

E-Rubric: Scientific Work Based on Android for Experimental Physic

M N Hudha*, S D Aji and C Huda

Physics Education, Universitas Kanjuruhan Malang, Indonesia

*muhammadnurhudha@unikama.ac.id

Abstract. Technological developments start from shifting papers to online, and shifting physical facilities to network facilities. Therefore the purpose of this research is to develop e-rubric of scientific work in accordance with the characteristics of the subjects of Experimental Physics 1 as a valuation tool to assist lecturers / observers when conducting scientific work assessment. This research applies research and development method 4D Thiagarajan (Define, Design, Develop, and Disseminate). Data analysis technique used is descriptive data analysis quantitative and qualitative. The result of this study is the android-based e-rubric of scientific work that can be used as a tool of assessment of scientific work on the course of Experimental Physics. The e-rubric has an advantage in the efficiency of assessment and can be directly printed student assessment results. Android-based e-rubric applied in this study using web applications in the database, so it has the advantages that the required memory is relatively low and it can utilize various android devices.

1. Introduction

The scientific work ability is an activity that refers to the ways scientists in studying the world and provide explanations based on scientific facts [1][2]. Scientific work abilities typically developed in physics education research include defining problems, stating hypotheses, designing experiments, collecting and analyzing data, evaluating or delivering experimental results, and concluding [3][4].

The Physics Experiments course is a direct practice course. The assessment is performance-oriented and should lead to applicative skills or practices that must be implemented on the spot and measurable on the spot [5]. Performance appraisals require students to demonstrate performance, not answering or choosing answers. So at the time of the assessment, the lecturer should concentrate so that no things are passed to students.

Assessment by means of observation is relatively difficult. In addition to assessing, a lecturer sometimes also have to teach [6]. Another difficulty, observers must memorize the indicator they want to find out [7]. Assessments typically use observation sheets or assessments manually on an observation or evaluation sheet. After evaluation, the lecturer should perform calculations and recapitulate the entire assessment result, making it less efficient. Therefore, a tool is needed to perform an easy, practical, efficient, accurate and rapid assessment of scientific works, and can be academically accounted.

The shifting of physical facilities to network facilities [8] forces an educator/lecturer to develop electronic devices in the classroom learning process. Assessment with the use of blended learning using mobile learning is proved to be effective in learning [9][10][11][12][13] and the activities of learners [14][15].



2. Methods

This research procedure adapts the 4-D model [16]. The development steps are arranged as shown in Figure 4.1.

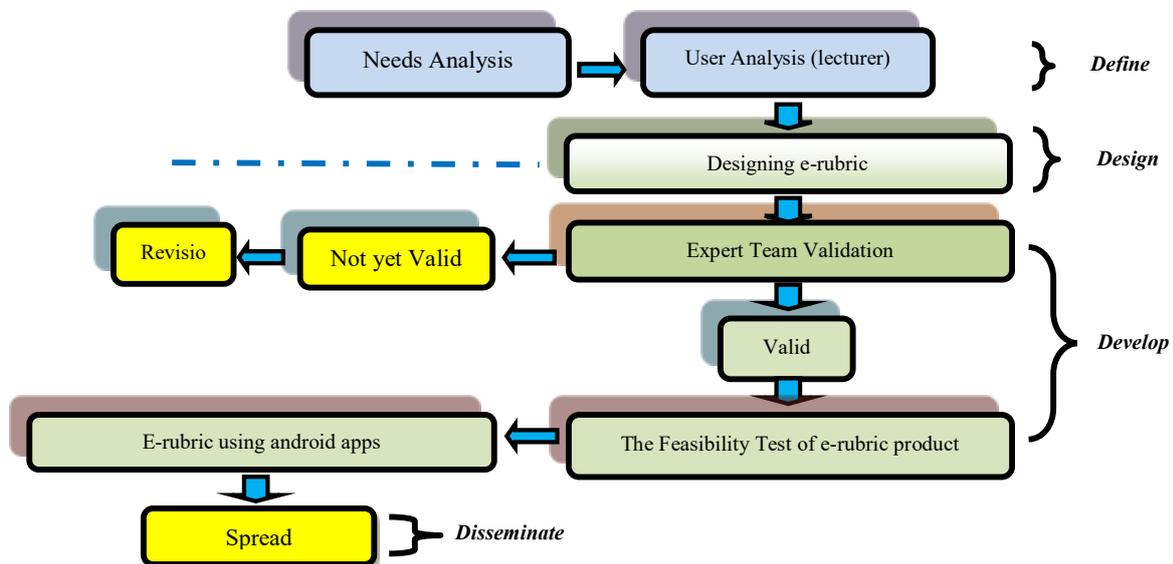


Figure 1. Development Procedure of Scientific Work E-rubric

The making of this E-Rubric application used PHP programming language (PHP: Hypertext Preprocessor) as server side scripting. Server Side Scripting is a technique in designing web design that involves embedded scripts in HTML documents (Hypertext Markup Language) requested by the client of a server, where requests will be proceeded on the server side via server-side available on the server. In this method the script runs on the web browser used by the user.

E-Rubric is an application that stores so many important data, therefore a media database is necessary in the storage to make it more structured and safe. Database used is MySQL which is a database management software system SQL or DBMS (Database Management System). The E-Rubric app is a website-based technology that runs on Smartphone devices. Thus, the manufacturing procedure is quite complicated. After this E-Rubric application can run on the server-side side will be rendered into an android-based applications. Programming language for the manufacture of android-based applications is JAVA. In creating the program, a tool is required in encoding E-Rubric application. The tool is Android Studio which is developed by JetBrains and cooperated with Google.

In testing along with validation of this application was done manually by a team of experts. The team of experts who did this are those who have the area of Software Development expertise. The team of experts who tested the application came from the staff of MIS (Management Information System) of Universitas Kanjuruhan Malang. In addition, it was also tested to the assessment expert and 2 lecturers.

Data analysis technique used to process this research data was descriptive data analysis of quantitative and qualitative. The data of expert test and small group test from questionnaire were analyzed by percentage and qualitatively described. Field test data / user test in the form of learning process in development environment was analyzed by qualitative data analysis of flow model [17] by applying multipurpose principle. Analysis activity, including: data reduction, data presentation, and withdrawal of conclusions or verification. Data reduction activities include classification and encoding according to the type of data. Presentation of data is in the form of descriptions, tables, diagrams, drawings or other visual forms. The data already presented are verified, interpreted, and summed up. Data analysis targets include the level of observation, description, and explanation.

3. Results and discussion

The result of the development of android-based scientific work e-rubric for the Experimental Physics 1 can be seen as follows.

3.1. Android-based scientific work e-rubric product

The e-rubric application can be viewed/ downloaded on the page, <https://drive.google.com/file/d/0Bz2j-z6nAZfXUDBpMjgxbldZaDg/view?usp=sharing>. The process of using e-rubric can be seen in Figure 2.

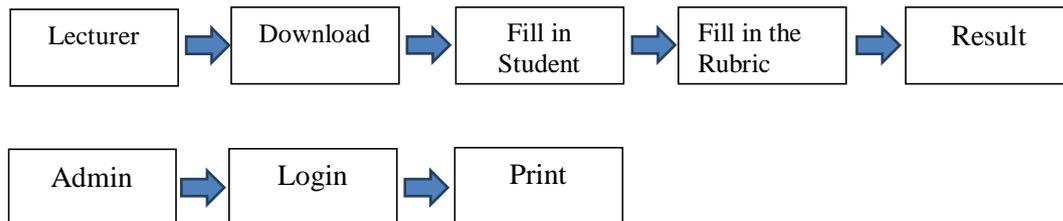


Figure 2. The Process of Using E-rubric

Figure 2 is the flow of the process of using e-rubric. In stage one lecturer must download android application from e rubric. Then when it is downloaded lecturers can fill in student data and can directly fill in the scientific work rubric. The indicator of the scientific work rubric can be seen in Table 1. The results of the scientific work appraisal can be directly seen after the lecturers fill in the data of all students.

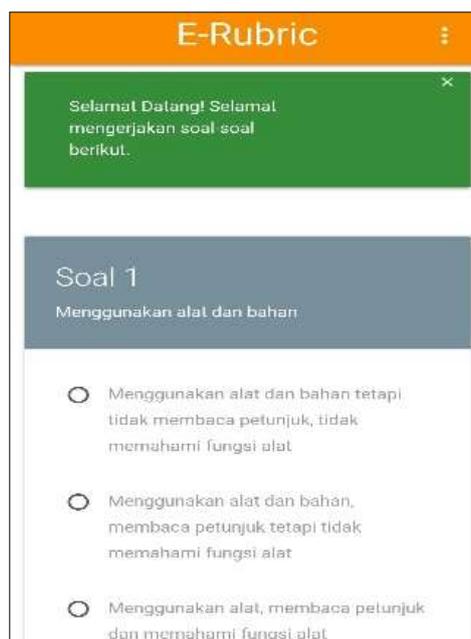


Figure 3. E-rubric Display

Lecturer can print the result of the student's score by login as admin. Then select the print menu and all scientific students' scoring data can be printed in PDF format. The display of e-rubric can be seen in Figure 3.

Scientific working indicators used in this research include using tools and materials, collecting data, analyzing data, concluding, and communicating experimental results. The results of scientific work are

expressed in the form of percentage and narrative text through observation during the learning process using the scientific work rubric. The scientific work indicators can be seen in Table 1.

Table 1. Scientific Working Rubric and Indicators

No	The ability of sub scientific working	Score		
		1	2	3
1	Using tools and materials	Using tools and materials but not reading instructions, do not understand tool functions	Using tools and materials, reading instructions but do not understand tool functions	Using tools, reading instructions and understand tool functions
2	Collecting data	The data collected is incomplete and the students do not understand the meaning of the data taken	Data collected complete, but students do not understand the meaning of data taken	The data collected is complete and the students understand the meaning of the data taken
3	Analyzing data	Showing the relationship of variables and determining the equations based on the graph, but both are wrong	Showing the correlation of variables by graph correctly but incorrectly determining the equations based on the graph	Showing the relationship of variables and determining the equations based on the graph correctly
4	Concluding	Concluding not based on the results of data analysis and not in accordance with the theory	Concludes based on the results of data analysis but not in accordance with the theory	Conclude based on the results of data analysis and in accordance with the theory
5	Communicating experimental results	Communicating experimental results (data, graphics, annotations) not based on concept, and briefly explained	Communicating experimental results (data, graphics, annotations) based on concept, and briefly explained	Communicating experimental results (data, graphics, annotations) based on concept, and described in detail (important things delivered)

[2]

3.2. Feasibility Test Result of E-rubric Assessment

The e-rubric feasibility data were obtained from assessment experts, expert teams and 2 lecturers. The data obtained consist of quantitative data and qualitative data. Quantitative data in the form of e-rubric assessment sheet is used to determine the feasibility of e-rubric. While qualitative data in the form of suggestions used to improve e-rubric. The results of the e-rubric feasibility component analysis are presented in Table 2.

Table 2. Results of e-rubric Feasibility Component Analysis

No.	Component	Percentage	Criteria
1.	Feasibility of Content	94 %	Very valid
2.	Feasibility of Presentation	90 %	Very valid
3.	Feasibility of Language	88 %	Very valid

The rubric [18] is an assessment guide that describes the desired criteria in assessing or providing a level of student learning outcomes [19]. In other words, the rubric is a scoring tool consisting of a list of a set of criteria or what should be calculated that is used to determine the quality of student's performance. The rubric itself consists of the assessed dimensions and criteria of students' learning achievement ability or learning achievement indicators of learners.

4. Conclusion

Android-based scientific work e-rubric can be used as an appraisal tool of scientific work on Experimental Physics course. The E-Rubric application is built on a website-based website that runs on Smartphone devices. The feasibility of scientific work e-rubric is very valid based on expert assessment, expert team and 2 lecturers on content component, presentation component and language component with each percentage of 94%, 90%, and 88%.

References

- [1] C J Wenning 2007 Assessing Inquiry Skill as a Component Of Scientific Literacy *J. Phys. Teach. Educ.* **4** 2 21–24
- [2] S D Aji and M N Hudha 2016 Kerja Ilmiah Siswa SMP dan SMA melalui authentic Problem Based Learning (aPBL) *J. Inspirasi Pendidik.* **6** 1
- [3] E Etkina 2006 Scientific abilities and their assessment *Phys. Educ. Res.* **2** 2 1–15
- [4] A Karelina and E Etkina 2007 Acting like a physicist: Student approach study to experimental design *Phys. Educ. Res.* **3** 2 1–12
- [5] M G Jones and L Brader-araje 2002 *The Impact of Constructivism on Education : Language , Discourse and Meaning* **5** 3
- [6] P Vinhais and M Abelha Supervision and appraisal of foreign language teachers' performance *Procedia - Soc. Behav. Sci.* **174** 783–790
- [7] C Ochoa, H Murcia, R Fuciños and K Domínguez 2017 *New implementation of Work Sampling Analysis for validating the Present Idle Time Indicator of Maintenance and Ship Repairing Business Line of Cotecmar* **10** 9–18
- [8] M. J. Rosenberg 2001 *E-Learning: Strategies for Delivering Knowledge in the Digital Age*. McGraw-Hill Professional
- [9] H Zhang, W Song and J Burston 2011 Reexamining the Effectiveness of Vocabulary Learning via Mobile Phones *Turkish Online J.* **10**
- [10] D Mcconatha, M Praul and M J Lynch 2008 Mobile Learning In Higher Education: An Empirical Assessment of A New Educational Tool *Turkish Online J. Educ. Technol. –TOJET* **7**
- [11] F. Al-Fahad 2009 Students' Attitudes And Perceptions Towards The Effectiveness of Mobile Learning in King Saud University *Turkish Online J. Educ. Technol. TOJET* **8**
- [12] C Huda 2010 Pengembangan Media Pembelajaran Model Atom berbasis Handphone sebagai Penunjang Pembelajaran Matakuliah Fisika Modern *Pros. Semin. Nas. MIPA Univ. Negeri Malang*
- [13] C. Huda 2012 Pengembangan Software Asesmen Microteaching dan PPL Keguruan Berbasis Handphone *Pros. Semin. Nas. Sains Pascasarj. Univ. Negeri Surabaya*
- [14] G Kosar 2016 Gülten Ko ú ar," *Int. Conf. Teach. Learn. English as an Addit. Lang.* **232** 736–744

- [15] P Kharb and P P Samanta, 2016 Journal of the Anatomical Society of India Blended learning approach for teaching and learning anatomy : Students ' and teachers ' perspective *Indian J. Rheumatol.* **65** 1 43–47
- [16] S. Thiagarajan, D. Semmel and M. Semmel 1974 *Instructional Development For Training Teachers Of Exeptional Children* Minesota: Indiana University
- [17] M B Miles and A M Huberman 1984 *Qualitative Data Analysis: A Sourcebook of New Methods* California: SAGE publications Inc
- [18] N A Bindayel 2017 Reliability of rubrics in the assessment of orthodontic oral presentation *Saudi Dent. J.* 1–5
- [19] P. Dickinson and J. Adams 2017 Ac ce pt e d cr t *Eval. Program Plann.*