



Development of Competency Test for Cluster Scheme of Information System-Based Network Cable Installation

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Abstract

Covid 19 pandemic influenced the learning process and brought traditional classes to online classes. This condition made the XI grade of Computer Networking students got difficulty in the examination at school. The students were not ready because of the absence of learning media that provided students with the material. The current research aimed to develop and analyse the feasibility, practicality, and also effectiveness of information systems for XI-grade students of Computer Engineering and Networking. The researcher adopted RnD with the ADDIE approach, and twenty students became the participants of the research. Media experts and material experts were involved in examining the product. An information system was implemented in the first group of the networking installation subject. The data collection used need analysis, the feasible test questionnaire of information system, pre-test, and post-test. The researcher applied mean, percentage descriptive analysis, Paired sample t-Test, and N-Gain as data analysis of the research. The result showed 1) the feasible test of information system achieved 4,79 for the media, or it was categorized as very feasible. Furthermore, the product gained 4,71 for the material, or it said very feasibly. 2) The practicality of the information system showed an overall average score was 97% of the practicality criteria. 3) Information system media was declared effective in increasing students' competency with an average N-gain score achieved 73% or stated as quite effective.

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INTRODUCTION

Revolution industry 4.0 gave a challenge to the education world, especially in human resources. In industry, the human source was a crucial aspect since it required qualified competency based on industrial needs. This statement was supported by Sedarmayanti (2014: 129), who elaborated that competency was the basic core since it was as an employee standard. The employees have to improve their competency quality that matches industrial revolution 4.0.

Spencer et.al (1993) depicted competency into two categories, namely practicum competency and interview test (hard skill) and written test (soft skill). Competency has several characteristics, such as individual motives, traits, self-concept, knowledge, and skills. Skill was defined as the ability to do certain duties or tasks, both hard skills and soft skills. *Knowledge* was explained as the individual information about something or thing in a field with a complex level. *Self-Concept* was the individual attitude in the workplace, while *the trait* was nature or character and a person's manners or behavior in responding to a thing. *Motive* consistency in thinking so that it can do an act. A competency aimed to support the individual motive that made an act to get knowledge and skill as the result.

Veithzal Rivai (2013: 302) explained competency as individual competency that can be observed as related to knowledge, skill, and attitude to solve the tasks based on decided performance. In industry, a person can be stated as competent if gaining certificate competency from National Professional Certification (BNSP) through Professional Certification Agency (LSP) organized by each institution. The competency test is a process in determining whether a person is recognized as Competent (K) or Not Competent (BK) based on certain qualifications in technical and non-technical assessment processes, according to relevant proof of competency and qualification (Manual of BNSP no. 304, 2008). One of the institutions in education that held competency tests is Vocational High School.

The vocational school produced qualified human sources ready to work in the industry. Unfortunately, this institution had not fully

successful in conducting the program that provided the required knowledge, skills, and experiences. The result showed that students were not able to fulfill their job duties (Murniati and Nasir, 2009). Helmut N & Eberhard S. (1983) elaborated that graduate vocational high school (SMK) has to gain adequate skills since it has a double system as a learning place and is industrial working oriented. One of the problems in organizing the competency test at SMK was the execution of the competency test has not been following the guidelines. It can be seen from less infrastructure, limited duration, and the suitability of the competency test with technological advances (Triantoro, 2020).

Vocational schools use LSP P1 in schools for the KKN level II competency test assessment model with a cluster scheme. This Cluster Schema system can be conducted at different times in each stage of the cluster. For example, the first-grade students will join the competency test of the first cluster at the end of their academic year. In this stage, the skill passport cluster was given for the first time. It continued to the competency test of the second cluster and so forth. It brought benefits to the students since the test was conducted in several phases. Gonczi (1998) elaborated scoring system in competency tests was supported by achievement notes. Furthermore, Santosa (2018) depicted the competency note can be formed as a skill passport of LSP P1 at school.

One of the popular majors in SMK NU Ungaran was Computer Engineering and Networking (TKJ). Since it had an important role in maintaining information from a conventional system to an electronic one, it caused TKJ to become a trend center. Also, it has a massive market in the environment (Ahmad Mursyidun, 2015). The execution of the competency test at TKJ was divided into three clusters. This cluster can be taken gradually so that the student can take the first cluster scheme (computer network installation). Scoring indicator and competency achievement from BNSP was work preparation, process (systematic and procedure), work result, work attitude, and time.

Based on observation and an interview with the chief of Computer Engineering and Networking (TKJ) at SMK Nahdatul Ulama

Ungaran, the researcher concluded Covid 19 pandemic brought an impact on the learning process. It forced the face to face classroom became an online class. One of the impacts was XI grade students faced problems such as difficulty in accessing appropriate material for the test. It happened since the absence of suitable learning media which supported students' learning activities.

The participant in the competency test can be unsuccessful if they do not prepare it well. At least three aspects of competency must be mastered by the students, such as skill, knowledge and attitude or good manners become crucial. Unfortunately, the execution of the competency test faced a problem since the learning media which supported the participant in preparing for their examination was not ready. The students were not ready and not maximum to sharpen their deep understanding of the test material (Kresna, 2019).

This theory was in line with Sa'diyah, E. A., Handayani, S., & Azizah (2022) entitled Developing Web-Based Learning Media to Support Students' Preparing Competency Test in Making Surimi. The result was 40% of participants did not pass the competency test. It needed the remedial test. In other words, it consumed extra time. The researcher found that psychological factors might influence students, such as too much material test and the material had been taught months or ages ago before the test. So, the students forgot the material.

Irwanti (2014) in her research entitled The Competency Test Evaluation of Multimedia Students at Vocational High School in Yogyakarta province. The problem was quite similar to the previous researcher. It was about the execution of the competency test was not in line with BNSP's manual book. So, the multimedia competency standard was far from the industrial required. Furthermore, the students faced a problem understanding the materials. The teacher met difficulty in delivering all materials in a short time, and the students tended to be passive in the learning process. Also, teachers faced difficulty in explaining materials, especially in the form of multimedia such as texts, pictures, audio, videos, and animations (Erwin dan Anik, 2016).

Multimedia offers an opportunity to learn in a new way by using a computer in the learning process so that the students tend to be active and give positive feedback in the learning process (Munir, 2012). The way of learning was influenced by mastering information and communication technologies or ICT such as using information systems.

Learning activities or testing activities that use *Information and Communication Technologies* (ICT) optimally can improve students' achievement (Chandra dan Loyd, 2008). One of the ICT benefits as teachers and students can learn dynamically and interactively (Rahman, et al, 2008). The ICT tool can be formed as an information system where it integrated a learning model and test into learning activities. One of the school institutions that held competency tests was SMK.

Based on the background above, the researcher chose research entitled "Development of Competency Test for Cluster Scheme of Information System-Based Network Cable Installation at Vocational High School Nahdlatul Ulama Ungaran.

RESEARCH METHOD

The present research adopted Research and Development (R&D) method. Sugiyono (2011: 333) elaborated that R&D was one of the research methodologies that aimed to produce a product and test product effectiveness. Sukmadinata (2009: 164) defined R&D as a process to develop a new product or to compete with its existing products. In education, R&D became a process to develop and dig up product validation. The present research aimed to advance an information system in a competency test with cluster scheme one (network cabling and installation) and then validated the product. This validation was conducted by an assessor expert and a media expert. After the validation, the product was validated by the user, whether it was feasible as a source information system of LSP P1 or not.

The competency test of Computer Engineering and Networking with cluster scheme one (network cabling and installation) was as follows:

Table 1. Cluster 1 TKJ

NO	UNIT CODE	UNIT TITLE
1.	J.611000.001.01	Collecting User Technical Needs
2.	J.611000.002.01	Collecting Networking Equipment Data with Suitable Technology
3.	J.611000.008.02	Preparing Network Cabling
4.	J.611000.009.02	Installing Network Cabling

This research applied Research and Development (R&D) approach. The developed product was an information system that would be tested with cluster scheme I with network cabling and installation materials. The test aimed to know the advanced students' competency in the scheme I. ADDIE system was also adopted as the trial design of research. ADDIE consisted of *Analysis, Design, Development, Implementation, and Evaluation*. Indarsih (2022) elaborated on Research and Development (R&D) in the education area covering the development process, product validation, product trial, and evaluation.

The analysis stage comprised the need analysis of the test participant and the designing information system activities. Designing activities consisted of system structure, collecting and choosing references, designing the system, and constructing system feedback. The result was discussed with the examiner and computer networking teacher. After the examiners agreed and felt the system was feasible, the next step was design realization.

There were two evaluations, namely formative evaluation, and summative evaluation.

Formative evaluation is concerned with evaluating the developed part, while summative aims to evaluate the implementation phase. The data were evaluated to know the weakness of a product, and it can be advice and questionnaire.

The current research used a random sampling system, and 20 students of XI TKJ became research participants. In other words, this research included population research. The study consisted of one group and had given a pre-test and a post-test. Next, the subject was given a treatment of information systems in a competency test with cluster scheme one (network cabling and installation).

RESEARCH RESULT AND DISCUSSION

Research Result

The researcher adopted ADDIE consisted of analysis, design, development, implementation, and evaluation. Based on the research and developed activities, the result can be seen as follows:

Table 2. Media Expert Feasibility Test

No	Aspect	Validator		Average
		Expert1	Expert2	
1	System Quality	4.60	4.80	4.70
2	Information Quality	4.67	5.00	4.83
3	Usage	4.5	4.5	4.50
4	Usage Satisfaction	4.5	4.75	4.63
5	Individual Impact	4.8	4.6	4.70
6	Organization Impact	4.8	5	4.90
The overall average of the experts				4.71

Table 3. Material Expert Feasibility Test

No	Aspect	Validator		Average
		Expert 1	Expert 2	
1	Content Feasibility Aspect	4.67	4.92	4.79
2	Presentation Feasibility Aspect	4.67	4.67	4.67
3	Language Feasibility Aspect	4.78	4.78	4.78
4	Contextual Aspect	4.88	5.00	4.94
The overall average of the experts				4.79

Table 4. Practicality Test

No	Response Indicator	Validator average		Average
		Assessor	Students	
1	Content Quality	90 %	98 %	94%
2	Learning goal alignment	100%	97 %	98%
3	Feedback and adaptation	100%	86 %	93%
4	Motivation	100%	95 %	98%
5	Presentation design	100%	95 %	98%
6	Interaction utility	100%	95 %	98%
7	Accessibility	100%	95 %	98%
8	Reusability	100%	94 %	97%
Average				97%

Table 5. *N-Gain* test (the effectivity)

Result	Experiment Class	Control Class
	N-gain Score (%)	N-Gain Score (%)
Average Score	73.2652 %	53.4445 %
Minimum Score	50.00 %	22.22 %
Maximum Score	93.75 %	71.43%

Tabel 6. T-test result

Data	Levene Statistic	T test	Significance Level
N-Gain_P	0.580	39.742	0.041

Discussion

The present research adopted the RnD methodology and ADDIE system. The result showed that the digitalization media used by ADDIE improved students' competencies (Herdiningrum, 2022). Developing information media such as tutorial websites and computer network installation needed a language programmer. This language programmer included HTML, CSS, javascript, and PHP. Thus language programmer was uploaded by using hosting 000webhost so that it connected to the internet. Since it online-based system, it can be

used on smartphones and desktops. The implementation stage aimed to implement a tutorial-based information system, while the evaluation stage aimed to measure the effectiveness of the developed media.

The developed information system learning media was examined through a formative test by material and media experts. This process was purposed to test the feasibility and validation from the user (assessor and students) to examine the practicality of learning media.

The test of media feasibility was conducted by two media experts and two material experts.

The result showed that the media expert gave 4,71, or it can be declared very feasible, while material experts gave 4,79, or it was very feasible for learning. The research conducted by Sa'diyah, Handayani, and Azizah (2022) showed that the validation test result gained a very feasible to use as learning media.

RnD aimed to decide the proportion of the last product, so a practicality test was needed (Van, 1999). As users of the learning information system, the assessor and students were involved in the practicality test. In the user validation stage, the result showed that the average overall score achieved 97%, or it can be declared that the product was very practical as learning media.

The next phase was an application that consisted of two stages. In the first stage, the participants were given a pre-test. After learning the materials, the participants were given a post-test (second stage). The difference was the students were given learning media (as a treatment) for the experiment class, while the participant in the control class was not given the treatment.

The last stage of developing learning media was evaluation. The evaluation was used to analyze the effectiveness of developed learning media. This effectivity correlated with competency improvement that lay on students learning output. The current research aimed to improve students' competency as the test subject. Based on the effectivity test toward the tutorial information system, the T-test result was $0,041 < 0,05$. It can be stated that there was a significantly different score between students' output (competency) before and after the treatment. The student's competency improvement after using learning media can be shown from the N-Gain test. The result showed that N-Gain got 73% of the average score or it can be said effective. In the conclusion, the tutorial learning media was effective to improve students' competency. Another research conducted by Yulianta (2019) showed students' responses toward information system media included in *the very agree category* in supporting learning activity to improve competency.

This research was in line with Khumaedi (2021), based on experts' validation of the feasibility of learning media such as audio visual

was very feasible to use in improving vocational students' competency. Furthermore, it can bring the class became more effective. The student's cognitive output tended to increase in the experiment class that used E-learning blog-based if it compared with the control class which used google classroom in learning activities (Khotimah, 2022).

Based on the analysis data, it can be concluded that learning media based-information systems can be applied in learning activities. This system had been proven effective, practical, and feasible in the competency tests implementation. The students' competencies and skills tended to increase. Furthermore, it helped students to prepare for the competency test with cluster scheme one (network cabling and installation). It was strengthened by developing competency and skills that can be influenced by digital learning technology (Muflihatus, 2022).

CONCLUSION AND SUGGESTION

Conclusion

Based on research results in developing information system media of competency test with cluster scheme one that had been conducted, it can be concluded that:

- a) Learning preparation for competency tests still used conventional systems, so the students faced difficulty in the learning process. It needed an information system that integrated with assessors' questions to facilitate students in preparing for the test.
- b) The present research used the ADDIE model to create an information system of competency test with cluster scheme one (network cabling and installation). ADDIE consisted of several stages; the analysis stage aimed to dig up the information from the field related to learning media. The second was the designing stage. It was constructing an information system pattern while the development stage aimed to develop an information system and to know the feasibility of the product. Language programming used HTML, CSS, PHP, and bootstrap while 000webhost.com was applied in a server so that it can be used online and on mobile. After that the

implementation stage and evaluation to know the effectivity the developed media.

- c) The development of an information system for competency tests with cluster scheme one TKJ was declared very feasible as learning media. The result showed that the media expert gave 4,71, or it can be declared very feasible, while material experts gave 4,79, or it was very feasible for learning.
- d) In the user validation stage, the result showed that the average overall score achieved 97%, or it can be declared that the product was very practical as learning media.
- e) The developed tutorial media for the Cluster I TKJ competency test was declared effective and significant as a tutorial media. The result showed that N-Gain got 73% of the average score or it can be said effective for preparing competency tests to improve students' skills.

Suggestion

- a) For the teacher, tutorial media can be used as a learning source to interest students' attention so that the students are more active in learning media.
- b) For the assessor, the information system media can be used as a tool to attract students' attention so that it is easy to test in its implementation.
- c) For the students of Computer Engineering and Networking (TKJ), these information system media provide systematic material, so it is easy to understand.
- d) For vocational education, the present information system media can be developed as tutorial media in any form related to vocational competence, so that it can be a learning reference for teachers and students.
- e) For other researchers, this study can be a reference for further research. It can be developed in ample scope of the education field, so it can be improved and become more feasible to be implemented in improving student competencies.

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