

PAPER • OPEN ACCESS

Standardized physics practice e-assessment instrument for senior high school

To cite this article: Dian Purnomo *et al* 2021 *J. Phys.: Conf. Ser.* **1796** 012090

View the [article online](#) for updates and enhancements.



The banner features a decorative top border with a repeating pattern of red, white, and blue diagonal stripes. On the left, the ECS logo is displayed in green and blue, followed by the text 'The Electrochemical Society' and 'Advancing solid state & electrochemical science & technology'. To the right of this text is a logo for the 18th meeting, consisting of a stylized 'E' and 'S' with '18th' below it. The main text of the banner reads '239th ECS Meeting with IMCS18', 'DIGITAL MEETING • May 30-June 3, 2021', and 'Live events daily • Free to register'. On the right side, there is a background image of a person's face overlaid with a digital network of lines and nodes. A red button with white text 'Register now!' is positioned at the bottom right of the banner.

ECS The Electrochemical Society
Advancing solid state & electrochemical science & technology

239th ECS Meeting with IMCS18

DIGITAL MEETING • May 30-June 3, 2021

Live events daily • Free to register

Register now!

Standardized physics practice e-assessment instrument for senior high school

Dian Purnomo¹, Undang Rosidin¹, Kartini Herlina¹

¹Physics Education, University of Lampung

*Corresponding author: dianpurnomo1506@gmail.com

Abstract. COVID-19 pandemic has a major impact on the world of education. The existence of the coronavirus outbreak has hampered teaching and learning activities that usually take place face-to-face and have now turned into distance learning (online). Online learning is inseparable from an assessment, both cognitive, affective, and psychomotor. Good assessment instruments will affect the results to be achieved. This study aims to analyze the e-assessment instrument for standardized physics practice exams in senior high school. The subjects of this study were 10 high school physics teachers with the selection using purposive. This research uses mixed methods, namely research by combining two forms of research, namely qualitative and quantitative research. The questionnaire was analyzed quantitatively, while the results of the questionnaire data were explained qualitatively. For data collection, the researcher provided an online questionnaire for preliminary analysis related to the e-assessment of standardized physics practice exams in high schools in Lampung.

1. Introduction

COVID-19 pandemic has a major impact on the world of education. The existence of this coronavirus outbreak hinders teaching and learning activities that usually take place face-to-face. However, this pandemic was able to accelerate education 4.0. The learning system is carried out remotely by utilizing technology [1] "Distance education, hereinafter referred to as PJJ, is an education in which students are separated from educators and learning uses various learning resources through the application of the principles of educational / learning technology". The distance education system (PJJ), which is perceived as a 21st-century innovation, is an education system that has a wide reach across space, time, and socioeconomics. The PJJ system opens access to education for anyone, anywhere, anytime. With these characteristics, the PJJ system is often seen as a solution to various educational problems, especially those related to equal distribution and democratization of education, as well as expanding access to quality education to all levels of society across time and space [2].

Distance education is defined as a teaching method in which students and teachers are physically separated and can then take advantage of a combination of technology, including audio correspondence, video, computers, and the internet [3]. In the implementation of distance learning (PJJ) cannot be separated from an assessment. Through assessment activities, information about processes, products, and attitudes towards learning is collected. The information collected is then used to make decisions about both individuals and groups involved in the learning process. Distance education assessment is carried out through a comprehensive examination mechanism through face-to-face, long-distance, or centralized use of information and communication technology with direct



supervision. Moore [4] define PJJ as "planned learning that takes place separately from its educators, requires special learning designs and techniques, communicates through various technologies, and uses special organizational and administrative structures".

In conducting the assessment we need standardized instruments to collect data as well as information. According to Permendikbud [5], an assessment instrument is a tool used to assess the learning outcomes of students, for example, tests, and attitude scales. Based on Kemendikbud [6] that "Education Assessment Standards are criteria regarding the scope, objectives, benefits, principles, mechanisms, procedures and instruments for assessing student learning outcomes that are used as the basis for assessing student learning outcomes in primary and secondary education. Assessment of learning outcomes aims to monitor and evaluate the process, learning progress, and improvement of learning outcomes of students on an ongoing basis. Assessments can be made for a variety of reasons and intentions that provide specific practices and perspectives [7] As-assessment from an educational point of view has an important role in education [8]. Assessment in education is defined as evaluation material to find out how education works effectively for each student.

According to BSNP [9], the assessment standards have a valid, objective, fair, integrated, open, comprehensive, systematic, criteria-based, and accountable assessment principles. The learning outcome assessment instrument used by educators fulfills the substance requirements, namely representing the competence assessed, construction, which meets technical requirements following the form of the instrument used, and language, namely using good and correct and communicative language according to the level of development of students. So that in the process of assessing learning outcomes students can represent all aspects to be assessed. If the learning is digital or online based, then there must be discussed in the research system as well. So an online-based assessment or E-Assessment is needed in the field of education. The use of information technology and computers in education is often used as a medium of learning and learning evaluation [10].

E-assessment is the use of information technology for related assessment activities. Cognitive abilities were assessed using assessment software, while practical abilities were assessed using e-portfolios, simulation software, videos, virtual labs, and others. Garrison and Vaughan [11] stated that in online learning and assessment there are several advantages, including reconceptualization and redesign of learning so that it is more refreshing (fresher), the ability to organize more content, and can make it an inquiry community. It offers increased variety and originality in design and assignments, for example through e-portfolios, simulations, and interactive games, enabling the assessment of skills that cannot easily be assessed in other ways [12].

In e-assessment, students can act as writers and evaluators of feedback results [13]. Morales et al. [14] revealed that computers can be used for simulations, manage large amounts of updated and enriched information, increase interaction with information, and make learners more participatory in the assessment process. Also, Sorensen [15] revealed that online assessments make these assessments more efficient in terms of time, funding, and achievement of assessment objectives. When online, it can help minimize the level of student cheating every time you carry out an exam and reduce the level of subjectivity in data processing. E-assessment provides direct assessment and feedback for students, improves student performance, reduces teacher time and labor [16].

In several previous studies in the implementation of distance learning (PJJ), the assessment conducted by the teacher was only limited to assessing learning outcomes. Sahidu et al [17] said that information and communication technology can be used in evaluating student learning outcomes. Ventouras et al [18] made an assessment using multiple-choice questions. Based on the results of a questionnaire given to 10 high school physics teachers in the float, the same results were obtained, namely that most teachers in distance learning only provide an assessment of learning outcomes, but here the teacher has not conducted a skills assessment, namely an assessment on a practical exam. Information and communication technology can be used to support and develop cognitive, affective, and psychomotor assessments [19]. Practical exams are considered difficult to do in distance learning, even though many media can be used in conducting practical exams, for example, virtual labs, simulations, tutorials, animations, videos, and so on. Ristekdikti [2] states that the assessment of skills

aspects through performance appraisal can be carried out through face-to-face, remote simulations, or utilizing information and communication technology. The use of information and communication technology can provide updates in the world of education, in this case, e-assessment. The use of innovative ICT-based applications can be used in an assessment [20]. The instrument used is in the form of a problem adjusted to the competence of graduates or learning outcomes required by the curriculum. So that to assess the practice exam based on ICT media, it is necessary to have a standardized assessment instrument that can be done remotely or online assessment.

2. Research Methods

The method used in this research was mixed methods by combining qualitative and quantitative research. The technique used in this study used a questionnaire instrument. The research subjects were 10 high school physics teachers in Lampung with the selection using purposive. The questionnaire was analyzed quantitatively, while the results of the questionnaire data were explained qualitatively. For data retrieval, the researcher provided an online questionnaire for preliminary analysis related to the e-assessment of standardized physics practice exams in high school. The flow diagram of the research stages is as follows:

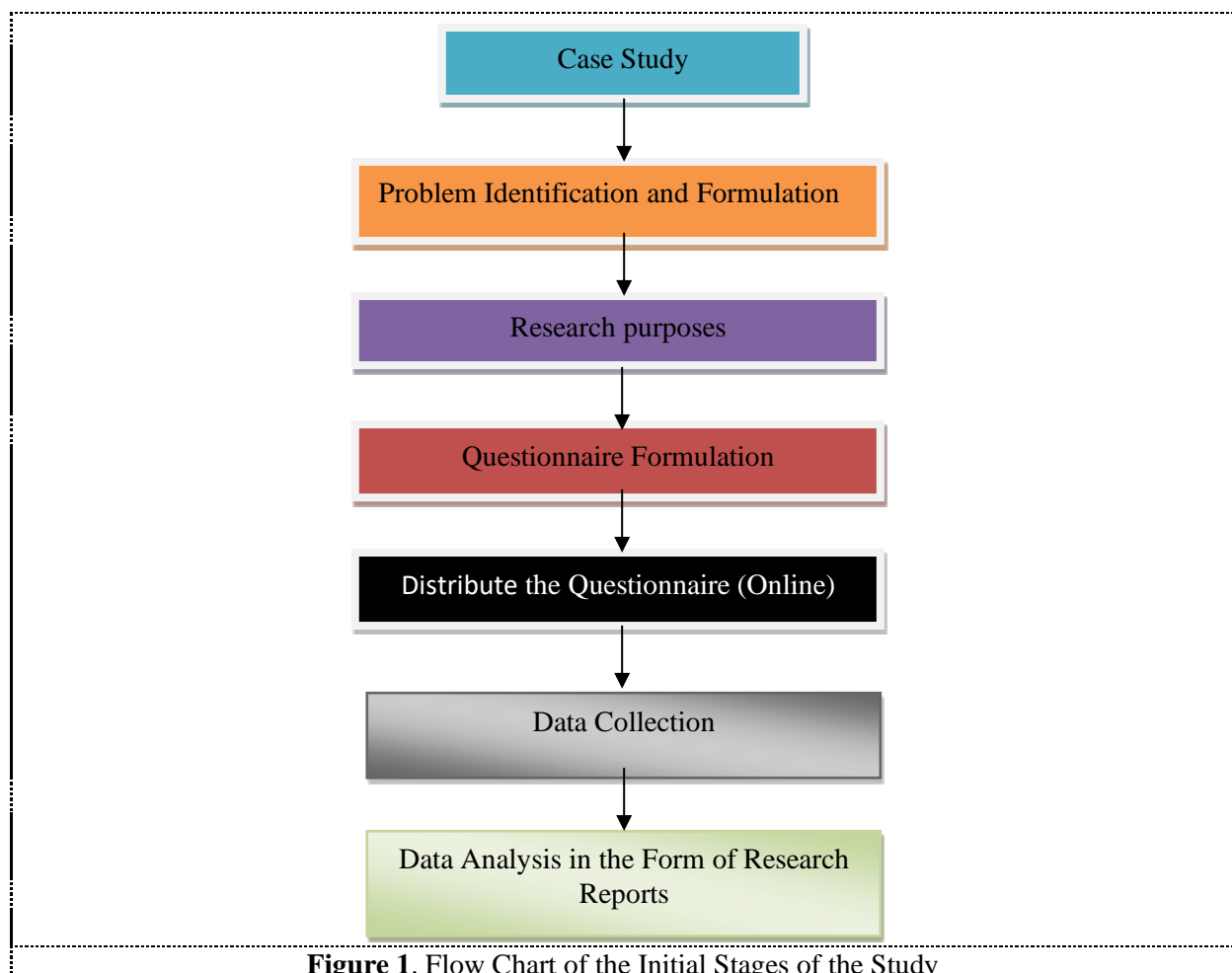


Figure 1. Flow Chart of the Initial Stages of the Study

Based on table 1, this research was carried out through the following stages: (1) conducting a case study, (2) identifying and formulating problems with the cases obtained, (3) determining the research objectives, (4) creating/formulating a questionnaire, (5)) distributing questionnaires online to research

subjects, (6) collecting data from questionnaires, and (7) analyzing data in the form of research reports.

3. Results and Discussion

The results of the case studies and also the questionnaires were related to the analysis of the needs of standardized physics practice exams in senior high school, it was obtained data that teachers in the implementation of distance learning (online) many teachers only conducted cognitive assessments of students and not all teachers conducted skills assessments. especially the practical physics exams in the laboratory. This is by the statement Suranti et al. [21] the most important thing in the world of education is the process of teaching and assessment, teaching to convey information to students and assessments to evaluate the results of the teaching given. Assessment should be used to check the extent to which changes in student behavior have occurred through the learning process. the assessment also plays a role in providing feedback to improve the learning process that has been used. besides, assessment is not only about measuring student learning outcomes at the end of the learning program but also monitoring student progress and providing feedback throughout the learning process.

Whereas for e-assessment of skills, many use the form of e-portfolio, such as the results of research conducted Bennett et al. [22] stated that technology such as e-portfolios, blogs, wikis, and forums can be used to encourage student engagement, collaboration, and reflection). Electronic portfolios ('electronic portfolios') such as [23] are widely used to enable students to record and reflect on their learning and to store evidence of achievement, usually across modules. This enables the assessment of existing skills if it is not difficult to assess and encourages a reflective approach to learning, with students having responsibility for what they put in so they can focus on the positive [24, 25]. Teachers can access e- student portfolios for assessment and feedback purposes and portfolios are often associated with improving student employability [26].

As for the results of the questionnaire given to 10 high school physics teachers in Lampung, the teacher filled out a questionnaire by checking the answers according to the actual situation, the teacher could check the answers more than once so that the following data were obtained:

Table 1. The Results of Needs Analysis on Standardized Physics Practice Exams in Senior High School

No	Question Items and Answer Options	The Number of Respondents' Answers	Percentage
1	During the COVID-19 pandemic, did your school conduct online learning?		
	Yes	10	100%
	No	2	20%
2	During the COVID 19 pandemic, what online learning did you provide to students?		
	Learning materials	8	80%
	Questions	9	90%
	Assessment	5	50%
	Learning Media	5	50%
	Module	4	40%
	Others	1	10%
There was no	0	0%	
3	In the implementation of online learning, did you give an assessment, yes/no, if so, what type of assessment did you give?		
	Cognitive assessment	8	80%
	Affective assessment	3	30%

No	Question Items and Answer Options	The Number of Respondents' Answers	Percentage
	Psychomotor assessment	4	40%
4	Did you perform psychomotor assessments while learning online		
	Yes	4	4%
	Not	6	60%
5	In assessing skills in online learning, what form of assessment did you give to students		
	Portfolio	4	40%
	Project	4	40%
	Practice	2	20%
	Product	0	0%
	Others	0	0%
	There is no	3	30%
6	Did you do laboratory practice exam assessments on online learning?		
	Yes	2	20%
	Not	8	80%
7	What types of practice exam media did you use when studying online?		
	Simulation	2	20%
	Virtual lab	2	20%
	Animations	3	30%
	Video	0	0
	Application	0	0
	Web-based	1	10%
	Others	1	10%
	I did not use any media	4	40%
8	Do you make the physics practice exam an e-assessment instrument during online learning?		
	Yes	6	60%
	Not	4	40%
	Maybe	10	100%
9	In your opinion, is there a need for an e-assessment of physics practice exams in online learning		
	Yes	0	0%
	Not	0	0%
	Maybe	6	60%
10.	In your opinion, is the assessment of the physics practice exam can be done in online learning?		
	Yes	0	0%
	Not	4	40%
	Maybe	1	10%
11	In your opinion, the existing assessment was effective enough to improve student learning outcomes.		

No	Question Items and Answer Options	The Number of Respondents' Answers	Percentage
	Yes	7	70%
	No	2	20%
	Maybe	1	10%

Based on table 2, it was found that during the COVID 19 pandemic, schools had been implementing distance learning (online). In online learning, the teacher provided materials, questions, assessments, learning media, and modules. Teachers provided cognitive, affective, and psychomotor assessments, but many teachers only gave cognitive assessments and a few teachers did affective and psychomotor assessments. Many forms of psychomotor assessments are given in the form of portfolios and projects and a few who carry out practical and product assessments, practice media used are animations, virtual lab, and video. thus not many teachers do psychomotor assessments due to the absence of standardized instruments and also lacking IT resources, therefore based on the results of the needs analysis above the standardized physics practice exam e-assessment instrument in high school is needed.

4. Conclusion

Based on the needs analysis data from the questionnaire, it was found that in the mass of the COVID 19 pandemic, schools implemented distance learning (online). In online learning, the teacher provides materials, questions, assessments, learning media, and modules. Teachers provide cognitive, affective, and psychomotor assessments, but many teachers only give cognitive assessments and a few teachers do affective and psychomotor assessments. Many forms of psychomotor assessments are given in the form of portfolios and projects and a few who carry out practical and product assessments, practice media used are animations, virtual lab, and video. thus not many teachers do psychomotor assessments due to the absence of standardized instruments and also lacking IT resources, therefore based on the results of the needs analysis above the standardized physics practice exam e-assessment instrument in high school is needed.

Reference

- [1] Kemendikbud 2014 Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 119 Tahun 2014 tentang Penyelenggaraan Pendidikan Jarak Jauh Jenjang Pendidikan Dasar dan Menengah *Menteri Pendidik. dan Kebud. Republik Indones.* 1650 1–12. <http://luk.tsipil.ugm.ac.id/atur/bsnp/Permendikbud119-2014PJJ-Dikdasmen.pdf>.
- [2] Indonesia/Ristekdikti 2016 Panduan Pelaksanaan Pendidikan Jarak Jauh 2016 *Direktorat Jenderal Pembelajaran dan Kemahasiswaan Kementerian. Riset, Teknol. dan Pendidik. Tinggi,* 2016.
- [3] I. Roffe 2004 E-learning for SMEs: Competition and dimensions of perceived value *J. Eur. Ind. Train.,*
- [4] M. G. Moore 1995 *Distance Education: A Systems View.*
- [5] Permendikbud 2014 Permendikbud nomor 104 tahun 2014 Tentang Penilaian Hasil Belajar oleh Pendidik pada Pendidikan Dasar dan Pendidikan Menengah.
- [6] Kemendikbud 2016 Salinan Permendikbud Nomor 23 tahun 2016 Tentang Standar Penilaian Pendidikan.
- [7] M. B. Fuller, “Bresciani,” Walvood & Anderson, 2013. Accessed: Sep. 17, 2020. [Online]. Available: <http://classifications.carnegiefoundation.org/>.
- [8] M. C. Heitink, F. M. Van der Kleij, B. P. Veldkamp, K. Schildkamp, and W. B. Kippers 2016 A systematic review of prerequisites for implementing assessment for learning in classroom practice *Educational Research Review*, **17** 50–62.
- [9] BSNP 2006 *Panduan Penyusunan Kurikulum Tingkat Satuan Pendidikan Jenjang Pendidikan Dasar dan Menengah.*

- [10] Z. W. Hong *et al.* 2018 Virtual-to-real: Learning to control in visual semantic segmentation.
- [11] D. R. Garrison and N. D. Vaughan 2012 *Blended Learning in Higher Education: Framework, Principles, and Guidelines*.
- [12] Jisc 2010 Open Access for UK Research: JISC's contributions, *Access*.
- [13] A. Gogoulou, E. Gouli, M. Grigoriadou, M. Samarakou, and D. Chinou 2007 A web-based educational setting supporting individualized learning, collaborative learning and assessment, *Educational Technology and Society*.
- [14] M. S. MF Morales, A Parsons, UL Pen, 2020 The Cosmic Dawn and Epoch of Reionization with the Square Kilometre Array. *Proc. Sci.*, **9**.
- [15] E. Sorensen 2013 Implementation and student perceptions of e-assessment in a Chemical Engineering module *Eur. J. Eng. Educ.*
- [16] N. Alruwais, G. Wills, and M. Wald 2018 Advantages and Challenges of Using e-Assessment *Int. J. Inf. Educ. Technol.*
- [17] H. Sahidu, G. Gunawan, I. Indriaturrahmi, and F. Astutik 2017 Desain sistem e-assessment pada pembelajaran fisika di LPTK *J. Pendidik. Fis. dan Teknol.*
- [18] E. Ventouras, D. Triantis, P. Tsiakas, and C. Stergiopoulos 2010 Comparison of examination methods based on multiple-choice questions and constructed-response questions using personal computers, *Comput. Educ.*, **54** 2 455–461.
- [19] G. A. and J. Garcia-Zubía 2012 Using Remote Labs in Education: Two Little Ducks in Remote Experimentation - Google Books.
- [20] S. Romero, M. Guenaga, J. García-Zubía, and P. Orduña 2015 Automatic assessment of progress using remote laboratories *Int. J. Online Eng.*
- [21] N. M. Y. Suranti, G. Gunawan, and H. Sahidu 2017 Pengaruh Model Project Based Learning Berbantuan Media Virtual Terhadap Penguasaan Konsep Peserta didik pada Materi Alat-alat Optik," *J. Pendidik. Fis. dan Teknol.*, 2017, doi: 10.29303/jpft.v2i2.292.
- [22] S. Bennett, A. Bishop, B. Dalgarno, J. W.-C 2012 Implementing Web 2.0 technologies in higher education: A collective case study, *Elsevier*.
- [23] Pebblepad 2013 "Home" 2013. <https://www.pebblepad.co.uk/> (accessed Sep. 17, 2020).
- [24] J. & Kaufman 2006 *Handbook of Research on ePortfolios*.
- [25] T. Madden 2016 Supporting student e-portfolios, *New Dir. Teach. Phys. Sci.*
- [26] A. Halstead and S. Sutherland 2006 ePortfolio: A means of enhancing employability and the professional development of engineers.