

Validity of Student Worksheets based Project Integrated Technological Pedagogical and Content Knowledge (TPACK) Biological Material

Wahdania Misliyanti^{1*}, Ismail², A. Mu'nisa³

¹Biology education, FMIPA, Universitas Negeri Makassar, Indonesia

^{2,3}Biology Department, FMIPA, Universitas Negeri Makassar, Indonesia

Email: [1misliyantiwahdania@gmail.com](mailto:misliyantiwahdania@gmail.com)

[2ismail6131@unm.ac.id](mailto:ismail6131@unm.ac.id)

[3andi.munisa@unm.ac.id](mailto:andi.munisa@unm.ac.id)

*Corresponding Author

Article History

Received : 22 - 07 - 2022

Revised : 15 - 10 - 2022

Accepted : 31 - 10 - 2022

Keywords:

Validiy. Student Worksheet, Project

Article link



Abstract

This study aims to produce a worksheet based on an integrated TPACK project on valid Ecological material. The purpose of this study was to determine the validity of the TPACK-integrated project-based worksheet. This research is a research and development (Research and Development) with a 4D model development model consisting of four stages, namely: (1) Define, (2) Design, (3) Development, and (4) Disseminate. The product produced in this research is the TPACK integrated project-based student worksheet, validated by 2 expert validators. The instrument used in this study was a product validation questionnaire. The data was obtained using the developed, was then analyzed quantitatively. The results showed that the level of validity of the worksheet based on the TPACK integrated project, which was 4.5, was in the valid category. So that the student worksheet based on the TPACK integrated project is declared valid. The benefit of this research is to determine the validity or level of accuracy of a basic material, namely the TPACK-based project-based worksheet so that it is useful and useful for teachers and students in the learning process.

©the authors

This is an open-access article under the CC-BY-NC-SA license

<https://creativecommons.org/licenses/by-nc-sa/4.0/>



Introduction

Teaching materials are one of the main components that can support a learning process in the classroom. One of the functions of teaching materials is to be a liaison between teachers and students. The existence of teaching materials can help teachers face the limitations of the absorption of students and the ability of teachers to manage to learn in the classroom. There are various types of student worksheets, one of which is the student worksheet. According to Prastowo (2012) student worksheets are teaching materials that serve to facilitate students in understanding the material, train independent learning with critical thinking skills, and facilitate the implementation of teaching by educators. Appropriate and supportive teaching materials will make it easier for students to understand and receive material in learning (Zunaidah and Amin, 2016). According to (Hala and Taiyeb, 2016) student worksheet is a student guide that is used to carry out investigations or problem-solving activities

Akbar, (2013) states that expert validation is done using of a person or several learning experts assessing the product using a validation instrument. (Salim, 2019) states that the validity of a product is if it meets valid requirements through evaluation by an instrument. A valid instrument will get the right or valid data so that it can produce the right research results and conclusions and vice versa (Sugiyono, 2019). (Kusaeri and Supranato, 2012) stated that validity refers to the accuracy, meaningfulness, and usefulness of a conclusion obtained from the interpretation of the score. (Azwar, 2014) states that content validity is

validity that is estimated through testing the content of a test with rational analysis or through professional judgment. Content validity is divided into two types, namely : face validity and logical validity. Content validity shows that a product developed is based on a relevant curriculum or based on a strong theoretical rationale while construct validity shows internal consistency between product components (Haviz, 2016).

According to Ngalmun, (2017); and (Hayati, Utaya, and Astina, 2016) Project Based Learning is a learning model centered on the main concepts and principles (central) of a discipline, involving students in problem-solving activities and other meaningful tasks. The 2013 curriculum training module in Ratumanan (2015), describes six steps of project-based learning, namely, (1) determining basic questions, (2) designing project plans, (3) developing schedules, (4) monitoring students and project progress, (5) test the results, and (6) evaluate the experience.

Technological Pedagogical and Content Knowledge (TPACK) is a teacher/ designer framework for integrating technology into the learning process. This concept appears in learning technology based on the model pedagogic content knowledge (PCK) which was pioneered by Shulman (1986) three components must be present in educators, namely mastery of the subject matter in accordance with the qualifications, and competencies that are classified into curriculum, pedagogy and technology. The basic concept of TPACK emphasizes the relationship between learning materials, technology. and pedagogy (Koehler, Mishra and Cain, 2009).

Methods

This research is a research and development (research and development). This development research refers to the 4D model conducted in April-May 2022. The research subjects are 2 expert validator lecturers. The research instrument is a product validation questionnaire. The data collection technique used in this research is a questionnaire. The questionnaire used is a validation questionnaire. The data analysis used is data analysis validity. Validity value (Va) or the total average value is referred to the interval of determining as the level of validity proposed by Sugiyono (2010).

Tabel 1. Validity Criteria

| Score | Description |
|-----------------|-------------|
| $1 \leq Va < 2$ | Invalid |
| $2 \leq Va < 3$ | Not Valid |
| $3 \leq Va < 4$ | Quite valid |
| $4 \leq Va < 5$ | Valid |
| $Va = 5$ | Very valid |

(Source: Sugiyono 2010).

Results and Discussion

Student Worksheet Validation Result

Table 2. Results of Student Worksheet Validation based on TPACK Integrated Projects reviewed

| No. | Aspect | Validator | | Average | Information |
|----------------------|---|-----------|------------|------------|--------------|
| | | V1 | V2 | | |
| 1. | The identity of the STUDENT WORKSHEET is contained in full (title of activity, class/semester, and author). | 5 | 5 | 5 | Very valid |
| 2. | Instructions for using the STUDENT WORKSHEET are contained in full. | 5 | 5 | 5 | Very valid |
| 3. | There is a column for writing answers and discussions. | 5 | 5 | 5 | Very valid |
| 4. | The available column capacity is free to write answers. | 5 | 5 | 5 | Very valid |
| 5. | STUDENT WORKSHEET is presented in a coherent and systematic manner | 5 | 4 | 4,5 | Valid |
| Total Average | | 5 | 4,8 | 4,9 | Valid |

(Source : Author's document, 2022)

The validity at the initial stage of this student worksheet in the presentation aspect was declared invalid. Because the capacity of the answer column in the student worksheet is not yet free for students to write their answers, there are also sections of the column that need to be corrected by adjusting what is required by the questions contained in the student worksheet. Input from expert validators, so that student worksheet is revised and developed in accordance with expert validators' suggestions. After going through this student worksheet revision stage, it was re-validated and declared valid as shown in table 2, it can be seen that the assessment of the two validators in each indicator of the presentation aspect of the student worksheet obtained a total average of 4.9 which was in the valid category, namely ($4 Va < 5$).

Based on the results of the validation of the two expert validators, this is because the TPACK-based project-based student worksheet was developed based on a curriculum analysis that contained a match between the goal indicators and the assignment method. This is in accordance with what was stated by (Fitriana et al., 2018) that the suitability of the material with basic competencies and indicators of competency achievement really needs to be considered in developing teaching materials, especially student worksheet.

Table 3. The Results Of The TPACK Integrated Project-Based Student Worksheet Validation Are Reviewed From The Aspect Of Content

| No. | Aspect | Validator | | Average | Information |
|----------------------|--|------------|------------|------------|--------------|
| | | V1 | V2 | | |
| 1. | The learning objectives are in accordance with the Basic Competencies (KD 3.5 and 4.5). | 4 | 4 | 4 | Valid |
| 2. | Student activities are in accordance with learning objectives | 4 | 4 | 4 | Valid |
| 3. | Compatibility with syntax model learning-based project based learning (PjBL). 1. Determination of basic questions 2. Design the project plan 3. Schedule 4. Monitor students and project progress 5. Test results 6. Evaluate experience | 5 | 5 | 5 | Very valid |
| 4. | Student worksheet contains appropriate questions. | 4 | 5 | 4,5 | Valid |
| 5. | The essentiality of materials and tasks in student worksheet | 5 | 4 | 4,5 | Valid |
| Total Average | | 4,4 | 4,4 | 4,4 | Valid |

(Source : Author's document, 2022)

At the next validation stage, it is focused on the content aspects in the TPACK integrated project-based student worksheet which is declared invalid, because the questions in the student worksheet are still too basic, so it is necessary to add some questions that can train students' critical thinking skills, in the student worksheet there is also no detailed explanation of the material. short. In the syntax section project-based learning also needs to be revised in the third stage, namely compiling a validator input schedule to replace the usual answer column with a table timeline product completion. Input from expert validators, so that student worksheet is revised and developed in accordance with suggestions and input from expert validators. After the revision of this student worksheet is validated and declared valid, it can be seen in table 3 based on the results of the validator's assessment for each indicator of the aspect of the content of the student worksheet obtaining a total average of 4.4 which is in the valid category, namely ($4 V < 5$).

Criteria that are important to consider in teaching materials other than material that is presented in a concise and clear manner, can motivate students, are written in good and correct language and arranged as attractive as possible. Learning device can is declared valid if the expert's assessment shows that the development of the device has internal consistency between each aspect that is assessed as being related to the components in the learning device. In line with that, the National Standards Agency (BSNP) has four indicators in the preparation of teaching materials, one of which is the feasibility of the content (Kinanti, 2017).

Table 4. The Results Of The TPACK Integrated Project-Based Student Worksheet Validation Are Reviewed From The Aspect Of View

| No. | Aspect | Validator | | Average | Information |
|----------------------|--|------------|------------|------------|--------------|
| | | V1 | V2 | | |
| 1. | Harmonious color combinations | 5 | 4 | 4,5 | Valid |
| 2. | Type selectionfonteasy to read | 4 | 5 | 4,5 | Valid |
| 3. | Sizefontbalanced. | 4 | 4 | 4 | Valid |
| 4. | The writing structure is spaced neatly | 5 | 5 | 5 | Very Valid |
| 5. | Use consistent margins. | 5 | 5 | 5 | Very Valid |
| 6. | Image size is proportional. | 4 | 5 | 4,5 | Valid |
| 7. | Illustration of images relevant to the contents of the student worksheet | 4 | 5 | 4,5 | Valid |
| 8. | The images presented can convey message to the reader. | 4 | 5 | 4,5 | Valid |
| 9. | The student worksheet display design is presented in an attractive manner. | 5 | 5 | 5 | Very Valid |
| Total Average | | 4,4 | 4,7 | 4,6 | Valid |

(Source : Author's document, 2022)

In terms of the appearance of the resulting student worksheet, there are several inputs from the expert validator before the student worksheet device is declared valid by the expert validator. For example, there are font student worksheet should use a font type that is easy and readable, and also uses a size font balanced, as well as the use of illustrations, for example, images should use images that have high quality so that they can be easily read by people learners. Based on the suggestions and input of the validator for each item on the display aspect, improvements are made until this student worksheet is declared valid. This is supported by research that has been done previously which states that student worksheet that is of good quality and feasible to be applied in the learning process is student worksheet that has met the standard of validity in a predetermined aspect then assessed by an expert validator and the use of letters in printed teaching materials should not be too small and easy to read (Banjarani *et al.*, 2020).

Table 5. Validation Results Of TPACK-Based Project-Based Student Worksheet Viewed From The Linguistic Aspect

| No. | Aspect | Validator | | Average | Information |
|----------------------|--|------------|------------|------------|--------------|
| | | V1 | V2 | | |
| 1. | Language compatibility with EYD | 4 | 5 | 4,5 | Valid |
| 2. | The language used is easy to understand. | 4 | 4 | 4 | Valid |
| 3. | The language used is according to the level cognitive learners. | 4 | 4 | 4 | Valid |
| 4. | The terms used are in accordance with the prevalence of biological science | 4 | 4 | 4 | Valid |
| 5. | The terms used are in accordance with the concept to be conveyed. | 4 | 4 | 4 | Valid |
| 6. | The sentence structure does not have a double meaning. | 4 | 4 | 4 | Valid |
| 7. | The sentence structure used is simple | 5 | 5 | 5 | Very Valid |
| 8. | The language used is communicative. | 5 | 5 | 5 | Very Valid |
| Total Average | | 4,2 | 4,3 | 4,3 | Valid |

(Source : Author's document, 2022)

In table 5, based on the results of the validator's assessment for each indicator of the linguistic aspect, student worksheet obtained a total average of 4.3 which is in the valid category, namely ($4 < V < 5$). In accordance with the theory revealed by (Rajabi and Buditjahjanto, 2015) that learning tools have valid criteria if the learning tools reflect the consistency between the parts of the learning tools that are arranged

and the suitability between the learning objectives, learning materials and assessments given. If the learning device compiled meets the criteria of construct validity and content validity, the learning device is said to be valid

Table 6. The Results Of The TPACK Integrated Project-Based Student Worksheet Validation Are Reviewed From The Aspect Of The TPACK Framework

| No. | Aspect | Validator | | Average | Information |
|----------------------|--|-----------|----------|------------|--------------|
| | | V1 | V2 | | |
| 1. | Selected technology to use in student worksheet according to the method used to teach biology content. | 5 | 4 | 4,5 | Valid |
| 2. | Student worksheet combines technology with the methods used to help students think, understand and learn the biological content being taught | 5 | 4 | 4,5 | Valid |
| 3. | Student worksheet implements technology that adapted to specific teaching topics. | 5 | 4 | 4,5 | Valid |
| 4. | Student worksheet prepares for the use of technology in helping problem solving for students. | 5 | 4 | 4,5 | Valid |
| Total Average | | 5 | 4 | 4,5 | Valid |

(Source : Author's document, 2022)

Based on the aspect of the framework TPACK has a statement average 4.5 with valid categories, which include the technology selected for use in the student worksheet, the combination of technology and the methods used, technology implementation, and the use of technology to solve problems for students. (Salim, 2019) states that the validity of a product if it meets the requirements valid through evaluation by an instrument. The tool can be used if it can measure the desired aspect of the researcher and can reveal the data on the variables studied.

Conclusions and Recommendations

The teaching materials used in this research are student worksheet based on the integrated tpack project on ecology material for class x SMA/MA. the value of the results of the validity test is 4.5 with a valid category. so that the tpack integrated project-based student worksheet is useful for teachers and students in the learning process.

The suggestion The advice in this article is that a teacher must be able to make the right and best media for students teaching materials for students so that the learning process can run well. It would be much better if. Teachers are able to innovate in making student worksheets because the characteristics of each student are different.

References

- Akbar, S. (2013). Instrumen Perangkat Pembelajaran. In *Bandung: Rosdakarya Offset*. Rosdakarya Offset.
- Azwar, S. (2014). Metode Penelitian. In *Yogyakarta: Pustaka Pelajar*. Pustaka Pelajar.
- Banjarani, T., Putri, A. N., Eka, N., Hindrasti, K., Biologi, S. P., Maritim, U., & Ali, R. (2020). Validitas Lembar Kerja Peserta Didik (STUDENT WORKSHEET) Berbasis Problem Based Learning pada Materi Sistem Ekskresi untuk Siswa Kelas VIII SMP. *Jurnal Pendidikan Dan Pembelajaran Sains Indonesia (JPPSI)*, 3.
- Darmojo, H., & Jenny, R. E., Kaligis. 1993. *Pendidikan IPA 2*. Jakarta: Depdikbud.
- Fitriana, V., Ahmad, A., Prodi, H., Seni, P., Fakultas, R., & Unm, D. (2018). Kesesuaian Antara Materi Pembelajaran dengan Kompetensi Dasar Indikator Pencapaian Kompetensi dalam Rencana Pelaksanaan Pembelajaran Seni Budaya (Seni Rupa) Kelas VIII SMP Negeri 1 Tanete Riaja Kabupaten Barru. *Jurnal Desain Komunikasi Visual Fakultas Seni Dan Desain UNM*, 5(2), 80–87.
- Hala, Y., & Taiyeb, A. M. (2016). Pengaruh Penggunaan Lembar Kerja Peserta Didik Berbasis Pendekatan Ilmiah Terhadap Aktivitas dan Hasil Belajar IPA Biologi Kelas VII Peserta Didik SMP Negeri 2 Watampone Influence of Use of Worksheet Students Based on Scientific Approach to Activities and. *Jurnal Sainsmat*, V(1), 42–57.
- Haviz, M. (2016). Research and Development; Penelitian Di Bidang Kependidikan Yang Inovatif, Produktif Dan Bermakna. *Ta'dib*, 16(1). <https://doi.org/10.31958/jt.v16i1.235>

- Hayati, W. I., Utaya, S., & Astina, I. K. (2016). Efektivitas Student Worksheet Berbasis Project Based Learning dalam Menumbuhkan Kemampuan Berpikir Kritis Siswa pada Mata Pelajaran Geografi. *Jurnal Pendidikan*, 1(3), 468–474.
- Hobri. (2013). Metodologi Penelitian Pengembangan (Developmental Research) Aplikasi pada Penelitian Pendidikan Matematika. In *Pena Salsabila*.
- Kinanti, L. P. (2017). Analisis kelayakan isi materi dari komponen materi pendukung pembelajaran dalam buku teks mata pelajaran sosiologi kelas xi sma negeri di kota bandung. *Sosietas*, 7(1), 341–345.
- Koehler, M. J., Mishra, P., & Cain, W. (2009). What is Technological Pedagogical Content Knowledge (TPACK)? *Journal of Education*, 193(3), 60–70. <https://doi.org/10.1177/002205741319300303>
- Kusaeri, & Supranato. (2012). Pengukuran dan Penilaian Pendidikan. In *Yogyakarta: Graha Ilmu*. Graha Ilmu.
- Ngalimun. 2017. *Strategi Pembelajaran Dilengkapi dengan 65 Model Pembelajaran*. Yogyakarta : Parama Ilmu.
- Prastowo, A. 2012. *Panduan Kreatif Membuat Bahan Ajar Inovati*. Yogyakarta: Diva Press
- Rajabi, M., & Buditjahjanto, I. G. P. A. (2015). Pengembangan Perangkat Pembelajaran Instalasi Sistem Operasi dengan Model Pembelajaran Berbasis Proyek. *Jurnal Pendidikan Vokasi: Teori Dan Praktek*, 3(1).
- Ratumanan. 2015. *Inovasi Pembelajaran: Mengembangkan Kompetensi Peserta Didik Secara Optimal*. Yogyakarta: Ombak.
- Salim. (2019). *Penelitian pendidikan: Metode, Pendekatann dan Jenis*. Jakarta: Kencana.
- Sugiyono. 2019. *Metode Penelitian & Pengembangan (Research and development)*. Bandung: Alfabeta.
- Zunaidah, F. N., & Amin, M. (2016). Pengembangan Bahan Ajar Matakuliah Bioteknologi Berdasarkan Kebutuhan Dan Karakter Mahasiswa Universitas Nusantara PGRI Kediri. *Jurnal Pendidikan Biologi Indonesia*, 2(1), 19–30. <https://media.neliti.com/media/publications/117910-ID-developing-the-learning-materials-of-bio.pdf>