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STUDENT RETENTION EARLY WARNING PROCEDURES: A CASE STUDY OF HIGHER EDUCATION INSTITUTION MANAGEMENT

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Abstract: This study investigates factors influencing student resignation and explores the role of academic departments and study programs in implementing early warning systems at Ciputra School of Business Makassar (CSB Makassar). Using a qualitative approach, in-depth interviews with students, faculty, and administrative staff were conducted to identify financial constraints, academic dissatisfaction, and social adaptation issues as key factors affecting retention. The research highlights the importance of proactive measures such as mentoring, academic advising, and personalized interventions to address these challenges. A proposed early warning system utilizing data analytics and real-time monitoring aims to identify at-risk students and deliver timely support. The findings contribute to understanding student retention dynamics and offer practical strategies for improving institutional practices. These insights are expected to enhance student engagement and satisfaction, providing a framework for other higher education institutions facing similar challenges.

Keywords: *Student retention, early warning system, higher education strategies*

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1. Introduction

Higher education plays a strategic role in human resource development and the national economy. In Indonesia, the number of students continues to increase, reaching 9.3 million in 2023 (BPS, 2023). However, the main challenge faced is low student retention, which is the ability of institutions to retain students until graduation. Data from the Regional Office IX of the Directorate General of Higher Education shows a downward trend in retention, particularly in South Sulawesi, where only 75% of students remain in their second semester (LLDikti 9, 2024). This indicates a serious problem in the continuity of student studies.

The factors causing low retention are diverse, including financial problems, academic dissatisfaction, and adaptation difficulties. The impact is not only detrimental to the institution financially and in terms of reputation, but also hinders the transfer of knowledge in human resource development. Various strategies have been implemented, such as improving academic services and counseling guidance, but early identification of students at risk of dropping out remains a challenge.

Ciputra School of Business (CSB) Makassar, as a new university since 2021, also faces similar problems. Internal data shows that 94.29% of students who dropped out did so in the first three semesters (2024). The trend of increasing dropout rates reached 300% in 2023/2024,

despite retention efforts. Therefore, the development of an early warning system and effective interventions are crucial to improve student retention.

When comparing the number of students who dropped out with *the student body* in that academic year, the *student retention* rate has also shown a downward trend in the last three academic years, from an initial figure of 98.58% in the 2021/2022 academic year, to 98.46% in the 2022/2023 academic year, to 97.16% in the 2023/2024 academic year.

Table 1. Student Retention Rate for the Last Three Academic Years

Academic Year	Student Body	Students Who Left	Student Retention Rate
2021/2022	211	3	98.58
2022/2023	520	8	98.46
2023/2024	846	24	97.16

Source: Processed data, 2024

Based on Table 1, when viewed from the *history* of student status, 19 out of 35 (54.29%) students who eventually dropped out of college began with their status as inactive students. Inactive is a term used in higher education institutions, which in this case refers to the status of students who are not registered for a particular semester without permission from the Higher Education Institution Leader (PDDIKTI, 2023). At CSB Makassar, this refers to students who did not fill out their Study Plan Card (KRS) for the semester they were going to attend.

Table 2. Number of Students Who Dropped Out Based on Exit Status

Academic Year	Withdrew	Expelled *(Drop Out)*	Notes
2021/2022	3	0	-
2022/2023	7	1	1 student started with inactive status
2023/2024	10	14	18 students started with inactive status
TOTAL	20	15	Total students who left
	35		

Source: Processed data, 2024

The phenomenon of declining student retention rates is not only experienced by CSB Makassar, but several other higher education institutions also face similar challenges related to this issue. Even some higher education institutions that are older than CSB Makassar are still struggling to maintain and improve their retention rates, and their student retention rates are not as good as CSB Makassar's. Although there are other higher education institutions with better retention rates than CSB Makassar, based on the data obtained and processed, the majority of higher education institutions still have retention rates below CSB Makassar, with the average retention rate of other higher education institutions being around ninety percent.

Table 3. Student Retention Rates for the Last Three Academic Years

University Name	**Year Established**	**Number of Students**	**Student Retention Rate**	**Retention Fluctuation**
University A	1963	16,818	91.4	-2.10
University B	1954	18,568	98.55	-0.48
University C	1980	1,234	95.14	-1.62
College D	1985	3,835	89.56	-2.42

University E	2023	1,364	88.28	-0.73
University F	2019	4,647	92.90	-0.86
College G	2000	314	94.27	-2.55
H University	2021	3,571	95.80	-0.28
University I	2023	290	86.90	-1.03
University J	2019	4,548	94.72	-1.10

Source: Processed data, 2024

The data above shows that student retention rates at other universities are also a challenge that needs to be addressed, making student retention an important issue for universities today. Student retention is a critical issue faced by universities, including in Indonesia. High dropout rates not only have a financial impact on institutions, but also affect the academic reputation and competitiveness of universities. Data shows that economic factors, social adaptation, and institutional support are the main causes of low retention (BPS, 2022; Tinto, 2017). Therefore, the development of data-based strategies, such as early warning systems, is a potential solution to overcome this problem.

Previous studies have identified the complexity of factors that affect retention, including financial difficulties, adaptation challenges, and lack of academic support (Astin, 2014; Aljohani, 2016). CSB Makassar, as a new university, also faces a trend of increasing dropout rates, especially in the first three semesters. Programs such as *Creative Campus Life Journey* have been implemented, but a more systematic approach, such as real-time monitoring and proactive intervention, is needed to improve retention effectiveness.

This study aims to analyze the development of an early warning system at CSB Makassar to identify at-risk students and design timely interventions. These findings are expected to not only contribute to academic literature but also provide practical recommendations for universities in improving student retention and maintaining institutional sustainability.

2. Research Method

This study uses a qualitative approach with a single case study design to analyze the implementation of early warning procedures in student retention at Ciputra School of Business (CSB) Makassar. This approach was chosen because it allows for in-depth exploration of the unique context of the institution (Yin, 2009). Data were collected through semi-structured interviews with three groups of informants:

1. Students (those who withdrew, were at risk of dropping out, and were still active, as well as mentor seniors),
2. Educators (leaders, program chairs, academic advisors), and
3. Educational staff (academic staff, BMA, and TLiC).

The research focused on three main dimensions: self-efficacy, sense of belonging, and perceptions of the curriculum (Tinto, 2017), as well as socio-economic adaptation challenges (Kuh et al., 2018). The selection of a single case study was based on the need for in-depth analysis without the interference of inter-case variations (Stake, 1995), while also considering resource limitations.

Data analysis was conducted thematically by integrating findings from various sources to identify patterns and policy recommendations. This approach is in line with previous research

on student retention (Pascarella & Terenzini, 2019), thus providing a strong theoretical and practical foundation.

Table 4. Criteria for Selecting Research Informants

No	Type of Informant	Criteria
	Students Who Dropped Out of College (Resigned)	1. Withdrew within the last 3 years 2. Minimum of 18 credits completed 3. Have participated in at least 1 student activity while actively enrolled
2	Students Who Have Dropped Out (Drop Out)	1. *Withdrew* during the past 3 years 2. Number of completed credits: minimum 10 credits 3. Did not register for courses for two consecutive periods 4. Have participated in at least 1 student activity while actively enrolled
3	Inactive Students	1. Students with non-active status during the even semester of 2023/2024 and/or the odd semester of 2024/2025 2. Was once inactive, then active again 3. Number of credits completed: minimum 18 credits 4. Have participated in at least 1 student activity while active
4	Active Students	1. Active student status from semester 1 to the present 2. Not a scholarship recipient 3. Has a Grade Point Average (GPA) according to *the following grades*: • Grade A: 3.01 – 4.00 • Grade B: 2.50 – 3.00 • Grade C: < 2.50
5	Mentor	1. Has experience mentoring students who are considering withdrawing 2. Active in other student organizations
6	Program Chair	1. Experience in handling student withdrawals 2. Experience as Program Chair for a minimum of 3 years
7	Academic Advisor	1. Experience in handling student withdrawals 2. Having students who ultimately withdraw and/or having students who ultimately return to active status
8	Academic Staff (BMA, TLiC)	1. Experience in handling student withdrawals 2. Current work experience of at least 2 years

Source: Processed data, 2024

This study employs a qualitative approach with data collection methods including semi-structured interviews, participatory observation, and document analysis (Creswell, 2013). Interviews were conducted with three groups of informants, namely students (active, at risk of dropping out, and those who withdrew), lecturers (academic advisors and program chairs), and administrative staff (Student & Alumni Bureau, TLiC) with interview guidelines developed based on Tinto's retention model (2017). Participatory observation was carried out in various campus settings, both academic and non-academic, to capture the dynamics of interactions that might not be revealed in interviews. Document analysis included student academic records, institutional policies on retention, and program evaluation reports as comparative data. The

research locations included the CSB Makassar campus and the students' hometowns to understand the socio-cultural context that influences academic decisions.

The data analysis process was carried out systematically through verbatim transcription of interviews and organization of observation notes. The data was then coded through open coding to identify basic concepts and axial coding to connect concepts into more abstract categories (Strauss & Corbin, 1998). Thematic analysis was conducted to integrate findings from various data sources and identify patterns that explain retention mechanisms. Source triangulation was performed by comparing the perspectives of students, lecturers, and staff, while method triangulation confirmed findings between interviews, observations, and documents (Patton, 1999; Miles & Huberman, 2014). This process ensured comprehensive and valid findings on the early warning system for student retention.

Data validity is maintained through several strategies. Expert triangulation involves the Head of LLDIKTI 9 to evaluate the suitability of interpretations with the reality in the field. Member checking is carried out by confirming data interpretations with research participants. An audit trail documents in detail the entire research process, including methodological decisions, analytical developments, and researcher reflections (Lincoln & Guba, 1985). This comprehensive approach allows for a holistic understanding of the effectiveness of the early warning system in the specific context of CSB Makassar, while also producing reliable findings for the development of student retention policies in higher education.

3. Results and Discussion

Factors Influencing the Decision to Drop Out

Based on qualitative data analysis, five main factors were found to drive students to drop out at CSB Makassar.

1) Financial Problems

Financial pressure was the dominant factor mentioned by the majority of informants, both students who had dropped out and those who were about to drop out. Difficulties in paying tuition fees and meeting living expenses, especially for students from outside the city, were the main triggers. In response, the institution implemented a paid internship program that proved to be an effective financial intervention. This program not only eases the economic burden but also fosters students' confidence and attachment to the campus, as expressed by one informant: "*this campus cares about each of its students...*" (GS). This finding reinforces Tinto's (2017) theory regarding the importance of creating a sense of security through financial support to build institutional commitment.

2) Difficulties in Social Adaptation

Students, especially those from outside the area, experience difficulties integrating into the campus social environment. Feelings of isolation, difficulty socializing, and the existence of *gossip* or bullying are obstacles to building *a sense of belonging*. Observations and interviews revealed that students who did not participate in orientation activities (O-Week) were more prone to isolation. This finding aligns with Tinto's (2017) concept of *integration,* which emphasizes that failure in social integration can accelerate the decision to *drop out.*

3) Dissatisfaction with the Curriculum and Learning Methods

Some students stated that the curriculum was too theoretical and irrelevant to the needs of the world of work and their career aspirations. Monotonous and less interactive teaching methods also contribute to decreased learning motivation. Conversely, *creative teaching* methods such as gamification and film discussions have been shown to significantly increase

student *engagement* and participation in class. Dissatisfaction with the relevance of the curriculum is also associated with low student *self-efficacy* in facing academic challenges.

4) Family and Personal Problems

Family conflicts, mental pressure, and personal responsibilities (such as early marriage or helping with family businesses) are significant factors that interfere with continuing studies. Lack of family support or sudden changes in family economic conditions (such as bankruptcy or the death of a parent) are often final reasons that cannot be compensated for by campus support.

5) Suboptimal Academic and Non-Academic Support

The role of Academic Advisors (PA) as the spearhead of the academic support system is considered suboptimal. Lecturers' time constraints due to their heavy workload, the large number of students under their guidance, and the lack of standardization of guidance procedures result in uneven *mentoring* quality. Students often feel that they do not receive enough attention, especially those who are not high achievers. On the other hand, support from the Student and Alumni Bureau (BMA) in the form of counseling and internship programs is appreciated, but coordination between the BMA and academic advisors still needs to be improved to create an integrated support system.

Table 5. Factors Causing Dropouts and Root Problems

Factors	Root Cause	Impact on Students
Financial	Cost of living, changes in family economic conditions	Stress, double burden (working & studying), dropping out of college
Social Adaptation	Cultural differences, *gossip*, lack of orientation participation	Social isolation, low *sense of belonging*
Curriculum	Theoretical material, lack of industry relevance, monotonous methods	Decreased motivation, negative perceptions of the value of studying
Family & Personal	Conflict, mental stress, new responsibilities	Concentration problems, academic irregularities
Academic support	Heavy workload for PA lecturers, no guidance standards, weak coordination	At-risk students go undetected, feel unsupported

Source: Processed Data (2024)

Effectiveness of Early Warning Procedures and Preventive Measures

The early warning system at CSB Makassar is implemented through the central role of academic advisors who conduct early detection based on indicators such as decreased attendance, late assignment submissions, and changes in student behavior. If detected, students will be given guidance and, if necessary, referred to the BMA for more in-depth intervention (e.g., financial assistance, counseling).

1) Success

The paid internship program is the most successful intervention in addressing financial issues. This program has succeeded in fostering a sense of pride, independence, and commitment among students to complete their studies. In addition, the *mentoring* program by *student mentors* and orientation activities (O-Week) play an important role in building social bonds and helping new students adapt.

2) Challenges and Weaknesses

The existing system is still reactive rather than proactive. Interventions are often only carried out after problems have persisted for a long time. The main challenges include:

1. Human Resources: The high workload of lecturers reduces the intensity of guidance.
2. Coordination: Weak coordination and data sharing between academic units (Study Programs, Academic Advisors) and non-academic units (BMA).
3. Lack of Standards: There are no standardized monitoring indicators or uniform mentoring models.
4. Participation: Student participation in *mentoring* programs.

4. Conclusion

This study aims to identify factors that influence students' decisions to drop out of CSB Makassar, evaluate the role of early warning procedures, and identify preventive measures that have been taken by the campus to improve student retention.

The results of this study indicate that there are several factors that significantly influence student retention at CSB Makassar. Academic factors are the main cause of students' difficulties in continuing their studies. Students who face severe academic challenges, difficulties in understanding the material, and a lack of learning support are more prone to academic stress, which ultimately increases the likelihood of them dropping out.

In addition to academic factors, financial problems also have a major influence on students' decisions to stay or leave college. Students who experience financial constraints, whether due to high tuition fees or the high cost of living in Makassar, often face pressures that lead to the decision to drop out. Although some of them have received scholarships, the fact that the cost of living remains a significant burden shows that more flexible and sustainable financial support needs to be considered by the university.

Another factor contributing to low retention rates is the lack of academic and social support for students. Students who do not receive effective academic guidance, intensive mentoring, and minimal involvement in the campus community are more likely to experience difficulties in their studies. This low level of involvement also has an impact on social adaptation difficulties, especially for students who come from outside the area or who were accepted in the last wave of new student admissions. The lack of social interaction and feelings of isolation from the academic environment can hinder their integration into the campus community, which ultimately influences their decision to drop out of college.

Based on these findings, universities need to take strategic steps to improve student retention, such as improving the academic *mentoring* system, strengthening financial support programs for students experiencing economic difficulties, and developing more inclusive social engagement programs for new students. In addition, there is a need to strengthen more *engaging* and interactive learning methods to increase students' confidence in completing their studies. With this more comprehensive approach, universities can create a more supportive academic environment, increase student motivation to learn, and significantly reduce dropout rates.

The early warning procedures implemented at CSB Makassar have proven to be quite effective in providing early intervention and helping students facing these challenges, although early warnings can begin much earlier when students enroll. Conducting in-depth *interviews* with prospective students, especially those who register at the end of the registration period, can be one of the early warning procedures that can be carried out. This is because field findings during document analysis indicate that students with late student ID numbers tend to have *self-efficacy* issues that could potentially lead to dropout.

Students with late NIMs often enter in the last wave of student admissions, so they have limited access to academic and social information at the beginning of their studies. Pascarella & Terenzini (2005) mention that a lack of involvement in academic and social communities can decrease *self-efficacy,* worsen adaptation, and lead to dropping out. This is also in line with Tinto's Social and Academic Integration Model (2017), which emphasizes that students who do not feel connected to the campus community are more prone to losing motivation.

From the perspective of Astin's Student Involvement Theory (2014), active involvement in academic and social environments is directly related to increased *self-efficacy*. Students who are passive or lack a support network, as found in some students with late student ID numbers, are at greater risk of experiencing feelings of incompetence, which can accelerate their decision to drop out. Research by Kuh *et al.* (2018) also shows that low social and academic involvement correlates with decreased *self-efficacy* and increased dropout rates.

Thus, students with late NIMs are at greater risk of experiencing *self-efficacy* constraints due to limited initial integration, low campus involvement, and a lack of belonging to the academic community. Therefore, universities need to strengthen orientation programs, *mentoring*, and strategies to increase student involvement from the beginning of their studies in order to increase *self-efficacy* and reduce the risk of dropping out.

A new finding in this study is the active role of academic advisors and the use of paid internship programs as strategic measures to maintain student retention. In addition, this study found that *creative teaching* (interesting teaching methods) is a new factor that has not been widely discussed in previous studies but has a significant influence on student retention.

PA lecturers play a central role in early warning procedures and provide support that directly influences student decisions. This is a new contribution in the local context. The role of PA lecturers can be strengthened through integration with *student mentors*, who, if given the right training, can function more effectively in reaching out to their junior students when *mentoring*.

Preventive measures taken by CSB Makassar, such as paid internship programs, *mentoring*, and student activities, have had a positive impact on student retention. These programs not only help students financially, but also increase their sense of belonging to the campus environment.

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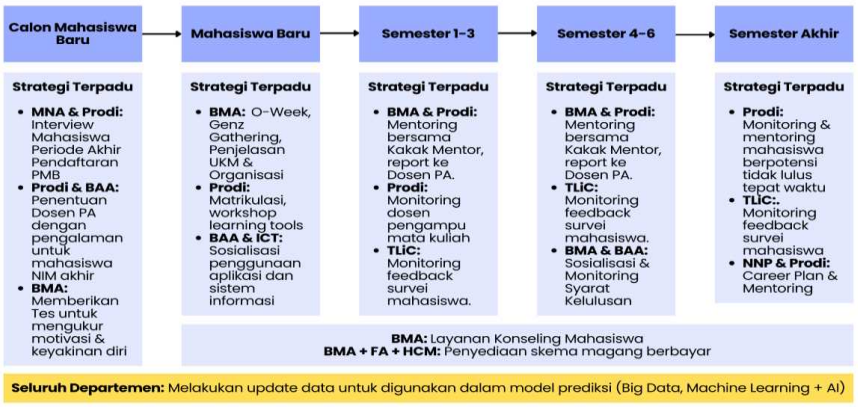

Figure 1. Proposed Integrated Student Retention Strategy

CSB Makassar implements an integrated and operational strategy to maintain student retention from admission to graduation. This process begins with the admission of new students, where interviews are conducted by the *Marketing and Admission* (MNA) and Study Program (Prodi) departments to assess students' academic readiness. In addition, the Prodi and the Academic Administration Bureau (BAA) assign Academic Advisors (PA) who are experienced in handling students with final NIM, while the Student and Alumni Bureau (BMA) conducts motivation and self-confidence tests to identify potential academic risks. As a first step in adaptation, new students participate in various orientation programs such as *O-Week, Genz Gathering,* and introductions to student activity units and organizations organized by the BMA. The Study Program also provides matriculation programs and *learning tools workshops,* while the BAA and the *Information & Communication Technology* (ICT) department conduct socialization on the use of academic applications and information systems to facilitate student access to campus services.

Entering semesters 1-3, students receive intensive assistance through *mentoring* with *student mentors* who report to the PA Lecturer. In addition, the Study Program conducts direct *monitoring* of students through lecturers teaching the courses, while the *Teaching, Learning Innovation Center* (TLiC) department conducts student feedback surveys to detect academic obstacles early on. To support academic success, *an* AI and *Machine Learning*-based *monitoring* system was developed to detect students experiencing a decline in academic performance. Students experiencing difficulties also receive personal guidance and participate in soft skills and time management *workshops*.

In semesters 4-6, student retention efforts are further strengthened through continued *mentoring* by *student mentors* and academic advisors, as well as *monitoring* of student survey *feedback* conducted by TLIC. BMA and BAA are also active in disseminating information and *monitoring* graduation requirements to ensure that students remain on the right academic track.

Entering the final semester, retention strategies are more focused on *monitoring* students who are at risk of not graduating on time. The study program provides special assistance and *mentoring*, while TLIC continues to conduct *feedback* surveys to understand the academic challenges faced by students. Students who experience obstacles in completing their thesis or final project are given intensive academic support, including graduation exam simulations and preparation for hearings. In addition, psychological and motivational support services are also provided for students who experience high pressure in the final stages of their studies. Furthermore, CSB Makassar provides structured internship programs in collaboration with

industry to enhance students' work experience, as well as *career mentoring* to help students align their coursework with industry needs.

To strengthen overall student retention, CSB Makassar also provides student counseling services through BMA, and has developed a paid internship scheme managed jointly by BMA, FA, and HCM. In addition, a *Big Data* and AI-based early warning system is used to detect at-risk students more quickly, so that intervention can be carried out earlier. With this integrated approach, CSB Makassar aims to reduce *dropout* rates and increase student success in completing their studies on time.

Recommendations

1. Early Detection
   From the results of this study, one thing that can be done very early on is to monitor prospective students who register at the end of the new student admission period. In-depth interviews can be conducted during this process. In addition, students with late student ID numbers can be accompanied by lecturers who have experience in handling cases of student dropouts, rather than lecturers who are inexperienced as academic advisors. Furthermore, as in the data processing in this study, where the critical period for student dropouts is during the first 3 semesters, *monitoring* of students with late student ID numbers is carried out periodically and recorded.

Table 6. Proposed Early Detection Model

No.	Objective	Indicators Based on Research	Proposed Early Detection Model
1	Students Enrolling at the End of the PMB Period	• Students lack motivation • Students have low *self-efficacy* • Students experiencing adaptation problems (due to missing *O-Week*) in the current academic year	• In-depth *interviews* with students • Assigning experienced academic advisors to mentor final-year students • Taking specific tests to measure motivation and self-efficacy
2	Students from outside Makassar City	• Have difficulties in social adaptation • Lack the courage to interact with lecturers	• *Feedback from* PA lecturers during initial *mentoring* • Periodic reports from student mentors/faculty advisors
3	Students with academic difficulties	• Irregular attendance • Late or fail to submit assignments • Grades below standard	• Reports from the instructors of each course

Source: Processed data, 2025

2. Synergy Between PA Lecturers and Student Mentors
   Given the central role of PA lecturers in the early warning procedure, but on the other hand, lecturers also have an obligation to carry out the three pillars of higher education (Teaching, Research and Community Service), coupled with the number of students under their guidance, it is recommended that CSB Makassar improve the synergy between PA lecturers and student mentors. Here, *student mentors* will act as an extension of PA lecturers to conduct scheduled *mentoring* with students. Later, on a regular basis, *student mentors* will also report on the progress of their *mentoring* with their juniors. With this scheme, it is hoped that the effectiveness *of* student *mentoring* will increase, assuming that students will

find it easier to open up to fellow students, even if they are from different batches, than if they were to talk to lecturers.

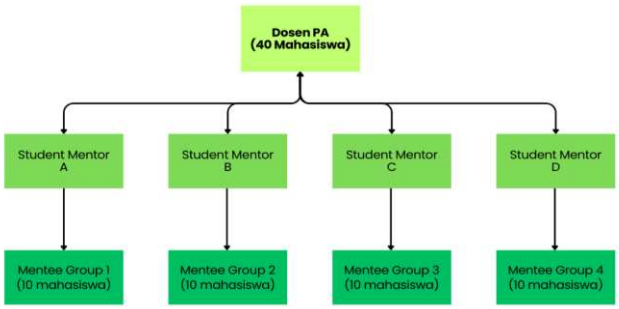

Figure 2. Synergy Model between PA Lecturers and Student Mentors

From the synergy model between PA lecturers and *student mentors* as shown in Figure 2, the example scheme is that a PA lecturer with a total of 40 students under their guidance (assuming 10 students per batch) will be assisted by 4 *student mentors*, where each *student mentor* will manage 10 *mentees* in a group. With this model, there are 6 advantages that can enhance the effectiveness and quality *of mentoring*.

Table 7. Advantages of the Student Mentor Mentoring Model

No.	Advantage	Description
1	Improving the Social and Academic Adaptation of New Students	● New students often experience difficulties adapting to the academic and social environment on campus. ● Senior *student mentors* can help *mentees* understand the academic system, campus culture, and how to interact with faculty and fellow students. ● With small groups (10 students per mentor), interactions are more intensive, making it easier for students to receive help and guidance.
2	More Personalized and Targeted Support	● Compared to the direct *mentoring* approach by academic advisors who handle 40 students, dividing students into small groups with *student mentors* allows students to receive more personalized attention. ● Students tend to feel more comfortable sharing academic and social issues with *student mentors*, who have similar experiences. ● Small-scale *mentoring* enhances the effectiveness of monitoring academic and social development.
3	Increasing Student Engagement on Campus	● This *mentoring* model encourages students to be more active in academic and social activities. ● *Student mentors* can encourage *mentees* to participate in Student Activity Units (UKM), campus organizations, and other self-development programs. ● Increasing student engagement also has an impact on enhancing *a sense of belonging*, which contributes to student retention.
4	Building a Culture of Mutual Support and Leadership	● *Student mentors* gain leadership experience by taking responsibility for groups of students. ● This model creates an ecosystem where senior students help junior students, building a culture of mutual support within the campus community.

		• *Mentees* who benefit from this program can become *student mentors* the following year, creating a sustainable *mentoring* system.
5	Early Detection of Academic and Non-Academic Problems	• Through interactions between *student mentors* and *mentees*, academic issues such as difficulties in certain courses or personal problems can be detected earlier. • *Student mentors* can report to the Academic Advisor if a student requires further intervention, such as additional academic or psychological counseling. • The institution can take action more quickly before the student decides to withdraw.
6	Efficiency in Academic Guidance	• Reducing the burden on Academic Advisors, who have significant responsibilities for academic guidance and administration. • *Student mentors* can help answer general questions about class schedules, evaluation systems, and learning strategies, allowing professors to focus more on complex academic guidance. • With this distribution of responsibilities, *mentoring* becomes more systematic and effective.

Source: Processed data, 2025

3. Strengthening Student Mentors

For *mentoring* to be effective, the ratio between mentors and *mentees* must be carefully considered. If there are too many *mentees*, the mentor's role of getting to know them better will not be fulfilled to the fullest. Therefore, mentor recruitment needs to be encouraged so that the ideal ratio can be achieved. To increase the number of mentors, it is possible to provide compensation in the form of Credit Points (KP). The number of KP given may need to be reviewed to ensure that the number of KP and the responsibilities carried by students are balanced, considering that mentors will be the first to detect students who are potentially at risk of dropping out.

Several things also need to be considered in strengthening *student mentors*, especially the training before *student mentors* carry out their duties to *mentor* their respective *mentees*.

Table 8. Proposed Training for Student Mentors

Aspect	Purpose	Description
Academic Training	To help *Student Mentors* understand the curriculum and academic system so that they can provide accurate guidance to *mentees*.	• Understanding of Curriculum Structure: Required courses, elective courses, and credit system. • Academic Evaluation System: Grading methods, GPA, graduation requirements. • Effective Learning Strategies: *Time management techniques*, active learning methods. • Access to Learning Resources: Library, scientific journals, *e-learning platforms.*
Communication and *Coaching* Skills Development	Enhancing the ability of *Student Mentors* to guide and motivate *mentees*.	• Effective Communication Techniques: *Active listening, open-ended questions*. • *Coaching & Mentoring* Approach: How to provide guidance without being overly directive.

		• Addressing Students with Diverse Personalities: Different approaches tailored to the *mentee's* character. • Building Positive Relationships with *Mentees*: Fostering trust and comfort.
Psychosocial and Student Well-being Support	Assisting *Student Mentors* in understanding the emotional challenges faced by new students and how to support them.	• Stress Management and Mental Health: *Self-care* techniques to identify signs of stress in *mentees*. • Student Development Psychology: Stages of adaptation for new students and common challenges they face. • Crisis and Conflict Management: Strategies for handling students experiencing academic and social pressure.
Leadership and *Problem-Solving* Training	Training *Student Mentors* to become inspirational leaders for their mentees.	• Collaborative Leadership: How to be a supportive mentor, not an authoritative one. • Decision-Making & *Problem Solving*: How to help *mentees* find solutions. • Managing Group Dynamics: Strategies for leading discussions and group activities.
Administrative and Program Management *Training*	Ensuring that the *mentoring* program runs in a structured and well-documented manner.	• SOPs and *Mentoring* Workflow: How *mentoring* sessions are conducted, rules and guidelines. • Reporting and Evaluation: How to track *mentee* progress and create brief reports. • Ethics and Boundaries in *Mentoring*: What a mentor can and cannot do.
Simulation and *Role-Play of* Mentoring Situations	Providing *Student Mentors* with hands-on experience before they actually mentor their mentees.	• Real-Life Case Simulation: Dealing with *mentees* who lack confidence, are less active, or are experiencing academic problems. • Group Discussion: Sharing experiences from previous mentors and discussing the best solutions.

Source: Processed data, 2025

4. Development of a Technology-Based Early Warning System
   In the medium and long term, CSB Makassar can also develop a technology-based early warning system. The combination of *Big Data*, *Machine Learning*, and *Artificial Intelligence* can help in creating a predictive model based on the history of previous events. This requires collaboration from the moment prospective students enroll, where they are asked to fill in more complete data than just PMB data. On the other hand, the academic department will also enter the history of student dropouts into the system. Next, AI will study the data of new students and conclude the behavior of old students who dropped out, to create a predictive model. This predictive model must of course be monitored regularly to see how accurate it is.

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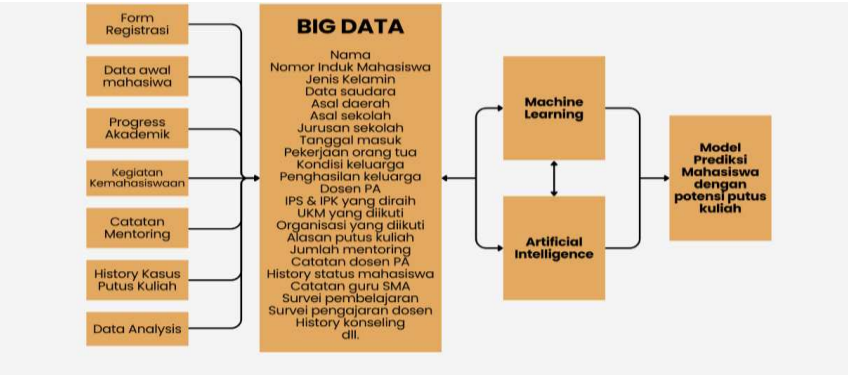

Figure 3. Technology-Based Early Warning System Model

The development of a Technology-Based Early Warning System at CSB Makassar involves a combination of *Big Data*, *Machine Learning*, and *Artificial Intelligence* (AI) to create a predictive model for students with the potential to drop out. The following is a technical explanation of how this system is implemented, where system development will be divided into 5 stages, namely; data collection and integration (*Big Data),* data processing with *machine learning,* implementation of *artificial intelligence,* implementation of a predictive model for students at risk of dropping out, and *monitoring* and evaluation of the model.

1) Data Collection and Integration *(Big Data)*

This early warning system begins with data collection from various sources, including:

a. Student Data Collected

- Registration Forms (initial data at the time of student registration)
- Demographic Data: Name, Student ID Number, gender, region of origin, school of origin, school major, parents' occupation, family conditions, family income.
- Academic Data: GPA & CGPA achieved, courses taken, attendance frequency, exam scores.
- Social and Extracurricular Data: Student clubs joined, organizations joined, involvement in campus activities.
- *Mentoring* Records: Number of *mentoring* sessions, *feedback* from academic advisors or *student mentors*.
- Counseling and Psychology History: Counseling *history* with the Student Affairs and Alumni Office.
- Withdrawal Case *History*: Information from previous students who withdrew from the program.
- Campus Survey Results: *Feedback* on learning from students, students' perceptions of faculty teaching.

b. Technology Infrastructure for Data

- Data from various sources will be collected in a Data *Warehouse*, then processed using ETL *(Extract, Transform, Load)* for standardization and storage in *a* centralized *database*.
- *Cloud Computing* is used to store data *in real-time*, allowing access for PA lecturers, academic staff, and AI systems.

2) Data Processing with *Machine Learning*

After the data is collected, *Machine Learning* (ML) will be used to find patterns and build predictive models. The *machine learning* methods used include:

a. *Supervised Learning (Classification Model)*
- This model studies historical data on students who have dropped out and compares it with active students.
- Algorithms used: *Random Forest, Decision Tree, Logistic Regression.*

b. *Unsupervised Learning (Clustering Model)*
- To identify students with similar patterns, such as low campus involvement or declining academic performance.
- Algorithms used: *K-Means Clustering.*

c. *Recurrent Neural Networks (RNN) and LSTM*
- To predict students' academic and social patterns continuously *(time-series analysis).*

3) *Artificial Intelligence* (AI) Implementation

Artificial Intelligence acts as an automated system that analyzes and provides recommendations for action based on *Machine Learning* predictions. The AI work process in the early warning system includes:

a. Collecting student data in *real time* from academic, *mentoring*, and attendance *databases*.

b. Running predictive models based on patterns of students who have previously dropped out.

c. Generating Early Warnings
- AI alerts academic advisors and staff to high-risk students if they exhibit patterns similar to those who have previously dropped out.
- AI can suggest academic or social interventions, such as additional *mentoring* sessions or financial assistance.

d. Analyzing Model Effectiveness on a Regular Basis
- The system continuously learns from new data to improve prediction accuracy.

4) Implementation of the Student Dropout Risk Prediction Model

Results from *Big Data, Machine Learning*, and AI are used to build a Prediction Model for Students at Risk of Dropping Out.

a. Risk Indicators Used in the Model
- Academic: Declining grades, number of failed courses, frequent absences.
- Financial: Student financial information, late tuition payments.
- Social: Inactive in campus activities, lack of interaction with academic advisors.
- Psychological: Results of consultations with campus psychologists or the student affairs office.

b. Notifications and Interventions
- If a student is identified as having a high-risk score, the system will automatically send notifications to:
  1. Academic Advisor (PA)
  2. Academic Program
  3. Student and Alumni Affairs Office (BMA)
  4. Academic Department
- Interventions that can be taken:
  1. Immediate counseling for high-risk students.
  2. Financial policies for students experiencing economic hardship.
  3. Additional mentoring for students experiencing academic difficulties.

5) *Monitoring* and Evaluation Model

To ensure the system remains accurate and relevant, the prediction model must be monitored regularly.

a. Model Evaluation
- Model Accuracy: Using *a Confusion Matrix* to assess prediction accuracy *(Precision, Recall, F1-Score)*.
- Model Validation: Using *k-fold cross-validation* to measure the reliability of the prediction model.
- Use of *Feedback*: Each intervention carried out will be evaluated to determine its effectiveness.

b. Further Development
- Integration with *Ciputra Education Digital Experience (CEdX)*: To enable PA lecturers and academic staff to directly access prediction results.
- Use of AI *Chatbot*: To provide automatic guidance to students at high risk of dropping out before they decide to do so.

By implementing these recommendations, it is hoped that student retention at CSB Makassar will continue to increase and the *dropout* rate can be minimized. The new findings generated from this research are also expected to contribute to other higher education institutions in developing more effective student retention strategies.

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