



# Enhancing the Professional Competence of Vocational School Teachers Through a Knowledge Management System-Based Training Model

Gunawan Ali<sup>1\*</sup>, Sonia Yulia Friska<sup>2</sup>, Vitriani<sup>3</sup>, Raimon Efendi<sup>4</sup> 

<sup>1,2,4</sup> Faculty of Teacher Training and Education, University of Dharmas Indonesia, Dharmasraya, Indonesia

<sup>3</sup> Faculty of Teacher Training and Education, University of Muhammadiyah Riau, Pekanbaru, Indonesia

## ARTICLE INFO

### Article history:

Received January 13, 2023

Revised January 19, 2023

Accepted June 20, 2023

Available online July 25, 2023

### Kata Kunci:

Kompetensi, Profesional, Guru SMK, Pelatihan, Knowledge Management System

### Keywords:

Competence, Professional, Vocational School Teachers, Training, Knowledge Management System



This is an open access article under the [CC BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.

Copyright © 2023 by Author. Published by Universitas Pendidikan Ganesha.

## ABSTRAK

Peran forum MGMP Teknik Jaringan Komputer belum optimal dalam pengembangan kompetensi profesional. Padahal jika diperhatikan kegunaan forum ini sangat penting untuk mendukung peningkatan dan pengembangan kompetensi profesional SMK guru Teknik Jaringan Komputer. Tujuan penelitian ini yaitu mengembangkan Model Pelatihan Berbasis Knowledge Management System untuk meningkatkan kompetensi profesional guru SMK. Penelitian ini merupakan penelitian dan pengembangan. Penelitian ini menggunakan prosedur pengembangan ADDIE. Subjek penelitian ini yaitu 35 orang guru SMK Keahlian Teknik Komputer Jaringan. Metode yang digunakan untuk mengumpulkan data yaitu wawancara dan angket. Instrumen pengumpulan data menggunakan lembar kuesioner. Teknik analisis data dapat penelitian ini yaitu statistik deskriptif. Hasil penelitian ini yaitu analisis kebutuhan menunjukkan tingkat kebutuhan terhadap model pelatihan ini sebesar 83.65%. Sintak Model ini pengantar, demonstrasi, diskusi, pelatihan B-KMS; dan evaluasi. Produk yang terdiri dari model pelatihan dalam bentuk buku; pelaksanaan pelatihan dalam bentuk buku panduan; materi pelatihan dalam bentuk buku; penggunaan aplikasi dalam bentuk buku untuk admin dan user; aplikasi knowledge management system. Hasil penelitian menunjukkan model pelatihan ini valid, praktis, efektif dan layak digunakan untuk meningkatkan kompetensi profesional guru.

## ABSTRACT

The role of the Computer Network Engineering MGMP forum could have been more optimal in developing professional competence. If one pays attention to the usefulness of this forum, it is essential to support the improvement and development of the professional competence of SMK Computer Network Engineering teachers. This research aims to develop a Knowledge Management System-Based Training Model to improve the professional competence of vocational teachers. This research is research and development. This study uses the ADDIE development procedure. The subjects of this study were 35 teachers at SMK Computer Network Engineering Skills. The methods used to collect data are interviews and questionnaires. The data collection instrument uses a questionnaire sheet. The data analysis technique for this research is descriptive statistics. The results of this study, namely the needs analysis, show the level of need for this training model is 83.65%. The syntax of this model is an introduction, demonstration, discussion, B-KMS training, and evaluation. Products consisting of training models in book form; implementation of activity in the form of a guidebook; training materials in book form; use of applications in the form of books for admins and users; knowledge management system application. The study results show that this training model is valid, practical, effective and appropriate for use to improve teachers' professional competence.

## 1. INTRODUCTION

Professional vocational high school education based on the demands of the industrial world, in the use of a competent and skilled workforce. Vocational training in the development of education in the development of the industrial world and society (Made Sudana et al., 2019; Sylte, 2020). The professionalism of a teacher must always improve his professional abilities. Teacher professional

\*Corresponding author.

E-mail addresses: [goenawanalie@gmail.com](mailto:goenawanalie@gmail.com) (Gunawan Ali)

development activities must be carried out continuously or continuously in line with government programs to answer the challenges of teacher competence in the 21st century (Almeida & Simoes, 2019; Badaru & Adu, 2022; Hardiyana, 2016). Teachers in functional positions have the duties, responsibilities and authorities of educating, teaching, guiding, training, assessing and evaluating, professional teachers have duties, responsibilities and authorities in improving the quality of education, and developing professionalism in a sustainable manner. Through lifelong learning of teachers as professional educators which has the roles of duties and authorities as students (learning agents), mediators, boosters, boosters, drivers, assessors of student learning according to ethical guidelines and have qualifications (Akar, 2020; Saribas & Ceyhan, 2015).

The three main characteristics of a teacher are not formed and developed by themselves, but must be through a system of education, training and sustainable development both institutionally, communally and personally (Budiyono, 2020; Hismanoglu & Hismanoglu, 2011; Norahmi, 2017). According to previous study teacher development is indeed important based on institutional needs, but what is more important is one of the individual needs of teachers to experience professionalism, learning content and changes over time according to its dimensions (Abu et al., 2020). From the teacher, in time and space, teachers must continuously improve their skills. The professional skills of a teacher must always be developed in terms of knowledge, understanding and skills related to their duties, to always be updated with developments in the world of education (Aprilliyah, 2014; Perdana et al., 2019).

One way that has been done to improve the professional competence of educators is by having Subject Teacher Consultations (MGMP). Its scope includes subject teachers at junior high schools, high schools and vocational high schools. Its working principle is reflection activity "from, by, and for teachers" from all schools, on this basis, the MGMP is organization non structural which is independent, family-based, and has no hierarchical relationship with other institutions (Djajadi, 2020; Noorjannah, 2014). The ineffectiveness of such a forum is strengthened based on the results of a field study conducted by interviewing several Vocational High School teachers. Technique Network Computers who are members of the West Sumatra Computer Network Engineering MGMP stated that in the implementation of professional competency development through this forum it was still not optimal, *sharing* facilities such as practice equipment, workshops, and laboratories can only be carried out between members in adjacent locations, meanwhile sharing *knowledge* and expertise is still relatively rare. Event Sharing This kind of thing is still limited to regular meeting events in the form of a Computer Network Engineering MGMP which is held once in 2 or 3 months, so it can be said sharing *resources* the MGMP Computer Network Engineering has not functioned optimally in increasing the professional competence of Vocational High School teachers for Computer Network Engineering Skills.

This was also reinforced by the results of field observations and interviews with several teachers from Vocational High Schools, namely Vocational School State 1 Sitiung, Public vocational secondary schools 1 Arbor Island, Public vocational secondary schools 7 Sijunjung and Public vocational secondary schools 1 Muaro Bungo pointed out that so far the implementation of the teacher professional competency development model has been implemented Vocational School expertise in Computer Network Engineering is still partial or not comprehensive, and the development of this competency has not shown sustainability either. This is shown, among others: (1) functional training of teachers Vocational School the expertise of Computer Network Engineering held by the MGMP Computer Network Engineering is still very limited and cannot reach all teachers Vocational School Computer Network Engineering expertise due to limited funds, facilities and infrastructure; (2) Teacher functional training Vocational School The Network Computer Engineering Expertise is considered non-continuous; (3) There are still many teachers Vocational School Computer Network Engineering Skills who do not want to take part in training if they have to pay personally; (4) There are several dual expertise teachers who teach at Vocational School Computer Network Engineering skills need to be increased in competence according to the area of expertise in Network Computer Engineering.

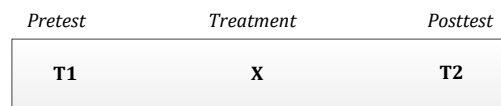
In this regard, it is necessary to increase teacher professionalism, which will be developed to be able to meet the needs of participants with different abilities. One of them is with training activities that focus on increasing professional competence. In line with the development of the technological era, namely the era of the industrial revolution 4.0 and society 5.0, the application of information technology is urgently needed, such as information technology-based training to improve teacher competence (Agustini et al., 2019; Soderstrom et al., 2011). In this study a Knowledge Management-based training model will be used that allows the use of information technology online (Faridawati et al., 2020; Prasetyo & Gintoro, 2010). Knowledge Management System is designed to document, classify, and distribute information related to knowledge (Kaniawulan et al., 2020; Wei et al., 2019). Knowledge management includes institutional actions in managing knowledge as a resource with different strategies to be precise and fast, so that they can communicate with each other, share information and apply it in their daily work (Faruq et al., 2021;

Makarova & Makarova, 2018; Wardhana et al., 2020). It is important to develop a knowledge management system that will help teachers develop their professional skills.

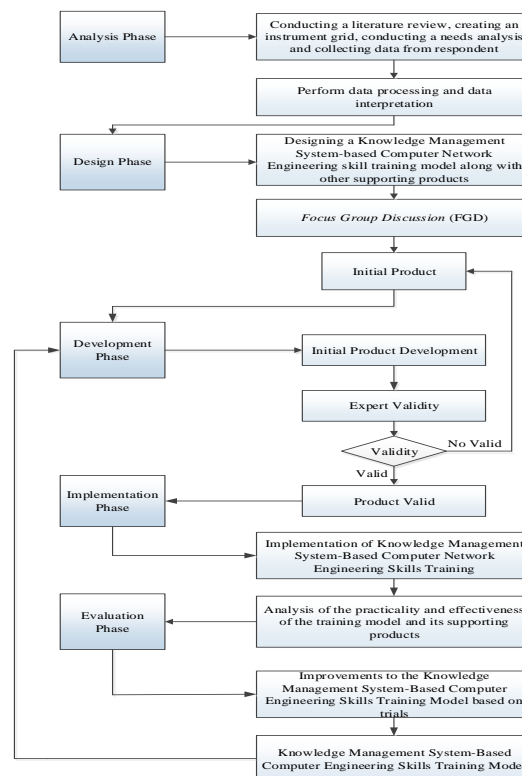
With this KMS-based training model, all competency issues are well documented and distributed to teachers in a timely and appropriate manner. can share knowledge, experience in learning, career and knowledge (Moosa & Shareefa, 2019; Wardhana et al., 2020). Thus, in order to create unity, professional school teachers with good professional qualifications become initiators for students and paths for achieving learning goals, as well as directing students to their goals. The aims of this study is to develop a Knowledge Management System-Based Training Model to improve the professional competence of vocational teachers.

**2. METHOD**

This research is research and development or educational design research. In this study, model development was carried out following the operational stages (analysis, design, development, implementation and evaluation) of the ADDIE model (Ali et al., 2017). This research was conducted on vocational school teachers with computer network skills. Testing was carried out experimentally with one group Pretest and Posttest Design, before being given the model treatment first pretest so that the results of the therapy can be known more precisely, because the conditions before being given the model treatment can be compared with those who have already applied the new model. The design design can be described in Figure 1. Analysis of research data was carried out using descriptive statistics and validity, practicality and effectiveness tests were also carried out. The flow of implementation of this development research can be seen in Figure 2.



**Figure 1. Trial Design**



**Figure 2. Training Implementation Flow**

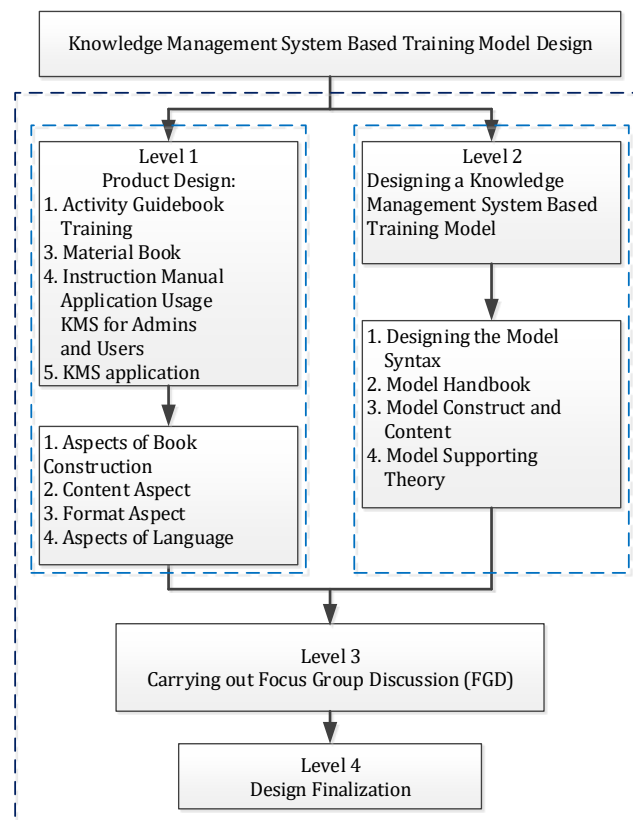
Preliminary study begins in this phase by carrying out a needs analysis. The initial step of this development research is needs analysis, aimed at determining the basic problems encountered in the development of teacher professional competence, so that the need for a training model based on Knowledge Management System. Respondents used in filling out this needs analysis questionnaire were teachers of

SMK Computer Network Engineering Expertise. The instrument grid for needs analysis can be seen in Table 1.

**Table 1. Instrument Grid for Needs Analysis**

No.	Instrument Name	Assessment Section	Instrument's Shape	Number of Statements
1	Need Analysis	Spects of the Need for Mastery of Materials	Liker scale questionnaire	1 – 5 (5 items)
		Aspects of Competency Standard Requirements		1 – 5 (5 items)
		Aspects of Material Development Needs		1 – 4 (4 items)
		Aspects of the Need for Continuing Professional Development		1 – 2 (2 items)
		Aspects of ICT Utilization Needs		1 – 5 (5 items)

A systematic process is the design phase for planning In this phase in planning strategy, and allows researchers to prepare researchers to prepare blue prints or frameworks of reference models are applied. This phase is the input for the development phase. The stafe of design phase is show in Figure 3.



**Figure 3. Design Phase**

Learning design and educational technology, Knowledge Management System-based training model developed and then validated by experts or experts. In this case, the authors request validation by vocational experts, Indonesian language experts and information technology experts as validators for this training model. In implementing it is developed by means of model trials in knowing the practicality and effectiveness of the model. Carry out practicality tests by giving questionnaires to participants and presenters. Conduct pretest and posttest to determine the effectiveness of this model. The development of a valid, practical and effective model that has been tested and revised is the result of the research.

Data for the development of knowledge management system-based training models, the type of data are qualitative data and quantitative data, which are obtained through interviews and questionnaires to teachers of vocational computer network engineering skills. (2) Data validity of the knowledge

management system based training model, this validity data is in the form of quantitative data and qualitative data. Quantitative data is in the form of ticks on the validation sheet questionnaire by the validator, while qualitative data is in the form of written input from the validator which is at the end of the validation sheet. (3) Data on the practicality of the training model based on knowledge management system, the practical data is in the form of quantitative data. This quantitative data was obtained from the results of filling in questionnaires from training participants, IT practitioners/associate teachers and application administrators; (4) Data on the effectiveness of the knowledge management system-based training model, this data was obtained through the results of the pretest and posttest of the training participants based on the Knowledge Management System. The categorization of the achievement value of the respondents used the classification presented in Table 2.

**Table 2. Value Scale**

Achievement Value	Category
90 % - 100 %	Very good
80 % - 89 %	Good
65 % - 79 %	Currently
55 % - 64 %	Less
0 % - 54 %	Less than once

The practicality of the model data is determined from the results of participant observation, IT practitioners/assistant teachers and administrators using a Likert scale. Data analysis practicality based training model development Knowledge Management System for SMK Teachers in Computer Network Engineering Skills using the following steps: (1) Give a score of answers with the criteria: 1 = Very Poor (SK) 2 = Not Good (KB), 3 = Moderate (SD), 4 = Good (B) ) and 5 = Very Good (SB); (2) The practicality is determined by using descriptive statistical analysis using the percentage formula and then converting from quantitative to qualitative data as shown in Table 3.

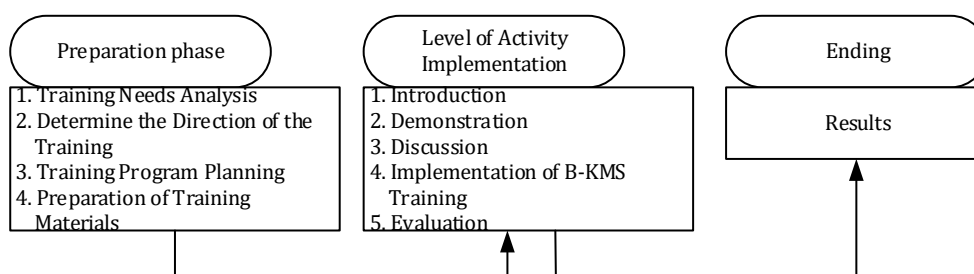
**Table 3. Conversion of Quantitative Data to Qualitative Data for Practicality**

Scale	Quantitative Data	Qualitative Data
1	90 % - 100 %	Very Practical
2	80 % - 89 %	Practical
3	65 % - 79 %	Currently
4	55 % - 64 %	Impractical
5	0 % - 54 %	Very Impractical

### 3. RESULT AND DISCUSSION

#### Result

This Knowledge Management System-based training model is designed to increase the professionalism of vocational teachers, an image of this model can be seen in Figure 4.

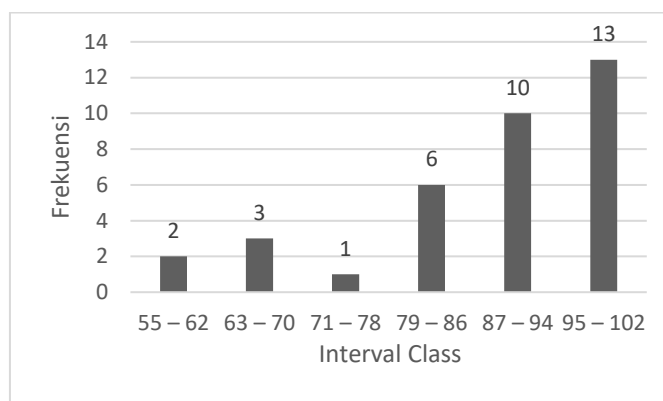


**Figure 4. Knowledge Management System Knowledge Management System Based Training Model**

From Figure 4, it can be deemed that the Knowledge Management System-based skills training model consists of 5 syntaxes, namely as follows: (1) Introduction, (2) Demonstration, (3) Discussion, (4) Implementation of KMS-Based Training, (5) Evaluation training.

**Results of Needs Analysis**

The results of the needs analysis show that the highest frequency of respondents is in the range of scores 95 – 102 as many as 13 or 37.14%, and 83.65% indicates a high need for Knowledge Management System-based training. More complete data can be seen through the Histogram in Figure 5.



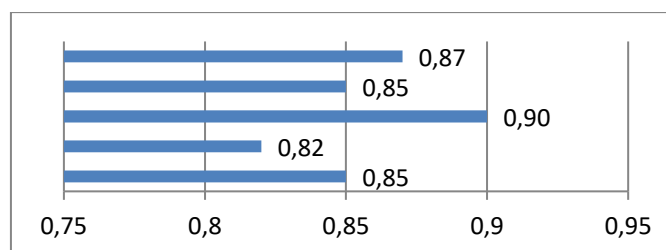
**Figure 5. Frequency Distribution of Needs Analysis Data**

**Results of the Validity of the Knowledge Management System Based Training Model**

The valid category of the validation of the instrument, one of the validators based on the feasibility aspect of the results, has an average score of 0.82. Based on the validity of the validator in the KMS-based training model: 1) The average value of supporting theory aspects is 0.81 for the valid category, 2) The average score of the objective aspect is 0.85 for the valid category, 3) The average score of the syntax aspect is 0.88 for the valid category, 4) the average score of the social system perspective is 0.89 with the valid category, 5) the average score of the principle aspect of the reaction is 0.84 with the valid category, 6) the valid category of the average support system score is 0.88, 7) the aspect of the impact of accompaniment in the valid category, an average of 0.83 and 8) the average score of the implementation aspect of the training is 0.85 in the valid category.

Based on the results of the validity test on the Knowledge Management System Based Training Model Book from the validator are: 1) The average value of organizational aspects is 0.85, valid category, 2) The average score of format aspects is 0.92, valid category. The average score of organizational aspects is 0.89, validation category. The average score of format aspects is 0.93, validation category, and the material aspect has a value of 0.83 with a valid category. The average score of organizational aspects is 0.86, valid category. The average score of format aspects is 0.86, valid category, and the average value of material aspects is 0.85, valid category. The average score of the organizational aspect is 0.91, a valid category, the average score of the format aspect is 0.90, a valid category, and the average score for material aspects is 0.85, a valid category. The average value of the organizational aspect is 0.90, the valid category. The average value of the format aspect is 0.91, the valid category, and the average value of material aspects is 0.85, a valid category.

Base on the results from the validator that the co-application design is it is show that has an average value of 0.90, valid criteria. Valid criteria in Operation have an average value of 0.88, and the valid category of Aspects in Utilization has an average value of 0.89. The language aspect has validity is show in Figure 6.



**Figure 6. Language Aspect Validation Graph**

Base on Figure 6 Book 1: Knowledge Management System Based Training Model average score of 0.85, valid category, Book 2: Training Implementation Guidebook valid category with an average score of 0.82, Book 3: Book Material has an average score of 0.90, said to be valid, Book 4: Application Usage Manual



for Administrators has an average score of 0.85, valid category, and book 5: valid category as an Application Usage guidebook for Users has an average score -average 0.87.

**Results of Knowledge Management System Based Practical Training**

Practicality of the Knowledge Management System Based Training Model in the perception of participants (Teachers) with a score of 90.10% and Very Practical. Practical results in the Knowledge Management System Based Training Model book in the perception of participants (teachers) with a score of 86.11% in the Practical category. The practical results of the Training Implementation Guide in the perception of participants (teachers) with an average score of 88.80% are in the Practical category. The results of practicality are categorized as practical in the material book in the perception of participants (teachers) with an average value of 86.74%. The results of practicality are said to be practical in the Knowledge Management System Application Use Manual in the perception of participants (teachers) with an average value of 86.06%.

It is said to be practical, seen from the results of the practicality of the Knowledge Management System application in the perception of participants (teachers) with an average value of 88.04%. The results of practicality in the practical category of Knowledge Management System Application Use Guide in the view of IT Practitioners/Teachers with an average value of 88.80%. The practical category is the practicality test results of the Knowledge Management System Application in the perception of IT Practitioners/Teacher Assistants with an average value of 85.33%. It is said to be practical, seen from the practicality of the Knowledge Management System Application Usage Guide in the administrator's perception with an average score of 88.00%. It is said that the practical category can be seen from the practicality of the Knowledge Management System application in the administrator's perception with an average value of 87.56%.

**Results of the Knowledge Management System Based Training Effectiveness**

The results of the pretest test found that respondents had an average ability score of 71.91. The highest pretest score was in the interval class 73-79, there were 17 respondents or 48.57%. While the Posttest test respondents have an average ability score of 80.40. The highest posttest score group was in the interval class 78-84 with 16 respondents or 45.71%. So it can be concluded that all data groups on the pretest and posttest have normal distribution of data because they have an Asymp. Sig. > of 0.050, posttest 0.192 and pretest 0.114, then both data pass the normality test. The result is show in Figure 7.

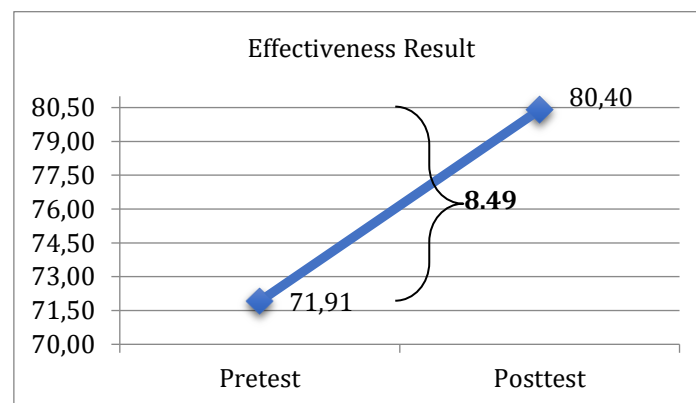


Figure 7. Pretest dan Posttest Graphs

The results of the homogeneity test can be explained that the research data on the pretest and posttest showed a significance score of 0.139 because the large significance score was 0.050, this means that the data to be tested have the same variance. Hypothesis testing was carried out using the Paired Sample t test, showing a score of tcount (4.505) > ttable (2.330), meaning that there is a significant difference in the results of training using a knowledge management system based training model with the conclusion H1 being accepted.

**Discussion**

This research produces a training model based on Knowledge Management System. The development of this model uses procedural stages based on needs analyzes so that the problems found in the training for the development of professional competence of SMK Computer Network Engineering teachers are known in accordance with their areas of competence (Cortellazzo et al., 2019; Tejedor et al., 2019). With the Knowledge-based training modelManagement System for teachers of Vocational High

School Computer Network Engineering Skills, then all matters related to Computer Network Engineering expertise will be documented properly and distributed to all teachers properly and quickly (Ali et al., 2017; Baker, 2004). All teachers can share knowledge, experience, both in the field of learning, career or expertise. So that in this way there will be a unity of Vocational High School teachers with Computer Network Engineering skills who have superior professional competence, become facilitators and partner for students to achieve learning goals in delivering students to achieve their goals.

The results of research that has submitted shows that product validity in expert assessment as a validator shows valid results in all assessments, practicality results show an average score with practical categories and the effectiveness score shows that the training process uses a Knowledge Management System-based training model for SMK teachers in Computer Network Engineering Skills very effective for implemented with the aim of increasing the professional competence of teachers of SMK Computer Network Engineering Skills in accordance with their field of expertise.

This research is in line with the results of research conducted by previous study that found by using a knowledge management system, it can increase employee performance (Al-Ahdal & Abduh, 2021). Likewise, research conducted other study related to the Knowledge Management System, shows that to create professionalism in the form of competence, educational institutions must apply the concept of knowledge management system (Wang & Liu, 2020).

Novelty of this training model, where the Knowledge Management System based training model has 5 syntax, namely: (1) Introduction; (2) Demonstrations; (3) Discussion; (4) Implementation of B-KMS Training; (5) Evaluation. This training model uses the Knowledge Management System application to support the continuation of this training. This training model also supports government programs namely sustainable competency development.

This research can make a significant contribution to improving the professional competence of vocational school teachers. Using a training model based on a knowledge management system, this research can help teachers access and utilize relevant knowledge to enhance their teaching skills and prepare students for the world of work. The use of knowledge management systems in vocational school teacher training can increase the efficiency and effectiveness of training. Teachers can easily access training materials, resources, and other related information through the system. This can reduce the time needed to find training materials and allow teachers to focus on developing relevant competencies. However, to assess the effectiveness and long-term impact of this knowledge management system-based training model, further research is needed. Further studies could be undertaken to measure changes in teacher competence, student performance, and the long-term impact on the quality of education in vocational schools.

#### 4. CONCLUSION

Based on data analysis and discussion, this research produces a Based Training Model *Knowledge Management System* which is valid based on the assessment of the validator or expert and is good and suitable for use. Model Based Training *Knowledge Management System* and the product as a supporting device is considered practical to use and very effective to implement with the aim of increasing the professional competence of vocational teachers according to their area of expertise.

#### 5. REFERENCES

- Abu, S., Supartha, I. W. G., I. P. G., S., & Rahyuda, A. G. (2020). Does teacher competence and commitment improve teacher's professionalism. *Cogent Business & Management*, 7(1). <https://doi.org/10.1080/23311975.2020.1781993>.
- Agustini, K., Santyasa, I. W., & Ratminingsih, N. M. (2019). Analysis of competence on "TPACK": 21st century teacher professional development. *Journal of Physics: Conference Series*, 1387(012035), 1-9. <https://doi.org/10.1088/1742-6596/1387/1/012035>.
- Akar, F. (2020). Examining the meaningful work level of generation x and generation y teachers. *Elementary Education Online*, 19(3), 1225-1241. <https://doi.org/10.17051/ilkonline.2020.728029>.
- Al-Ahdal, A. A. M. H., & Abduh, M. Y. M. (2021). English Writing Proficiency and Apprehensions Among Saudi College Students: Facts and remedies. *TESOL International Journal*, 16(1), 34-56. <https://www.researchgate.net/profile/Mariam-Abduh/publication/348327244>.
- Ali, G., Rukun, K., & Syahril, S. (2017). *Training Model-Based Knowledge Management System for Vocational High School Teachers Skills Engineering Computer Network*. 00(00), 186-193. <http://repository.unp.ac.id/id/eprint/17618>.
- Almeida, F., & Simoes, J. (2019). The Role of Serious Games, Gamification and Industry 4.0 Tools in the Education 4.0 Paradigm. *Contemporary Educational Technology*, 10(2), 120-136.



- <https://doi.org/10.30935/cet.554469>.
- Aprilliyah. (2014). Pengembangan Media Pembelajaran Modul Interaktif Pada Materi Jurnal Khusus Kelas X Akuntansi di SMK Negeri Mojoagung. *Jurnal Khusus*, 2(2), 1–7. <https://jurnalmahasiswa.unesa.ac.id/index.php/35/article/view/9412>.
- Badaru, K. A., & Adu, E. O. (2022). Platformisation of Education: An Analysis of South African Universities' Learning Management Systems. *Research in Social Sciences and Technology*, 7(2), 66–86. <https://doi.org/10.46303/ressat.2022.10>.
- Baker, K. H. (2004). A Comparison of Students' Achievement and Attitudes between Constructivist and Traditional Classroom Environments in Thailand Vocational Electronics. *Programs King Mongkut's Institute of Technology*, 29(2), 133–153. <https://doi.org/10.5328/JVER29.2.133>.
- Budiyono, B. (2020). Inovasi Pemanfaatan Teknologi Sebagai Media Pembelajaran di Era Revolusi 4.0. *Jurnal Kependidikan: Jurnal Hasil Penelitian Dan Kajian Kepustakaan Di Bidang Pendidikan, Pengajaran Dan Pembelajaran*, 6(2), 300. <https://doi.org/10.33394/jk.v6i2.2475>.
- Cortellazzo, L., Bruni, E., & Zampieri, R. (2019). The Role of Leadership in a Digitalized World: A Review. *Frontiers in Psychology*, 10, 1938. <https://doi.org/10.3389/fpsyg.2019.01938>.
- Djajadi, M. (2020). Efektivitas Pendidikan dan Pelatihan Guru: Suatu Upaya Meningkatkan Kualitas Pengajaran Fisika. *Jurnal Sipatokkong BPSDM Sulsel*, 1(1), 30–44. <http://ojs.bpsdmsulsel.id/index.php/sipatokkong/article/view/13>.
- Faridawati, F. F., Minarto, E., Istiana Wati, I., Sutrisno, S., & Hakim, L. (2020). Pembelajaran Robotik Untuk Mempersiapkan Generasi Muda Menghadapi Revolusi Industri 4.0 Dan Society 5.0. *SPEKTA (Jurnal Pengabdian Kepada Masyarakat: Teknologi Dan Aplikasi)*, 1(2), 85. <https://doi.org/10.12928/spekta.v1i2.2826>.
- Faruq, Sabani, N., Sukarno, A., & Purwandari, E. (2021). Systematic Literature Review: Psychological Concepts Of Learning In Handling Speaking Delay In Early Children. *Jurnal Penelitian Humaniora*, 23(1), 45–54. <https://doi.org/10.23917/humaniora.v23i1.19126>.
- Hardiyana, A. (2016). Optimalisasi Pemanfaatan Teknologi Informasi dan Komunikasi dalam Pembelajaran PAUD. *AWLADY: Jurnal Pendidikan Anak*, 2(1), 1–12. <https://doi.org/10.24235/awlady.v2i1>.
- Hismanoglu, M., & Hismanoglu, S. (2011). Task-based language teaching: What every EFL teacher should do. *Procedia - Social and Behavioral Sciences*, 15, 46–52. <https://doi.org/10.1016/j.sbspro.2011.03.049>.
- Kaniawulan, I., Muttaqin, M. R., Ulhaq, D., Studi, P., Informatika, T., Studi, P., Mesin, T., & Korespondensi, P. (2020). Sistem Manajemen Pengetahuan Forum Diskusi Dosen Knowledge Management System of Lecturer Discussion Forum. *Jurnal Teknologi Informasi Dan Ilmu Komputer (JTIK)*, 7(1), 51–58. <https://doi.org/10.25126/jtik.202071258>.
- Made Sudana, I., Apriyani, D., & Nurmasitah, S. (2019). Revitalization of vocational high school roadmap to encounter the 4.0 industrial revolution. *Journal of Social Sciences Research*, 5(2), 338–342. <https://doi.org/10.32861/jssr.52.338.342>.
- Makarova, E. A., & Makarova, E. L. (2018). Blending pedagogy and digital technology to transform educational environment. *International Journal of Cognitive Research in Science, Engineering and Education*, 6(2), 57–65. <https://doi.org/10.5937/ijcrsee1802057M>.
- Moosa, V., & Shareefa, M. (2019). The impact of teachers' experience and qualification on efficacy, knowledge and implementation of differentiated instruction. *International Journal of Instruction*, 12(2), 587–604. <https://doi.org/10.29333/iji.2019.12237a>.
- Noorjannah, L. (2014). Pengembangan Profesionalisme Guru Melalui Penulisan Karya Tulis Ilmiah Bagi Guru Profesional Di Sma Negeri 1 Kauman Kabupaten Tulungagung. *Jurnal Humanity*, 10(1), 11406. <https://doi.org/10.20527/btjpm.v2i2.2230>.
- Norahmi, M. (2017). 21st-century teachers: The students' perspectives. *Journal on English as a Foreign Language*, 7(1), 77. <https://doi.org/10.23971/jefl.v7i1.538>.
- Perdana, E. M., Manongga, D., & Iriani, A. (2019). Model Konseptual bagi Pengembangan Knowledge Management di SMA Menggunakan Soft System Methodology. *Jurnal Teknologi Informasi Dan Ilmu Komputer*, 6(2), 169. <https://doi.org/10.25126/jtik.201962932>.
- Prasetyo, T. I., & Gintoro, G. (2010). Pengembangan Model Pelatihan Online Berbasis Web Untuk Keunggulan Bersaing Pada Pt Intellisys Tripratama. *CommIT (Communication and Information Technology) Journal*, 4(2), 109. <https://doi.org/10.21512/commit.v4i2.544>.
- Saribas, D., & Ceyhan, G. D. (2015). Learning to teach scientific practices: pedagogical decisions and reflections during a course for pre-service science teachers. *International Journal of STEM Education*, 2(1). <https://doi.org/10.1186/s40594-015-0023-y>.
- Soderstrom, Lovqvist, & Tornquist. (2011). *From Distance to online education: Educational Management in the 21th Century*. Annual Conference Dublin.

- Sylte, A. L. (2020). Predicting the future competence needs in working life: Didactical implications for VET in Norway. *International Journal for Research in Vocational Education and Training*, 7(2), 167–192. <https://doi.org/10.13152/IJRVET.7.2.3>.
- Tejedor, G., Segalàs, J., Barrón, Á., Fernández-Morilla, M., Fuertes, M. T., Ruiz-Morales, J., Gutiérrez, I., García-González, E., Aramburuzabala, P., & Hernández, À. (2019). Didactic strategies to promote competencies in sustainability. *Sustainability (Switzerland)*, 11(7), 1–24. <https://doi.org/10.3390/su11072086>.
- Wang, Y., & Liu, Q. (2020). Effects of online teaching presence on students' interactions and collaborative knowledge construction. *Journal of Computer Assisted Learning*, 36(3), 370–382. <https://doi.org/10.1111/jcal.12408>.
- Wardhana, A. C., Nurhadryani, Y., Wahjuni, S., Komputer, D. I., Informatika, F., & Korespondensi, P. (2020). *Knowledge Management System Berbasis Web Tentang Budidaya Web-Based Knowledge Management System Concerning Hydroponic Cultivation To Support Smart Society*. 7(3). <https://doi.org/10.25126/jtiik.202072200>.
- Wei, M. H., Chen, X. Z., Zhan, X. X., Zhang, Z. X., Yu, S. J., & Yan, W. R. (2019). The effect of a web-based training for improving primary health care providers' knowledge about diabetes mellitus management in rural China: A pre-post intervention study. *PLoS ONE*, 14(9), 1–11. <https://doi.org/10.1371/journal.pone.0222930>.