Instrument Development For Evaluating Students' Employability Skills

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Abstract. An assessment on the level of employability skills of students is deemed necessary, given the employers' need for skills that must be mastered by job seekers. The purpose of this study is to create an instrument that is able to assess the level of mastery of students' employability skills. Instrument making was carried out through seven stages: composing of variable constructs, preparing of instrument lines, arranging the instrument items, conducting content validation, testing instrument, conducting the consistency analysis of items, and estimating the reliability coefficient of instruments. Based on the instrument making process, it has been found out that the construct of the measured employability skills variable includes the skills of communication, teamwork, problem-solving, and technology utilization. Subsequent stages were carried out procedurally and content validation was carried out until obtaining the expert approval. The process of analyzing the consistency of items and estimating the reliability coefficient of the instrument was conducted using the SPSS. The results of the consistency analysis of items with SPSS showed seven statement items that had an internal consistency index below 0.3. As a consequence, these items were not used for not representing the construct of the measured indicator. After doing the item consistency analysis, 49 good items were obtained and the instrument reliability coefficient was estimated. Based on the analysis results, the reliability coefficient of the instrument obtained the value of 0.905. As the results obtained were more than 0.7, the instrument was then stated to be reliable and could be used as a data collection tool.

1. Introduction
The current era of technological disruption requires people to become quality human resources to compete and succeed in the world of work. A person's success at work is largely determined by his or her skills. Employability skills are the basis of a person's career development and the skills required are not only determined by technical skills, but also influenced by soft skills. According to Wagaskar, Tripathy, Chauhan, Malaji, & Yadav, the combination of skills as the foundation of one's career life is called as a mix of skills - often called as employability skills [1]. This opinion has been also supported by research by Harvard University The Carnegie Foundation and Stanford Research Center stating that a person's success at work is 85% highly determined by soft skills and only 15% by technical competence and knowledge possessed [2]. Other research stated that many graduates have no competencies required by the world of work, while the rapid development of technology in various
fields raises very competitively to survive in the current era of disruption. This competency, often referred to as employability skills, is highly expected for employers to have. Employment opportunities increase, but graduates are unable to fulfill the work positions offered for lacking the skills and competencies needed by employers [3]. The lack of basic and applied competencies of graduates, especially in applying technology, teamwork, collaboration, creativity, critical thinking in problem solving, and communication, causes several weaknesses in their competencies [4].

Employability skills are the key skills needed by employers and important for job seekers [5]. These skills can also be stated as a series of achievements, understandings and personal attributes that make individuals more likely to get a job and be successful in their chosen job [6]. This statement was supported by Singh and Singh in their research, stating that employability skills are individual work abilities that include self-management, problem solving, arithmetic, use of information technology, and effective communication [7]. This ability is able to make them developed in the workplace. Another opinion added that employability skills are useful for surviving and developing in a company and contributing successfully to the company's strategic direction [8,9] and useful for lifelong learning [8].

Munadi, et al. revealed that employability skills refer to a collection of non-technical skills needed to enter the workforce, to survive and develop a career in the workplace, or for career development in a new workplace [10]. These skills include communication skills, cooperation, problem solving, initiative and effort, planning and organizing activities, managing themselves, learning, using technology, and occupational safety and health [10]. The College and Career Readiness and Success Center stated that to be successful in the labor market at all levels of work and in all sectors, it needs employability skills much [11]. According to Trought, these skills include self-management, teamwork, conflict management and problem solving, communication, information technology skills, computational ability and data analysis, leadership, and emotional intelligence [12].

In general, it can be concluded that employability skills are a series of skills required by someone to get a job, developed in a workplace, and support one's career life, and be successful in an occupied job. Then based on the explanation above and the literature review that has been done, the employability skills component most needed by employers include problem solving skills, communication skills, teamwork skills, and technology utilization skills[13].

The description above proves that employability skills are very important and the implementation needs to be improved by education providers because these skills can affect the success of every student [12]. Based on this, we need an instrument that can be used to measure the level of mastery of one's employability skills. This opinion is supported by several education practitioners and other researchers stating that instruments need to be developed to measure the level of mastery of individual employability skills before entering the workforce. It is because although graduates are stated to have special skills employability skills are still low [14,15]. This then has caused companies and governments spend more on employability training [15]. Rasul, Abd Rauf, Mansor, and Puvanasvaran also stated that engineering graduates lack employability skills because it requires a job skills assessment tool to help students to generate graduates with employability skills as required by industry [16].

The assessment of the employability skills of an individual with an instrument can be used as a benchmark for one's personal development. Self-development is useful for someone to have the work readiness - the ownership of skills and attributes that ensure someone is skilled at work and allows him or her to succeed at work [17]. Work readiness owned by graduates will make them qualified human resources and be able to compete in the world of work.

The importance of work readiness makes education providers need to pay attention to the level of mastery of students' employability skills because the level of work skills determines the work readiness of a student [18]. This is in line with the opinion of Sunardi, Purmono, and Sutadji who stated that the biggest challenge in education today is to produce graduates who have the balanced academic skills, technical skills and employability skills [19]. These employability skills are needed to enter the workforce, to keep working, and to develop a career in the workplace, or for career
development in a new workplace. The ownership of employability skills by individuals is also needed to reduce the unemployment and poverty [20]. Therefore, it is necessary to develop a number of instruments to measure the extent of students’ employability skills. The results of data retrieval through these instruments can be used as a reference for students’ self-development regarding what things need to be improved in the learning process so that these students become the graduates who are ready to work. Based on the description of the problems above, the instruments in this study are developed to measure the level of employability skills mastery to gain graduated students who are ready to work and meet the employers’ criterias.

2. Research Methods
In a quantitative research, the instruments of research are very decisive in which the quality of data and the quality of these determine the results of research. This can be interpreted that a research instrument determines the results of research [21]. Therefore, in the development of instruments to assess students’ employability skills, the steps of instrument preparation according to Budiyono include 1) composing of the measured variable constructs, 2) the preparation of instrument lines, 3) composing of instrument items based on predetermined indicator, 4) conducting the content validation to experts, 5) carrying out trials to see the appropriateness of instrument items, 6) carrying out the item analysis to determine good items, 7) conducting the construct validation, and 8) estimating the reliability coefficient of the instrument [21]. The description of the instrument development process in this article will be carried out in seven stages, while the stages for the construct validation process are discussed separately in other articles.

As revealed above, the steps of developing this instrument take into account its validity and reliability. This is in agreement with Mohajan stating that reliability and validity are the two most important and fundamental features in evaluating each measurement instrument or tool for a good research [22]. The key indicator of the quality of an instrument is the accuracy of the measurement of the reliability and validity of a study.

Validity is defined as the extent to which concepts are measured accurately in quantitative studies. The reliability of an instrument is the extent to which research instruments consistently have the same results if used in the same situation on repeated occasions. The validity of an instrument is divided into three types: content validity, construct validity, and criteria validity [23]. According to the validity of the content, an instrument is called valid if the contents of the instrument have represented the entire contents of the thing measured and all items of the instrument have been arranged according to the rules determined. To assess whether an instrument has content validity, an expert judgment was conducted. The experts chosen have assessed whether the indicator grid made by the instrument developer has shown that the classification of the grid represents the content or the construct to be measured. The next step the experts assessed whether each instrument item prepared was suitable or relevant to the classification of the grid and met other specified requirements. The thing that needs to be considered in the content validation process is the main purpose of validation in which the researcher can get the input from the validator about the refinement of the instrument and its items from the theoretical side. Based on these, the instrument developer fixes the grid and/or items that need improvement, and then consults the validator again. This is done until the validator approves the improvements made by the instrument developer [21].

The validation process in the development of this instrument is carried out with the following steps, 1) defining the construct (concept) or domain to be measured along with the measurement indicators; 2) making grids based on constructs or domains measured and measurement indicators; 3) writing instrument items based on the lattice made; 4) conducting the content validation to experts; 5) providing a table to see the compatibility of the grid with the construct or domain being measured and the suitability between the instrument items and the grid and to provide a place to provide suggestions for improvement; and 6) making any improvements based on expert input suggestions and consulting improvements to the expert until being approved by the expert [21].
3. Results
The results of the preparation of the instrument are described as follows:

3.1. Composing of the measured variable constructs
In this step the construct of the measured variable was developed by describing the operational definition of the variable, and determining the measurement indicators. Based on the previous theoretical description the measured variables are employability skills including communication skills, teamwork, problem solving, and technology utilization. The indicators for each component of the employability were obtained from the following elaboration.

3.1.1. Communication skills
According to Brewer, spoken and written communication skills and information technology are media for sharing knowledge, interests, attitudes, opinions, feelings, and ideas to influence and ultimately lead others [8]. Communication is the art and process of creating and sharing ideas. Effective communication depends on the wealth of ideas [24]. Accordingly, communication is the transmission of messages between people or groups [25]. Another opinion states that communication is about understanding and uniting people, but there is no guarantee that they will always agree with what is said [26]. Communication with others involves two main processes, complementary, and often concurrent, namely speaking and expressing oneself; listening and responding to others. Communication is about exchanging information; making, deciding or modifying relationships [27]. In line, communication is a form of human interaction that influences one another, intentionally or unintentionally and is not limited to the forms of verbal communication, but also in terms of facial expressions, paintings, art, and technology [28]. Whereas, scientific communication refers to an oral and written communication skill, for example, the process of speaking, listening, writing and reading. These skills are needed so that students have learning skills that integrate scientific communication into science studies [29].

Based on the opinion above, communication skills can be defined as the skills of listening, speaking, writing, reading, choosing information, identifying with whom to share information and ideas in an effort to influence others. Then, individuals can be said to have communication skills if they have several indicators or have the following skills: 1) Communicating verbally, 2) Influencing other person, 3) Active listening, 4) Understanding written material, 5) Delivering information in writing.

3.1.2. Teamwork skills.
Team work is a process in which a group of people gather their resources and skills to work together and achieve shared goals [30]. The statement is supported by Sanyal and Hisam who revealed that teamwork is the power of a group of individuals in making better decisions efficiently, and works together by distributing tasks equally among all team members to reduce workload and perform better for the achievement of objectives together [31]. Luca and Tarricone stated Teamwork is individuals who work together in the same work environment to achieve team goals together by sharing knowledge and skills [32]. Then Kozlowski and Bell revealed that teamwork is two or more individuals who share tasks for a common goal, interact, show task interdependence, manage boundaries in an organizational context [33]. Another opinion states that teamwork is a team member who has the same goals, vision and values for success [34]. While teamwork skills can be interpreted as a group of people with complementary skills who are committed and responsible, coordinating and supporting each other in achieving the same goals [35]. Correspondingly, teamwork skills are an adaptive, dynamic, and episodic process that includes thoughts, feelings, and behaviors among team members when interacting towards shared goals [36].

Based on the above studies, it can be concluded that teamwork skills are defined as a group of individuals who have knowledge about cooperation with diverse skills, committed, responsible, and working together by distributing tasks evenly to reduce any workloads and achieve better performance
for achieving goals together. While the indicators of teamwork skills include as follows: 1) Having knowledge about team work, 2) Able to coordinate well through the distribution of tasks, 3) Understanding the role in the team according to the skills possessed, 4) Able to communicate effectively at work, 5) Able to cooperate in completing deficiencies for a common goal, and 6) Responsible for carrying out the tasks distributed.

3.1.3. Problem solving skills

Problem-solving ability is an ability to produce innovative solutions and recommendations [12]. Another opinion states that the ability of problem solving is one's ability to evaluate information or situations; break it down into main components; consider various ways to approach and solve it; and decide which is the most appropriate one[8]. Correspondingly, Yu, Fan, and Lin stated the ability to define problems and analyze and collect data, produce potential solutions, choose optimal solutions, implement optimal solutions, evaluate results, and revise solutions based on results [37]. Ulya stated that problem solving skills are the ability to apply previously owned knowledge to new situations that involve high-level thinking processes. These skills include the ability to identify problems, define goals, explore solutions, implement strategies, review and evaluate the impact of influence [38]. Then, Bransford and Stein added that problem solving skills are one's ability to identify problems and regard problems as opportunities to do something creative and seek to find solutions actively [39].

Based on some of the literature above, problem solving skills can be defined as the ability to identify problems and produce appropriate solutions to solve these problems. Someone can be said to have the indicators of problem solving skills if he or she is able to: a) identify the problem, b) determine the problem, c) explore alternative solutions, d) choose the optimal solution, e) Implement a solution, and f) re-examine

3.1.4. Technology utilization skills

One of the skills required at work is technology utilization skills. These skills enable the employees to carry out work tasks successfully through the application of information technology appropriately and effectively. These skills include skills in understanding and using technology [11]. Trought said that this skill is one of the most valuable components of employability skills according to employers. Technology utilization (IT) skills can help workers to complete the tasks. IT skills include word processing skills, spreadsheets, file management, and e-mail [12]. This statement is supported by the Australian Government stating one component of the employability skills needed for the future includes technology skills that can help to get work done more effectively [9]. Kashefpakdel, Newton, and Clark revealed one component of the employability skills needed in the workplace, namely digital skills. These skills include proficiency in using a PC, the ability to use basic software such as Microsoft Office (Excel, Word, and PowerPoint), and the ability to manage social media wisely [40]. BRICS added important qualifications & skills in which workers must possess for Industry 4.0 including the knowledge of ICT, namely: a) knowledge of basic information technology; b) the ability to use and interact with computers and smart machines such as robots, or tablets; and c) understanding the communication between machines, IT security and data protection [41].

Based on the above study, technology utilization skills can be defined as individual skills in utilizing technology to facilitate the work. Technology utilization skills indicators include: a) Understanding the importance of technology, and b) Skillfully using technology for effective work

3.2. Making grids based on constructs or domains measured and measurement indicators

The preparation of instrument lines is based on constructs, operational definitions, and indicators in step number 1 (point 3.1). Instrument grids to assess students' employability skills can be seen in Table 1 below.
### 3.3. Write instrument items based on the lattice made

The preparation of statement items for the instrument was carried out with reference to the instrument grid shown in Table 1. Overall, before going through the instrument validation process, it has 51 items. The number of statement items to assess communication skills consists of 12 items, 15 items for teamwork skills, 18 items for problem solving skills, and 6 items for utilizing technology skills.

| Component                | Indicator                                                                 | Item number |
|--------------------------|---------------------------------------------------------------------------|-------------|
| Communication skills     | Able to communicate verbally                                             | 1,2,3       |
|                          | Active listening                                                          | 4,5,6       |
|                          | Understanding written material                                            | 7,8,9       |
|                          | Convey information in writing                                             | 10,11,12    |
| Team work skills         | Able to coordinate well through the distribution of tasks                 | 13,14,15    |
|                          | Understanding the role in the team according to the skills possessed      | 16,17,18    |
|                          | Able to communicate effectively at work                                   | 19,20,21    |
|                          | Able to work together and complement each other's shortcomings for common goals | 22,23,24    |
|                          | Commit and take responsibility in carrying out the distributed tasks      | 25,26,27    |
| Problem solving skills   | Identifying the problem                                                   | 28,29,30    |
|                          | Determining the problem                                                   | 31,32,33    |
|                          | Exploring alternative solutions                                           | 34,35,36    |
|                          | Choosing the optimal solution                                             | 37,38,39    |
|                          | Implementing a solution                                                   | 40,41,42    |
|                          | Re-examining                                                              | 43,44,45    |
| utilizing technology skills | Understanding and using technology                                        | 46,47,48    |
|                          | Skillfully utilizing technology for effective work                        | 49,50,51    |

### 3.4. Conducting content validation to experts

Conducting content validation processes was related to the instrument lines and items (by consulting the relevant experts until approval of the instrument lines and items by the expert). The content validation on the instrument for preliminary research was carried out by consulting four experts: one from industry practitioners namely HRD staff and three lecturers. The results of the validation from the experts can be seen as follows.

Experts 1, 2, 3, and 4 stated that the operational definition of the variable was appropriate, the indicators developed were complete and in line with the construction/concept/definition of operational employability skills, and many items were proportional to the indicators.

In addition, Expert 1 added that the indicators developed were in accordance with the concept of employability skills and field needs. In making the items, it was important to concern with knowledge, skills, and attitude. It needs an item that assesses the willingness to face a problem until it is finished on the indicator. Expert 2 commented that to the questionnaire grid, a column was added to distinguish positive (+) and negative (-) items, and then the rating scale was needed to be included in the instrument. Every indicator must measure one object. In some statements there are the inappropriate use of sentences and sentence structure needs to be improved. Expert 3 suggested that adding indicators could influence others on communication skills. In addition to the teamwork skills indicators needed to be added to have knowledge about teamwork. Expert 4 advice and comment were almost the same as expert 2, i.e. an instrument needed to be added rubric/assessment guideline, a mapping of positive (+) and negative (-) statements, and consistency in writing and improving sentence structure was needed.

After the expert evaluation process was complete, revisions were made based on the advice and input from experts and consulted again until being agreed. The final results of the revision obtained a slight change in indicators on the components of communication skills, teamwork skills, and
technology utilization skills. In addition, the instrument statement items, originally amounted to 51 items became 56 items. The following indicators of employability skills components that have been revised according to the suggestions and comments of experts:

a. Communication skills indicators: able to communicate verbally, able to influence others, active listening, understanding written material, and conveying information in writing,

b. Team work skills indicators: having knowledge about team working, able to coordinate well through the distribution of tasks, understanding the role in the team according to the skills possessed, able to communicate effectively at work, able to work together in completing deficiencies for common goals, and responsible for carrying out the tasks that have been distributed

c. Problem solving skills indicators: able to identify problems, able to determine the problem, able to explore alternative solutions, able to choose the optimal solution, able to implement solutions, and able to review.

d. Utilizing technology skills: understanding the importance of technology, and skillfully utilizing technology for effective work

3.5. Conducting trials to see the feasibility of the instrument items

The next step after the validation process by experts was to conduct trials in three Vocational High Schools (SMK): SMK Negeri 2 Klaten, SMK Ma'arif Salam, and SMK Negeri 2 Wonosobo to see the appropriateness of the instrument points.

3.6. Conduct item analysis to determine good items

After the instrument trial process, item analysis was carried out by examining the internal consistency of the questionnaire items. The internal consistency of each item was seen from the correlation between the score of these items with their total score. A questionnaire item had good internal consistency if its internal consistency index was equal or more than 0.3. The analysis of items with an internal consistency index of items processed with the help of SPSS showed seven items with an index value of less than 0.3, indicating that these items did not represent the construct of the indicator. Because these seven items had an internal consistency index of less than 0.3, these items must be removed because they were not considered to represent the construct of the indicator. Based on the results of content validation by experts, the instrument consisted of 56 items. The items omitted because the consistency index was not good were the items number 8, 24, 27, 28, 32, 45, and 53. After the seven items have been removed, 49 other instruments could be said to be items of the instruments good because it had an internal consistency index of more than 0.3 indicating that these items represented the construct of the indicator.

3.7. Estimating the reliability coefficient of the specified instrument.

The final step was to estimate the reliability coefficient of the instrument. There were three ways that could be used to estimate the reliability coefficient of an instrument including the one-time test method, the retest method, and the parallel form method [21]. In the development of this instrument a one-time test method was used. In this method, a group of subjects was measured once. The formula used to estimate the reliability coefficient with this method was the alpha formula. This instrument was stated reliable if the reliability coefficient was equal or more than 0.70. The results of the estimated instrument reliability coefficient after being processed with SPSS obtained a value of 0.905. Because the reliability coefficient results more than 0.7, this instrument could then be stated to be reliable.

4. Discussion

The importance of measuring instruments in evaluating the level of mastery of employability skills makes researchers develop instruments to assess the extent of employability skills as a reference for students' self-development to become graduates who are ready to work. This statement is in line with
the opinions of other researchers who revealed the need for the development of instruments as a tool to measure the level of individual employability skills before entering the workforce. This is needed because many graduates and workers have sufficient technical skills but lack mastery of employability skills. As a consequence, this causes some problems for employers [15,16,18,19]. Because of the importance of this instrument, the development process needs to pay attention to the level of validity and reliability of the instrument. Validity and reliability are the two most basic features in making a measurement instrument [22]. Instruments for assessing the level of individual employability skills have been developed, but the development process often does not pay attention to a strong theoretical basis and lack of validation processes.

In contrast to the development of instruments conducted by researchers, developing the indicators of employability skills components based on literature review, Zakaria et al. developed an instrument based on the Situational Judgment Test (SJT) and the acquisition of components for the employability skills component assessed was not explained explicitly[15]. In addition, Zakaria et al. only did content validity with the help of experts and conducted instrument reliability analyzes using the Chi-Square test[15].

The importance of measuring tools for evaluating employability skills also made Rasul et al. developed an assessment tool to measure and assess the level of individual work skills using the Kepner-Tregoe (K-T) method. This method is often used by employers in determining the level of employee performance. Rasul et al. did not develop the indicators of employability skills components, but the content of the instrument was adapted from the Secretary’s Commission on Achieving Necessary Skills (SCANS)[14]. The validation process of the assessment tools developed was carried out by employers and lecturers. Different from the employability skills instrument developed in this study, the employability skills assessment indicators were developed from a literature review, the validation process was carried out through content validation by experts, and tested through consistency analysis items to prove the validity and appropriateness of the instrument's instrument points.

The component of employability skills as measured through instruments is based on the skills most needed by employers, including problem-solving skills, communication skills, teamwork skills, and technology utilization skills. It was proven by researchers in the literature review about the most employability skills needed to face the world of work in the future [13]. After the instrument is successfully made, the validation process is carried out until obtaining expert approval. Then to prove the validity and reliability of the data, the researcher conducted an analysis of item consistency and estimated reliability coefficients of the data. The results of the analysis state that the instruments that have been developed are valid and reliable so that they are feasible to be used as data collection tools in further research. This is supported by other researchers who stated that validity and reliability are two of the most important and fundamental features that instruments must have can be used as good evaluation tools in research[22,23,42].

5. Conclusion
Employability skills are skills that must be mastered by job seekers and key skills needed by employers. Because of the importance of employability skills, education providers as graduates and prospective workers need to evaluate the mastery level of employability skills. The results of the evaluation can be used as a benchmark for one's personal development so that education providers are able to equip their students to become graduates who are ready to work. Based on this, an instrument was developed to evaluate the level of employability skills of students. Through this instrument, it can be seen what needs vocational students must have to face the world of work and employers. In addition, the measurement indicators in the instrument can see the potential of SMK students. The preparation of this instrument was carried out through a theoretical stage which was derived into statement items to assess the employability skills. Furthermore, the instrument was developed through seven stages and has passed the process of trial and validation by experts. The trial results data were then analyzed for grain consistency index and estimated reliability coefficients with the help of SPSS.
The results of the analysis stated that 49 items were stated to be good and reliable instruments so that they could be used as data collection tools regarding students' employability skills.

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