DEVELOPMENT OF KNOWLEDGE MANAGEMENT SYSTEM OF TEACHERS' COMPETENCY

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ABSTRACT

Teachers had a strategic role in helping achieving an educational purpose. Every teacher should have specific competencies. Sustainable quality improvement of teachers needed to get support and attention from various stakeholders including leaders at schools and government. Therefore, a medium was required to facilitate the process of various knowledge of teacher competency which had been documented and unlimited to time and location. One of the solutions was developing a knowledge management system. The research method was adopted from Knowledge Management System Life Cycle (KMSLC) method. Results of this research was a web-based knowledge management system with features supporting the process of capturing, developing, distributing, and utilizing knowledge. Development of the knowledge management system could facilitate teachers to gain knowledge related to teachers' competencies easily.

Keywords: knowledge management system, knowledge management system life cycle, teacher competency

INTRODUCTION

The success of educational process shall be actualized if there are supporting components to achieve educational purpose. Teacher is one of the educational components with a strategic role to achieve educational purposes. A teacher as a learning agent has a function to improve the quality of national education and in charge of planning, implementing, and assessing learning outcomes as well as guiding students to actively achieve their educational achievement. Consequently, a teacher should have certain competency to support the implementation of their duties properly.

Based on the regulation of Ministry of National Education of Indonesia, compulsory competencies for teachers include pedagogic, personality, social, and professional competencies. Moreover, the Indonesian government continues to improve the quality of teachers' competency through several activities. One of the

activities related to the development of teacher competency is the implementation of teacher competency test, hereinafter referred to as UKG (*Uji Kompetensi Guru*). UKG is an examination to measure basic competencies regarding subject matter and pedagogics in the teachers' content domain. The basic competencies of the field of study are tested according to the field of certification studies (for teachers who are certified educators) and in accordance with the academic qualifications (for teachers who are not yet certified educators) [1].

Data of UKG results in 2015 shows that competency of teachers remains low especially on pedagogic competency with average national score of 48.94 which is below the minimum competency standards, hereinafter referred to as SKM, which is 55 [2]. This result indicates that teachers' performance need to be further developed because they have underperformed various mastery of requisite competency. Furthermore, a sustainable improvement of

teachers' competency needs support and attention from various parties including the schools.

Additionally, according to the acquisition of teachers' competency test results of SMK Pembangunan Bogor in 2018, there are only 2 out of 5 teachers who succeeded to meet SKM in the competency test [2]. This shows that teachers' competency of SMK Pembangunan Bogor still needs to be developed. Various trainings have been implemented to develop the teachers' competency. However, the result of the UKG indicates that the trainings were not effective. It might be happen because educators have limited time to participate in the trainings due to their minimum compulsory requirement of classroom activities. Knowledge gap occurs between senior teachers and new teachers because there is no process of knowledge transferring. Knowledge and experience of the teachers have not been documented. This causes the difference of competency while teaching. Therefore, a medium is required to facilitate the process of knowledge sharing without limitation of time and location. One of the solutions is developing knowledge management system as a medium of knowledge sharing and source of teachers' competency learning.

Knowledge management system is widely used in other fields namely finance, business and industries [3]–[5]. In educational sectors, previous studies related to a knowledge management system also have been done**.** Yang [6] implemented a blog-based knowledge management system to support learning process, which revealed that it may help creating and fostering knowledge. Mardhia & Langi [7] built a knowledge management system on lesson study activities to manage teacher's

knowledge related to lesson study activities. Moreover, Maman et al. [8] developed a website of learning system using knowledge management system as media for sharing knowledge to improve competencies of early childhood teachers. Sari [9] also designed a knowledge management system to support the accreditation process of an educational institution .

Based on the existing problems, the researcher will develop a knowledge management system, hereinafter referred to as KMS of teachers' competency at SMK Pembangunan Bogor. Developing a knowledge management system becomes necessary for SMK Pembangunan Bogor as a medium to share knowledge among teachers, facilitate in documenting and gaining knowledge related to teachers' competency as well as media of learning. Learning feature is also equipped with multiple choice exercises on each learning activity.

METHOD

This study adopted Knowledge Management System Life Cycle (KMSLC) method from Awad & Ghaziri [10]. It consisted 6 stages starting from evaluating the existing infrastructure to verify and validate the model. It is presented in Figure 1.

Evaluating the existing infrastructure stage is the analysis of knowledge and human resources as well as analysis of technology and information infrastructure, network infrastructure, and application that is currently running at the school. Forming the knowledge management team stage refers to selecting and assigning team members to involve in the model development.
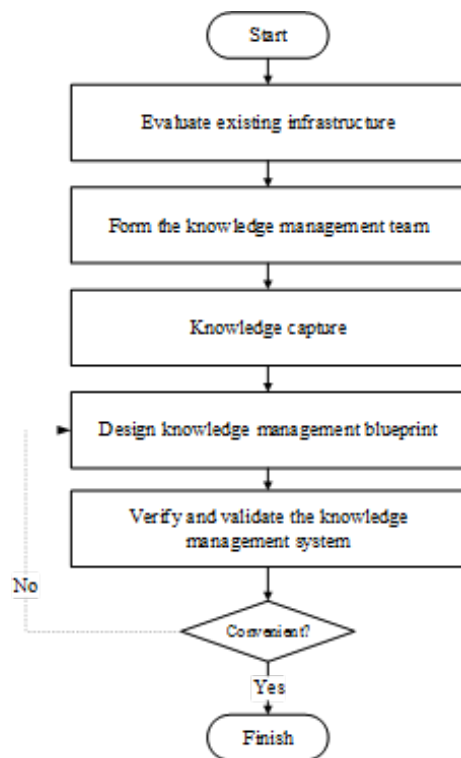
Figure 1. Research Stages

Furthermore, knowledge capturing stage is an activity to classify the explicit and tacit knowledge according to the teacher's competencies aspects. Explicit knowledge refers to a knowledge that has been saved as a document, book, or report [10]. Tacit knowledge is the knowledge that is still in the mind of knowledge resource itself (experts) that is obtained through interview [10].

Designing knowledge management blueprint stage starts from knowledge codification using a knowledge map and designing a knowledge management system using an object-oriented approach model of the Unified Modeling Language (UML). The design has four main elements including data, architecture, interface, and component [11].

Verifying and validating the knowledge management system is conversion of the blueprint into PHP program code language programming with framework Code igniter as well as data basis MySQL. This stage also verifies completeness and validity of knowledge by experts and validate functionality of the system using a black-box testing approach.

RESULTS AND DISCUSSION

All teachers of SMK Pembangunan Bogor has been equipped with computer facilities with LAN (Local area Network) internet connection and Wi-Fi connection which allow all computers at the school to be interconnected. Internet network on the school environment is provided by two ISPs (Internet Service Provider) with sufficient speed (20 and 30 Mbps).

SMK Pembangunan Bogor currently does not have a software system to save and manage knowledge related to teachers' competency. According to observation results at SMK Pembangunan Bogor, the existing knowledge related to teachers' competency is in the form of electronic, non-electronic document, or knowledge that has not been documented from the experts' experience. Available human resources related to teachers' competency at SMK Pembangunan Bogor is presented in Table 1.

Table 1. Availability of Human Resources

Department	Information
Principal	Expert
Vice principal of curriculum	Expert
Vice principal of student affairs	Expert
Counseling teacher	Expert
Homeroom teacher	Expert
Productive teacher	Expert
Administration	Data resource

The knowledge management team in schools involves vice principals, homeroom teachers, counseling teachers, and productive teachers as teachers' competency experts, information technology technicians as administrator, and researchers as

knowledge management system developers. Process of capturing knowledge is implemented using SECI model from Nonaka & Takeuchi [12] shown in Table 2.

Table 2. Process of Capturing Teacher Competency Knowledge

To From	*Tacit*	*Explicit*
Tacit	- Interview and discussion with experts - Observation of learning process	- Documenting knowledge derived from experts - Knowledge is saved into database
Explicit	- Document checking by experts	- Document in the form of non-electronic into electronic

Based on the process of capturing knowledge that has been implemented, results shows that knowledge resource is divided into two locations namely (1) teacher and (2) Artifacts. Knowledge is in the form of idea, skill, training, independent learning, and experience during teaching. Knowledge of pedagogic competency is derived from vice principal of student affairs, curriculum, counseling, and homeroom teachers. Knowledge of professional competency is derived from productive teachers, multimedia skills competency, accounting and financial institutions, automation and office governance, as well as online business and marketing. The knowledge is categorized as tacit knowledge that can be seen on Table 3.

Knowledge that exists in artifact is in the form of documented files related to teachers 'competency of pedagogic and professional aspects. Those knowledge are categorized as explicit knowledge. The form of this knowledge maybe electronic (E) and non-electronic (Non-E) explained in Table 4. Knowledge codification representation results using knowledge map can be seen in Figure 2. exercises on each learning activity. The forum feature can be used by system users to interact and discuss with other users regarding a topic or issue.

Table 3. Tacit knowledge

Department	Tacit knowledge
Vice principal of student affairs	- Expert in developing students potential
Vice principal of curriculum	- Expert in implementing reflective action to improve learning quality - Expert in organizing learning process according to students characteristics
Counseling teacher	- Expert in communicating effectively, empathetically and politely with students.
Homeroom teacher	- Expert in potential identification, initial capability, and learning difficulties of students.
Productive teacher	- Expert in utilizing information and communication technology for learning interests. - Expert in implementing various approaches, strategic, methods, and technique of learning that creatively educating. - Expert in developing learning material of teaching creatively. - Experience in organizing competency test for students. - Experience in participating subjects teachers forum, *musyawarah guru mata pelajaran* (MGMP), and so forth.

Use case diagram describes interaction between one or more actors with system [13]. Actors in this system includes experts, teachers, and administrators. All actors need to login to access the existing features in the system. Each actor has a

different access right. Details of access rights can be seen in Figure 3 while the domain class diagram that shows relations between classes can be seen in Figure 4.

Table 4. Explicit knowledge

Explicit knowledge	Document type	
	E	Non-E
- Teacher discipline	√	√
- Learning module of pedagogic competency	√	
- Learning module of professional multimedia competency, accounting and financial institutions, automation and office governance, online business and marketing	√	
- Operational procedure of handling of students	√	√
- Annual and semester programs	√	√
- Core competency and basic competency of every expertise program.	√	√
- Basic competency mapping	√	√
- Syllabus for each subject	√	√
- Lesson plan	√	√
- Minimum completion criteria	√	√
- Aspects and procedures of learning outcomes assessment	√	√
- Analysis and instrument of learning outcomes assessment	√	√
- Linkage analysis between graduate competency standard, core competency, and basic competency of knowledge and skills	√	√
- Documents of observation, issues, and visitation of student's guardian.		√

Functional need of software from a management system of teachers' competency knowledge, hereinafter referred to as SIMAPKG, includes features of e-document, articles, learning, and discussion forum. The e-document feature facilitates users to share explicit knowledge in the form of document. The article feature facilitates users to document tacit knowledge in the

form of articles and share the articles with other users. Learning feature means learning media for teacher in the form of presentation document files, learning module, and video files related to teachers' competency. Learning feature is also equipped with multiple choice. Architecture system on Figure 5 using architecture model with 6 layers adopted from architecture system of Awad & Ghaziri [10].
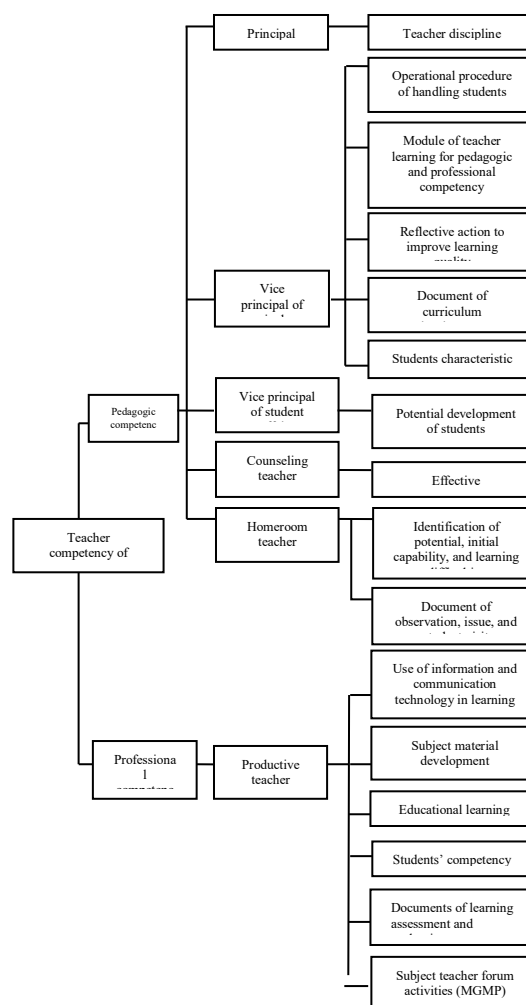

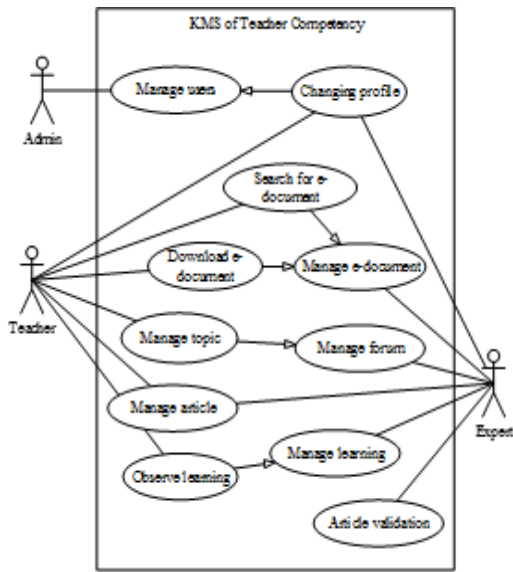Figure 2. Knowledge Map of Teacher Competency

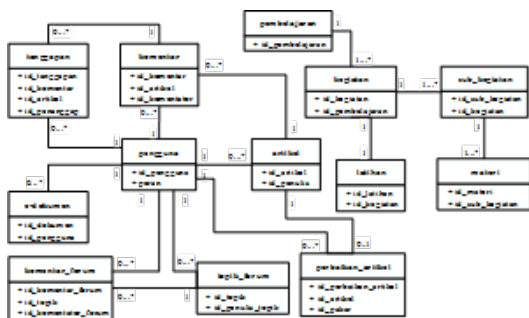Figure 3. Use Case of SIMAPKG
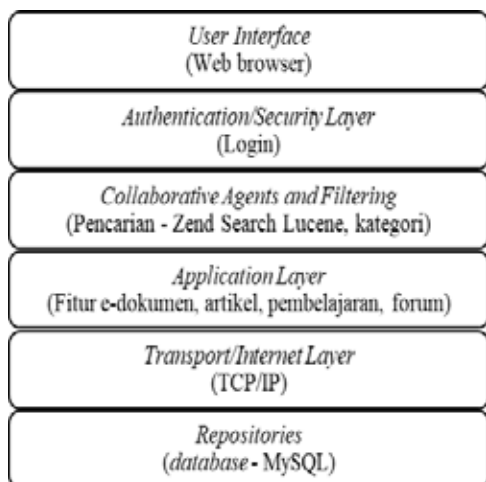

Figure 4. Domain Class Diagram of SIMAPKG

Figure 5. Architecture of SIMAPKG

The verification stage is carried out by interviewing experts regarding completeness and validity of knowledge. Verification results stated that knowledge inserted to the system is valid and related to aspects of teachers' competency. Validation stage is done by examining application of a knowledge management system using a black-box tes conducted by experts and administrators.

System development is done on the localhost network using the help from Xampp software with PHP language programming and Codeigniter framework as well as a MySQL database. System display for e-document, articles, and learning menu with users' role as teachers can be seen in Figure 6, Figure 7, and Figure 8.
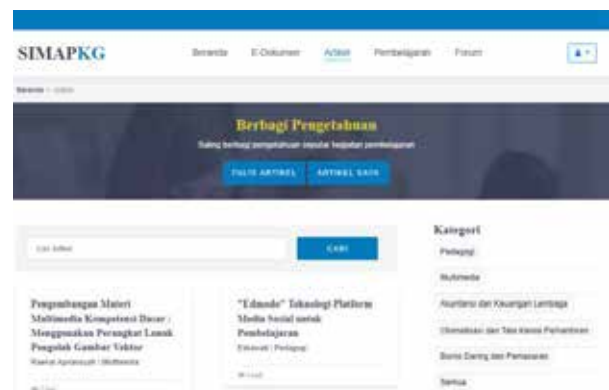

Figure 6. Display of Teacher E-Document Pages

Figure 7. Display of teacher article pages

Figure 8. Display of teacher learning pages

CONCLUSION

This study has successfully developed a knowledge management system of teachers' competency named SIMAPKG. Knowledge management system is developed using KMSLC that is object-oriented and implemented using Codeigniter framework with PHP language programming and MySQL database. SIMAPKG is developed as a media to share knowledge and teachers' competency learning media for pedagogic and professional aspects. SIMAPKG is a web-based system with feature to support process of capturing, developing, sharing, and utilizing knowledge. Features to support those processes among others are e-document, article, learning, and forum. Results of black-box testing shows that the system is effectively functioned and convenient with users' needs Further system development can be developed by managing all aspects of teachers' competency that includes personality and social aspects competencies and is expected to implement a knowledge management system and assess the effectiveness of the use of the knowledge management system.

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