The Validity of Problem-Based Learning Model Learning Tools With A Contextual Learning Approach

Abdulrahman Djou[1], *Trisnawaty Junus* Buhungo[1*] , *and Supartin*[1]

[1]Education Physics Departement, Faculty of Mathematics and Natural Sciences, Universitas Negeri Gorontalo, Indonesia

Abstract. The purpose of this study was to describe the feasibility of verifying the results of physics learning tools using a problem-based learning model with contextual learning. This research was conducted at Muhammadiyah Batudaa High School, using research samples from class XI-IPA1. Identification of the sample in this study using simple random sampling. This research is a development research using the ADDIE research and development (R&D) model developed by Reiser and Mollenda which includes the stages of analysis, design, development, implementation and evaluation. Validation testing is carried out at the development stage. The results showed that the test results with an average score of 3.7 to 3.92 were classified as very valid and suitable for use**.**

1 Introduction

The activity of learning in the new normal condition at this point are giving enforcement of the circumtances in which due learning face-to-face and lead to the online learning. In the terms of preparing the face-to-face learning enviroment ahead of the learning process actualization, at this current phase the educators has been required to be more creative for learning activities.

Student achievement has a significant quality and giving impact to the international context by student success. Surrounded by 44 countries in the worldwide, the performances of Indonesian students only in the ranks of 37th according to TIMSS. This implies that children in Indonesian can only grasp 30% of reading activities, the difficulties about sustained understanding student reflection problems. The crucial for students are to handle the habit and to develop adapting and nurturing, stimulating students mentally and physically. Established on the Minister of Education and Culture's Decree No. 23 of 2016 reinforce about learning activities in the primary and secondary educational system are need for stimulating, interactive teaching and learning. These activities are required to motivating students to be more proactive in participate, initiative, stimulating productivity, and enhance individual empowerement based on their interests, skill, and developing physical and psychological in general.

Indonesian Curriculum has experienced growth and sustains to modify in the era of science and innovation developments, society requirements, and students' knowledge. Regarding the education program 2013 revised has been changed, education in Indonesia are planning to obtain the capacity of well-being and fostering loyalty among citizens, profitable, innovative, creative, embrace an active role in the society, and nation-state including the worldwide heritages. The actualization for this program can be accomplished with educational policy in the 2013 curriculum.

The expertise of physics is contained learning materials about factual, conceptualization, hypothesis, principles and laws that discussing general structure. Field of study that investigates physics in overall logical findings bordering [2]. Physics is the one of fundamental principles that linked to feature, structure, material substances. Physics is not limited to speculation and formulas that required to be memorized, but physics need to conceptual understanding that has centered building information methods through to the revelation and informations introduction [3]. The physics theory inadequate to acquire knowledge of it, as a result of physics hypothetically is not about to memorized it but needed to understanding and practicing. In the physics concept that has been related in daily life, therefore the problem-based learning is needed [4].

The learning model is conceptual structure designs that can be serves to attempt teachers with providing orginize, and actualize the learning activity for students to organize learning materials and resources [5]. Learning process can be assessed as proficient if the learning tools are suitable, structures, and enabled the development of skills and numerical. Learning process can be assessed as proficient and requires to be considered by information, skill, and mindset that have been earned from the students. Learning process are focus on students ability to obtain information about the action of the problem-based learning (PBL) models.

In hands-on teaching, teachers must be creative in presenting interesting ways of learning to increase student interest. As an educator, teachers are required to be more creative and innovative both in determining the learning model and the methods used.

Learning that involves students explaining different problems through different logical strategic steps so that students can retrieve information related to these problems is problem-based learning. PBL learning is

*Corresponding author: trisnawaty.buhungo@ung.ac.id

learning that can stimulate student activity to seek and respond to the information they get themselves, as well as construct their own knowledge to solve problems. The steps in APP can direct students to find their own knowledge through consistent scientific method processes so that students are expected to be active in the ongoing teaching and learning process [6 ; 7; 8].

PBL is a learning model designed to help students develop thinking skills, problem solving skills, and intellectual skills [9; 10; 11]. The steps in the Problem Based Learning Model (PBL) direct students to reflect, analyze, research, and compile research reports. The investigation phase will be carried out independently or in groups, this is the essence of the PBL model. Activities that will be carried out by students in this phase include collecting data, forming hypotheses, and finding solutions to existing problems so that problem solving skills can be developed and practiced. The application of learning using question and answer can increase students' metacognitive capacity in problem solving [12].

In the application of PBL learning, besides the advantages there are also disadvantages. The PBL feature poses a question or problem and generates a solution for that problem [13]. Problems in the learning process activities in the classroom will arise if in the problem solving process students do not observe a real incident and make assumptions. Problem solving activities are easier to do if students can make initial conclusions from the problems given. This is important because in the process of teaching and learning physics, students must be able to solve real-life physics problems around them. Observation and hypothesis operations are not found in the PBL syntax [14]. APP can develop students' complex skills and independent learning [15;16]

Education is said to be effective if it can involve abstract and concrete learning. According to [17], teaching and learning activities that focus on the learning process with the aim of encouraging students to approach learning material independently through phenomena in everyday life are learning using a contextual approach. Contextual learning is student-centered learning where students are stimulated to acquire material independently.

Learning involves students in learning activities through their experiences and does not only focus on recording but teaching and contextual learning (CTL). The concepts and principles of CTL learning are related to the creation of creative and critical students. In CTL learning based on the topics that have been determined in the material being taught, students have the opportunity to internalize the concept of the material independently. Students then connect the concepts obtained from the experiences gained at school with the experiences around them. Thanks to the experience gained, the material is perfectly stored in students' memories because students can understand the material that has been taught.

The characteristics of CTL learning are the ability to work together, establish relationships with each other, generate fun, not cause boredom, learning becomes dynamic, interdependent, using different resources and active development of students.

According to [6], the learning process using learning concept into the CTL methods that helps educators relate the material taught to students' real-life experiences in everyday life so that students are encouraged to make connections and apply them in everyday life. knowledge acquired in their life experiences. Therefore, learning to use CTL in its learning activities is not just an exchange of information between teachers and students but concepts need to be memorized, but teachers must be able to encourage student learning to seek their own survival (lift skills).

Based on the research [18], a learning strategy that enables students to perceive the learning matter by linking it into their real-life within the contextual teaching and learning. The learning process are effectively to applying in the real-life and contains information that can be associated into workplace experience.

The Contextual Teaching and Learning (CTL) components are: 1) Building, 2) Asking, 3) Searching, 4) Community Learning, 5) Modeling, 6) Reflection, and 7) Actual Assessment [19; 20]. According to [21], contextual learning is a learning concept that relates the material being taught to real life conditions that exist in students' daily lives. The teacher is an educator who acts as a facilitator so that students can establish relationships with information obtained from real life. This is also in accordance with what was said by [22; 23] explains contextual learning that this learning can be a guide for achieving academic achievement emphasizing maximum counseling methods for students so that students can independently translate material obtained from their life experiences.

The contextual of fundamental learning : a) experiental learning; b) practical experience; c) consideration of policy; d) student-centered; e) dynamic learning activities; f) relevance of information that was found in actual life; g) real life oriented; h) behavior changing; i) students prefer to improve rather than memorize; j) the activity is learning; k) teaching; l) helping people; m) problem solving; n) evaluate learning outcomes using multiple ways not just through tests [24].

Learning process are applicable to CTL, in particular PjBL, WBL, PBL, and Discovery-Learning, instructional learning and adaptive approach. This approach is can provide the teachers to connecting learning contents in the real life, and can motivating students to connect their knowledge into their real life. CTL learning strategies become a basic standards to emphasize critical thinking, introduce learning terms into different contextual, motivate students to learn with each other and using authentical Blanchard evaluations [25; 26; 27].

Problem-Based Learning (PBL) can combined with Contextual Teaching Learning (CTL) approach, that can be involves students to acquire their new knowledge and associate with real-life in order to find a solution from the problems. This approach encourages students to explores expand their comprehension about the learning concepts. One from the advantages of CTL in conjunction with PBL is that it supports learning activities across the PBL structure, and learning experiences for the students. PBL implementation with CTL approach, students involve in problem-solving activities and relevant in their lives, therefore generating a dynamic learning process.

All the elements used to carry out the learning process that can help teachers achieve good learning objectives are learning tools. In teaching and learning activities, especially physics, the first step taken is to organize physics learning material in accordance with the learning objectives to be achieved so that the use of the material is in accordance with what has been prepared in order to create learning motivation for students, so that the material being taught is easy to understand.

According to [28], educators in developed countries such as the United States as a learning tool for each learning topic to be taught, include: 1) syllabus, 2) lesson plans, 3) teaching materials, 4) LKPD, 5) learning media (minimum power point ; 6) assessment of learning outcomes.

Based on the explanation that has been detailed, the aims of this study research to describe physics learning tools using problem-based learning model with a contextual learning approach, the learning tools include syllabus, learning plans (RPP), teaching materials, LKPD, and learning test results.

2 Method

This research is classified as development research which focuses on building and describing the feasibility of validating the results of a physics learning tool using the PBL learning model with the CTL approach to learning outcomes on elasticity and Hooke's law. This research includes research and development (R&D) using the ADDIE development model developed by Reiser and Mollenda whose development stages include the stages of analysis, design, development, implementation and evaluation, for the purpose of describing learning tools that are quality, tested and feasible to implement. Each step consists of several parts. The analysis phase includes curriculum analysis and needs analysis. The design stage is the stage of designing the components of learning tools which include syllabus, lesson plans, teaching materials, LKPD, and assessment of learning outcomes. The development stage is the stage of developing learning tools as well as the stage of determining the validity of learning devices through validation sheets provided by the two assessors. This learning device will be applied to class XI-IPA-1 SMA Muhammadiyah Batudaa in the odd semester of the 2022/2023 school year by taking samples using the simple random sampling technique.

The data analysis technique in this study used descriptive analysis techniques which described the validity of the learning tools developed through data analysis from the evaluation of the developed learning tools carried out by two authenticators. To see the validity of learning devices, criteria are used according to [29] as in the Table 1.

Table 1. Learning device eligibility criteria

Score intervals	Assessment criteria	Information
3.5≤ P<4	Very valid	Can be used without revision
2.6 ≤ P<3.5	Valid	Usable with minor revisions
1.6 ≤ P<2.5	Invalid	Can be used with multiple revisions
1≤ P<1.5	very Invalid	Can't use it yet and still needs consultation

3 Results and Discussion

The validity of the learning tools results are regarded from validators responses and suggestions into the table of validations. Total of the validators is two from this study, they were Professor on this field from Universitas Negeri Gorontalo, especially in the Physics Department. The instrument are reinforce from the expert and exclude learning tools that have been used. Tools and instruments of learning that consisting of syllabus, learning plans, LKPD, conceptual tests, learning observation sheets, teacher and students responses.

The validation results are in the form of comments and suggestions for tools and facilities which must then be modified so that they can be used for research. The results of the learning device assessment can be described as follows:

3.1. The Result of Syllabus validation

The preparation of the syllabus refers to the systematic preparation of the 2013 curriculum syllabus. The results of the syllabus validation can be seen in the Table 2.

Table 2. Syllabus validation results

Number	Rated aspect	The average score of Validator-1 and Validator-2
1	Construction	4
2	Fill	3,41
	Total	7,41
	Average	3,7

Based on Table 2. The slyllabus validation results that has validated by two validators can be categorized Extremely Valid, due to the overall average score is 3.7 in accordance with criteria [29]. Therefore, the syllabus that has been developed can be used in this research.

3.2. The results of the validation of the learning implementation plan

The preparation of lesson plans refers to problem-based learning models and contextual learning designed in two meetings and adjusted systematically to the 2013 curriculum. The lesson plan is presented in the Table 3.

Table 3. The results of the validation of the learning implementation plan

Number	Rated aspect	The average score of Validator-1 and Validator-2
1	Construction	4
2	Fill	3.79
3	Legibility	3.66
4	Language	3.91
	Total	15,36
	Average	3.84

Based on Table 3. Learning Plans (RPP) validation results that have occured validated by two svalidators can be categorized Extremely Valid, due to the overall average score is 3.84 based on criteria [29]. Therefore, the Learning Plans (RPP) that has been developed can be used in this research.

3.3. Teaching material validation results

The preparation of teaching materials is related to problem-based learning models and contextual learning. The results of the evaluation of teaching materials are presented in the Table 4.

Table 4. Teaching material validation results

Number	Rated aspect	The average score of Validator-1 and Validator-2
1	Construction	3.86
2	Fill	3.75
3	Legibility	4
4	Appearance	4
	Total	15,61
	Average	3,9

Based on Table 4, Validation of teaching materials results that have occured validated by two svalidators can be categorized Extremely Valid, due to the overall average score is 3.9 based on the criteria [29]. Therefore, teaching materials that has been developed can be used in this research.

3.4. Validation results of student worksheets

Preparation of student worksheets related to problem-based learning models and contextual learning. The results of testing student worksheets are presented in the Table 5.

Table 5. Validation results of student worksheets

Number	Rated aspect	The average score of Validator-1 and Validator-2
1	Construction	3.83
2	Fill	3,9
3	Legibility	3.87
4	Language	4
5	Appearance	4
	Total	19,6
	Average	3.92

Based on Table 5, the validation results of student worksheets that have been validated by two validators can be categorized Extremely Valid, due to the overall average score is 3.92 based on criteria [29]. Therefore, LKS that has been developed can be used in this research.

3.5. The results of the validation test of learning outcomes

The preparation of the learning outcomes test refers to indicators of understanding the concept which consists of 7 indicators including interpretation, illustration, classification, summary, conclusion, comparison and explanation. The test sheet obtained also has a rating grid and scale. The results of the learning outcomes test are shown in the Table 6.

Table 6. Validation of learning outcomes test results

Number	Rated aspect	The average score of Validator-1 and Validator-2
1	Construction	3.83
2	Fill	3.87
3	Legibility	4
4	Language	4
	Total	15,7
	Average	3.92

Based on Table 6, the learning outcomes results that have occured validated by two svalidators can be categorized Extremely Valid, due to the overall average score is 3.92 based on the criteria [29]. Therefore, the learning outcomes sheet that has been developed can be used in this research.

3.6. Teacher and Student Response Questionnaire Validation Results.

The results of the validation of the teacher's response questionnaire can be seen in the Table 7.

Table 7. Results of teacher response questionnaire validation

Number	Rated aspect	The average score of validator 1 and validator 2
1	Construction	4
2	Fill	3,9
3	Legibility	4
4	Language	3.75
	Total	15.65
	Average	3.91

Based on Table 7. The results of Teacher Feedback Questionnaire validation being analyzed and validated by two validators is able to classified as Extremely High, due to the overall average score is 3.91 based on the criteria [29]. Accordingly, the response of teachers questionnaire sheet can be applied in this study of research.

The results of the student response questionnaire validation can be viewed in the Table 8.

Table 8. Validation of student response questionnaires results

Number	Rated aspect	The average score of Validator-1 and Validator-2
1	Construction	4
2	Fill	3.87
3	Legibility	4
4	Language	3.75
	Total	15,62
	Average	3,9

Based on Table 8. Questionnaire of the results of student responses that have already occurred and validated by two validators is able to classified as Extremely Valid, due to the overall average score is 3,9 [29]. Accordingly, student questionnaires can be used in research.

3.7. Student Activity Assessment Validation Sheets Results

The validation results of student activity assessment sheets can be viewed in the Table 9.

Table 9. Validation of student activity assessment sheets results

Number	Rated aspect	The average score of Validator-1 and Validator-2
1	Construction	4
2	Fill	3.83
3	Legibility	4
4	Language	3.75
	Total	15.58
	Average	3.89

Based on Table 9, the validation results of student activity assessments that have been validated by two validators can be classified as Extremely Valid, due to the overall average score is 3.89 based on the criteria according to [29]. Accordingly, the assessment of student activity can be used in research.

3.8. Learning implementation assessment validation sheet results

Learning implementation assessment validation sheet results can be viewed in the Table 10.

Table 10. The results of the validation of the learning implementation assessment sheet

Number	Rated aspect	The average score of validator 1 and validator 2
1	Construction	4
2	Fill	3,5
3	Legibility	3.87
4	Language	4
	Total	15,37
	Average	3.84

Based on Table 10. The evaluation of the learning results implementation that have already occurred and validated by two validators is able to classified as Extremely Valid, due to the overall average score is 3.84 based on criteria [29]. Accordingly, student questionnaires can be used in research.

The learning tools developed have been validated by 2 experts and based on an assessment of the learning tools that are considered very valid, which is determined by professional judgment through research on the devices, both in part and as a whole. The learning device components evaluated by the validator include aspects of structure, content, readability, language, and appearance of each device. The assessment tools are syllabus, lesson plans, teaching materials, worksheets and tools for viewing learning outcomes. The results of data analysis regarding the validation sheet used, indicate that the overall validator's assessment of the learning tools developed has very valid criteria based on validity criteria according to [29]. Therefore, learning tools can be used in learning activities.

4. Conclusion

In accordance with the findings from the results of development research on learning tools using a problem-based learning model with contextual approach in learning material elasticity and hooke's law was undertaken at Muhammadiyah Batudaa High School, considered from the feasibility of validation results through expert assessment with the achievement of an average score of 3.65-3.92 and classified as very valid and feasible to use.

Reference

1. Kemendikbud. Lampiran Permendikbud Nomr 23 Tahun 2016 Tentang Standar Proses Pendidikan dan Menengah. Jakarta: Kemendikbud.
2. I. S. Utami, R. F. Septiyanto, F. C. Wibowo, & A. Suryana. Pengembangan STEM-A (science,

technology, engineering, mathematic and animation) berbasis kearifan lokal dalam pembelajaran fisika. Jurnal Ilmiah Pendidikan Fisika Al-Biruni, 6 1 (2017)

3. I. K. Mahardika, M. Maryani, S. C. C. Murti. Penggunaan Model Pembelajaran Creative Problem Solving Disertai LKS Kartun Fisika pada Pembelajaran Fisika di SMP. Jurnal Pembelajaran Fisika, 1 2 (2021)
4. B. Handoyo, & S. Susilo. The Effects of 5E Learning Cycle Assisted with Spatial Based Population Geography Textbook on Students' Achievement. International Journal of Instruction, 13 (2020)
5. J. Suprihatiningrum. Strategi Pembelajaran : Teori dan Aplikasi. Yogyakarta: ARR RUZZ MEDIA, (2013)
6. Rusman. Model-model pembelajaran: Mengembangkan profesionalisme Guru. Edisi 2. Jakarta: Rajawali pers, (2013).
7. N. Issufiah, S. Sunardi, W. Sri, & G. Gunarhadi. The Implementatyion Off Problem Based Learning Model (PBL) on Teachers and Students Grade Five Elementary Schools in Surakarta City. International Journal of Active Learning, 3 2 (2018).
8. B. Y. Cahyono, & U. P. Astuti. Effect of Process Writing Approach Combined with Video-Based Mobile Learning on Indonesian EFL Learners' Writing Skill across Creativity Levels. International Journal of Instruction, 12 3 (2019).
9. N. Sulistyani. Implementation of problem-based learning model (PBL) based on reflective pedagogy approach on advanced statistics learning. IJIET (International Journal of Indonesian Education and Teaching), 2 1 (2018).
10. Y. I. Sari, D. H. Utomo, & I. K. Astina. The Effect of Problem Based Learning on Problem Solving and Scientific Writing Skills. International Journal of Instruction, 14 2 (2021).
11. M. D. Saputra, S. Joyoatmojo, D. K. Wardani, & K. B. Sangka. Developing critical-thinking skills through the collaboration of jigsaw model with problem-based learning model. International Journal of Instruction, 12 1 (2019).
12. Dafik, B. Sucianto, M. Irvan, & M. A. Rohim. Using Group Drawing Activities to Facilitate the Understanding of the Systemic Aspects of Project. International Journal of Instruction, 12 4 (2019).
13. Arends. Learning to Teach (Belajar Untuk Mengajar) Buku II. Alih Bahasa oleh Helly Prajitno Soetjipto dan Sri Mulyanti Soetjipto. Yogyakarta: Pustaka Pelajar, (2008)
14. D. Wahyuni. Efektivitas Implementasi Pembelajaran Model Problem Based Learning (PBL) Diintegrasikan dengan Predict–Observe-Explain (POE) Terhadap Prestasi Belajar Siswa Ditinjau dari Kreativitas dan Kemampuan Inferensi Siswa (Doctoral dissertation, UNS (Sebelas Maret University)) (2014).
15. B. Sugiharto, A. D. Corebima, & H. Susilo. The Pre-Service Biology Teacher Readiness in Blended Collaborative Problem Based Learning (BCPBL). International Journal of Instruction, 12 4 (2019).
16. L. Widiawati, S. Joyoatmojo, & S. Sudiyanto. Higher order thinking skills as effect of problem based learning in the 21st century learning. International Journal of Multicultural and Multireligious Understanding, 5 3 (2018).
17. W. Sanjaya. Strategi Pembelajaran Berorientasi Standar Proses Pendidikan. Jakarta: Kencana Prenada Media Group, (2007)
18. N. T. Rahayuningsih, A. T. Ashadi, & S. Sarwanto. Pembelajaran Biologi dengan Model CTL (Contextual Teaching And Learning) Menggunakan Media Animasi dan Media Lingkungan Ditinjau dari Sikap Ilmiah Dan Gaya Belajar. Inkuiri, 2 2 (2013).
19. D. T. Wahyuningtyas. The assembling of contextual teaching and learning (CTL) model assisted by origami paper media for increasing plane learning result in the fifth grade of primary school. International Journal of Elementary Education, 1 3 (2017).
20. A. Yudha, S. Sufianto, B. E. P. Damara, B. Taqwan, & S. Haji. The impact of contextual teaching and learning (CTL) ability in understanding mathematical concepts. Advances in Social Science, Education and Humanities Research, 295 (2019).
21. H. T. Taniredja, E. M. Faridli, & S. Harmianto. Model-model pembelajaran inovatif dan efektif, (2015)
22. A. Afriani. Pembelajaran Kontekstual (Cotextual Teaching and Learning) dan Pemahaman Konsep Siswa. Jurnal Al-Mutaaliyah: Jurnal Pendidikan Guru Madrasah Ibtidaiyah, 3 1 (2018).
23. C. C. Hyun, L. M. Wijayanti, M. Asbari, A. Purwanto, P. B. Santoso, W. Igak, & R. Pramono. Implementation of contextual teaching and learning (CTL) to improve the concept and practice of love for faith-learning integration. International Journal of Control and Automation, 13 1 (2020).
24. A. Suprijono. Cooperative Learning Teori & Aplikasi Paikem. Yogyakarta: Pustaka Belajar, (2014).
25. A. Nawas. Contextual teaching and learning (CTL) approach through react strategies on improving the students' critical thinking in writing. International Journal of Management and Applied Science, 2018 ; 4 7 (2018).
26. D. Herawaty, & W. Widada. The influence of contextual learning models and the cognitive conflict to understand mathematical concepts and problems solving abilities. In 1st Annual International Conference on Mathematics, Science, and Education (ICoMSE 2017) (pp. 224-230). Atlantis Press. (2017, August).

27. S. Rahayu, & R. Cahyadi. Experimentation of NHT and TPS learning model using ctl approach towards mathematics learning outcomes viewed from student learning styles. International Journal of Trends in Mathematics Education Research, 2 4 (2019).
28. A. Mawardani, Pengembangan Lembar Kerja Peserta Didik (LKPD) Thinking Acitivity Berbasis Penilaian Kerja Amali (PEKA) untuk keterampilan Hasil Belajar Materi Pokok Gerak Lurus Pesera Didik SMA. Yogyakarta: Universitas Negeri Yogyakarta. (2015)
29. B. Purnomo. Pengembangan Bahan Ajar Ilmu Pengetahuan Sosial Terpadu dengan Pendekatan Kontekstual pada SMP Kelas IX Semester I. Jurnal Ilmiah Universitas Batanghari Jambi, 14 2 (2017)
30. T. Makahinda, P. Silangen, A. Pesik, A. Pengembangan Perangkat Pembelajaran Proyek Dan Penilaian Proyek Dalam Perkuliahan Termodinamika. FRONTIERS: JURNAL SAINS DAN TEKNOLOGI, 2, 2 (2019).