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Assessment Methods with Gradations of Answers on Learning through E-Learning

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***Abstract*—The assessment with gradations of answers methods on e-Learning was developed, could be referable to the vocational courses especially in Department of Mechanical Engineering, Faculty of Engineering, State University of Padang. The research that was adapting the Gall & Borg procedures, simplified into five phases, namely: (1) identification of problems and needs analysis; (2) the preparation of a conceptual model; (3) expert validation and verification; (4) testing and revision; and (5) the implementation of the final product. Validation was done through expert judgment of lecturer from the State University of Padang and State University of Yogyakarta. The validity, effectiveness, and practicality models were analyzed qualitatively and quantitatively. The results obtained indicate that: (1) the model developed has met the criteria of a valid, practical, and effective way; (2) assessment model with gradations of answers on learning through e-learning this, especially the learning of vocational courses worthy of use.**

Keywords—assessment; gradations; vocational learning; e-learning

I. INTRODUCTION

The very rapidly development of Information and Communication Technology have given great influence on various sectors of life. Almost none of field that is untouched by the development of this technology, directly or not. Exchange of information takes place quickly, limitations of time, space and distance seem to have become the past. This has made a lot of changes, including paradigm in the world of education. The learning process is no longer depends only on the method and the conventional means known so far. Teachers are no longer the only source of knowledge for his students. The teacher must play a greater role as a facilitator of learn pupils. The development of information and communication technologies in schools not only improve the learning but also affected the social aspect [1].

A new paradigm in education has been shifting the limitations of learning to be learning to know, learning to do, learning to be dan learning to live together [2]. All devices should prepare educational concepts and strategies customized to the demands of the development of information technology. For example, the teacher can put his learning material in the virtual world both accessible to audiences, and that can only be accessed by certain parties. This access can be done wherever and whenever, in accordance with the specified priority, depending on the learning strategies are planned.

Conventional learning system becomes not effective anymore. Various concepts relating to the ability of the brain, intelligence, and creativity, develop further, and was more and more strengthened the argument that wants to correct the weaknesses of the conventional learning system. The learning system with a closed class of the surrounding environment; setting a static and very formal; the teacher as the sole source of knowledge; How to teach that linear in the process of the transfer of knowledge; seeking a learning situation and condition of silence to get maximum concentrations of learning; using the mandatory book that tends to be the only legitimate reference in class; and so forth, all of which was now judged to contain many weaknesses even in the aggregate be counterproductive towards self-development and students intellectual. Advances in technology have made the changes very quickly and intensely. Information and knowledge can be accessed quickly and easily through information and communication technologies. Combined internet and computers and other communication devices have shaped a generation of value, style and a new culture that is called 'digital age' [3].

The utilization of the technology should become an integral part of the renewal of learning. The need to make use of technology is influenced by the fact that occurred in the community outside the school that's been prevalent use of technology in communicating activity, find information, and commercial activity. It is like a pressure on the school community to also use technology in order to make the students familiar with the technology. Furthermore, due to the influence of the progress of the application of higher technology, technology and media into a tool that is considered very important and strategic in order to support the achievement of learning objectives. Further development of the utilization of technology in this learning process is the utilization of information technology and networking, which is known by the term e-learning, where the learning process is carried out remotely online as well as offline.

CNC Programming courses selection as a model is by consideration of these subjects contain elements of learning and evaluation of learning that can be developed in the direction of e-learning. CNC stands for Computer Numerical

Control, is a system of automation of machine tools that are operated and controlled numerically by order of the programmed and stored in media storage. CNC Programming courses provide material that combines the skills of programming that is a "cognitive skill" and control of the machine as well as safety. In the future, the process of learning by e-learning model is certainly going to be growing. It is therefore expected that this assessment model can become a model and inspiration for the development of learning assessments on e-learning for other vocational courses.

A. Vocational Education

Vocational education is a kind of education that aims to prepare students to be able to work in a particular field [4]. According to Pavlova the main purpose of vocational education framework is preparing graduates to work directly [5]. Whereas Gough States that the polytechnic education in addition to prepare graduates for a particular job, must also prepare them to constantly keep learning [6]. While the OECD in its report stated that "Vocational education and training (VET) includes education and training programmes designed for, typically leading to, a particular job or type of job [7]. It normally involves practical training as well as the learning of relevant theory. Thus it can be concluded that the vocational education is education that aims to not only prepare graduates to be able to work in a particular field, but also ready for self-development in the face of the next challenge.

The learning process is a process that involves various phases, starting from the approach, strategy, methods, techniques, tactics and models of learning [8]. To know the success of the learning process, an evaluation should be done through a series of actions that involve measurement and assessment. The evaluation dealing with the qualitative and quantitative aspects, while the measurement is always related to the quantitative aspects. Quantitative evaluation on aspects of the obtained through measurements while the qualitative form of interpretation and consideration towards the measurement results [9]. Therefore, the learning process must always be accompanied by an evaluation so it can be known whether the process has been done already or have achieved the purpose of learning. Learning approach on outline can be grouped in a conventional learning process-oriented or centered on the teacher (teacher centered approach) and the unconventional process of learning oriented student-centered (or student centered approach), as well as the learning approach that combines both.

B. E-learning

One form of student-centered learning, this is a distance learning, where between teacher and student is in a separate room with a distance that could have been very far. There is no face to face interaction between teachers and students during the learning process. Distance learning is defined as "…. the communication over distance between teacher and student mediated by print or some form of technology designed to bridge the separation between teacher and student in space or time…." [10].

Fee defining e-learning as "an approach to learning and development: a collection of learning methods using digital technologies, which enable, matter and enhance learning" [3]. E-learning is classically defined as a process of learning through electronic media, which due to technological developments and shifts in content as well as the adaptation now this is defined as the management of learning through the media Internet or web that include aspects of: material, evaluation, interaction/communication, and cooperation [11]. Some of the terminology that is used to learning with information and communication technology other than e-learning such as online learning, internet learning, distributed learning, tele-learning, virtual learning, computer-assisted learning, web based learning, and distance learning [12]. But all the terminology referring to one thing, that learners/pupils in a different or separate from teachers/tutors. Further development of e-learning, is what is called the mobile learning (M-learning) which is a form of web-based learning applications that are generally accessed from devices that are equipped with wireless transmission and easy carried about like mobile [13].

Generally, e-learning can be classified into three categories: (a) Asynchronous, namely an e-learning model in which the learning process can be carried out any time and the any time, any place, (b) Synchronous, i.e. e-learning model in which the process of economic learning exercised at a certain time though real time and any place, and (c) Blended/hybrid, where the learning process is done in a mix of conventional learning process requires face-to-face, combined with learning through the web. Based on the nature of its interactivity according to Suteja and Gen e-learning can be classified into two groups, namely: e-learning that is static, where users can only download materials (content) study is required, and e-learning that is dynamic with more varied facilities such as discussion forums, e-mail, and evaluation tools [14].

The model used in this research is the asynchronous e-learning, where students can access learning and doing at the time and place he wants. The process of learning to be more flexible because the students can customize their schedule with each other's.

C. Assessment

High level thinking skills is a level thinking (The Higher Order Thinking Skills/HOTS) which occurs when a person takes the new information and the information that is already stored in the memory, the next linking the information and deliver it to achieve a goal or answer required. These skills can be empowered by giving an unusual problem in the form of questions, and assessing through the ability to analyze, evaluate and create [15].

According to Mardapi, the assessment includes all the ways that are used to assess the performance of the individual [16]. The assessment process includes gathering evidence about attainment of learning students are collected either through tests, observations or reports themselves.

II. RESEARCH METHODS

Products developed i.e. Vocational Learning Assessment Model on E-learning, by taking a course object CNC Programming. Model learning packages CNC Programming

courses taught in the Department of Mechanical Engineering, Faculty of Engineering, State University of Padang (FT-UNP). Models equipped with the link which allows students doing additional appropriate information retrieval needs.

The learning instrument contains a model of learning in the form of teaching materials, syllabus and assessment of learning. The syllabus used with customized competency listed in the framework of the Indonesia National Qualifications (KKNI). Learning materials developed in accordance with the CNC Programming Learning material that is used in mechanical engineering FT-UNP with the addition of the latest information and visual illustration. Because this subject constitutes the basics about machines and CNC program, then the discussion only to the lathe and milling CNC training course (TU-2A and 3A). While the assessment of learning customized to the grid drawn up based on the competencies listed in KKNI. These competencies outlined in the aspects of the form; (1) the capability of creating and reading engineering drawings; (2) using a measuring instrument; (3) basic machining techniques; (4) the basic concept of CNC machines; (5) make the program; (6) setting up the machine and tool used, and (7) Operating CNC machine.

The procedures used in this study was adapted from Gall and Borg with 5 stages, namely: (1) collect the necessary information and perform analysis of the product to be developed; (2) the preparation of a conceptual model and developed the initial product; (3) validation and verification; (4) test model, evaluation, revision, (5) the implementation and reporting of results [17].

A. Information Gathering and Products Analysis

At this stage preliminary studies conducted to gather information on everything that is needed in the development of the model. The information collected is done in the form of: observation of existing models, identification of existing problems in the field, and needs analysis.

B. The Design of a Conceptual Model

This development requires support, review and validation of the experts, colleagues and establishing for the purpose of improvement. In designing the model, there are several things to consider, such as: (1) students or students who become the target, (2) infrastructure and means of supporting such as; CNC machines, computers, internet, network, as well as the laboran (3) the expected learning outcomes.

C. Expert Validation

Expert validation performed to assess and provide input towards the model developed to determine whether a product was made feasible in use or not. Expert validation is done through expert judgement consisting of six respondents from FT-UNP. The respondent derives from the field of learning, evaluation and material. Validation is performed for the device in the form of learning syllabus, teaching material and assessment material. While the validation of research instruments conducted by two experts from the Post Graduate Programs of Yogyakarta State University (PPs-UNY).

D. Testing, Revision and Implementation of the Model and Product

The implementation of trial activities accompanied by observations of the use of the product by the user. Trial results and observations are then evaluated. Furthermore conducted consultations and discussions with the experts of each field that is then used to fine-tune the model. After trials and through several revisions, then the products later implemented. The results of the implementation are discussed, analyzed and continued with the development of research outcomes. The five stages of the development of this model can be seen in figure 1.

E. The Research Subject, Data Collection Instrument and Data Analysis Techniques

The subject of this research is a student and lecturer of mechanical engineering FT-UNP, students and lecturers in question is students who take the courses and lecturers CNC Programming taught courses CNC Programming. These subjects are compulsory subjects and lecturer who became the subject of the study amounted to 8 people, while the students as much as 48 people, taken at random from all students who take the course CNC Programming.

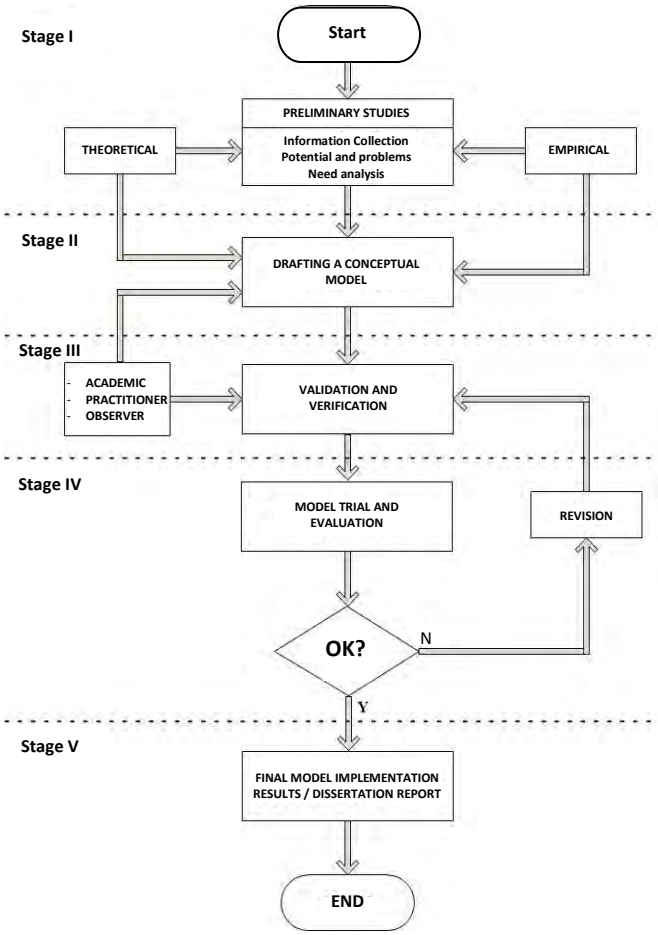

Fig. 1. Research procedure.

The data and opinions from the experts who used the device were to validate learning analyzed through mean, interrater agreement coefficient, and its validity coefficient formula

Aiken [18], and the coefficient of Cronbach alpha. From the analysis of the values is known the magnitude of the percentage of the deal from the experts to the materials requested their opinions. For the validity of the instrument that is done by experts appointed from the PPs UNY, whereas the validity of the construct analyzed through analysis of the confirmatory factors. To fit criteria or whether to use the criteria of price (χ^2/df) according to Meyers [19]. From this analysis it can be known whether the constructs of the instrument correctly measuring the desired competencies.

III. The Result of the Research

A. The Observations in the Department and the University

Observations made in mechanical engineering FT-UNP shows that e-learning is far from done with optimal. From the 67 courses that exist, there are 5 new courses have been conducted in e-learning, i.e. project courses of cooperation with P4TK Medan, and that is no longer active due to the expiration of the cooperation program. Some courses only as placing materials in pages that are provided without any other activities as follow-up. Observations on the university computer center showed that the development of the network and the device, already a priority program in accordance with the UNP Strategic Planning. Until the end of 2014, the server has already owned more than 10 terabits of capacity so that almost the entire academic student administration services ranging from entrance exam to register and print the graduation transcript, could already be in online.

B. The Development Result

Paradigm learning-oriented approach on students (student oriented approach) is the main runway from the design of this model. On a web-based learning, students are able to learn independently as well as cooperative with other students with the facilities provided in accordance with the competence to achieve speed, learning styles and needs of each. On these activities are indeed needed an environment that supports and motivates students to be active in learning. The lecturer acts as a planner, supervisor, assessor and motivation learning process. The main components of the model developed is; learning device, learning materials, and the assessment learning.

Model validation is done through expert judgement consisting of six experts, 3 from the learning and 3 of the material field, while the instrument validation by 2 experts. The results of the validation of the syllabus is presented in table 1. Appraisers give average score of 3.75 scale of 4. These results indicate that the syllabus already has good validity, and can be used with little revision. An examination of the validity of assessment formula of interracial Aiken showed coefficients of 0.86. This means that assessors agreed 86% with aspects of the syllabus are assessed.

TABLE I. VALIDATION OF THE SYLLABUS

No.	Description	Appraisers				Mean
		1	*2*	*3*	*4*	
I	Clarity and conformity					
	1. The identity of the subject are clear	4	4	4	4	4,00
	2. Courses description revealed in good	4	4	3	4	3,75
	3. The expected competence clearly stated	4	4	3	4	3,75
	4. Teaching material and the sources is clearly mentioned	3	4	3	4	3,50
	5. Assessment criteria in accordance with the purpose of learning	4	3	4	4	3,75
	6. The assessment instructions are clearly stated	4	4	3	4	3,75
	Total score average					3,75
II	The general assessment about the syllabus	A	B	B	B	B

TABLE II. VALIDATION OF LEARNING MATERIAL

No.	Description	Appraiser				Mean
		1	*2*	*3*	*4*	
I	Subject					
	1. Material in accordance with the curriculum and syllabus	4	4	4	4	4,00
	2. Material in accordance with the real conditions	4	3	4	4	3,75
	3. Material in accordance with the subject matter	4	4	3	4	3,75
	4. Adequate material coverage in accordance with the expected competencies	3	3	3	3	3,00
	5 The Material sequence was adequate	3	3	3	3	3,00
	6. The material has sufficient online link	4	3	4	4	3,75
	Total score average					3,52
II	The general assessment about the subject material	A	B	B	A	B

TABLE III. VALIDATION OF LEARNING ASSESSMENT

No	Description	Appraiser					Mean
		1	*2*	*3*	*4*	*5*	
I	Subject						
	1. The material to be tested has including all subjects	3	3	3	3	3	3,00
	2. The level of difficulty of the question is too high	3	3	3	4	2	3,00
	3. Material tests in accordance with the expected competencies	4	4	3	3	3	3,40
	4. The number of reserved adequate and in accordance with the allocation of time	3	3	2	3	3	2,80
	5. Relationship questions with answers has obvious	4	4	4	4	3	3,80
	6. Answers certainly looks different	4	4	4	4	4	4,00
	7. Gradations of choice on the answer can measure the level of competence of students	4	4	4	3	4	3,80
	Total score average						3,40
II	The general assessment about the Learning Assesment	A	B	B	B	B	B

Assessment of learning material by the validator is presented in table 2. The results can be concluded that the teaching material is already match the syllabus and can be used as learning materials. Appraisers give average score 3.52 from scale of 4. An examination of the validity of assessment formula of interracial Aiken showed coefficients of 0.85. This means that reviewers have agreed amounted to 85% with the material uploaded as learning materials on the model.

The validity of the assessment study carried out by evaluation and measurement expert as well as lecturer who teach CNC Programming courses. The purpose of validation of these experts is to ensure the validity of the content of the material that is used in the assessment. The result is as shown in table 3. Appraisers give average score of 3.40 scale of 4. An examination of the validity of assessment formula of interracial Aiken showed coefficients of 0.80. This means that reviewers agree with 80% of the material that has been published as learning materials on the model.

Product testing is conducted on a group of students totalling 16 people and 4 people lecturer who taught courses CNC. The results obtained showed that the model can be accessed by students, and the questions that are asked to do by the student achievement outcomes on average 60% for stage 1 and stage 2 examination 66%. The results of the testing of question form to the lecturers who teach CNC Programming, shows a good correlation, with a coefficient α of 0.79. While the results of students ' perception about the now against the competencies of the correlation coefficient has $\alpha = 0.78$.

The product is then implemented to 2 learning group of CNC Programming. Question form for lecturer is also given to the lecturer who taught courses on programming CNC. Analysis of the results of the question form given to the lecturer illustrates that the lecturers who teach the subjects Programming CNC generally agreed with the details asked for. This can be seen from the average score of all answers given lecturer is 3.85 on a scale of 5, meaning that professors tend to agree with the questions asked. This professor's opinion can be grouped based on grating instruments that have been compiled previously. The result is as shown in the following table 4.

TABLE IV. THE LECTURER PERCEPTION OF STUDENT COMPETENCIES

No	Aspect	Mean
1	Aspects of Learning; the syllabus, the completeness and accuracy of the material sequences, content, language, and reference	3,80
2	Aspects of The Media; appearance, accessibility, and communication	3,75
3	Aspects of Assessment: :	
	a. Basic Engineering Competency;	
	Engineering drawings	3,88
	Basic machining	3,95
	b Competence Of CNC Competence;	
	The basic concept of CNC machines	3,84
	Programing	3,95
	Preparing the machine and tool	3,56
	Operate machinery	4,05
	The average score of CNC competence	3,85

Against the student competence in the basic machining and engineering drawings, the lecturer argue that students already have good ability. This means that students already have enough basis for learning CNC Programming. For the competency of the CNC, which covers basic concepts, understand and make the program, setting up the machine and the tool used and the competencies to operate CNC machines, the score obtained is also good. This is apparent where to competency only CNC score provided a lecturer is 3.85 on a scale of 5. Overall, the lecturer assesses that the competence of students in learning CNC Programming in e-learning is also good with an average score of 3.85. The lecturer can be trusted with the reliability coefficient $\alpha = 0.94$. This means that the lecturers agreed that students have a good CNC competence after the following learning CNC Programming on e-learning.

Student perceptions about their competency after following learning CNC Programming generates a somewhat different response with the response given by the lecturer. Overall the students had a higher perception towards their competencies, with the average score 3.94 compared perceptions of professors against the students with score 3.85 with reliability coefficient $\alpha = 0.87$. If grouped based on aspect as in the lattice, then the result is as seen in table 5. Towards the learning aspect and the media of the model, the students argued that the model can already they use it well. Information about the learning objectives, material and language used, and also display aspects, accessibility and communication, students argue it's been good, with an average score of 3.96. This means that students generally do not experience any difficulty in using this model.

TABLE V. THE STUDENTS PERCEPTIONS OF THEIR COMPETENCIES ACHIEVED IN LEARNING CNC PROGRAMMING ON E-LEARNING

No	Aspect	Mean
1	Aspects of Learning; the syllabus, the completeness and accuracy of the material sequences, content, language, and reference	4,01
2	Aspects of The Media; appearance, accessibility, and communication	3,90
3	Aspects of Assessment:	
	a. Basic Engineering ;	
	Engineering drawings	3,90
	Basic machining	3,93
	b. The CNC competence ;	
	The basic concept of CNC machines	3,86
	Programing	3,73
	Preparing the machine and too	4,30
	Operate machinery	3,89
	The average score of CNC competence	3,94

C. Analysis of the Instruments Construct Validity

Testing of the constructs validity of the instrument were made to the students competences expected from following learning CNC Programming on e-learning. Examination done to both instruments, namely instruments for lecturers and instruments for students.

According to Stevens, the model is declared fit if has the following criteria: (1) Chi-Square was not significant (small or

close to zero), (2) P-value > 0.05; and (3) the Root Mean Square Error of Approximation (RMSEA) < 0.05 [20]. Meyers stated that the size of his fit model can also be determined by a variety of other factors, including the chi-square divided by the degrees of freedom (χ^2/df), where: (1) (χ^2/df) model 2 classified fit <, (2) 2 < (χ^2/df) 5, model < can be considered fit [19]. In the constructs analysis in this research, because the number of samples that are worn only 32, the criteria of Stevens is not fully used [20]. According to Meyers for less than 200 data will result in a value of RSMEA would be much bloated so not referable [19]. So in this case, the criteria used is the price (χ^2/df). Competence to operate the machine, the results obtained for the (χ^2/df) is 1.495, while from the perception of students is 2.28. This means that the perception of lecturer entrance fit category invalid constructs while the perception of students because this value is between 2 and 5, then invalid constructs can be considered fit [19].

TABLE VI. THE RESULTS OF THE CONSTRUCTS ANALYSIS

Competence	(χ^2/df)	Criteria
Enggineering Drawing	0 and 2,460	deemed fit
Basic Machining	1,550 and 2,460	fit and deemed fit
Basic CNC	1,250 and 1,425	fit
Programming	0,375 and 0,715	fit
Setting up the machine and Tool	0	fit
Operate Machinery	1,495 and 2,280	fit and deemed fit

D. The Research Limitations

Some limitations of the study are as follows: (1) because not all students have personal computers, then not all of the maha-siswa who take the courses programming CNC can be the subject of the research, (2) it is still difficult to control that students working on their own assignment, quiz or test, instead of working with others, and (3) the limitations of the network remains a common barrier to learning in e-learning. When carrying out off-campus learning according to the needs and conditions of each student is the main principle of the learning in e-learning.

IV. SUMMARY AND ADVICE

Some of the conclusions that can be given are as follows: (1) lattice Formulation of courses and grating instruments Vocational Learning Assessment Model on E-learning (VLAMoE) can be done well, and has been validated by experts, (2) development of MAPVE, for courses CNC programming has been done well. Component model of learning, learning material and learning assessment devices have been validated by experts in their fields and have been declared can be used, (3) VLAMoE, for the Implementation of programming learning CNC in mechanical engineering FT-UNP was successfully carried out, and can be accessed by a lecturer or student. The model developed is declared valid, practical and effective to use. Analysis of invalid constructs against the competency of students based on their perception of their own students and lecturers on learning CNC programming is done with Confirmatory Factor Analysis, pointed out that indicators are formulated can represent competence is intended, with a loading factor is quite high, and (5) overall lecturers giving competence to the assessment of students in learning CNC Programming in e-learning. Students also had good perception towards their competencies by using e-learning instructional model. There was no significant difference between the perceptions of faculty and student perceptions of competence against after learning CNC Programming in e-learning.

A few suggestions that may be proposed are as follows: (1) it needs to be a more intense socialization in order for e-learning, learning for courses – courses Polytechnic can has-rima and implemented by teachers, (2) it needs to be a mechanism or policies that can create a lesson that makes willing lecturers carried out online at least gradually, (3) to think about a way how the student could have a personal computer easily and inexpensively with the assistance of the Agency, because without having a personal computer that can be used anywhere, then e-learning learning objectives will not be achieved, and (4) the Model is expected to be the first step to the implementation of the assessment in e-learning for other vocational courses.

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