

Rubric in Vocational Education

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Abstract—Rubric is a very important tool for teachers and students for a variety of purposes. Teachers use the rubric for evaluating student work while students use rubrics for self-assessment. Therefore, this paper was emphasized scoring rubric as a scoring tool for teachers in an environment of Competency Based Education and Training (CBET) in Malaysia Vocational College. A total of three teachers in the fields of electrical and electronics engineering were interviewed to identify how the use of rubrics practiced since vocational transformation implemented in 2012. Overall holistic rubric used to determine the performance of students in the skills area.

Keywords—Rubric, Vocational Education.

I. INTRODUCTION

VOCATIONAL education and training (VET) aims to provide the labor market with workers at the sub-professional level. The basis of vocational education is a combination of formal education and workplace experience. The VET is conducted at schools and at the tertiary level [1]. In the United States and several countries in Europe, the education system has undergone rapid changes over the last 20 years from one that is examination-based to a system characterized by formative assessment. This shift is attributed to the low degree of student knowledge at the school level and the unpreparedness of workers to join the labor force of the business and industrial sectors [2]. The assessment system at the time was dominated by examinations using multiple-choice questions that affect students and teachers. Education policy makers feel disappointed with testing models that use multiple-choice questions because they could not work properly. The weakness has been identified in conventional assessment, such that the practice drills are tedious and excessively focus on the facts. Thus, the more dominant model persists with more accountability, and the assessment education community has shifted to more varied performance assessments known as authentic assessment [3].

Changes from the traditional teaching mode to a competency-based education and training (CBET) likewise occur in technical and vocational education. CBET has several features. (1) The achievement of students (i.e., competency) is specific and accurate, which is crucial in employability. (2) CBET provides high quality and good design of student-centered teaching. (3) CBET uses the media to help the trainees master the given tasks. (4) It allocates a certain period for providing feedback during the learning process. (5) It

provides trainees with adequate time to master a unit prior to being allowed to study the next unit. (6) It requires trainees to perform each task to a high level of proficiency in a job prior to receiving credit for achieving each task. (7) CBET allows the comparison of performance with the fixed standard [4].

The technical and vocational education system in Malaysia has undergone numerous changes since its inception. Beginning in 2013, 79 secondary vocational schools have been upgraded to full vocational colleges compared to only 10 schools in 2012 [5]. The transformation of vocational education in Malaysia is in line with its objective to achieve the developed country status by 2020. Vocational education highlights employability and the cultivation of soft skills, vocational skills, and skills for mastering several business languages (i.e., English, Mandarin, and Arabic), as well as entrepreneurship and industry experience. However, 10 schools continue to maintain their status as technical schools. The new vocational education will emphasize the technical or practical industry practices and reduce academic composition [6]. Vocational competency standards will be adopted extensively in vocational colleges to replace the Modular Certification System. Students will be awarded the Diploma in Vocational after completion of the four-year course. Vocational competency standard aims to produce a workforce that (i) possesses vocational skills, knowledge, self-esteem, and accreditation, (ii) is well versed in and adheres to industry standards and meets employability needs, and (iii) is recognized and accepted by higher learning institutions inside and outside the country [6]. The transformation likewise involves a change from conventional to authentic assessment. Thus, the standard curriculum of vocational colleges is adopted.

The standard format for curriculum consists of three components, namely, content standards, learning standards, and performance criteria. Content standards are specific statements about what students should know and can do in a school period, which cover knowledge, skills, and values. Learning standards are setting criteria or indicators of quality of learning and achievement, which can be measured for each content standard. Performance criteria are statements that specify the factors to be assessed and the required level of performance [6]. The level of student competency is measured by standards reference consisting of standards of performance (academic) and competencies (vocational). Performance standards aim to obtain information about the extent to which students know, understand, and can do or have mastered what they have learned based on statements in accordance with performance levels as envisaged in the document. Competency standards aim to obtain information about the extent to which students have competency in an assignment in

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accordance with a predetermined level of competency (knowledge, skills, and values) as intended [5].

A. General Definition of Rubric

Performance assessment becomes crucial within the CBET context. Answers to open tasks given by the students cannot be assessed using a machine because the process is highly subjective [7]. The issue is how to conduct an objective assessment and make it consistent with a subjective assessment. To improve the reliability of scoring performance, rubric is the best instrument that reflects the level of performance (i.e., from high to low) [18]. Rubric has the potential to significantly contribute to the quality of teaching; however, the flaws that make many rubrics virtually worthless should be corrected [8].

Rubric is derived from the Latin word *red*. The definitions of rubric given by several authors are different but have similar meanings. Rubric in education is defined as the scoring guide designed to provide constructive feedback to students and help them to more clearly understand the characteristics of quality work as outlined in the guide; this guide states the grading quality criteria (i.e., weak to excellent) [9]-[11] of student responses constructed as writing exams, oral exams, and science projects [12]. Rubric is a mechanism for evaluating the quality of student work. Moreover, rubric has a specific format that details and defines the criteria [7]. A good rubric covers the essence of the quality required by the current teacher evaluation process for forming a good performance. Scoring guides and rubrics have the same meaning and are often used interchangeably nevertheless; the criteria for scoring guide rubric are less clear than the more obvious and interesting technically [12]. Overall, rubric is a scoring guide that contains the criteria used by teachers and students to ensure that the quality of work meets the criteria standards.

The two types of rubrics are holistic and analytic. Holistic rubric provides a single score or rating for the entire product or performance based on the overall impact of the work of students [12]. Holistic rubric is used when examiners intend to gain a quick view of overall student achievement and assess the quality and performance of a simple product. However, the use of holistic rubrics has several weaknesses. For instance, two students who have different performances are likely to obtain the same marks or marks that are considerably different because the criteria are too general. Identifying the strengths and weaknesses of the students in the lesson plan is likewise inappropriate. In addition, the student use of holistic rubrics is unsuitable because the criteria are too general [7]. Holistic rubrics use efficiency labels, such as efficient, weak, and brilliant [14]. Analytical rubrics provide more detailed key criteria for performances or products that can be evaluated separately. Different scores are assigned for different criteria and the examiner will develop the criteria and ultimately collect them into an overall score [12]. In contrast, analytic rubrics provide detailed feedback to students and parents, which imply that quality is more important than speed in conducting an assessment, clarifying complicated skills or product performance as determined by dimensions, planning

lessons, and detailing student performance. However, the scoring process slows down and the rater requires additional time to understand and use the rubric [7]. The structure of analytical rubrics typically consists of the topic of assignment, name of student, and grade atop the form. The rubric itself has important criteria based on standards at the right column, and is broken down into small logical criteria and sequences according to developments. The position rating from low to high comprises numbers, words, and pictures. The last column is for scoring or weighting that shows the total points scored. Space at the bottom is provided for students and teachers to share their comments [9].

Rubric is a useful tool for enhancing student learning, improving the quality of student work, allowing students to determine the expectations required by the teacher, and facilitating self-assessment or peer assessment [1]. Furthermore, rubric provides information about the strengths or weaknesses that require improvement [9]. Sharing the rubric with the students is advantageous to them in terms of determining the aspects that require emphasis prior to their examination [15]. Rubric is used by teachers as a tool for assessing student performance or the performance of an open question [9], [12] thus helping them assign grades to provide a common set of guidelines for determining the quality of student work [9], reducing the time for evaluating the work of students [11], and maintaining consistency when teachers give marks to students [7].

B. Rubric Design

Designing a rubric is not a simple matter [11]. The current paper discusses several methods for developing a rubric. Rubric can be built based on the experiences of teachers. The characteristics of the required quality are likewise identified by the teacher. The assignments of students are then classified into several groups according to the specified level of quality. The criteria for distinguishing between these groups are identified as well. The criteria for assessment could likewise be obtained through the literature review. Teachers can adapt the existing rubric criteria [7].

Table I outlines the seven steps as in [10] involved in designing the rubric.

TABLE I
STEPS IN DESIGNING THE RUBRIC

Step	Method
1	Re-examine the learning objectives to be addressed by the task.
2	Identify specific observable attributes that teachers intend to see students demonstrate in their product, process, or performance.
3	Perform brain storming on features that describe each attribute.
4a	For holistic rubrics, write thorough narrative descriptions for excellent work and poor work incorporating each attribute into the description.
5a	For holistic rubrics, complete the rubric by describing other levels on the continuum that ranges from excellent to poor work for the collective attributes.
4b	For analytical rubrics, write thorough narrative descriptions for excellent work and poor work for each individual attribute.
5b	For analytical rubrics, complete the rubric by describing other levels on the continuum that ranges from excellent to poor work for each attribute.
6	Collect samples of student work at each level on the continuum.
7	Revise the rubric if necessary.

According to [15] posited the following five-step process for developing criteria and designing the rubric: (1) Establish what teachers want the students to know and can do. (2) Define the factors to be assessed. (3) Determine whether a project or skill is to be assessed. (4) Introduce the rubric to students. (5) Learn from the use of the rubric. Student should be involved in developing the rubric. Using a model is the best means of encouraging students to develop the rubric. Teachers should demonstrate a strong and a weak assignment to the students. From this model, students can identify the characteristics that lead to the assignment in which they can list the criteria to be considered for quality work. Moreover, students can describe the best and the poor quality, and set the mid-level quality based on knowledge and common problem. Students should be provided time to revise their work based on their feedback, and utilize the same rubric to evaluate their work [11].

Developing a generic analytical rubric involves eight steps [16].

TABLE II
STEPS IN DEVELOPING A GENERIC ANALYTICAL RUBRIC

Step	Method
1	Determine the required performance objectives based on assessment methods that need to be displayed in the work of the students to show proficient performance.
2	Identify the performance level for each criterion.
3	Develop a descriptive scoring for each level of evaluation and criterion.
4	Obtain feedback on the rubric built.
5	Revise the section based on the feedback.
6	Test the validity and reliability of the rubric.
7	Test the pilot rubric.
8	Use the information from the pilot test to improve the rubric.

Three methods for formulating a systematic evaluation of performance assessment tasks, namely, clarifying the performance to be evaluated, developing the framework, and devising the means of scoring and recording [17].

In his book titled *From Standard to Rubric in Six Steps*, [9] proposed six steps teachers can access in planning a unit in the curriculum in the context of addressing the real problem. These steps are as follows. (1) Set the standard target. Targeting is the process in which teachers define standards, individually or in groups, design curricula and different teaching strategies, and develop assessments to meet the standards. (2) Identify the main idea. Generating ideas is the key concept or enduring understanding that has challenged humans since the beginning. (3) Provide a checklist for teachers. Teacher checklists such as lesson plans should cover most of the developments achieved by the students. The checklist should specify the criteria, indicators, or benchmarks in the standards, which should be logically applied and sequentially organized to allow students to understand each step in the process. Prior to establishing the criteria, teachers should build the checklist for developing their own criteria as a teaching guide. The developed criteria are typically based on previous teaching experience. (4) Provide the performance task. The performance of a complex task challenges students

to complete various tasks and solve problems. Task performance is evaluated by several methods through products or processes and across activities. Student assignments require students to engage in an interactive and integrated approach to solving problems related to the real scenario. The form of student assignments is based on learning as problem solving, critical thinking, collaboration, communication, analytical skills, and technological skills required to compete globally. Performance tasks require students to apply what they have learned in developing the product or achieving the performance to demonstrate their learning. (5) Develop a checklist for students. Student checklists provide a teaching roadmap for enabling students to learn the process and sequence for solving complex tasks. The checklist shows each step in the complicated process of subskills to be achieved by students in mastering the standards. Although teachers have to spend enormous time on producing a checklist, they do not have to repeatedly answer student questions. Many students do not listen carefully to teacher instructions; thus, the use of checklists is the best means of overcoming the need for the teacher to repeat the same command. (6) Design the instructional rubric.

II. METHODOLOGY

This study was conducted in three vocational colleges. Three teachers involved in vocational education and with extensive experience in the field were interviewed using a set of interview protocols. Interviews were transcribed verbatim. Keywords and phrases related to developing the rubric were extracted, aggregated, and translated into themes. Interview questions focused on the process of how teachers develop the rubric and the type of rubric to be used to measure competency in practical skills in vocational colleges.

III. FINDINGS

Practical activity is highly significant in the VET system and in performance assessment. However, performance assessment requires human judgment in performing a complex scoring [18]. From the interviews conducted, practical skills were judged based on the process and final product using the rubric. Effective assessment requires specification criteria and a procedure that is fair to everyone [19]. Several researchers argue that the use of rubrics improves the reliability of the evaluation, increases the validity of the assessment, and produce scores and grades that can be trusted. The usage of rubric in vocational college remains limited as a scoring tool instead of constructive feedback to students. In vocational colleges, teachers themselves develop the rubric. Different tasks require different rubrics. Therefore, teachers should develop numerous rubrics to assess different tasks. Rubrics could be developed in several ways. The main consideration is to ensure that the learning objectives are in line with the tasks [11], [15], [10]. The attributes should then be specified using the brainstorming method [11] and based on teacher experience and literature review, as well as adapted from an existing rubric [7] or based on the use of the model of the

previous student work [10]. Involving students in producing the rubric will help them identify the tasks and assignments that are poor or excellent. Therefore, students can define quality using a specific list of criteria (i.e., good, weak and intermediate criteria). The rubric can be subsequently used by students as a self-assessment or assignments guide for performing favorably.

Several criteria determine the competency for courses involving practical skills. The three key elements that are valued by teachers in evaluating competency are work process, work product, and attitude (see Table III). These elements are in line with the competency standard outlined by the Ministry of Education, such that obtaining information about the extent to which students have competency on an assignment is in accordance with a predetermined level of competency (knowledge, skills, and values) as intended [6].

This evaluation form consists of the rating scale, criteria evaluated, weightage, and scores. Teachers give points to students depending on the criteria. Moreover, the rating scale is relatively weak. A score of 0 is given if the student competency is not accordance with the criteria; 1 if the student competency is in accordance with some of the criteria; 2 if the student competency is in accordance with the established criteria; and 3 and above if the student competency is in accordance with the criteria. However, teachers simply guess the marks given to students because of the lack of detailed criteria and the influence of student attitude. The absence of standards complicates the process of determining competency.

This rubric is too holistic and generic to evaluate competency. A holistic rubric implies rating an activity without regard for the separate pieces, and it is more product-oriented and typically used when the components of an activity are too interrelated for easy division [13]. The use of a holistic approach to scoring often wastes the available information, which reduces the validity of the assessment [20]. Thus, the generic criteria are only distinguished by comparative terminology. Assessors do not have a specific reference to value, which causes them to assess based on their own views. The interpretation of individual consistency across assessors and assessments therefore varies [21]. The decisions made by individual teachers are filled with noise when unclear criteria are used. Novice teachers likewise use the same rubric to evaluate students. Novice and experienced teachers assess skills differently. Clarity and consistency in the aspect to be judged are affected as well [21]. Based on the implementation of assessment practices in Australia, a competency grading system is appropriate in the reference criteria used for assessing competencies; meanwhile, a generic reference is unsuitable because it is limited to a general aptitude measurement [21].

TABLE III
EXAMPLE OF A RUBRIC ON PRACTICAL SKILLS

Rating Scale			
3: The practical skills follow and exceed the criteria.			
2: The practical skills are in accordance with the criteria.			
1: The practical skills are in accordance with some of the criteria.			
0: The practical skills are not in accordance with the criteria.			
Criteria Evaluated	Rating Scale	Weightage	Score
	0 1 2 3		
Work Process (40%)			
• Make adjustments and hardware tools.	0 1 2 3		
• Write the mnemonic code based on a given ladder diagram.	0 1 2 3		
• Insert the command mnemonic code into the Consul Program.	0 1 2 3		
Work Product (30%)			
PLC can execute instructions correctly (1 and 2 lights on a scale of 1, 3, and 4 lights on a scale of 2, 5 lights on a scale of 3).	0 1 2 3		
Attitude (5%)			
• Preparation	0 1 2 3		
• Tools management	0 1 2 3		
• Ability to incorporate directions	0 1 2 3		
• Time precision	0 1 2 3		
Safety (5%)			
• Personnel and co-workers			
• Machine	0 1 2 3		

A standard reference method uses specific criteria for determining the level of performance throughout the development continuum. The continuum is used to interpret and determine the range of achievement levels. The interpretation of reference standards requires the development and use of a scoring rubric (i.e., a description of the quality of performance specific to the units, supported by learning theory, and according to hierarchy and sequence). The reference standard for competency assessment, which changes the specified level of quality performance throughout the development continuum, is consistent as well [21].

The interviews likewise indicated that the rubric used by teachers only guides the scoring marks and does not provide feedback to student work. Formative feedback is one of the principal means of student learning and improving learning. Feedback comprises not only comments about what students have accomplished but also suggestions for what can be subsequently achieved [22]. The present study implied that most of the teachers did not provide feedback after every practical work. The students merely obtained marks without receiving any comments from teachers, and the teachers kept the reports until the end of the semester. However, according to [22], many students poorly use feedback and are merely interested in obtaining marks; sometimes they do not bother to read what their teachers have written. Comments given to practical work in the present will help students make adjustments in an ongoing manner. The CBET provides them with an opportunity to receive feedback on their performance [4].

IV. CONCLUSION

Transforming a vocational school to a vocational college has changed the conventional assessment system to a more authentic one. Teachers are given the mandate to administer the assessment task questions ranging from the development of practical papers to the assessment of the process and the end product of practice. The rubric of providing a fair score for all students has been extensively used in the assessment system in vocational colleges in Malaysia, especially in the assessment of competency for practical courses. The reason is that the assessment of competency cannot be measured via a dichotomous scale but via performance evaluation. Rubric was developed by teachers themselves based on previous experience and the standard rubric provided by the Ministry of Education. In addition, a uniform rubric among colleges is lacking, even among those that carry the same rating. The usage of rubric in vocational colleges remains limited as a scoring guide instead of constructive feedback. Moreover, the rubric developed did not contain a quality definition that distinguished excellent students from poor students. Therefore, a fair, valid, and reliable rubric with a detailed quality definition is necessary for measuring student competency in practical skills.

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