the eta value, the stronger the relationship. Table 4 shows that the relationship between GPA and student retention is slightly closer than the relationship between student satisfaction in social relationships with fellow students and student retention.

Table 4. Eta value between independent variables and student retention

Independent variables	Eta value
Satisfaction on social relationships with fellow students (SOCIAL_REL_STUDENTS)	0.22
GPA	0.23

3.4. Characteristics of each category of student retention

The grouping of student retention categories is good if there is no intersection between each group that occurs [19]. Figure 1 (centroid score of the four categories of student retention) shows the four points of

the centroid score of the four categories of student retention, which shows the extent to which each category of student retention is grouped based on the discriminant function formed (functions 1 and 2). The centroid score mapping for each category of student retention in Figure 1 is formed based on discriminant functions 1 and 2, namely based on a linear combination of GPA and SOCIAL_REL_STUDENTS (as independent variables) which separates categories of student retention (as dependent variable). Based on Figure 1, it can be seen that the positions of the centroids for categories 2 (stop-out) and 4 (leaver) are close together, meaning that students from the Stop-out and Leaver categories have similar characteristics because they have similar average scores.
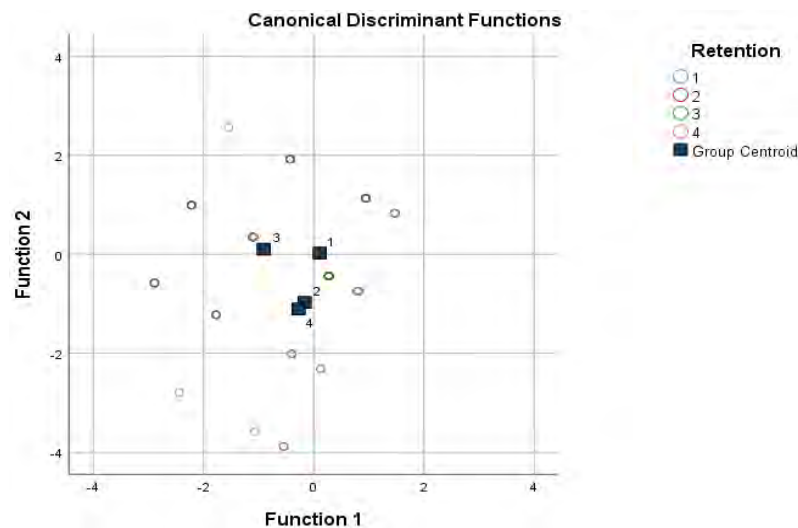

Figure 1. Centroid score of the four categories of student retention

In order to analyze the traits of the four retention categories, we conducted an analysis of the average score of the independent variables that significantly influenced the student retention category. These variables include GPA and satisfaction with social relationships with fellow students (SOCIAL_REL_STUDENTS). The graph of the differences in the average score of the GPA and satisfaction with social relationships with fellow students, for each category of student retention, can be seen in Figure 2 (average score of GPAs and SOCIAL_REL_STUDENS for each category of student retention).
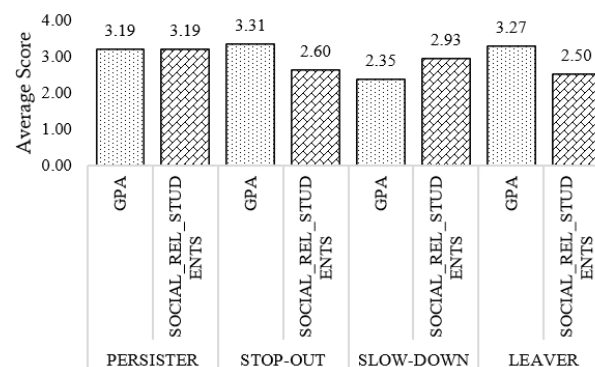

Figure 2. Average score of GPAs and SOCIAL_REL_STUDENTS for each category of student retention

It will be easier to observe through Figure 2 that: students who focus on completing studies according to the study program curriculum (persister) are students with a balanced GPA and satisfaction in social relationships with fellow students, with a score above the number 3. It means that the persister category students have a good GPA and have a high satisfaction score on social relationships with fellow students. Students who leave college for a while but will return to complete their studies (stop-out) and students who leave the current

study program, either by moving to another study program or resigning (leaver) have similar characteristics, namely students with good GPA scores but unsatisfactory social relationships with fellow students. The lowest score of satisfaction on social relationships with fellow students is owned by leaver. Students with the stop-out and leavers include students who can achieve good grades but are not satisfied with their social relationships with fellow students, leading to a lack of motivation to continue their studies. Slow-down students consist of those who plan to complete their studies but enroll in only a few courses per semester. Slow-down students have low GPAs but satisfactory social relationships with fellow students. Despite their intention to continue studying, their low GPA leads them to take fewer courses per semester.

3.5. Discussion and implications

The results of data processing showed that independent variables that have a significant effect on student retention are GPA and student satisfaction in social relationships with fellow students. Correlation analysis showed that the relationship between GPA and student retention was slightly closer than the relationship between student satisfaction in social relationships with fellow students and student retention. It turns out that for engineering students at Indonesian private universities, social relationships with fellow students have as strong an influence as GPA, in determining their retention in completing their studies.

A clear pattern is revealed based on the average score of independent variables significantly affecting student retention. This allows for the identification of the characteristics of each category of student retention in Figure 2 (average score of GPAs and SOCIAL_REL_STUDENTS for each category of student retention). The most ideal student retention category is the persister category. The persister category is students with a GPA and satisfaction in social relationships with fellow students in a balanced score (average score above 3). Stop-out category and leaver have similar characteristics, namely students with good GPAs (GPAs even higher than the persister category) but unsatisfactory in social relationships with fellow students. The slow-down category is a student who is unable to achieve good grades (indicated by a low GPA) but has satisfactory social relationships with fellow students. The characteristics of stop-outs and leavers are similar because stop-out students have the potential to become leavers. Often students who initially planned to take a leave of absence for a moment, do not continue their studies for various reasons. Figure 2 shows the importance of student satisfaction in social relationships with fellow students to keep students continuing their studies until they are finished. Even if the students have a low GPA, if they have high satisfaction with social relationships with their fellow students, they will still be motivated to continue their studies until completion. The results of interviews with engineering faculty students stated that one of the reasons stop-out students do not continue their studies is because they feel left behind by their classmates and feel awkward when they have to study together with younger students. Apart from that, the results of interviews with engineering faculty students also stated that the possibility of a student becoming a leaver is in the first and second semester (the beginning of college) because at that time they are faced with major changes, namely the transition from high school to college. Students who are unable to adapt often give up at the start of the course.

The characteristics of the leaver category based on this research do not follow asavisanu's research results [11]. Asavisanu [11] stated that students with low scores often voluntarily dropped out, and the inability of students to complete their studies was indicated by low scores. In this study, the characteristic of a leaver is not a low GPA, but a low satisfaction in social relationships with fellow students. The results of interviews with engineering faculty students stated that students who have a good GPA but are not satisfied with their social relationships with fellow students will feel uncomfortable when they have to connect with other students. For them, social relationships with fellow students cause stress and a lack of self-confidence because it will continue for at least four years of college, causing that student to decide not to continue their studies (leaver). Furthermore, the engineering faculty students stated that good social relationships with fellow students reduced mental burdens. They stated that studying at the engineering faculty was already hard enough, so don't add to the mental burden of not having friends. Apart from that, engineering faculty students also think that a balance between GPA and social relationships with fellow students is also important in college life and the student's future, where GPA is seen as an entry ticket to several academic and non-academic organizations (for example, becoming a laboratory assistant, student association), the ease of students obtaining information during college, as well as the ease of getting a job after graduating from college. Good social relationships with fellow students will make life easier during college by helping each other and encouraging and motivating each other. Apart from that, friends can encourage students to have a healthy sense of competition, so that they always try to be better.

The interview results also showed that engineering faculty students agreed that GPA and student satisfaction in social relationships with fellow students influenced their retention in completing college, and also influenced retention in completing school during high school and middle school. To achieve a good GPA, a student needs cooperation with other students. The large number of practicums carried out in group form requires good communication skills and the ability to collaborate with other students because there will be a

lot of discussion, tasks, and group work. Students who are unable to socialize with other students will experience difficulties during practicums and group work. The results of interviews with engineering faculty students even stated that the motivation to carry out practical assignments and reports was felt to be much higher when done together with fellow students, compared to when done alone. Students from the engineering faculty that were interviewed stated that poor social relationships with fellow students would reduce morale due to lack of support, and the feeling of loneliness, especially in carrying out activities that were usually done with friends (group assignments). Students and their colleagues can motivate and help each other, encourage and strengthen each other. Lack of social relationships with fellow students will reduce students' motivation to attend lectures even though the students can understand the lecture material presented by the lecturer. Apart from that, students who have poor social relationships with fellow students sometimes miss out on important information that is useful when studying.

Apart from the results of interviews with engineering students, the effect of student satisfaction in social relationships with fellow students is also supported by many similar previous research results. Roberts and Styron [20] state that student persistence is strongly influenced by students' social integration and relationships with others (especially with fellow students). In their research, it was found that social connectedness had the greatest influence on the group of students in the southern region of the United States who continued their studies or did not continue their studies [20]. Student satisfaction in social relations with fellow students has also been shown to have a significant effect on the retention of Indonesian students [12]. The results of this study also support the research of French *et al.* [21] which states that persistence in engineering students from large U.S. midwestern universities is related to student academic achievement (including GPA) and motivation [21].

Watterson and Carnegie [22] stated that one of the variables that significantly affect student retention is that students do not feel engaged with the faculty and have a low sense of belonging. Marra *et al.* [23] also stated in their research that one of the variables that influence students' decisions to leave the engineering faculty is a lack of sense of belonging [23]. However, different results were found in this study because the sense of belonging to the campus and the sense of involvement in the campus community had no significant effect on student retention. In this study, the level of parental education did not significantly affect student retention. This is not in line with the results of Nandeshwar's research [24] and Hall *et al.* [25] who state that the retention rate of students who have parents with higher income will be better than students with lower income parents [24], because students from higher socio-economic backgrounds tend to get more encouragement from their families to study in the field of engineering [25].

3.6. Proposal to improve grade point average

GPA is a form of student academic performance. One of the efforts to increase GPA is to increase students' academic self-efficacy. According to Bandura, in Nicholson *et al.* [26], academic self-efficacy is related to future orientation, and cognitive judgments of competence. Faculty can design tutorial programs for students because tutorials can increase student confidence, as well as improve student grades [26]. Tutorial programs can be scheduled for certain courses that have a high level of difficulty or have the highest percentage of failures. The technical implementation of the tutorial program can involve lecturers or fellow students who are competent in related subjects (peer tutoring). Of course, the tutor students must coordinate with the lecturers to ensure that the material presented is correct. Peer learning has a strong positive influence on student motivation [27], therefore peer tutoring will be more effective for students, because students will feel free to ask questions or give their opinions, and this will increase their chances of having a close relationship with other fellow tutors and students. Peer tutoring programs can be successful because students have more opportunities to respond, longer assignment time, and fast feedback, so peer tutoring can provide benefits for students' academic abilities [28].

To increase GPA, students should be encouraged to carry out self-directed learning. Self-directed learning skills are needed by students because the learning process can be done anywhere, at any time, and is a lifelong activity [29]. Apart from low cost, convenience, and flexibility, online learning also makes it easier for students to carry out self-directed learning [30]. Almahasees *et al.* [30] recommend blended learning between face-to-face and online learning, to optimize the learning process. It is necessary to carry out blended learning between face-to-face and online learning because each learning method has advantages and disadvantages. Online learning supports students from a quantitative thinking perspective, but online learning is less able to develop quality student-faculty interactions and is less able to discuss with other students compared to face-to-face learning [31]. Murniati's *et al.* research [29] suggests several strategies for students so that self-directed learning can be successful, namely prioritizing the activities that must be done, utilizing social media as a tool (for example YouTube), and maintaining good relationships with fellow students (fellow students, seniors, and alumni) to get support in the form of information related to assignments, books, and encouragement.

The flipped classroom is a recommended learning strategy for engineering students, because the flipped classroom is a strategy that has high effectiveness in supporting student learning processes in higher education [32], and can improve academic achievement and student performance [33]. By implementing the flipped classroom method, students can study the material provided by the lecturer at home or elsewhere using a smartphone or computer device, before meeting in class. With the preparation made by the students, in class lecturers no longer need to discuss lecture material from the beginning but can evaluate students' understanding and correct if there is incorrect understanding. After that, class activities can be continued with a discussion of problem-based projects [34]. The use of modern technology in running a flipped classroom will enable students to review and follow-up learning material independently [32], so that students' self-directed learning abilities increase.

Project-based learning (PBL) is recommended for use in engineering students' learning process. Various studies have shown that PBL has a positive influence on comprehensive understanding, students' cognitive competence, activeness in the learning process, and improved learning outcomes [35]. Not all courses are suitable for using PBL. Applied courses would be more appropriate to use this PBL learning process. The use of gamification is also recommended for use in the learning process for engineering students. Gamification in education is the use of game elements in the learning process, which is appropriate for educational environments, from kindergarten, and elementary school to higher education [36]. Various studies show that gamification can increase creativity and collaboration [37]. Apart from that, gamification helps students understand the material better and lightens students' learning burden [38]. Faculty leaders and lecturers can jointly discuss which courses are suitable for using gamification, so that students are more interested in learning the material being taught.

Student engagement is the connection between students and processes at school, namely student behavior related to cognitive strategies chosen by students, active participation, and emotional attachment to certain specific learning tasks, for example, class attendance, assignment submission, and obedience to teacher directions [39]. There is a positive relationship between feedback and student engagement [40], so one effort to increase student engagement is to provide consistent and timely feedback [41]. Apart from providing consistent and timely feedback, Chakraborty and Nafukho [41] suggest several strategies for increasing student engagement, namely using appropriate technology to deliver lecture material, establishing a positive learning environment and learning community, and providing a good support system.

Students need help to set specific and clear goals and give feedback regarding the efforts they are making [42] so that students can monitor for themselves whether their efforts are sufficient in achieving these goals. Lecturers need to explain their expectations regarding the competencies or skills that should be achieved by students. Lecturers should provide advice on efforts that students should make and provide feedback related to efforts made by students to achieve their goals. Thus, students can plan strategies they still have to do, and in the end, students' academic performance will increase. Wentzel's model of social support and classroom competence states that social support and students' self-perceptions are related to academic outcomes [43]. Academic outcomes can be formed by university completion, GPA, and other academic achievements. Students will value and pursue the same goals as those held by lecturers and fellow students (academic and social goals), if students feel the interaction and connection with teachers and fellow students, and are given clear direction regarding the goals to be achieved [43].

Academic advising is a common and effective way to improve GPA. A good academic advising program will be able to increase student retention [44] because it can help students realize their goals at university, and help students understand why they are pursuing their educational goals [20] so that progress will occur until the student graduates [11]. On the other hand, poor academic advising can reduce GPA [23]. The university needs to design academic advising programs seriously. At the university level, a special division can be created, consisting of caring lecturers who have been prepared to assist students in academic planning. At the faculty or study program level, the academic advising program can involve guardian lecturers, where the guardian lecturers handle 15-20 students, monitor, and assist students in academic planning. The guardian lecturers are substitutes for students' parents on campus, who can exchange ideas with students, especially related to academic issues and career planning.

There is a strong connection between academic self-efficacy and academic achievement [45]. This is because students with higher academic self-efficacy tend to take on more challenging tasks and are more resilient when faced with difficult tasks [46]. Additionally, students' confidence in their grades, their professors, and their attendance levels can positively impact their GPA at the end of the semester to boost students' confidence, faculty should design preparation programs tailored to the varying abilities and backgrounds of the students. These programs should be scheduled before the start of the new semester, especially for courses that are considered difficult but serve as a foundation for many other courses (e.g., mathematics courses). Preparing students for non-academic skills like teamwork and time management is also important. To enhance the effectiveness of the preparation program, consideration can be given to leveraging assistance from fellow students as teaching

assistants or tutors. It is hoped that involving teaching assistants or tutors from fellow students will improve students' motivation to participate in the preparation program. The involvement of fellow students will also increase students' chances to establish social relationships with fellow students. Apart from preparation programs, faculties are also advised to create concrete policies and programs to help students who struggle while attending lectures, for example creating stress management programs to overcome the stress faced by students [47], remedial programs, and other programs.

3.7. Proposal to improve student satisfaction in social relationships with fellow students

The faculty needs to increase student satisfaction in social relationships with fellow students. One effort that can be made is to provide opportunities for students to get to know each other through group assignments or team projects. Besides honing teamwork skills, group assignments also allow students to interact and get to know each other, and this will increase their chances of having a close relationship with other fellow students. Opportunities to interact with fellow students are an important step in increasing student satisfaction, which will ultimately increase students' resilience to complete college [48].

Students can also be involved as much as possible in various activities at the faculty or university [22]. The faculty or university can design activities that require the participation of many students, such as scientific competitions, sports and arts competitions, study tours, social events, or even just social gatherings. Students are involved in the committee that regulates the activities, as well as being involved as participants. The most important point in this activity is the participation of the students.

Apart from creating activities that encourage interaction between students, faculties also need to pay attention to each student. This can be done with the help of the guardian lecturer, class lecturer, or class leader. Students who tend to be alone, appear lonely, and do not socialize, need to be given special attention and invited to communicate about their life on campus, then help overcome the problems they face according to the scope and authority of the faculty. The implementation of peer tutoring, apart from increasing student grades, will also have a positive influence on group dynamics, by increasing communication through discussions, repeated interactions, and coordination, so this not only improves student work results, it also improves social relations between students [27].

4.   CONCLUSION

The problem of student retention in engineering faculties at Indonesian private universities requires special handling, which may be different from public universities. The sample of this study consisted of 297 engineering students from a private university in Indonesia as a case study. The results showed that engineering faculty-student retention is influenced by GPA and student satisfaction in social relationships with fellow students. The most ideal student retention category is the persister category. The persister category consists of students with balanced GPAs and student satisfaction in social relationships with fellow students, both of which have high scores. Leaver and stop-out categories have a similar pattern, namely high GPA but low satisfaction in social relationships with fellow students. To enhance student retention, the faculty/university should focus more on student satisfaction in social relationships with fellow students than GPA because a low GPA is not a characteristic of leavers.

This research uses a case study from one engineering faculty at a private university in Indonesia. However, despite this, the engineering faculty that is the object of research is an engineering faculty that has been around for a long time and is quite reputable so it should be able to describe the condition of engineering faculties in Indonesia which is generally in decline. The results may not be generalizable for all study programs at the engineering faculty but can provide an overview of engineering student retention at Indonesian private universities. Further research is needed regarding the factors that significantly influence this research, namely student satisfaction in social relationships with fellow students so that universities and faculties get accurate input in improving engineering student retention. In addition, considering the better quality and smaller numbers of public universities compared to private universities, it is reasonable to conduct further research regarding differences in variables influencing student retention at public universities and private universities. To follow up on the results of interviews with engineering faculty students which stated that the high need for social relations with fellow students is partly due to the large number of assignments and practicums carried out while studying at the engineering faculty, it is necessary to carry out further research comparing engineering and non-engineering faculty students. These comparisons will enrich research in the field of student retention in Indonesia.

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