Jurnal Pendidikan Matematika RAFA
p-ISSN :2460-8718
e-ISSN : 2460-8726

Available online at:
http://jurnal.radenfatah.ac.id/index.php/jpmrafa
December 2024, 10(1): 102-111

Development of LKPD differentiated on statistical material

Candra Anggraeni[1)], Anastasya Bella[2)], Siti Inganah[3)]

1)2)3)Fakultas Keguruan dan Ilmu Pendidikan, Universitas Muhammadiyah Malang, Jawa Timur Indonesia
*Correspondence email: anastasyabellaputri@gmail.com
(Received 21-06-2024, Reviewed 21-08-2024, Accepted 30-08-2024)

Abstract

This research aims to develop a valid and practically differentiated LKPD that can be usedby secondary school students when learning statistics in a data-focused format. This research uses the ADDIE (Analysis, Design, Development, Implementation and Evaluation) method. The tools of this research into LKPD are differentiated based on statistical materials, validation models and practical tests of LKPD by teachers and students. The research process begins with initial analysis through expert validation, review, practical testing, and small and large-scale trials. The results of the development of differentiated E-LKPD to support students' mathematical competencies by subject experts are worth testing with revisions based on reviewer suggestions. The results showed 78% for validation of the material, 89% for verification by media experts, 83.3% for practical application by teachers and 86% for field test results by students. The carriedout development of educational materials in the differentiated format of E-LKPD conformsto the correct standards and is also practical for use by high school students in statistical material.

Keywords: *Developing LKPD, Differentiated Learning*

Abstrak

Penelitian ini bertujuan untuk mengembangkan LKPD berdiferensiasi yang valid serta praktis yang dapat digunakan oleh siswa SMA dalam pembelajaran statistika yang berupa pemusatan data. Penelitian ini menggunakan metode ADDIE (*Analyze, Design, Development, Implementation, Evaluation*). Instrumen penelitian ini yaitu LKPD berdiferensiasi pada materi statistika, Lembar validasi, uji kepraktisan LKPD oleh guru dan siswa. Proses penelitian dimulai dengan analisis awal hingga validasi ahli, revisi, uji praktisi, uji coba skala kecil, dan uji coba skala besar. Hasil pengembangan E-LKPD berdiferensiasi untuk menunjang kemampuan literasi matematis siswa oleh ahli materi ini layak diuji cobakan dengan revisi berdasarkan saran penilai. Hasilnya menunjukan 78% untuk validasi materi, 89% untuk validasi ahli media, 83.3% untuk kepraktisan oleh guru dan 86% pada hasil uji coba lapangan oleh siswa. Pengembangan yang dilakukan terhadap bahan ajar berupa E- LKPD berdiferensiasi memenuhi standar yang valid dan juga praktis untuk digunakan oleh siswa SMA pada materi statistika.

Kata kunci: Pengembangan LKPD, Pembelajaran Berdiferensiasi

INTRODUCTION

Education is an important factor in human life. Through education, humans will gain knowledge and skills to improve their attitudes and behavior. Education is an effort to shape the souls of students both physically and mentally according to their nature to become better human beings (Forisma & Hidayat, 2023; Istiq'faroh, 2020; Sujana, 2019). The aim of education explained by Ki Hajar Dewantara is to guide all children's natures so that they can achieve safety and happiness as human beings (Apriyantini & Sukendra, 2023; Masitoh & Cahyani, 2020; I. D. Santika & Khoiriyah, 2023). The function of education is to develop the potential of students (Amaliyah & Rahmat, 2021; Khotimah et al., 2020; Ujud et al., 2023). The teacher's task is to prepare learning designs well, such as learning media, learning materials, and assessments used in the learning process to achieve the goals and functions of education (Astutik et al., 2022).

In this digital era, the use of technology in education has become a necessity. Teachers must be able to adapt to technology in preparing learning to achieve educational goals. One thing teacher can do is use E-LKPD to achieve learning objectives. Electronic LKPD is an interactive LKPD that contains practice sheets for students which can be done digitally and carried out systematically and continuously for a certain period of time (Nurani, 2024; Supriatna et al., 2022). E-LKPD which is packaged with media will be clearer and more interesting for students (Khotimah et al., 2020). E-LKPD is prepared not only to follow technological developments but must also follow the needs and characteristics of students. The learning objective of designing E-LKPD content is to improve students' mathematical skills in statistics material, including improving critical thinking, problem solving abilities, and communication skills (Febrianto & Kurniawati, 2023; Pratiwi et al., 2023). For this reason, it is necessary to develop differentiated E-LKPD to meet the needs of students in the learning process.

Differentiated learning is learning whose process is adapted to student needs such as learning styles, interests and motivation as well as students' talents (Apriyantini & Sukendra, 2023; Marlina, 2019). Differentiated learning is learning that is in accordance with the Merdeka curriculum because the application of differentiated learning places more emphasis on the student center (Fitriana, 2023; Suniasih, 2023). Applying appropriate differentiated learning strategies will be able to improve the quality of learning in the classroom, including reading habitual activities (Indah L & Hamdu, 2022). Based on the results of national education report cards for SMA/SMK/MA/ equivalent levels in 2023, students' mathematical literacy abilities are classified as moderate, namely 35.16%. This means that appropriate learning is needed to improve

students' mathematical literacy. Differentiated learning can be an appropriate learning alternative to improve students' mathematical literacy skills (Rahmah et al., 2022).

There has been previous research discussing the development of differentiated e-LKPD, namely research conducted by (Hardiansyah et al., 2023; L. Santika et al., 2024; Triyani et al., 2024). However, no one has researched the development of differentiated e -LKPD based on statistics material. Based on the results of the explanation above, the aim of this research will be to discuss the development of differentiated E-worksheet that is valid and practical for use by high school students on statistics material. With the research title "Development of Differentiated E-Worksheet on Statistical".

RESEARCH METHODS

In order to support optimal research results, research methods are needed as a systematic and logical step in conducting research. The resulting data is processed and analyzed, conclusions are drawn, and solutions to the problem are sought. The research method used is the research and development (*R&D*) method. As explained by (H. Hasanah, 2020; L. W. Hasanah et al., 2023), the research and development method is a scientific method for researching, designing, producing and also proving the effectiveness of the product being made. The development model used in this research is the ADDIE model using 5 research stages namely Analysis, Design, Development, Implementation and Evaluation (Tegeh & Kirna, 2013). The following is the procedure for the ADDIE development model which can be seen in **Figure 1**.

1. The first stage namely analysis, at this stage an analysis will be carried out to the curriculum and analysis of the characteristics of high school students. This aims to adjust needs so that they are right on target.
2. Design, at this stage will design e-worksheet and compile material according to the analysis that has been carried out. This stage aims to prepare the e-worksheet design and pay attention to the format from start to finish.
3. Development, the e-worksheet is prepared based on the framework created at the design stage so it is obtained development product prototype. The e-worksheet prototype developed was assessed by experts to determine whether this prototype was suitable for testing. Then, this prototype was modified following the comments and suggestions provided. This stage aims to produce a revised draft of the e-worksheet based on expert opinions to produce a product that can be tested.
4. Implementation, implementing the e-worksheet which has been validated by experts in the previous stage, so that it is right on target and meets the standard needs of

teachers and students in learning activities. The next step is to test the teaching materials on teachers and high school students.

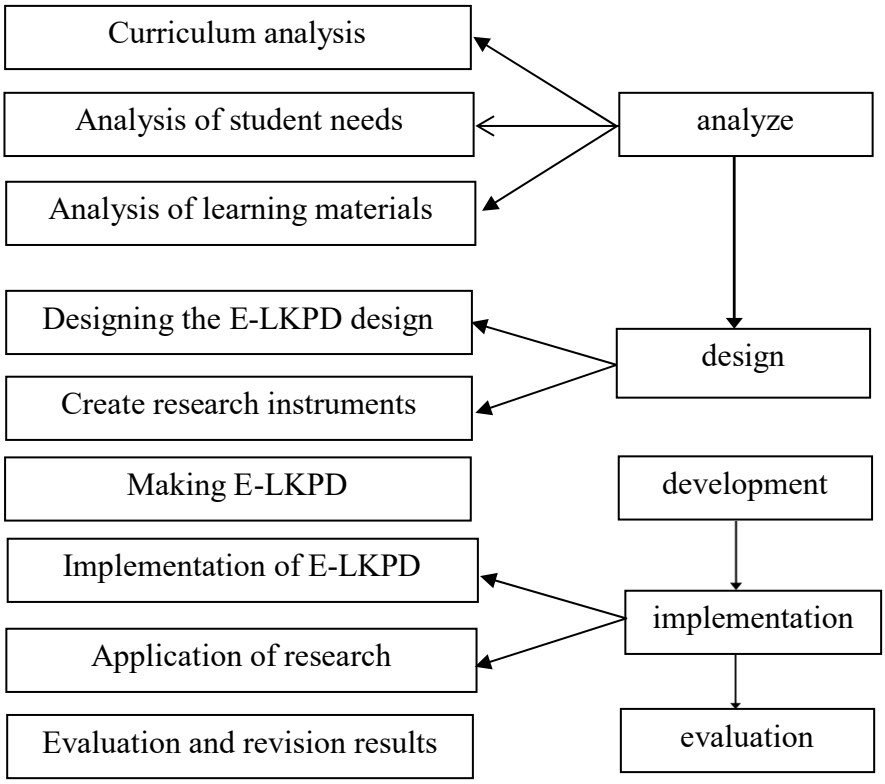

Figure 1. ADDIE development procedure

5. Evaluation, the assessment of teaching materials is seen from expert validation, a questionnaire on the practicality of using teaching materials, and a student response questionnaire to see the quality of the teaching materials developed. The data for filling out the questionnaire in the form of numbers leads to the Likert scale filling method using 5 choices, namely: (5) Very Good/Agree, (4) Good/Agree, (3) Fairly Good/Agree, (2) Not Good/Agree, and (1) Very Poor/Agree. Conversion of Achievement Levels on a scale of 5 is monitored in the table below.

Table 1. Conversion of expert score achievement levels

Criteria Achievement	Level
$80\% < p \leq 100\%$	Very Good (VG)
$60\% < p \leq 80\%$	Good (G)
$40\% < p \leq 60\%$	Fairly Good (FG)
$20\% < p \leq 40\%$	Not Good (NG)
$0\% < p \leq 20\%$	Very Poor (VP)

Table 2. Conversion of Achievement Levels from Questionnaire Results

.

Criteria Achievement	Level
80% < $p \leq$ 100%	Very Good (VG)
60% < $p \leq$ 80%	Good (G)
40% < $p \leq$ 60%	Fairly Good (FG)
20% < $p \leq$ 40%	Not Good (NG)
0% < $p \leq$ 20%	Very Poor (VP)

The instrument that will be used in this research is a questionnaire instrument. The questionnaire includes validation sheet for material experts and media experts, questionnaire on the practicality of using e-worksheet by teachers, and questionnaire on students responses to teaching materials. The expert validator involved 2 mathematics education lecturers and 2 mathematics teachers. Meanwhile, the student responses as a trial were students of senior high school class X. The results of the teacher assessment questionnaire are used to determine the teacher's response to teaching materials including the practicality of the teaching materials, while the results of the student response questionnaire are used to show the effectiveness and attractiveness of the teaching materials.

There are two types of data in this research, namely qualitative data and quantitative data. Qualitative data was obtained from comments of mathematics learning experts and reviewer assessments, comments are analyzed descriptively. Quantitative data in the form of scores from reviewers' assessments and product readability trials. The instruments used in this research were student questionnaire, interview guide, validation sheet, assessment sheet, and product readability test questionnaire. The product assessment questionnaire is filled out by the reviewer in the form of a check list with a score of 1-5 consisting of 4 assessment aspects, namely didactic, construction, technical and product uniqueness aspects. Meanwhile, the product readability test questionnaire consists of 4 assessment aspects, namely content, language, presentation and graphic aspects.

RESULTS AND DISCUSSION

The following are the research results that have been obtained based on the stages of the ADDIE development model.

Analysis

At the stage of carrying out the analysis by interviewing mathematics teachers. The teacher stated that he had used the independent curriculum. The results of the curriculum

analysis show that these classes study statistics in class X semester 1. From the analyze it can be concluded that e-worksheet has not been developed by high school teachers.

Design

Research at this stage produces a differentiated e-worksheet. The design begins with determining learning objectives, determining the learning flow, designing learning tools, and designing learning materials and evaluation materials for learning outcomes. The differentiated e-worksheet design is compatible with product needs analysis. The selected concepts and content are statistics including measures of tendency central.

Development

The design of e-worksheet was evaluated by experts, consisting of two learning experts and two material experts. The results of the evaluation by experts show that this device deserves to be tested with several modifications. The validity criteria for the differentiated LKPD instrument based on four experts showed 78% for material validation, 89% for media expert validation. Based on these results, it can be stated that the E-LKPD developed is valid and suitable for testing. This is in line with research conducted by (Febrianto & Kurniawati, 2023; Indah L & Hamdu, 2022; Pramono, 2020). E-LKPD is differentiated for use by high school students on appropriate and valid statistical material after being revised according to expert advice. The test instrument that had been modified based on the validator's suggestions was handed over to the mathematics teacher at senior high school as the practitioner. Based on the percentage, it states that 86% is valid, which means the instrument is effective. Some improvements include: (1) Clear learning outcomes, provide objectives and steps for working on questions, (2) Use appropriate terms and interesting content (3) More consistent spelling and writing.

Implementation

At this stage, what the researcher does is carry out trials. The trial was carried out to see the practicality of the e-LKPD being developed. Practicality tests are given to practicing teachers and students. In the practicality test given to teachers, the results were 83.3%. These results indicate that the e-LKPD developed has been declared practical to use. Practical E-LKPD can make it easier to achieve students' learning goals as E-LKPD users (Indah L & Hamdu, 2022). After being declared practical by the teacher, the next step is to try out the LKPD on students. Practicality tests by students were carried out twice, namely for small classes and large classes. In the small class trial it was given to level X students of senior high school with a total of 10 students. The student response rate to e-LKPD is 80%, meaning the instrument is practical to use. Students understand

quite well the questions presented on the LKPD sheet on differentiated arithmetic material. It takes about 40 minutes to work on all the problems in the LKPD. Next, there was a large class experiment with 28 students as subjects at SMA Muhammadiyah 3 Tanjunganom. In the large class experiment the classes taken are different from the small class experiment. The results of the class experiment gave a result of 90%, which means the instrument is very practical to use. Based on small class and large class trials, it shows that the e-LKPD instrument can be stated to be very practical and can be used in learning. E-LKPD can increase students' motivation, interest and avoid boredom in the learning process pembelajaran (Febrianto & Kurniawati, 2023; Nabilla et al., 2022; Wijayanti et al., 2020).

Evaluation

The evaluation is carried out to provide value to the learning program. Evaluation is carried out throughout the implementation of the five stages of the ADDIE model. Evaluation is a process to see whether the product being made can be used or not. The evaluation is carried out by a team of experts and evaluates the results of product validation and trials and then the data is analyzed.

CONCLUSION

Based on the results obtained from research, it is known that there are valid standards for instrument E-LKPD was developed for class X statistics material. The instrument is considered valid and practical to use based on the results of validation from experts. The importance of the ADDIE development steps in developing differentiated E-LKPD is a consideration when used as mathematics learning material in schools that suits the needs of students. By using different materials this research can be developed further. Based on the results and discussion of the research, it was concluded that the development carried out on teaching materials in the form of differentiated E-LKPD met valid standards and was also practical for use by high school students in statistics material.

REFERENCE

Amaliyah, A., & Rahmat, A. (2021). Pengembangan potensi diri peserta didik melalui proses pendidikan. *Attadib: Journal of Elementary Education*, *5*(1), 28. https://doi.org/10.32507/attadib.v5i1.926

Apriyantini, N. P. D., & Sukendra, I. K. (2023). Penerapan pembelajaran berdiferensiasi berbantuan E-LKPD untuk meningkatkan keaktifan belajar matematika siswa. *Jurnal Pendidikan (Widyadari)*, *24*(1), 55–63. https://doi.org/10.59672/widyadari.v24i2.3191

Astutik, D., Yuhastina, Y., Ghufronudin, G., & Parahita, B. N. (2022). Guru dan proses pendidikan dalam pembelajaran daring di masa pandemi Covid-19. *Scholaria: Jurnal Pendidikan Dan Kebudayaan*, *12*(1), 46–54. https://doi.org/10.24246/j.js.2022.v12.i1.p46-54

Febrianto, Y., & Kurniawati, D. (2023). Pengembangan E-LKPD terintegrasi STEM-PJBL pada materi asam basa kelas XI SMA menggunakan flip pdf proffesional software. *Entalpi Pendidikan Kimia*, 31–39. https://doi.org/10.24036/epk.v4i2.314

Fitriana, A. & I. D. P. J. (2023). Implementasi pembelajaran berdiferensiasi berbantuan e-LKPD untuk meningkatkan hasil belajar matematika siswa. *Widyadari*, *24*(2), 276–285. https://doi.org/10.59672/widyadari.v24i2.3191

Forisma, A., & Hidayat, T. (2023). Pembentukan karakter peserta didik melalui pendidikan humanistik di era 4.0 paradigma Abraham Maslow dan Ki Hajar Dewantara. *Jurnal Tarbiyah Islamiyah*, *8*(2), 825–840.

Hardiansyah, H., Asmawi, U. S., & Darmansyah, A. (2023). Pengembangan LKPD Interaktif dalam Pembelajaran Berdiferensiasi. *DWIJA CENDEKIA: Jurnal Riset Pedagogik*, *7*(3). https://doi.org/10.20961/jdc.v7i3.78584

Hasanah, H. (2020). Pengembangan bahan ajar matematika berbasis STEM pada materi bangun ruang. *Indonesian Journal of Learning Education and Counseling*, *3*(1), 91–100. https://doi.org/10.31960/ijolec.v3i1.582

Hasanah, L. W., Silalahi, H., & Utama, N. B. P. (2023). Strategi pembelajaran berdiferensiasi pada pembelajaran matematika materi keliling bangun datar kelas IV Sekolah Dasar. *Jurnal Didaktika Pendidikan Dasar*, *7*(1). https://doi.org/10.26811/didaktika.v7i1.1064

Indah L, N. A., & Hamdu, G. (2022). Analisis pelaksanaan pembelajaran literasi dan numerasi di Sekolah Dasar. *PEDADIDAKTIKA: Jurnal Ilmiah Pendidikan Guru Sekolah Dasar*, *9*(3), 461–470. https://doi.org/10.17509/pedadidaktika.v9i3.53452

Istiq'faroh, N. (2020). Relevansi filosofi Ki Hajar Dewantara sebagai dasar kebijakan pendidikan nasional merdeka belajar di Indonesia. *Jurnal Pendidikan*, *3*(2), 1–10.

Khotimah, S. K., Yasa, A. D., & ... (2020). Pengembangan e-LKPD matematika berbasis Penguatan Pendidikan Karakter (PPK) kelas V SD. *Prosiding Seminar ...*, *4*, 401–408.

Marlina. (2019). Panduan Pelaksanaan Model Pembelajaran Berdiferensiasi di Sekolah Inklusif. *Google Scholar*, 1–58.

Masitoh, S., & Cahyani, F. (2020). Penerapan sistem among dalam proses pendidikan

suatu upaya mengembangkan kompetensi guru. *Kwangsan: Jurnal Teknologi Pendidikan*, *8*(1), 122. https://doi.org/10.31800/jtp.kw.v8n1.p122--141

Nabilla, N., Edy, S., & Khikmiyah, F. (2022). Pengembangan e-LKPD matematika interaktif berbasis literasi digital. *Jurnal Pembelajaran Matematika Inovatif*, *5*(6).

Nurani. (2024). *Pengembangan e-LKPD interaktif berbasis pembelajaran berdiferensiasi pada materi sistem pernapasan manusia kelas XI SMA*. Universitas Jambi.

Pramono, Z. H. (2020). Pengembangan modul pembelajaran CAM untuk mata pelajaran teknik pemesinan CNC dan CAM SMK Negeri 1 Magelang. *Molucca Medica*, *11* (April), 13–45.

Pratiwi, G. A., Nugroho, A. A., & Ngatmini. (2023). Pengembangan e-LKPD berbasis pbl untuk meningkatkan kemampuan pemecahan masalah matematis peserta didik kelas V Sekolah Dasar. *Didaktik : Jurnal Ilmiah PGSD FKIP Universitas Mandiri*, *09*, 670–683. https://doi.org/10.36989/didaktik.v9i1.727

Rahmah, S., Dalila, A. A., Liliawati, W., & Setiawan, A. (2022). Pendekatan pembelajaran diferensiasi dalam model inkuiri terhadap kemampuan numerasi siswa. *Jurnal Imiah Pendidikan Dan Pembelajaran*, *6*(2), 393–401. https://doi.org/10.23887/jipp.v6i2.50838

Santika, I. D., & Khoiriyah, B. (2023). Pembelajaran berdiferensiasi dan relevansi Visi Pedagogis Ki Hajar Dewantara dalam mewujudkan merdeka belajar. *Jurnal Pendidikan Dan Konseling*, *5*(1), 1707–1715. https://doi.org/10.47134/jtp.v1i2.80

Santika, L., Mulyono, D., & Fitriyana, N. (2024). Pengembangan e-LKPD matematika berbantuan aplikasi liveworksheet pada materi bangun ruang sisi datar. *Anargya : Jurnal Ilmiah Pendidikan Matematika*, *7*(2), 126–138. https://doi.org/10.24176/anargya.v7i2.13222

Sujana, I. W. C. (2019). Fungsi dan tujuan pendidikan Indonesia. *Adi Widya: Jurnal Pendidikan Dasar*, *4*(1), 29. https://doi.org/10.25078/aw.v4i1.927

Suniasih, N. W. (2023). *Pelatihan dan pendampingan penyusunan e-lkpd sebagai perangkat pembelajaran berdiferensiasi konten* . *8*(November), 978–985.

Supriatna, A. R., Siregar, R., & Nurrahma, H. D. (2022). Pengembangan e-LKPD berbasis Problem Based Learning pada muatan pelajaran matematika pada website liveworksheets di Sekolah Dasar. *Edukatif : Jurnal Ilmu Pendidikan*, *4*(3), 4025–4035. https://doi.org/10.31004/edukatif.v4i3.2844

Tegeh, I. M., & Kirna, I. M. (2013). Pengembangan bahan ajar metode penelitian pendidikan dengan ADDIE model. *Jurnal IKA*, *11*(1).

Triyani, R., Subhan Pamungkas, A., Hadi, C. A., & Santosa, F. (2024). Pengembangan e-LKPD matematika berbasis liveworksheet dalam menunjang pembelajaran berdiferensiasi pada siswa SMP. *Jurnal Matematika Dan Pendidikan Matematika*, *13* (1), 34–52. https://doi.org/10.33387/dpi.v13i1.7775

Ujud, S., Nur, T. D., Yusuf, Y., Saibi, N., & Ramli, M. R. (2023). Penerapan model pembelajaran discovery learning untuk meningkatkan hasil belajar siswa SMA Negeri 10 Kota Ternate kelas X pada materi pencemaran lingkungan. *Jurnal Bioedukasi*, *6*(2), 337–347. https://doi.org/10.33387/bioedu.v6i2.7305

Wijayanti, E., Fayeldi, T., & Pranyata, Y. I. P. (2020). Pengembangan media pembelajaran matematika berbasis website pada materi persamaan garis lurus kelas VIII di SMP PGRI 01 pakisaji kabupaten malang. *Emasains: Jurnal Edukasi Matematika Dan Sains*, *IX*(2), 224–235.