

## **ASSESSMENT OF STUDENT COMPETENCE USING ELECTRONIC RUBRIC**

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### **Abstract**

This study was concerned use electronic rubrics in for students competence assessments. Fourth industrial revolution have brought with it a lot of changes on how the world operate including in the area of education. The fourth industrial era is characterized by the usage of ubiquitous information and computer technology. In systematic review, only research articles published during the period 2009 to 2018 were considered. This study focused on how to evaluate learning programs using rubrics. It specifically dwelt on how e-rubrics could be used in education to assess students' skill and performance. This study was based on the premise that electronic rubric can be used effectively as an evaluation tool in education and could help to improve quality learning process and learning outcomes. The study provided a specific analysis of e-rubrics and briefly reports on the various of practically using e-rubrics in the education sector, especially during the evaluation processes. Electronic rubrics produce sufficient quality information if certain conditions are met, especially when having clear and focused criteria. Evidence about the effects of using electronic rubrics on overall performance results is positive feedback.

Keywords: Electronic rubric, Evaluation, Student competence.

## 1. Introduction

In this fourth industrial revolution (industry 4.0), technology is a widely used tool because it is considered more effective and efficient [1]. In the education sector technology is used as learning media and as a learning resource [2]. Big data collection that is widely accessible and free becomes capital to continue to develop [3]. Today's educational institutions should innovate evaluation systems [4]. It is imperative to note that evaluation procedures are of immense benefit in the learning processes of students more than teaching methods [5]. There are various evaluation tools that can be used in assessing student competency in vocational education. One of the evaluation tools that can be incentivized is the rubric.

Rubric is a scoring guide that is used in the process of assessing students' skills in terms performance and it is based on several scores of several criteria [6]. Based on various opinions, the rubric can be defined as a guideline in the performance appraisal process to assess the competency of students whose contents consists of scores and several criteria that must be achieved and fulfilled by the student. The use of electronic rubrics (e-rubrics) is one strategy for assessing student assignments or projects [7]. The use of e-rubrics is an alternative that can be chosen in evaluating student work [8].

E-rubrics have definite characteristics for evaluating learning outcomes (products, project or task) and the level of achievement or competence achieved by students [9]. Before giving assignments to students, the teacher informs students about the standard that must be achieved by students in accordance with the plan set out in the curriculum, the assessment process by using e-rubric to provide feedback to students [10, 11]. Electronic rubrics can be used as formative or summative assessment tool and can be classified as either assessment rubrics or instructional rubrics [11, 12].

Instructional rubrics facilitate students in the process of learning and self-assessment, peer assessment, and teacher assessment [13]. Excellent rubrics enables students to conceptualize and master skills [11-14]. E-rubrics provide more interaction between students and teachers and teachers do not become autonomous in the process of evaluating student competencies [15]. Information provided in the e-rubric assessment is usually more detailed and enables teachers to identify competencies that students can find difficult to achieve [16].

In recent years, a number of studies focusing on the use of rubrics to assess student work have been published [17, 18] and how these tools support teaching and learning in order to achieve certain competencies [9, 11]. Assessing student competence requires innovation both in the area of teaching, learning and assessment. Developing student competencies must be seen in more detail and in depth [19]. In this context, self-regulation in the learning process becomes increasingly important [20, 21]. Technology-based rubrics (e-rubrics) is an alternative tool that can be used to improve the process of student competency assessment [22]. Competency assessment in the world of education must continue to be developed with the advancement and development of technology in the fourth industrial revolution era (industry 4.0) [23], so as to facilitate access, effective and efficient implementation [24].

Research on the use of electronic rubrics in skills assessment can provide convenience and time efficiency in the assessment process [23]. This review

focused on e-rubrics usage in the process of assessing students' skills and competencies. The digitization of assessment processes from manuals using digitally made paper needs to be developed to meet the demands of the world of education and should facilitate the assessment and evaluation of students' skills [24]. The results of related studies indicate that the use of rubrics and assessment instruments to evaluate the performance of students enhances student skills [25]. Technological developments push educators or classroom practitioners to develop electronic aids to make learning process enjoyable in the classroom [26]. Modern educational practitioners integrate technology in all facets of learning [1].

Two main parts are discussed in this article. Firstly, to help teachers the better understand however to design skills assessments using e-rubrics. Secondly, this article provides a summary and critique of the research topics that dwelt on rubric with respect to assessment of students' skills and competencies. The study aimed to develop, explore and evaluate the scope of the use of e-rubrics in the context of student competency assessment and evaluation. Researchers and Educators can use this information to identify unanswered issues or questions in the literature and define the future direction of research focusing on the use of e-rubrics in assessing student skills and competencies. Parts of this article will focus on the following; a brief description of the e-rubric including features, methods, results and discussion, and conclusions.

## **2. Theoretical Framework**

### **2.1. What is a rubric?**

A rubric is a tool used to assess the contents of a list of criteria for a competency from a job. It includes a description of the quality level with respect to performance criteria [1]. The definition of the rubric assessment has two important aspects, namely the assessment criteria which are coherent and have clear performance descriptions for the assessment criteria [27]. A good rubric should be an evaluation tool that is useful descriptively and evaluatively. A rubric can be used as an evaluation tool and the working principle is to keep up performance with an overview of the assessment criteria that have been determined.

### **2.2. The purpose of using a rubric**

Rubrics are very important for the evaluation tool. The purpose of the rubric is to assess evaluation, or practice carried out by students. The main goal is to see the process carried out by students in producing a product, and assessment should be comprehensive from start up to the final production of a product. In addition, the rubric can also be assessed from the results of reports, the CPP book, or other assignments [28].

Rubrics provide a clear assessment structure for observation. In addition to assessing performance, the rubric also describes the performance details that need to be assessed. The results of the assessment of performance quality are based on a rubric developed. This is done as a feedback process in implementing learning in the classroom. When a student has not reached the criteria that must be achieved, with assessment it can be seen what criteria must be improved and which skills should be improved. This is different from assessing the quality of scores or judgments that do not use a rubric [29].

### 2.3. Types of assessments based on rubrics

Various types of assessments can be made using rubric. There are two types of assessments that can be designed using rubric, namely, evaluation process and product assessment [27]. Process evaluation focuses on skills, for example physical skills, use of equipment, oral communication, and work habits. While the product assessment on the outcome of the learning activities. The product assessment of the product is more focused on the end result of the product, for example a constructed object, written term papers, and other academic products that demonstrate understanding of concepts [28].

Rubric assessment is usually categorized into two types according to their assessment aspects and criteria [29]. First, is whether the rubric assessment is used to assess one activity at the same time. Second, is whether the rubric is used in only one and general activity. Table 1 simplifies the advantages and disadvantages types of rubric.

**Table 1. The advantages and disadvantages types of rubrics.**

Rubric Type	Understanding	Advantages	Disadvantages
<b>Analytical</b>	Each criterion is separately evaluated that is, starting dimensions and properties are assessed in a structured manner.	<ul style="list-style-type: none"> <li>• Information are diagnostically provided to teachers.</li> <li>• There is formal feedback on students.</li> <li>• Make it easy to connect instructions more than in holistic rubric.</li> <li>• Assessments is flexible, and good for formative assessments.</li> <li>• Can also be implemented in summative assessment.</li> <li>• Can combine multiple assessment scores.</li> </ul>	<ul style="list-style-type: none"> <li>• More time is needed for the assessment process.</li> <li>• More time needed for the achievement of reliability.</li> </ul>
<b>Holistic</b>	The evaluation is holistically carried out (that is, criteria, dimensions and properties)	<ul style="list-style-type: none"> <li>• The assessment process is faster than under analytical rubric.</li> <li>• Little time spent is spent to achieve reliability between assessments.</li> <li>• It is highly recommended for summative assessment process.</li> </ul>	<ul style="list-style-type: none"> <li>• The resulting grades are overall and there is no merging of alternative grades nor further feedback information to students.</li> <li>• It is not recommended for formative assessment.</li> </ul>

In Table 1, the rubric is divided by 2 types, they are analytical type and holistic type. They have many advantages and disadvantages. So, in this study analysed to build good rubric for material in e-rubric. Because e-rubric has goals to make all assessment by e-rubric will be easy to use and assessing. It was made to support assessment in all computation era in industry 4.0. Because in this era, all used by computation and all assessment must use technology as support system for assessing.

### 3. Method

Literature review articles were searched and downloaded from Web of Science database and Scopus databases. The following key words were used to obtain research-based articles from the mentioned databases; "electronic rubrics" and "assessment rubrics." 50 articles published in the period 2009 and 2018 were considered. Rubric articles focusing on student' skills and competencies especially electronic rubric design to measure student competency in vocational education were considered. The 50 articles as references were studied, analysed and coding use a spreadsheet program. This study used 6 books for references were studied, analysed and coding use a spreadsheet program also. The articles were retrieved, reviewed and tabulated based on:

- a. Basic data: author, publication year, journal, study place.
- b. Research method: research technique, method, theme, data collection, data analysis methods, research results.
- c. Content analysis: rubrics assessments, technology, content areas and pathways designed (that is how researchers / educators design rubrics assessment for vocational education in relation to the competencies that need to be measured).
- d. Discussion: discussion of issues, future instructions, personal comments.

These four coding steps enable researchers to systematically study trends, problems and possibilities that arise in the direction of future research. Personal comments emanate from questions and understanding that arises from researchers' understanding of literature review. And the used as references to write this study.

### 4. Results and Discussion

Research question 1: designing skills assessment using e-rubrics. Research question 2: concerned with the effect of using e-rubrics on assessing student skills and competencies.

#### 4.1. Designing skills assessment using e-rubric

Rubrics are assessment guides that are used to evaluate the quality of student competencies in terms of writing, oral and project [30]. Rubrics can also be viewed as "documents that describe competencies by including calculated criteria and describe skills and competence quality levels as either good or bad [31]. Creating effective rubric for evaluating student competencies must be based on specific criteria in terms of competencies to be measured [31, 32]. Before compiling a rubric assessment, it is better to synchronize first with the goals and competencies that must be achieved by students in line with the planned design and these can facilitate the design of rubrics that are specific to the skills to be measured [33].

Rubric designed to be able to measure student learning outcomes consistently and objectively, it is tailored to the student's ability and competency to be achieved by

students [34]. Likert scale use in the manufacture of assessment rubric is the most convenient, because it can give a feedback on the evaluation process and more profound when the assessment takes place [35, 36]. Preparation of the rubric should be able to adopt the assessment process that encourages students to further enhance the skills of students, electronic rubric including one appropriately selected tool in the development of student skills assessment [37, 38].

Electronic rubrics are alternative evaluation tools that help instructor and teacher determine and explain students what should be achieved during the learning process by using pre-determined performance criteria. Students can monitor process and progress learning and outcome the competencies to be achieved and how to improve when that competency has not been achieved [26]. Electronic rubric to describe specific characteristics of learning outcomes achieved by students (products and tasks) and the level of performance that must be achieved by students. Before the process of ongoing assessment, teachers or instructors provide information about what standards are to be achieved, how the performance appraisal process and the feedback given [10, 11].

Electronic rubric can have the same content guidelines with conventional rubric. It distinguishes that the assessment process more efficiently by using special programs that are more sophisticated [39]. There are several programs that can be used in electronic rubric development namely Annenberg Learner, Essay Tagger Common Core Rubric Creation Tool, eRubric, RubiStar, and Technology General Rubric Generator [40]. The widely used design of electronic rubric is the eRubric [8]. Figure 1 shows the title, description and home page of electronic rubric.



**Fig. 1. Title, author, description and modified.**

This eRubric application was designed by the University of Malaga in the environment (© GTEA2). This eRubric is used as a technology support tool through SIR, RedIRIS Identity Service (in Spain) and EduGain (in Europe). Presently, every European Higher Education Institution access and utilize eRubric (© GTEA) with data identified at their institutions. This application is available in several languages (English, Spanish, Portuguese, Swedish).

The technology support for this application is based on SimpleSAMLphp, which includes Security Assertion Markup Language (SAML) software in PHP developed by Uninett, Norway [41]. The Gtea Group provides a website to access

the eRubric application [39, 42]. Electronic Rubric can offer a graphical view of the competencies that must be achieved by students. Teachers can access student ratings online in the form of values and graphics and can easily check whether this is the first or second assessment because it is recorded in the rubric electronic memory. This graphical display also visualizes the impact of eRubric on student learning over time [43].

#### **4.2. Effects of using e-rubrics on student skills and competency assessments**

Electronic rubrics are alternative evaluation tools that help instructor and teacher alternative in determining and explaining what should be achieved by students and the performance criteria specified in achieving competence. Students can monitor the progress of competence they have achieved, they will know the weaknesses and how so that they can achieve these outcomes [44]. The use of electronic rubric becomes important in the evaluating student performance and competencies. Electronic rubric can explain more characteristics that are more specific competences. This can be from learning outcomes. Then level of performance must be achieved. The tackling task, electronic rubric there is information about standards evaluation must be met, assess evaluation tool, and upon assignments completion, feedback is provided [45].

The use of the rubric in the evaluation of learning process has a positive impact [38, 46-47]. The argument is based on facts that are available from the results of comparative analysis between classes that do not use rubric and the class that uses rubric. The differences are evident, and classes that use rubric are more directed and experiences improvement in the learning process [31, 33]. For instructors, rubrics can be useful in helping them ensure that they teach according to the competencies and needs of students in these subjects [48]. Marking rubric has the objective to develop and organize students by guiding them through the stages of goal setting, planning, self-monitoring and self-reflection. Assessment factors identified as affecting the effectiveness of the self-assessment of students [49].

Electronic rubrics produce feedback on skills, and students feel more prepared on the implementation of practical exams [50]. The main feature of electronic rubrics is that the implementation process is a key factor in terms of timeliness, user-convenience, simplicity, objectivity, its use in improving qualitative or quantitative learning and training, self-assessment, and in fostering responsibility [51].

Electronic rubric promote greater interaction and help students become more independent in the learning process and in increasing competence. At the same time, they give teachers detailed information, enabling them to perform and define which competencies are difficult to obtain, and allows for faster in the process of communication between teachers and students [52].

From this discussion, the contribution uses electronic rubric to both instructor and students clearly articulated. From the results of several studies, it was explained that the instructor did not feel the same way as students. Use of electronic rubrics in various knowledge, such as to further develop student evaluation or to improve instructor and assessment programs affects classroom stakeholders differently. They noted that students' perceptions of electronic rubrics are generally [31].

Comparison between electronic rubric with conventional rubric is not too much difference, except it uses methods (online, coeducation or grade) or support and the

availability of facilities and supporting infrastructure. Electronic rubric promote greater interaction and help students become more independent when assessing their competence. At the same time, they give teachers detailed information, enabling them to define which competencies are difficult to obtain, and allows for faster in the process of communication between the teacher-pupil [53].

Management System to provide formative feedback [54], Availability rubrics and online feedback to promote communication and interaction with the students about their learning progress [55, 56], However, note that the majority of students liked the structure, detail and clarity rubric, and most are more supportive of freedom when dealing with difficult questions. Therefore, given the inequality prevailing in the opinion of students, teachers must be careful when determining the extent to which criteria and performance levels should be structured.

## 5. Conclusions

Electronic rubrics are evaluation tools that provide a framework, with criteria and levels of achievement. They assess students' skills and performance, their learning needs, as well as their own learning outcomes and class context. The electronic rubric was designed with utility in mind. It was designed to be independently used by decision makers as an evaluation tools during the learning process. Electronic rubrics (e-rubric) offers a good scope application in education, especially in the evaluation process. The use also supported a students' ICT competencies and their learning methods. Electronic rubric to support the process of assessing students' skills and performance to achieve the expected competencies. The rapid use of ICT in the learning process requires teachers to be more innovative in designing assessments. E-rubric is useful for the improvement of the quality of student's skills to achieve competence. The fourth industrial revolution is CPS (Cyber Physical System) based.

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