



Further Validation of Learning Outcome Assessment Instruments on Occupational Safety & Health (K3/OSH) for Students of Building / Civil Engineering

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Abstract

At present and in the future, the existence of a universty, beside fill in to the predetermined conditions is also assessed by how much graduates enter the world of work. Therefore, universities must accommodate themselves. The important unit of a university is a department, including the Department of Civil Engineering, in Universitas Negeri Semarang (UNNES). Industry-oriented learning enhancement, one of which is the assessment of learning outcomes for subjects must also be developed. This study develop an instrument for assessing learning outcomes in the K3/OSH subject in the Civil Engineering Department of UNNES. The existing learning outcome instruments need to be more developed so that they are not too theoretically but more industry-oriented, in the realms of knowledge, attitudes, and psychomotor. Continuous improvement needs to be done because the material learning that must be adapted to the industry that always evolving. Apart from the above, UNNES also has a vision of conservation with environmental preservation as one of its focus. Conservation values must also be included in the instrument. The next issue is corona pandemic. Students must be assessed in knoweldge of work in pandemic eventhough he or she know from out of class. Through the development of these instruments, it was hoped that the Civil Engineering Department of UNNES can play a more real role in both the world of education and the world of work (construction).

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INTRODUCTION

Civil engineering projects have a very important meaning in state development, because from these activities various development facilities and infrastructure will be generated. These projects are organized to produce a new facility and its maintenance and repair during the design life (Suhendro, 2003). Construction projects are not only important in the end result, namely the facilities, because during the construction process they also employ a large number of workers so that they can affect the regional economy.

However, apart from its important contribution to development, in its implementation the construction sector still has poor performance in terms of occupational safety and health (Endroyo *et.al.* 2016). Occupational Safety and Health in Indonesia have ranks 5th (worst) compared to Singapore, Malaysia, Thailand and the Philippines, and until the end of 2008 did not change much by referring to Arka (2008) that the rate of work accidents in Indonesia was 52 out of 53 countries surveyed with the rate of accidents in the construction industry in the highest order.

The efforts must be done, i.e. to improve learning on occupational safety and health in college are in accordance with what is being carried out in the business / industrial and integrated to the structure of the curriculum program. This is in line with the "mas" Minister of Education's policy. In fact, one of the accreditation indicators is also planned with the percentage of graduates who have worked. Beside the above general requirement, UNNES also has a vision about conservation and environmental perspective, so necessary get it in part of learning evaluation. Recently the Covid-19 pandemic was spreading around the world and required a new order in the workplace, and all of which have also become material learning in K3/OSH. Based on the description above, it is necessary to study the improvement of devices/instruments for measuring learning achievement in the Work Safety course in the field of Building/Civil Engineering in the Civil

Engineering Department of UNNES, to improve this department to be more industrial-oriented.

The research objective is to develop an instrument for assessing the K3 learning outcomes by: (1) Reviewing whether the K3 learning outcomes assessment instrument for students majoring in Building/Civil Engineering is still relevant to the industrial world?, (2) Identifying the learning outcome assessment instrument for safety and health in construction work which is in effect until the time the research is taking place (existing model), (3) Developing a learning model instrument for occupational safety and health based on the construction industry, in vocational higher education in the field of civil engineering, (4) Knowing the validity and reliability of the proposed instrument. Furthermore, the research results expected can: (1) improve the K3 learning outcomes assessment instrument in the building / civil engineering department of UNNES, and (2) can be disseminated to several universities so that it is hoped that it can also be useful for other universities.

The Role of Education in Improving Construction Safety

According to Suma'mur (1981), to improve occupational safety and health can be pursued in various ways, one is **education and training**. According to Pellicer (2009), the factor of **education and training** are important issues for building occupational safety and health.. The results of research by Endroyo et al. (2010) on construction service actors in Semarang, it shows that the education factor has a positive (0.300) and significant (sig: 0.048) correlation with occupational safety and health attitudes. In this reseach, the improvement of occupational safety and health in construction will be studied in terms of teaching in vocational higher education.

Previous studies also by Endroyo (2014) show that the existence of occupational safety and health courses in Civil/Building Engineering higher education in Indonesia still varies. Some are taught in separate courses, some are combined with other matter/courses,

some are implemented in practical courses, so that the quantity and quality of the material does not guarantee a minimum competency. In this can be said, that the portrait of learning safety and health at work in higher education is not encouraging. There is a "gap" between the current condition (*das sein*) and what should be achieved (*das sollen*). Many learning materials are not suitable yet to the world of work. In the world of work, there are standard rules, procedures and standards regarding occupational safety and health that must be studied by students of Civil / Building higher education. Some of the learning materials include occupational safety and health management, both referring to national and international standardization, and matters surrounding the latest issues.

One aspect of education/training is the evaluation/assessment of the learning outcomes of students/trainees. With reliable tools/instruments, the competence of graduates can be justified. This research aim to compose a set of instrument for assessing a learning outcomes on occupational safety and health (K3/OSH) for students of building/civil engineering. That instrument regards to the industrial, comply with the vision of UNNES as a conservation university, and also the SOP of implementing work during a pandemic.

ASSESSMENT

Assessment is a systematic process of gathering evidence, then comparing the evidence with certain standards (LPJKN, 2007). Assessment is a systematic process in gathering information for further analysis, for example by comparing it with certain standards so that it can be seen the level of performance or achievement of the assessed subject (Yulia *et.al*, 2004). Assessment is explaining and interpreting measurement results by comparing observations with criteria (Mardapi, 2008). Measurement is attaching numbers to an object to describe the quantity attributes of that object (Nunnally in Ghozali, 2008). Evaluation is the determination

of values or behavior, it can be individual or institutional behavior (Mardapi, 2008).

Each assessment activity requires certain guidelines or criteria as a reference in determining achievement limits. With the results of this assessment, it will be known which ones are good and which are not. For all of these, the key to success is planning and implementing an assessment whose results are unchanged if the evaluation is repeated by the same evaluator or conducted by another group (Rossi and Freeman, 1985). Ward (1980) also states that an assessment process must be accountable for its validity and reliability. Validity is the assessment ability that can measure what will be measured, and reliability is the consistency of the assessment in measuring what will be measured.

Validity and reliability are the most basic fundamentals in developing an assessment instrument. Validity is evidence and theory support for the interpretation of scores according to their intended use (Mardapi, 2008). Valid means that the instrument can be used to measure what should be measured (Sugiyono, 2009). There are several kinds of validity of the assessment instrument, namely face validity, content validity (Purwanto, 1999), internal validity (Arikunto, 1987), concurrent validity, and predictive validity (Purwanto, 1999). Face validity is determined by the instrument performance format (Azwar, 2007). Content validity can be proven if the items of the assessment instrument show the accuracy of the characteristics to be measured, usually obtained by asking experts in their fields (Purwanto, 1999). Furthermore, internal validity can be demonstrated through a high suitability between instrument parts and the instrument as a whole (Arikunto, 1987). While the concurrent validity can be demonstrated by comparing with other instruments that are known and accepted. As for predictive validity, it means that the instrument is used to predict future abilities and it becomes reality (Purwanto, 1999).

Reliability can be further described as an assessment ability that can provide consistent measurement results for an object, if used either at different times or by different people.

(Purwanto, 1999). There are various ways to determine the level of instrument reliability, for example with the Alpha formula (Azwar, 2007), and composite reliability (Ghozali, 2008).

The research carried out to the preparation of an instrument for assessing the K3 learning outcomes of students majoring in Building / Civil Engineering. Research will be oriented towards industry, conservation, and work in pandemi, and will cover the cognitive, effective and psychomotor domains. It is hoped that the preparation of this instrument is a development of existing instruments so that it will increase the competence of graduates.

METHODS

This research is a descriptive study. The research site is in the Department of Civil Engineering, UNNES. The time of study is 2020 (mono year). The research population was students of UNNES Building Engineering Education. This study uses a qualitative approach and a quantitative approach (mixed approach). According to Creswell (2003) the mixed approach is an approach that uses qualitative and quantitative methods in the social sciences. The use of a mixed approach is because the research subjects of learning materials are more appropriate using a qualitative approach. However, in data analysis it is more appropriate to use a quantitative approach. The research implementation is broadly carried out in six stages, namely: (1) collect information from industry and education providers, (2) K3 learning outcomes assessment instruments, (3) instrument validation, (4) analyzing the results of instrument validation, and (5) formulating research results.

The research variable, namely the K3 learning outcomes of students majoring in Civil / Building UNNES. This variable consists of the sub-variables of knowledge, attitudes and psychomotor. Each sub variable is divided into various indicators. The indicators are described from industry-focused, and conservation-oriented, as well as working in a pandemi situation. From the variables above, other

related variables will be developed. It is all in accordance with the characteristics of qualitative research that can develop during research (Sugiyono, 2009).

Data collection is done in several ways. For the purposes of the first and second research, a qualitative approach was used, so that the data collection instrument was the researcher himself. According to Sugiono (2009), in qualitative research, data collection is usually done by using observations, questionnaires, in-depth interviews, and documentation. In the first and second research objectives, literature studies, documentation, interviews (during this pandemi using the telephone, WA) are used. Furthermore, research that uses a quantitative approach, for example for the third and fourth research purposes, uses tests and questionnaires.

Analysis in a qualitative approach, the data that has been collected is usually in the form of rough data, for example in the form of field notes, recorded interviews, results of questionnaires, and so on. All that needs further analysis. In a qualitative approach, data analysis has been started since the researcher jumped into the field to collect the first data. If necessary, the researchers returned to collecting data in the field as a cyclical process. The problems to be analyzed using a qualitative approach are about the learning material about learning outcomes including the conservation and working during a pandemi. Furthermore, analysis in the quantitative approach, data are arranged in groups and entered into a prepared working table. The data were analyzed with statistics. In this study, for data analysis with statistics, will be used is the product moment correlation technique for the internal validity test, the difficulty index test and the item difference power index.

RESEARCH RESULTS AND DISCUSSION

The research was conducted from July to August 2020 in the Department of Civil Engineering, Semarang State University. At that time, Indonesia as in other parts of the world

was infected with the Covid-19 pandemic. This greatly disturbs the implementation of data retrieval. On the contrary, this pandemic condition is included in the K3 discussion, so how safety works during a pandemic will be included in the material for developing an OHS assessment instrument. The results of this study are: (1) The instrument for assessing the K3 learning outcomes of students of the Department of Building/Civil Engineering at the FT UNNES is no longer relevant to the current development in industrial world. The matters that may be added are: (a) the existence of new regulations in the field of construction safety, namely ISO 45001 in 2018, Permen PU number 05 / PRT / M / 2014 and circular of the Minister of Public Works number 66 / SE / M / 2015 dated December 3, 2015, and others, (b) Learning material in the conservation

curriculum, so it must be integrated in every subject, including K3, (c) Requirements for work during a pandemic, which is also included in the scope of K3. (2) The references used for developing the K3 assessment instrument being developed are: construction field, conservation education, and regulations of work in pandemic. (3) Addition of learning material about K3 at the present time are drawn in Table 1, and the development of instruments of K3 assessment in Table 2. (4) The development of the instruments are: questions about regulations, namely by revising 2-3 questions from 7 questions, questions about conservation by adding 2 questions of 7 questions, and questions about works during a pandemic, by adding 3 questions. (5) The validity and reliability of the instruments (existing) and a developed one are described in Table 3:

Table 1. Additions to K3 learning material as necessary

Material/ Subjects	Sub subjects	Notes
The new regulations in construction safety	Permen PU No. 05/PRT/ M/ 2014 SE Menteri PU nomor 66/SE/M/2015 SE Men PU No. 66/SE /M/ 2015). ISO 45001 tahun 2018	Source: rules and regulations on K3 in the construction sector in Indonesia
Conservation education	a. Conservation insights b. Environmental ethics c. Conservation behavior d. Green architecture, clean energy, and internal transportation	Source: UNNES Conservation Education RPS 2017
Work in pandemic	a. Basic knowledge about covid-19 and pandemic in general b. The characteristics of the covid-19 virus c. How to prevent the spread of covid-19 d. Face mask e. Hand sanitizer f. Check body temperature, g. Disinfectant spraying h. Sunlight i. Gymnastics j. Extra food	Source: Rian Irawan, Manager at Local Initiative For OSH Network – LION Indonesia(http://lionindonesia.org/blog/2020/05/16/keselamatan-dan-kesehatan-kerja-perlindungan-pekerja-di-tengah-pandemi-covid-19/)

Table 2. The development of instrument of K3 assessment

Material/Scope	Existing instrument	Proposed instrument
Regulation of K3	7 questions -	Revising 2-3 question.
Conservation education	No question	Adding 2 question
Work in pandemic	No question	Adding 2 question

Table 3. The comparative of existing instrument and proposed instrument

Indicator	Existing instrument	Proposed instrument
Content validity	No longer relevant to the development	Based on the discussion in the sub-chapter of the research results, was found that the content of the proposed instrument was more in line with developments.
Internal validity	Cognitive domain: 0,382 – 0,422. instrument: test Affective domain: 0,55 – 0,93 instrument: questionnaire Psymotoric domain: valid instrument: observation sheet	Cognitive domain: 0,482 - 0,98 Instrument: test Affective domain: 0,5 - 0,811 instrument: questionnaire Psymotoric domain: valid: can't be conducted, instrument : observation sheet
Reliability instrument	Cognitive domain: 0,6 instrument: test Affective domain: 0,97 instrument : questionnaire Psymotoric domain: - Instrument: observation sheet	Cognitive domain: 0,808 instrumen: test Affective domain: 0,98 instru- Ment: questionnaire Psymotoric domain: can't beconducted. observation sheet
Index of difficulty	0,1 – 1 Instrument: test	0,22 – 0,89 Instrument: test
Power difference	0,125 – 0,625 Instrument: test	0,24 – 0,98 Instrument: test

(6) In the future, it is still necessary to review this K3 instrument, whether it is still relevant or not with the latest conditions.

CONCLUSION

According to the results, may be concluded that the new instrument is better than existing instrument, seen from content validity, internal validity, reliability instrument, index of difficulty, power difference. From content, the new instrument near more relevant to the later situation. From internal validity there are no different significantly among two instruments. And finally, from index of difficulty and power difference, the new instrument better than the existing instrument. From the result, the new instrument may be used for the assessment of learning outcomes of K3 courses, both at the FT UNNES and Civil Engineering study programs in general.

Suggestions that are: (1) It is recommended that the instrument obtained from this study be used as an instrument for assessing learning outcomes of K3 courses in building / civil colleges, (2) Periodically it is necessary to evaluate

the instrument for assessing the learning outcomes of the K3/OHS college.

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