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# PROFILE AND VALIDITY OF ELECTRONICS STUDENTS WORKSHEETS BASED ON PROJECT BASED LEARNING ON PLANT GROWTH AND DEVELOPMENT MATERIALS FOR GRADE 12 HIGH SCHOOL

## *Profil dan Validitas Elektronik Lembar Kerja Peserta Didik (E-LKPD) Berbasis Project Based Learning Materi Pertumbuhan dan Perkembangan pada Tumbuhan Kelas XII SMA*

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## Abstract

The learning process that involves active students is one of them by making innovations in the field of information technology which is currently growing rapidly. This innovation is teaching material. Currently, one of the supports for the learning process and liason between teachers and students is the existence of teaching materials. This study aimed to produce an electronic student work sheet based on PjBL material for growth and development in plants that is theoretically feasible in terms of presentation, content and language aspect through validation by experts. This research uses a 4-D development model (Define, Design, develop and Disseminate) without disseminate. Student worksheet design is carried out at the design stage and the validation is carried out at the develop stage. The data analysis technique uses descriptive qualitative and quantitative. Student worksheet on growth and development materials has been successfully develop with integrated Project Based Learning syntax. The results of the validation are 94% (very valid), in the content aspect 97.5% (very valid), and the language aspect 100% (very valid). This electronic student worksheets have several features that support learning, such as let's review together, finally I Know and the implementation of practicum projects. The results of this study indicate that the PjBL-based e-LKPD is stated to be theoretically feasible in the very valid category and can be tested on a limited basis to determine empirical validity.
**Keywords:** *validity, electronic-student work sheet, Project Based Learning*

## Abstrak

*Proses pembelajaran yang melibatkan siswa aktif salah satunya dengan membuat inovasi dalam bidang teknologi informasi yang saat ini berkembang dengan pesat. Inovasi tersebut yaitu bahan ajar. Saat ini salah satu penunjang proses pembelajaran dan penghubung antara guru dan siswa adalah adanya bahan ajar. Penelitian ini bertujuan untuk menghasilkan e-LKPD berbasis PjBL materi pertumbuhan dan perkembangan pada tumbuhan yang layak secara teoritis ditinjau dari aspek penyajian, isi dan bahasa melalui validasi oleh ahli. Penelitian in menggunakan model pengembangan 4D (Define, Design, Develop and Disseminate) tanpa tahap disseminate, perancangan e-LKPD ini dilakukan pada tahap design dan validasi dilakukan pada tahap develop. Data dianalisis secara deskiptif kualitatif dan deksriptif kuantitatif. E-LKPD materi pertumbuhan dan perkembangan berhasil dikembangkan dengan terintegrasi sintaks Project Based Learning (PjBL). Hasil validasi sebesar 94% (sangat valid), pada aspek isi 97.5% (sangat valid), dan aspek bahasa 100% (sangat valid). E-LKPD ini terdapat beberapa fitur yang menunjang pembelajaran seperti mari review bersama, finally I Know serta pelaksanaan proyek praktikum. Hasil telaah tersebut menunjukkan bahwa e-LKPD berbasis PjBL dinyatakan layak secara teoritis dengan kategori sangat valid dan dapat diujicobakan secara terbatas untuk mengetahui validitas empiris.*
**Kata Kunci:** Validitas, e-LKPD, *Pembelajaran Berbasis proyek*

## INTRODUCTION

The curriculum is designed as a solution to anticipate the needs that must be fullfilled by students in accordance with the conditions of society and the nation (Kemdikbud, 2014). In the 2013 curriculum, learning biology emphasizes students to gain direct learning experiences through the use and development of process skills and

scientific attitudes (Kemdikbud, 2013). According to the *US-Based Partnership for 21st Century skills* (P21), identifying that the competencies needed in the 21st century are *(Communication, Critical Thinking, Collaboration and Creative)* or *4C*. Based on these, an appropriate learning strategy is needed in order to occupy the required competencies. In fact, today's learning still does not involve many students actively so that students have not obtained preferable achievement and motivation to learn through the learning experiences they have done. Based on the results of research from Ebrahimi (2010) which revealed that the learning process that actively involves students or student-centered learning (student's center) can affect the acquisition of achievement and motivation to learn better than teacher-centered.

One of the learning processes that involve active students is innovation in the field of information technology, which is currently growing very rapidly (Asyhar, 2012). These innovations are mainly in teaching materials. Teaching materials are one of the important sources to support the learning process. Teaching materials become a connection between teachers and students. The teacher as a facilitator, so that the use of teaching materials is able to assist teachers in dealing with the problem of limited student absorption and the teacher's ability to manage learning in the classroom. Teaching materials are Student Worksheets (LKPD) have four functions. First, as teaching materials that are able to minimize the role of educators but are able to make students more active. The second function is LKPD as teaching materials that can make it easier for students to understand the material given by the teacher. The third is as a concise teaching material and there is a task to train students, the last function of the LKPD is to facilitate the implementation of teaching and learning to students. (Prastowo, 2016). The function of LKPD is to facilitate the learning process, so that it can support learning in the 21st century. This century's learning utilizes technological advances, especially information and communication technology assistance to facilitate the learning process. Learning by using electronic media can also improve learning outcomes so it is necessary to select the right teaching materials according to the topic (Bakri, 2018). The use of technology can also reduce the use of paper or paperless, so the right solution to deal with these problems is to use teaching materials in the form of electronic student worksheets (e-LKPD). The use of e-LKPD is expected to make learning more effective and students can play an active role in the learning process.

One of the learning models that involve students is Project Based Learning. *Project-based learning* (PjBL) is a learning model that can produce a real product/project carried out by students. Students play an active role in carrying out the project assignments. The PjBL learning model pays great attention to the systematic work process in making useful projects or products (Sutirman, 2013).

The advantage of the PjBL-based electronic student worksheets that was developed is that it can help facilitate and guide students to be able to investigate, solve student-centered problems and produce real products in the form of project results. In addition, in this e-LKPD there are supporting features that can increase students' previous knowledge.

The PjBL-based Student Worksheet has its own advantages, namely that students are not only able to solve problems related to the learning material being taught, but are also required to be able to produce science skills in everyday life. This is reinforced by the theory of Addin et al (2014) which states that PjBL has an influence on increasing affective learning outcomes by 85% and on psychomotor learning outcomes it is known that 94% of students can complete (Barlenti et al, 2017). The validity of LKPD development based on Project Based Learning obtained a percentage of 96.75% (Ratna, 2020).

Project-based learning materials that can produce a product and students can play an active role are growth and development materials. This material can be related to the environment of students by way of students being directly involved through practicums that produce products from the influence of internal and external factors on growth and development. Using this material, students are expected to get a learning experience and can increase motivation and learning achievement. Biological material that becomes difficult for both teachers and students is growth and development material. This is evidenced by the low learning outcomes of students due to a lack of carrying out activities related to activities of daily life (Supriyatin, 2018).

Referring to the introduction part that has been described, this research aims to produce an electronic students worksheets based on project based learning material for growth and development in plants that are theoretically feasible. The validity of the e-LKPD was obtained based on the feasibility of the content, presentation and language.

## METHOD

This research is a type of development research with reference to the 4-D development model by

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Thiagarajan, et al. 1974 namely Define, Design, Develop, and Disseminate. This research only reached the development stage without the disseminate stage. The target of this research was e-LKPD based on Project Based Learning on Plant Growth and Development. This research was divided into three stages, namely the early stage, data collection and the final stage.

The early stage was the stage of developing e-LKPD consisting of 1) *define*, including early analysis, student analysis, task and concept analysis and formulation of learning objectives; 2) *Design*, including the stage of selecting the format and media as well as designing the initial design of the e-LKPD which resulted in draft I; 3) *Develop*, including the results of the review and validation by the validator to became a draft of the e-LKPD that had been validated.

The data collection stage is carried out in validation activities using validation instruments. The validation aspects assessed were presentation, content and language. The validation was carried out by three validators, namely education experts, material experts and teachers in the field of biology studies by scoring the items in each validation aspect based on the scoring criteria referring to the Likert scale in Table 1. Below:

**Table 1.** Likert Scale Scoring Criteria

| Criteria | Score |
|---|---|
| Excellent | 4 |
| Good | 3 |
| Fair | 2 |
| Poor | 1 |

The final stage is the stage of data processing and data analysis from the results of the study and validation. The data analysis technique was carried out descriptively qualitatively and descriptively quantitatively. Qualitative descriptive analysis was done by collecting data in the form of suggestions and inputs that had been obtained from each validator which could then be used for evaluation and improvement of e-LKPD. Descriptive quantitative analysis was carried out to analyze the data in the form of obtaining scores derived from the validation results (Indriani, 2020).

The scores obtained from the three validators on the items in each aspect would be averaged and then used to determine the validity score using the following equation:

$$V = \frac{\sum \bar{X}}{n} \quad (1)$$

Dengan:

V = validty score
$\overline{X}$ = the average score of the three validators
N = items in each aspect

(adapted from Putra, 2018)

The results of the validity scores were converted into percentages (%) using the following equation:

$$P = \frac{V}{m} \times 100\% \quad (2)$$

dengan:

P = validity percentage (%)
V = the average score of the three validators
m = maximal score

(adapted from Putra, 2018)

The percentage of validity was then interpreted according to the criteria in Table 2. The e-LKPD could be declared valid if the percentage of validity was 61%.

**Table 2.** Interpretation Criteria Percentage of Validity

| Percentage (%) | Criteria |
|---|---|
| 25 – 40 | Invalid |
| 41 – 55 | Less Valid |
| 56 – 70 | Valid Enough |
| 71 – 85 | Valid |
| 86 – 100 | Highly Valid |

(adapted from Riduwan, 2013)

## RESULT AND DISCUSSION

This research produced electronic teaching materials in the form of Electronic Student Worksheets Based on Project Based Learning on Growth and Development Materials for class XII SMA along with validity results in terms of presentation, content and language aspects.

### *e*-LKPD Profile

This project-based electronic student worksheet was produced using Flip PDF Professional software which can make teaching materials in the form of books or worksheets in electronic form. The characteristics of the developed e-LKPD were digital forms that are easy to use and access via mobile devices or PCs. Information and materials on e-LKPD were not only in written form but there were image formats related to the material that make it easier for students to learn and explore the material. In addition, there were supporting features so that visually and specifications this e-LKPD had more appeal and advantages compared to print LKPDs that were generally used. The use of electronic teaching materials in learning could help increase interest in learning, student focus and learning did not feel monotonous (Sriwahyuni, 2019) so

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that the use of electronic teaching materials could help teachers and students during the learning process.


(a) (b)

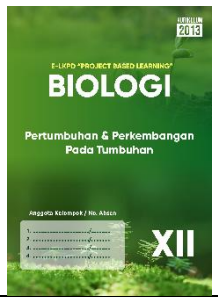
**Figure 1.** display (a) front cover, display (b) back cover

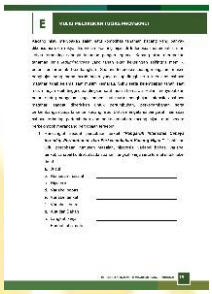
The cover design of the e-LKPD in **Figure 1** was made attractive and informative, which can represent and describe the contents and materials contained in this e-LKPD. The front cover was the main cover listed, namely the title of e-LKPD (e-LKPD Project Based Learning), Title of material (Growth and Development in Plants), education level of students (XII SMA), Curriculum used (2013 Curriculum), background image plants that represent the material to be taught, namely the growth and development of plants. The back cover did not contain much information because the back cover is only a complement.

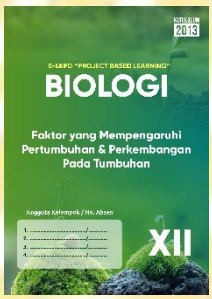
*Electronic* student worksheets based on Project Based Learning were developed using growth and development materials in plants contained in several sub-chapters related to plant growth and development materials as well as project-based activities. An explanation regarding the form of e-LKPD development will be presented in **Table 3**. below:

***Table 3.*** Forms of e-LKPD Development Based on Project Based Learning Materials for Growth and Development in Plants Class XII

| Parts of *e*-LKPD | Display | Substance |
|---|---|---|
| Electronic Student Worksheet 1: Contains material Growth Development in plants | | Sub-chapter 1: Growth and development |
| | | Sub-chapter 2: Germination |
| | | Sub-chapter 3: Primary Growth |
| | | Sub-chapter 4: Secondary growth |
| Activity 1: Implementation of mung bean germination practicum project | | Sub-chapter 5: Mung bean germination project |
| | | Sub-chapter 6: Project report preparation |
| *Electronic* Student Worksheet 2: Contains material Factors that affect growth and development in plants | | Sub-chapter 1: Practical Project Discussion |
| | | Sub-chapter 2: External Factors |
| | | Sub-chapter 3: Internal factors |






The contents of e-LKPD 1 consisted of several sub-chapters, 1) Sub-chapter 1: contained growth and development which contains information related to differences in growth and development based on image observations. 2) Sub-chapter 2: contained germination material which contains information related to the germination process and the different types of germination based on the location of the cotyledons. 3) Sub-chapter 3: contained material related to primary growth includs plant parts that undergo a primary growth process. 4) Sub-chapter 4: contained secondary growth material which contains information related to the process of formation of secondary xylem and phloem in stems as well as cambium activity.

Activity 1 in this e-LKPD contained activities for implementing a practicum project on growth and

germination of mung beans. This project contained steps based on PjBL which include: 1) Problem determination, 2) Project planning, 3) Project schedule development, 4) Project work monitoring, 5) Project appraisal, 6) Project evaluation.

The first step in working on this germination project was determining the problem. After reading the reading provided, students were expected to be able to determine the problem that will be taken as the title of the project. Then, students started to plan the project from buying and preparing the necessary tools and materials as well as the work steps that must be done. Students were expected to be able to design experiments according to the directions given. All project activities must be carried out in a coherent manner. The next step was the preparation of the project schedule. The preparation of project schedules carried out by students was expected to make it easier for students to complete projects on time. The table containing the project planning schedule contained activities that students must do every day, documentation of project activities and then reported to the teacher for signatures. In addition, students were expected to be able to use time efficiently so that the projects they were working on can run smoothly. Then the monitoring of this project work was carried out by the teacher on the student project. Students could consult about difficulties and obstacles in project work. This could make it easier for students to find the right solution so that the project could be completed on time. In addition, monitoring project work could make it easier for students to know the progress of the project they were doing. After the project implementation had been completed, an assessment of the project results would be done by the teacher. This assessment was done to determine the results of the project work that has been carried out. Assessment of project results was implemented by presenting project results using poster media. Students could use attractive, informative and easy-to-read designs. After evaluating the project results, the project evaluation was excuted. The teacher would provide criticism and suggestions for the projects that had been implemented. Students were also expected to compile a project report according to the available format. This was done to make it easier for teachers and students to know the process from the beginning to the end of the practicum.

Part of e-LKPD 2 contained material related to factors that affect growth and development in plants as well as discussion of practicum projects. This practical discussion was used as material for evaluating projects that have been excuted by students.

This *electronic* student worksheet that has been developed also contained several features that could support and help students understand the material that has been studied. The supporting features were presented in Table 4. The following are the features:

**Table 4**. Supporting Features in PjBL-based e-LKPD

| Supporting features | Function |
|---|---|
|   | Contains questions given to review or review the knowledge that has been obtained by students |
|   | Contains information about the material that can add to the latest insights of students. |

Table 4 contained the supporting features of e-LKPD. The first feature is *let's review together*. This feature contained questions that were used to review or review the knowledge that has been obtained by students. Each sub-chapter contained material that was explained. After reading these materials, students filled in the *let's review together* feature to find out how far students understand the material that had been read and studied. The second feature was *Finally, I Know!* This feature contained the latest information related to the material being studied. This feature could be used to add the latest insights of students related to growth and development in plants. There were some terms that the students may not know, so the explanations of these terms could be seen in the *Finally, I Know!*

**Table 5.** Results of the PjBL-based e-LKPD Study

| No. | Comments and Suggesions | Repair |
|---|---|---|
| 1. | The front cover design and layout must be improved | Improve the cover design and layout according to the validator's suggestions |

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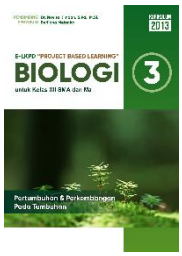
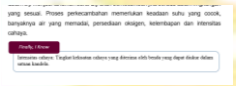
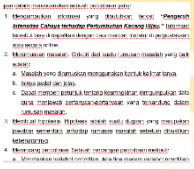
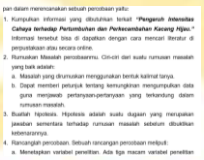
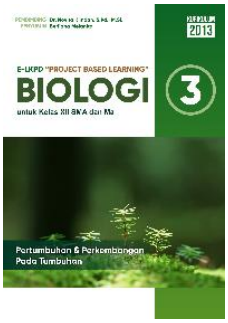
| | | |
|---|---|---|
| |   |   |
| 2. | The picture shown is still not continuous with the explanation of the material   | Change the image that is not right so that the material explained is easier to understand   |
| 3. | The composition of colors and text is corrected again in the title and content of the e-LKPD.  | Change the design, color composition and writing so that they can be read properly.  |
| 4. | The use of words must be consistent from beginning to end  | Replacing words with words that should have been used from the start  |
| 5 | The supervisor's name comes first before the author's name   | The author's name comes first before the supervisor's name   |

Based on the results of the study conducted by the validator, there were several comments and suggestions on the e-LKPD that have been prepared. The first suggestions and comments were the design and layout on the cover page. The cover page showed that there are differences in the colors used, namely white and green. Based on the suggestion, it is better if the cover was green in its entirety so that there is no color gap. Cover repair was done by changing the color and layout. The second comment regarding the image used was still not consistent with the explanation of the material, giving rise to a different meaning. On the advice given by the validator, the authors changed the image that is not right so that the material described was easier to understand and did not effect different meanings. The third was related to the color composition and writing that needs to be improved. Some of the writing descriptions of the color composition were not good enough so that they are not visible to the reader. Then the compilers improved the correct color composition so that it is easy to read properly. The next comment was related to the use of words that must be consistent from the start. For example: the student uses the term student. So that all student words used must use the term student. The last comments and suggestions regarding the location of the supervisor's name took precedence before the author's name. It is recommended that the author's name comes first before the supervisor's name.

### Validity of e-LKPD

Electronic student worksheets that had been reviewed and repaired based on suggestions and input were then tested for validity to three validators, namely material expert lecturers, education expert lecturers and biology teacher at SMA Muhammadiyah 2 Surabaya. This validation was excuted to determine the level of validity of the e-LKPD that had been developed. The following were the validation results obtained from the three validators presented in Table 6.

**Table 6**. Results of PjBL-based e-LKPD 1 validation

| | Aspects of assessment | Score | | | $\overline{X}$ | V | P (%) |
|---|---|---|---|---|---|---|---|
| | | $V_1$ | $V_2$ | $V_3$ | | | |
| **A.** | **Presentation aspect** | | | | | | |
| 1 | Presentation Technique | 3 | 4 | 4 | 3.6 | **3.76** | **94** |
| 2 | Serving equipment | 4 | 4 | 4 | 4 | | |
| 3 | Display quality | 3 | 4 | 4 | 3.6 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4 | Layout quality | 4 | 4 | 4 | 4 | | |
| 5 | Image quality | 3 | 4 | 4 | 3.6 | | |
| | | **Category** | | | | **Highly Valid** | |
| **B.** | **Content Aspect** | | | | | | |
| 6 | The suitability of the material with the concept | 3 | 4 | 4 | 3.6 | | |
| 7 | Instructions for using e-LKPD | 4 | 4 | 4 | 4 | **3.9** | **97.5** |
| 8 | Questions on e-LKPD | 4 | 4 | 4 | 4 | | |
| 9 | Concept suitability | 3 | 4 | 4 | 3.6 | | |
| | | **Categories** | | | | **Highly Valid** | |
| **C.** | **Language Aspect** | | | | | | |
| 10 | Language Use | 4 | 4 | 4 | 4 | | |
| 11 | Use of the Term | 4 | 4 | 4 | 4 | | |
| 12 | Quality of Information sources | 4 | 4 | 4 | 4 | **4** | **100** |
| | | | | | **Category** | **Highly Valid** | |
| **Percentage of Overall Validity (%)** | | | | | | **97.1** | |
| | | | | | **Category** | **Highly Valid** | |

Description:
$V_1$ = Material expert
$V_2$ = Education expert
$V_3$ = Biology study teacher
$\overline{X}$ = average
V = validity score
P = Percentage of validity (%)

Based on the results of the validation of e-LKPD 1 of the three main aspects of the assessment, namely the language aspect that got the highest average score of 4 with a percentage of 100% the highly valid category, it means that the terms and language used in PjBL-based e-LKPD are material for plants growth and development that easy understood. The size of the letters used had been adjusted to the needs so that when students read it is easy to understand. One of the requirements for the preparation of a good LKPD and in accordance with the applied learning model is the use and selection of writing and language (Saputra, 2016).

Project based learning is one of the learning models that can construct students' knowledge and skills through project activities. This can help increase students' creativity and motivation and provide opportunities for teachers to be able to manage learning in the classroom and outside the classroom which involves project work (Wena, 2013).

Students worksheets based on project based learning not only solve problems from learning materials but are required to apply science skills in everyday life (Ladyana, 2014).

Electronic student worksheets that have been developed based on the presentation aspect got an average score of 3.76 with a percentage of 94% in the very valid category, which means the design, appearance and layout of the e-LKPD that have been developed are in accordance with the concept presented. The presentation in this e-LKPD used capital letters in important parts such as titles, learning objectives and instructions for use. Aspects of a good presentation could help students to understand the material growth and development of plants. In addition, important information on the material being taught also uses bold and italic letters. This was in accordance with (Widajajanti, 2008) that the use of capital letters in writing can help make it easier for students to understand the learning objectives to be implemented. In addition, the emphasis of important information can use capital letters or italics (Italic) (Arsyad, 2014). Printing letters could help attract students' attention to understand the material. Thus, it was very useful for students to understand the learning objectives as well as the implementation and completion of project activities. There were several scores worth 3 given by the validator lecturer because of the lack of precise presentation techniques, display quality and images so that there are improvements.

Electronic student worksheets for growth and development in plants according to content aspects got an average score of 3.9 with a percentage of 97.5% highly valid category. In order to achieve the goals to be achieved in accordance with the expected competencies, learning resources were needed that will be used as references in the learning process that can help guide students (Kosasih, 2014). The electronic LKPD that has been developed had received suggestions that steps for assessing project assignments use posters. So that the steps can be fulfilled properly. There was a score of 3 given by the validator because some concepts were not correct and must be corrected so that they do not have double meaning when studied by students.

Overall, the electronic LKPD 1 material on growth and development in plants that has been developed from the three assessment aspects used, namely the content and language presentation aspects, obtained an overall validity percentage of 97.1% with a highly valid

category. This shows that the e-LKPD could fulfill and assist students in the learning process.

The following were the validation results obtained from the three validators presented in Table 7.

**Table 7**. Results of PjBL-based e-LKPD 2 Validation

| | Aspects of assessment | Score | | | $\overline{X}$ | V | P (%) |
|---|---|---|---|---|---|---|---|
| | | $V_1$ | $V_2$ | $V_3$ | | | $V_1$ |
| **A.** | **Presentation aspect** | | | | | | |
| 1 | Presentation Technique | 3 | 4 | 4 | 3.6 | | |
| 2 | Serving equipment | 4 | 4 | 4 | 4 | | |
| 3 | Display quality | 3 | 4 | 3 | 3.3 | **3.7** | **92.5** |
| 4 | Layout quality | 4 | 4 | 4 | 4 | | |
| 5 | Image quality | 3 | 4 | 4 | 3.6 | | |
| | | **Category** | | | | | **Highly Valid** |
| **B.** | **Content Aspect** | | | | | | |
| 6 | The suitability of the material with the concept | 3 | 4 | 4 | 3.6 | | |
| 7 | Instructions for using e-LKPD | 4 | 4 | 4 | 4 | **3.9** | **97.5** |
| 8 | Questions on e-LKPD | 4 | 4 | 4 | 4 | | |
| 9 | Concept suitability | 4 | 4 | 4 | 4 | | |
| | | **Category** | | | | | **Highly Valid** |
| **C.** | **Language Aspect** | | | | | | |
| 10 | Language Use | 4 | 4 | 4 | 4 | | |
| 11 | Use of the Term | 4 | 4 | 4 | 4 | | |
| 12 | Quality of Information sources | 4 | 4 | 4 | 4 | **4** | **100** |
| | | | | **Category** | | | **Highly Valid** |
| **Percentage of Overall Validity (%)** | | | | | | | **96.6** |
| | | | | **Category** | | | **Highly Valid** |

Description:
$V_1$ = Material expert
$V_2$ = Education expert
$V_3$ = Biology study teacher
$\overline{X}$ = Average
V = validity score
P = Percentage of validity (%)

The results of the validation of e-LKPD 2 from the three main aspects of the assessment, namely the language aspect that got the highest average score of 4 with a percentage of 100% highly valid category, it means that the terms and language used in PjBL-based e-LKPD were material for plants growth and development factors that easy to be understood. The size of the letters had also been adjusted to the needs of students as in e-LKPD 1.

Electronic Student Worksheet 2 which has been developed based on the presentation aspect got an average score of 3.7 with a percentage of 92.5% highly valid category which means the design, appearance and layout of the e-LKPD that has been developed in accordance with the concept presented and can attract students' interest in learning. Some aspects of the score were worth 3 because the quality of the display is not right so it must be repaired to make it look nicer and neater.

Aspects of the electronic content of student worksheets on growth and development in plants got an average score of 3.9 with a percentage of 97.5% highly valid category. The most important aspect that can support the achievement of the skills that were trained on students is the content of the e-LKPD, this is in line with Nizar, et al (2016). LKPD was a series of activities that are contained in a teaching material which must be implemented by students in order to maximize understanding which has been obtained as an effort to achieve basic abilities in learning activities.

Overall, e-LKPD 2 obtained a validity percentage of 96.6% with a very valid category. PjBL-oriented student worksheets had many advantages, one of them it can provide opportunities for students during the learning process to be able to interact directly with the environment being observed so that it can help motivate students to learn the concepts and material being studied. Students would also gain new experiences with the discovery of knowledge concepts that can be built alone or with groups based on project activities carried out (Setiawan, 2021).

Each student worksheets have advantages and disadvantages. LKPD 1 has a lot of material, concepts and practice questions for students to do. This can train the skills and knowledge of students. While in LKPD 2 the

materials, concepts and exercises are less than LKPD 1 but cover overall of the results and discussion of the projects being worked on.

## CONCLUSION

Based on this research, the e-LKPD 1 and 2 materials on growth and development in class XII SMA, plants can be used to train students' abilities in working with groups through the Project Based Learning model. The developed E-LKPD is declared very valid based on the results of validation by experts in every aspect of presentation, content and language as well as conformity with *Project Based Learning* syntax.

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