Smart edu design as a 21st century learning system innovation in optimizing one of the roles of universities

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Abstract. The development of science and technology is closely related to the quality of higher education. Science and technology innovation is used as a tool to empower communities so that they can develop sustainable development. The survey results at one of Indonesia's private universities showed the low role of universities in schools as their environment. The progress of science in universities is very fast but different from the situation in the environment. This indicates an imbalance in the development of knowledge that occurs in universities with schools. Based on the results of a literature study, the smart edu design is used as an alternative solution in this regard. Smart edu is a managerial learning system innovation adapted from the smart city concept. Features in this program allow students, lecturers and teachers in the field to interact with each other. Students can assess the problem without having to go to the field on the other hand the teacher can assess the solution which is the result of learning between the student and the lecturer. Thus the learning transparency can be built through this system so that the inequality of knowledge development can be overcome.

1. Introduction

The University is one of the institutions that play a major role in the development of science and technology, the innovation and research produced are expected to contribute to the progress of society [1]. The role of the university is not limited as a problem solver, but it must be able to develop community competencies so as to provide an acceleration of sustainable development for the surrounding environment [2]. However, the fact at one of the Indonesian private universities, especially the elementary school teacher education study program, shows that the role of universities is only focused on improving the quality of the university, and not paying enough attention to the development of the competence of the surrounding community.

The results of case studies in the field show that the focus of learning and knowledge innovation as learning outcomes is only focused on the interests of lectures. Learning is based on the field problem but the solution to the problem being studied does not arrive at the field. Facts in the field 91% of 35 schools that were verified showed the low ability of teachers in the use of instructional media, 86% of teachers had difficulty in choosing the right model in accordance with the material being taught, and
97% lack of understanding of teachers towards current educational processes so that the teacher's learning still an old habit. This indicates an imbalance in the development of knowledge that occurs in universities with schools as the environment around the campus.

The system of managerial learning is one of the things that must be considered in this case. The disconnection of the connection between the campus environment and the school environment in the field was caused by the absence of an open learning system where each teacher in the field could assess the results of knowledge development carried out in universities. This is something that has not been touched by the researchers, most researchers only focus on in-service training to improve teacher competencies, where the implementation is a separate program from the role of universities for the community. Like from research Teacher training, teacher quality and student achievement [3], Predicting intra-individual changes in teacher burnout: The role of perceived school environment and motivational factors [4], Creating foundations for collaboration in schools: Utilizing professional learning communities to support teacher candidate learning and visions of teaching [5]. This program is only carried out within a certain time limit, it is not continuity so that most of these programs are "business". Their existence is lost when training is not available, the teacher returns to his habit of activities. The impact of the teacher's competence cannot be increased according to what is targeted in the training. Based on the background that has been explained, researchers are trying to develop a design program for managerial learning systems that can facilitate.

2. Methods

In this case the research was carried out by combining several methods including survey, case study analysis and literature study in solving the problems obtained. The survey in this case is intended to describe the trend of the object of research based on the data obtained, the researchers did not give treatment to the object but studied the population of the object under study [6]. In conducting the survey, the respondent must first understand and be willing to answer the instrument proposed [7]. The survey technique was carried out at one private university and 35 elementary schools both state and private in Indonesia. The design used in this study is qualitative, where the process of data collection is carried out in a structured manner by emphasizing aspects of observation to participants more deeply. The procedure steps carried out in this study can be seen in the figure 1.

![Figure 1. Chart of research procedures](chart)

Based on the description of the chart, the first step of the researcher in carrying out his research is conducting a survey, the institution is prepared and adjusted to the object of the survey which is the research objective. For university objects, the survey was conducted directly by researchers, while for 35 elementary school objects carried out by the team, in this case students were involved in survey activities to elementary schools. The results of the survey that has been carried out are in the form of a collection of problems, the researchers conducted a case study analysis to get the core problems that occur in the field. The core is the direction of researchers in developing a managerial learning system program, by conducting literature studies and collecting relevant references, smart edu designs are produced as alternative solutions proposed by researchers.
3. Results and Discussion

A city can be declared as smart if the city can know (sensing) and understand about the situation / problems of the city in more depth, and can take action on the problem [8]. Smart city is a digital city where the use of ICT is basic in its development [8]. Smart city can be formed if there are smart governance components, smart economy, smart people, smart mobility, smart environment, and smart living [9]. Communication, mobility, health, economy, government and others are all controlled in the use of ICT so that people can access easily related to the conditions of their own cities, thus the core in smart city is transparency [10].

The smart city concept in this case was used as the basis for developing the smart edu design. Smart edu is intended as a managerial system of learning where ICT is used as a basis for its development. Smart Edu facilitates and connects students, lecturers and teachers in the field in one system so that they can communicate and collaborate with each other in the learning scheme. The use of ICT in the learning system can systematically integrate all components of learning, including the interaction of learning across space and time with guaranteed quality [11]. Thus through an ICT-based management system can facilitate the learning process in a systematic, comprehensive, integrated, and more effective [12].

The ICT developed in this program is the application of Android smartphones, this is because Android smartphones are general, lecturers, students and even teachers who have and can operate them. Android smartphones feature powerful on-board computing capabilities, large memory, large screens, and an open operating system that encourages application development so that its role is more like a handheld computer [13]. Thus the use of Android smartphones in terms of developing learning system applications is very possible. Learning by smartphone allows students to access learning material from anywhere at any time so that it can improve efficiency and productivity [14]. The following is a general description of the smart edu learning manager developed.

Figure 2. Smart edu design development scheme

Android smartphones are used as facilities in connecting the communication of lecturers, students and teachers in the field, transparency and the development of science can be delivered to the field. For lecturers and students, the features in this program enable students and lecturers to assess problems that occur in the field without having to go into the field, because in this program the teacher can convey the real conditions that occur in the field. For teachers, this program provides features related to how good science learning innovations, the use of media and the selection of the right model according to the material taught as a result of learning studies in college. The evaluation system in this program allows students to understand their competencies. The evaluation feature in this program
shows the development of each student's competency from time to time and the comparison in the form of graphs about each student's competencies, thus the position of each student's ability can be seen. Figure 2 and table 1 show the design of the smart edu program developed.

![Image of smart edu program](image)

**Figure 3.** The design of the smart edu program developed

**Table 1.** The association of smart city-based learning with 21st century skills competence.

| Feature     | Function                                                                 |
|-------------|---------------------------------------------------------------------------|
| Chatting    | The chat feature is one of the most important features in this application. This feature connects communication between students, lecturers and teachers in the field. Through the chat system in this application, collaboration between students, lecturers and teachers can be formed. In this chat facility is divided into 3 groups, to chat one group, the user can click on it.       |
| Problem     | The problem feature has a function to uncover problems in the field. Teachers can express problems they have in the field related to science learning. Thus through this feature students do not have to do a field case study, but the teacher has upped the problem through this feature. |
| News        | The function of the news feature is to describe to the teacher in the field related to scientific development (specifically science) and the results of learning innovations from the university which are solutions to problems raised from the field. Menu update knowledge has a function related to the development of knowledge so that the progress of knowledge can be conveyed to the field, while models and videos contain learning innovations as an alternative solution in the field. |
| Learning    | This feature is very useful for students as users. The 'task' feature is used to enter assignments for student users, there are upload points, uploaded tasks can be either files or videos. As for the "lack of learning" feature, it is important to know the shortcomings of what needs to be completed, if you want it to be logged, the user can enter the 'repair' feature. |
| Evaluate    | The evaluation feature has a function to inform students of the learning outcomes and achievements. Thus, the assessment transparency in learning in this feature can be formed. If students want to see the task score, they can enter the task menu as well as other features. |

Based on the explanation of the smart edu program built, the program facilitates and connects the development of knowledge at the university to schools as an environmental part of the university. Optimization of the role of universities can increase with the existence of program design applications like this, because the learning process carried out originates from the field and ends in the field as a
solution to the problem solvers proposed. Thus the knowledge possessed by the teacher in the field can increase.

Transparency and the formation of communities in learning are educational challenges in the future [15]. The design of this program has a knot as a solution to future learning. In this program interactions can be formed between students, lecturers, and teachers in the field communicatively and collaboratively, where each can contribute its function in accordance with its capacity. In other words, the smart edu program design can create a cross-institutional, cross-space learning community, and be flexible wherever users access. In addition to this, teachers in the field can freely access features that contain new knowledge, solutions to problems, and other knowledge that is developing at the university. With such transparency, the imbalance in the development of knowledge between universities and the environment can be eroded.

4. Conclusion

This paper explains related to future learning system innovations in accordance with the 21st century education system. The low optimization of the role of the university regarding sustainable development of the surrounding environment is one of the reasons for the emergence of the thinking of managerial learning system innovation. The smart edu design is the core of the discussion in this paper. Smart edu is a learning managerial system innovation by adapting the concept of smart city. Transparency and the use of ICT are the characteristics of this program. Program development is designed in the form of an application that can be downloaded in an Android smartphone, thus the smartphone is used as a media that connects students, lecturers and teachers in the field. With the existence of a managerial learning system like this, the development of knowledge at the university can be continuously delivered to schools as an environment for universities.

5. References

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