A Systematic Literature Review: Framework Design of Student Performance Monitoring System in Higher Education

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Abstract. In many organizations and institution particularly college, monitoring of students is a very important factor especially in identifying every problem that faced student in college. Various kinds of problems faced by the student can cause a high number of students to retake courses. Because of the alarming situation of the quality in higher education caused some measure has to be taken. In this paper will be focused on student monitoring framework design in higher education. Systematic literature review (SLR) used as a methodology in reviewing literature. This paper will be classified of each research on primary studies by object of research, indicators, variables, and methods. From the literature review results it is known that student monitoring framework design in higher education can be explored further by considering their assignment point and quiz at each class meeting with the aim to reduce number of students to retake courses especially in freshman students.

1. Introduction

Monitoring is defined as observe and check the progress or quality of something over a period time, another definition states that monitoring as supervising activity in progress to ensure that objects are on the track and on schedule in meeting the objectives and performance targets. In many organizations and institutions particularly college, monitoring of students is a very important factor specially in identifying every problem that faced student in college. One of the problems faced by students in universities is the high level of courses repetition. The high rate of courses repetition in the end will give impact to drop out rate of students. So the special treatment is needed for students who faced these problems in order to minimize course repetition rate. Therefore a system is needed that can provide early warning of student learning activities. In implementing students’ performance monitoring system, there are many stages for designing the application framework so that application eventually can produces data that reasonable conclusions are derived by stakeholders for decision making that expectedly impact on students’ learning outcomes. This paper aims to conduct a survey of research trends and research agenda related to framework of student’s performance monitoring system especially in education sector.

2. Methodology

Systematic review has many differences with the traditional review, which is defined by [1] as ‘A method for understanding most of the information of related fields, and the means to provide answers to questions about what works and what does not’. The aim of systematic literature review is tightly specified with the research topics and objectives with a specific review questions, while the aim of traditional literature review is to gain broad understanding and give descriptions about the research.
topics [2]. This paper used systematic literature review that was applied to identify object of research, indicators, variables, and methods from related research. The steps to write systematic literature review (in Figure 1) are;

- Collect References from Electronic articles
  This is the first step while doing a systematic literature review which at this stage doing several sub-phases, there are designing the research questions and search query.
- Identify relevant references
  At this stage, doing a comprehensive analysis to select the sources of the research.
- Identify relevant studies based on the search criteria
  After identifying relevant references, next are doing quality assessment and data extraction to find out whether the research obtained from the reference is in accordance with the topic or not.
- Primary study after an assessment
  After the attribute of the journal have been mapped in data extraction, the next step is doing synthesis. This stage has a purpose to know what has been known by the author and which is not yet known by the author.

![Figure 1. Step of Systematic Literature Review](image)

2.1. Research Questions
This paper aims to collect and investigate research objects, indicators, variables, and methods in framework of student’s performance monitoring system studies. Table 1 shows the research questions on literature review.

| Research Question | Motivation                          |
|-------------------|-------------------------------------|
| RQ1               | What kind of research object which are discussed | Identify the most used research object |
| RQ2               | What kind of research indicators which are discussed | Identify the research indicators |
| RQ3               | What kind of variables considered are used most | Identify the most used variables |
| RQ4               | What kind of methods are used most | Identify the most used methods |

2.2. Search Query
The purposes of the search process is the identification of the journal articles that investigated in framework of student’s performance monitoring system. In this paper, we used online databases to review the search process that was conducted between 2008-2018.
2.3. Selection of Sources
The searches conducted to find relevant research in this survey are limited by searching only for journal articles and conference papers in order to obtain valid results. The search was conducted using the online scientific database included IEEE and Tandfonline.

2.4. Study Selection
In the process of selecting the primary studies, we used insertion and rejection criteria. These criteria are shown in Table 2.

Table 2. Research questions on literature review

| Accepted Criteria                                                                 | Rejected Criteria                            |
|----------------------------------------------------------------------------------|---------------------------------------------|
| Research object in education area such as higher education, senior high school, etc | Research that not written in English          |
| Discussing about framework design of students performance monitoring system      | Research that published more than 10 years   |
| Research that have both the conference and journal versions and newest publication|                                             |
| Research that published between 2008 until 2018                                  |                                             |

In this survey, we used Mendeley (https://www.mendeley.com) as software that used to store and manage the search results. The final list of selected studies for the first stage had 10 primary studies.

2.5. Data Extraction
The next step is to extraction on selected primary studies to collect data that contribute to answering research questions related to this review. By using research questions and analysis then will be identified data extraction properties. Four properties were used to answer the research questions shown in Table 3. The data extraction is performed in an iterative manner.

Table 3. Data extraction properties mapped to research questions

| Properties                              | Research Questions |
|-----------------------------------------|--------------------|
| Research Object, Research Indicators    | RQ1, RQ2           |
| Research Variables, Research Method     | RQ3, RQ4           |
3. Result

3.1. Significant Journals Publication
This paper was conducted search from 2008-2018 as mentioned in search query section, but there are also additional papers as additional references from related research. The research on framework design of students performance monitoring system was increased year by year, as proven by the number of related journals that increasing from 2008 until 2018 that shown in Figure 3.

![Figure 3. Number of selected research over the years](image)

This figure shows that the joint topic of framework design of student’s performance monitoring system is still one of the important topics and can develop in further research.

3.2. Research Objects in Framework Design of Students Performance Monitoring System
Several survey in framework design of student’s performance monitoring system with different research object. Based on research objects, we identify 2 research object, such as in higher education, and senior high school. But, several paper also discussed about junior high school and some research does not mention the research object. Data number based on research object shown in Figure 4.

![Figure 4. Number based on research object](image)

Based on Figure 2. We know that higher education is one of favorite research object. Based on the analysis and more specifically, we get identification of the types of students based on the research included in primary studies. Data number based on student type shown in Figure 5.

![Figure 5. Number based on student type](image)
3.3. Research Indicators in Framework Design of Students Performance Monitoring System

Students’ performance monitoring systems can be understood to include longstanding practices such as the reporting of quiz, midterm grades until final grades. In this research there are some indicators that can give impact to number of retake course of student. There are lack of participation, falling grades and frequent absences. Data number based on Indicators shown in Figure 6.

![Figure 6. Number based on indicators](image)

3.4. Research Variables in Framework Design of Students Performance Monitoring System

Organizational especially university commonly have unit to handle and manage the students problem. The unit can be divided into academic advisors, academic support personnel, and counselling staff. These variable are variable that affect the success of student. Number based on these variables is shown in Figure 7.

![Figure 7. Number based on variables](image)

3.5. Research Method in Framework Design of Students Performance Monitoring System

In research about students’ performance monitoring systems, several authors most commonly uses one method, there are fuzzy logic. It is because fuzzy logic is simple, flexible, tolerant of imprecise data, and can be blended with conventional control techniques and based on natural language. Actually many method that can authors use to solved the problems. But some paper also not identified the method, so fuzzy logic is one of the most method that use to solve the problem. Number based on Method shown in Figure 8.

![Figure 8. Number based on method used](image)
3.6. Possibility Proposed Research

3.6.1. Gaps Found. The gaps found in this research are:
- Former research still involves any stakeholder.
- Several studies still use limited indicators, in this case the more indicators considered will be more accurate to the research.
- Several studies considering timing of early warning system only in one step of the college, in this case most institutions appear to accommodate this practice by allowing for early alerts to occur at any time during the semester to achieve better monitoring activities.

3.6.2. Research Opportunity. Future research opportunities are:
- Involving other stakeholders, such as academic advisors, faculty instructors, academic support personnel, peer staff, or residence staff.
- Considering other indicators, such as social interactions, medical or health concern, and personal/family difficulties.
- The target population in the study can be proposed not only at the initial level students (freshman), but also sophomore, junior and senior level.
- Considering course learning outcome (CLO) that was applied to an internationally accredited assessment system, such as Japan Accreditation Board for Engineering Education (JABEE) or Indonesian Accreditation Board for Engineering Education (IABEE)

4. Conclusion
This paper presented a systematic literature review on framework design of students performance monitoring systems. In this study conducted systematic literature review to get research opportunities and research gap which will be examined in subsequent research. This paper also proposed research indicators and variables that can be considered in further research. Based on systematic literature review step, we obtained 7 primary studies which are included in the criteria that described in the inclusion and exclusion section. In this paper also shows that studies framework design of students performance monitoring systems have increased based on number in each years (2008 until 2018). This paper also proposed that framework design of students performance monitoring systems can be develop by considering their assignment point and quiz at each class meeting with the aim to reduce number of students to retake courses especially in freshman students. Proposed research to do further research can also considering course learning outcome (CLO) that was applied to an internationally accredited assessment system, such as Japan Accreditation Board for Engineering Education (JABEE) or Indonesian Accreditation Board for Engineering Education (IABEE)

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