Validity level analysis model PjBL for biology learning

I Hajar*, Lufri, A Fauzan
Science Education Study Program, Universitas Negeri Padang, Indonesia

*ibnu@edu.uir.ac.id

Abstract. Researcher has develop based model project based learning, this model known as the PjBL for Biologi learning. The purpose of this research is to know the level validity model developed. PjBL developed for learning biology in the study education program at Riau of Islamic University (UIR). This research uses the method R & D, the model used the model Plomp (2013 ). Data collection techniques using a technique, interviews and survey. Data analysis by determining the s cohen' kappa berbantuan spss version 20. The results of the study explained that book model PjBL developed being used to the revision of small. Guidebooks work lecturer developed very reasonable used with small revision. Guidebooks work student who developed very reasonable used with small revision. The study conclusion PjBL model developed very reasonable used learning in biology.

1. Introduction
Biology experienced a very rapid development in the XXI century and influenced various aspects of human life. Therefore it is not wrong for Naisbitt & Aburdene's opinion about the XXI century as the century of biology. Changing the position of biology is a challenge for biologists and biology educators. Apart from the changes in biology's position above, biology is difficult for students to master. Several studies show this: (1) only 10% of students get an A, during midterm exams, the majority of students are remedial in general biology courses, (2) the average student learning outcomes only achieved a score of 62 (2013 data) and a score of 65 (2014) in the zoology course, (3) 69.5% of students were able to plan experimental procedures (69.5%). (4) Naturalistic intelligence of biology education students with an average of 5.57.

When viewed from the data above, students experience difficulties in mastering knowledge, skills / psychomotor. According to Aunt, students need learning that develops student cognitive capacity: higher order mental skills, critical & systemic thinking. Developing skills: leadership and team work, cultural agility: entrepreneurship (including social entrepreneurship): in the form of basic capacities possessed by all students" [1]. When students learn to reflect on the effectiveness of the approach they are implementing, they will be able to identify problems and then make the necessary adjustments.

The results of Hajar's research (2019) lecturers in the Riau Islamic University (UIR) Biology education study program even semester of the 2018/2019 academic year have used a learning model, namely small group discussion, cooperative learning, contextual instruction (63.16% each), cases study, discovery learning, cooperative learning, and collaborative learning (53.18% each), PjBL (31.58%). From the data above, it can be seen that PjBL is a model that few lecturers use in biology lectures. Another result of Hajar's research (2019) is that students experience difficulties in determining problems in planning (42.86%), decreased interest in implementing projects and some
even stopped as a result of them asking for additional time (42.86%), there were differences in student perceptions in project tasks (57.14%).

This is what underlies the need for a PjBL model for Biology courses. This model is used in biology lectures in the UIR Biology education program. This learning model is a model with a semi-structured discipline project category. According to Gross (2013: 231), this type of teacher provides boundaries for the subject area and the general approach used. Projects give students the opportunity to define a specific project and choose a specific approach. According to Felder and Brent (1996), Leeds, et al. (1998) students may need some advice and assistance in taking a role in the classroom. The problem formulated in this study is what is the level of validity of the PjBL model for Biology courses developed for biology courses? Development research aims to determine the validity of the PjBL model developed for Biology courses.

2. Theory Study

Adults who do the learning process are people who have experienced various events and experiences. What is needed in learning are things that can answer various problems faced in his life so far [6]. Pannaen and Malati provide suggestions for adult learning strategies, namely: 1) increasing the discussion, 2) providing references or at least providing information about the references used in learning, 3) increasing participation, 4) determining signs or criteria to accompany the freedom given to students, 5) mediating differences, 6) coordinating and analyzing information, 7) providing summaries or summaries [6].

Based on normative epistemology, the PjBL Model is learning achieved through learning communities that work together to solve real-world problems. The development of the PjBL model is based on values and aims to instill value in students, this is included in axiology. Print states that the curriculum must impart ethical knowledge (right / wrong) including the skills needed to make the right decisions according to ethics (Ansyar, 2014: 74).

There are four bases that must be considered in giving birth to new ways of teaching in higher education, namely: First, education which is held based on the spirit of discovery. Second, education held in the spirit of assembling "assembling" thinking. Third, involving experts, practitioners or activists in the business and industrial world. Fourth, the education that is held must be developed based on studies not only based on scientific disciplines but based on market needs [1].

The results of this research and development are in the form of a PjBL prototype model to obtain quality development results required an assessment. The quality of development according to [3] is based on quality criteria, namely validity, practicality, and effectiveness. The validity aspect can be seen from: (1) whether the curriculum or PjBL model developed is based on state-of-the-art knowledge; and (2) whether the various components of the learning device are consistently related to one another. The practical aspect is seen from the user point of view: (1) whether the experts and practitioners think that what has been developed can be used under normal conditions; and (2) whether the reality shows that what has been developed can be applied by educators and students. The learning model developed is said to be valid if the model is based on adequate theory (content validity) and all components of the learning model are consistently related to one another (construct validity) [3].

3. Methods

This research uses research and development (R&D) methods. The development model used is the Plomp model (2013). To find out the validity of the model, an assessment was carried out by experts (expert judgment), practitioners, and students (one to one). The assessment was also carried out in a focus group discussion (FGD). The research instrument used a validated learning model validation questionnaire. Data collection techniques using interview techniques and questionnaires. Data analysis used validity analysis by determining the coefficient of Cohen’s Kappa (k), assisted by the SPSS for Windows 20.0 series.
4. Results and Discussion

4.1. Development Result

The validity of the PjBL model expert for Biology lectures is determined by the expert's assessment of the prototype. The validity aspect can be seen from the answers to the following questions: (1) whether the model developed is based on state of the art knowledge; (2) whether the various components of the learning device are consistently related to one another. Validity testing is carried out from the validity of the content, and from the validity of the construction. There are 3 aspects assessed by the validator, namely the feasibility of the content, the feasibility of the model structure, the aspects of language and graphics. Based on the results of the validation by the five (5) validators, the results show that the PjBL model book for Biology courses is valid (0.80), with an interclass correlation coefficient (ICC) of 0.847 or reliability between assessments, which means that this model book can be used for Biology lectures with little improvement. For more details, see Table 1.

Table 1. Validation Results of the PjBL Model for Biology Lectures

| No | Aspects Assessed          | Validity (k) | Category       |
|----|---------------------------|--------------|----------------|
| 1  | Rational                  | 0.80         | valid          |
| 2  | Model Component           |              |                |
| 1  | Syntax                    | 0.82         | Very valid     |
| 2  | Prinsipile Reaction       | 0.81         | Very valid     |
| 3  | Social System             | 0.80         | Valid          |
| 4  | Support System            | 0.81         | Very valid     |
| 5  | Instruktional impact      | 0.77         | valid          |
| 3  | Language & Graphic aspects| 0.77         | valid          |
|    | Average                   | 0.80         | Valid          |

Evaluation of the Lecturer Work Guidelines book by the five (5) validators with 3 aspects of assessment, namely the lay out aspect, the language aspect and the content. Based on the results of the validation, it was found that the PjBL model of Lecturer Work Guidelines (PKD) for Biology lectures was very valid (0.88), with an interclass correlation coefficient (ICC) of 0.812 or reliability between assessments, meaning that the PjBL model PKD book for Biology courses could be used, with a little improvement. For more details, see Table 2.

Table 2. Validation Results of the PjBL Model PKD Book for Biology Lectures

| Aspects Assessed Validity | Coefisien Cohen’ Kappa (k) | Category       |
|---------------------------|-----------------------------|----------------|
| 1. Lay out                | 0.89                        | Very valid     |
| 2. Language               | 0.87                        | Very valid     |
| 3. Content                | 0.88                        | Very valid     |
| Rata-rata                 | 0.88                        | Very valid     |

Likewise for the assessment of the Student Work Guidelines (PKM) book by the five (5) validators with 3 aspects of assessment, namely the layout aspect, the language aspect and the graphic aspect. Based on the results of the validation by the five (5) validators, the results show that the PKM book in the PjBL model for Biology lectures is very valid (0.89), with an interclass correlation coefficient (ICC) of 0.812 or reliability between assessments, which means the PKM book is the PjBL model for lectures. Biology can be used with minor improvements. For more details, see Table 3.
Table 3. Results of the PjBL Model PKM Validation Book for Biology Classes

| Aspects Assessed | Validity | Coefficient Cohen’s Kappa (k) | Category |
|------------------|----------|-----------------------------|----------|
| 1. Lay out       |          | 0.90                        | Very valid |
| 2. Language      |          | 0.88                        | Very valid |
| 3. Graphic       |          | 0.87                        | Very valid |
| Rata-rata        |          | 0.89                        | Very valid |

Validation is an aspect of product quality that is produced and measured from an expert’s point of view. The products produced in this development consisted of model books, PKD books, PKM books. The following is a discussion of the results of product validation.

4.2. Discussion

Validation is an aspect of product quality that is produced and measured from an expert’s point of view. The products produced in this development consisted of model books, PKD books, PKM books. The following is a discussion of the results of product validation. The PjBL model book for Biology lectures received a valid assessment according to the expert. The results of the expert’s assessment of the PKD book are classified as very good intervals, which can be used with a few revisions. The revisions made were related to the structure of the learning device, clarity of the steps in the activity. The assessment of the PKM book by the category validator is very valid. The PKM book does not contain learning tools (RPS). The results of the expert on the PKM book were classified as very good and could be used with a few revisions. Revise according to expert advice.

The validity of the content shows that the PjBL model for Biology courses is developed based on strong theoretical rationale, the theory underlying the learning model has been described and discussed in depth. This relates to construct validity. The construct validity shows the internal consistency between the components of the model. Model construction includes (1) syntax, (2) social systems, (3) reaction principles, (4) support systems, and (5) instructional and indirect impacts. This is in accordance with the opinion of [35] which reveals the existence of an assessment criterion in determining the quality of the model, namely validity. Likewise, the model construction used in developing the PjBL model for Biology courses follows the instructions from [24], namely the learning model is built by several components including the model syntax, social systems, reaction principles, support systems and instructional impacts and impacts. companion. Therefore, the quality of the learning model is determined by the validity of the model components.

Apart from the construct validity, the quality of the model is also determined by the content validity where the PjBL model for Biology courses must be developed based on current knowledge. According to Nieveen the intervention must meet needs, and its components must be based on current knowledge (content validity) and all components must be consistently linked with one another. If the intervention meets these requirements, it is considered legitimate [37]. The PjBL model for Biology courses is supported by supporting theories such as constructivism learning theory.

The development of the PjBL model for Biology courses states that the learning model is said to be valid if the model development is in accordance with the procedure and is based on the field of knowledge and the theory of developing teaching materials. Tessmer explained that products validated by experts have a good level of resistance compared to other techniques [37].

Validity refers to the level of intervention design that is based on state of art knowledge and the various components of an intervention related to one another [35]. The model is said to be valid if the model is based on adequate theory (content validity) and all components are consistently related to one another (Rochmad, 2012). Meanwhile, Yanto [53] explains that learning syntax is said to be valid if the sequence of learning activities is logical, has clear learning objectives, has a clear activity organization, contains clear teacher activities, has clear assessments and supports the achievement of learning objectives. A logical sequence of learning activities means that it does not conflict with the demands of learning in general.
All the experts gave a syntax assessment of the PjBL model for Biology courses that had a clear purpose. To achieve this goal, it is necessary to take steps to achieve the activity objectives that have been determined. The validation tests carried out on the PjBL model for Biology lectures have met the formative evaluation techniques proposed by Tessmer, namely self-assessment, expert judgment, representative personal assessment, assessment by small groups, and field trials (Tessmer, 2005).

5. Conclusion

Based on the results of the study, it can be concluded that the PjBL learning model for biology lectures and its supporting components is suitable for use in biology courses with a very high category.

References

[1] Ahmad, T. Y. 2019. Membangun Perguruan Tinggi Bermutu. (https://independent.academia.edu/, diakses 20 Maret 2019).
[2] Anto, F. 2019. Pengembangan Model Pembelajaran Berbasis Masalah untuk Pembelajaran Fisika. Disertasi. Padang: UNP (tidak dipublikasikan).
[3] Arikunto, S. 1993. Prosedur Penelitian: Pendekatan Suatu Praktek. Jakarta: Rineka Cipta.
[4] Chiang and Lee. 2016. “The Effect of Project-Based Learning on Learning Motivation and Problem-Solving Ability of Vocational High School Students”. International Journal of Information and Education Technology, (Online), Vol. 6, No. 9, (http://www.ijiet.org/, diakses 15 Juli 2018).
[5] Creswell J.W. Research Design: Pendekatan, Kualitatif, Kuantitatif, dan Mixet. Terjemahan oleh Ahmad Wafaid. 2010. Jogjakarta: Pustaka Pelajar.
[6] Daryanto, Tarno, H. 2017. Pendidikan Orang Dewasa. Jogjakarta: Gava Media.
[7] Depkes. 2012. Jamu dan Kesehatan. Penelitian dan Pengembangan Kesehatan Kementerian Kesehatan adalah Riset Tumbuhan Obat dan Jamu I (Ristoja). Jakarta: Depkes
[8] Dewey, J. 1972. Experience and Education. Newyork: Collier Books.
[9] Doppelt, Y. 2003. Implementation and Assessment of Project-Based Learning in a Flexible Environment. International Journal of Technology and Design Education, (Online), Vol. 13, No. 3, (https://pdfs.semanticscholar.org/, diakses 6 Juli 2018).
[10] Faridah, Ramlah, Norhasbiah dan Ahmad. 2016. “The Effect Of Project-Based Learning Against Students’ Engagement”. International Journal of Development Research, (Online), Vol. 6, No. 02, https://www.researchgate.net/, diakses 15 Juli 2018).
[11] Fatmawati, B. 2011. Pembelajaran Berbasis Proyek Untuk Meningkatkan Keterampilan Berpikir Kreatif Mahasiswa. Jurnal Pengajaran MIPA, Volume 16, Nomor 2, Oktober 2011, hlm. 85-92.
[12] Fisher, A. 2008. Critical Thinking: An Introduction. USA: Cambridge University Press.
[13] FKIP UIR. 2014. Buku Kurikulum dan Penunut Mahasiswa FKIP UIR Pekanbaru: UIR Press.
[14] Fry, H. Ketteridge, S.Marshall, S. 2009. The Handbook for Teaching and Learning in Higher Education. New York and London: Routledge.
[15] Gay, L.R. (1991). Educational Evaluation and Measurement: Competencies for Analysis and Application. (2nd). New York: Macmillan Publishing Company.
[16] Grant, S. 2017. “Implementing Project-Based Language Teaching in an Asian Context: A University EAP Writing Course Case Study From Macau”. Asian-Pacific Journal of Second and Foreign Language Education, (Online), Vol. 2, No. 3, (https://sfleducation.springeropen.com/, diakses 11 Juli 2018).
[17] Grow, D.B. 2015. Perangkat Pembelajaran. Jakarta: RajaGrafindo Persada
[18] Hajar, I. 2017. Pengembangan Modul Budidaya Tanaman Obat. Prosedining Nasional. Pendidikan Biologi FKIP Universitas Islam Riau, tanggal 24 April 2018.
[19] Hajar, I. Nurhasanah, H. 2017. Pengembangan Modul Budidaya Tanaman Obat Keluarga. Jurnal Pendidikan Biologi, 3 (5): 15 – 23.
[20] Hamzah. B.U. 2006. Paradigma Baru Psikologi Pembelajaran. Jakarta: Rineka Cipta.
[21] Han, S. Rosli, R. Mery, M. C., Robert, M. C. 2016. “The Effect Of Science, Technology, Engineering and Mathematics (STEM) Project Based Learning (PBL) On Students’ Achievement In Four Mathematics Topics”. Journal of Turkish Science Education, (Online), Vol. 13, No. 28, (https://ukm.pure.elsevier.com/, diakses 30 Juli 2018).

[22] Haviz, M. 2012. Pengembangan Model Pembelajaran Integratif pada Biologi Perkembangan Hewan di Perguruan Tinggi Agama Islam. (Disertasi). Program Pascasarjana Universitas Negeri Padang.

[23] Hong, L.S, dan Rossini, P. 2015. “Effectiveness of Project-Based Learning as a Strategy for Property Education”. Journal Pacific Rim Property Research, (Online), Vol. 16, No. 3, (https://www.tandfonline.com/, diakses 10 Juli 2018).

[24] Joyce, B., and Weil, M. 1992. Models of Teaching. (9th Edition). Massachusetts: Allyn and Bacon Publisher.

[25] Jama, J. 2011. Filsafat Ilmu (Bahan Kajian Perkuliahan). Padang: Universitas Negeri Padang.

[26] Kizkapan, Bektas. 2017. “The Effect of Project Based Learning on Seventh Grade Students’ Academic Achievement”. International Journal of Instruction, (Online), Vol. 10, No. 1, (https://eric.ed.gov/, diakses 16 Juli 2018).

[27] Kokotsaki, Menzies, Wiggins. 2016. “Project-based learning: A review of the literature”. Sage Journals, (Online), Vol. 19, No. 3, (http://journals.sagepub.com/, diakses 17 Juli 2018).

[28] Kovalyova, Soboleva, Kerimkulov. 2016. “Project Based Learning in Teaching Communication Skills in English as a Foreign Language to Engineering Students”. International Journal of Emerging Technologis in Learning, (Online), Vol. 11, No. 04, (http://journals.sfu.ca/, diakses 6 Juli 2018).

[29] Lembaga Pengembangan Pembelajaran Universitas Esa Unggul. Rencana Pembelajaran Semester. (http://ddp.esaunggul.ac.id/, diakses 15 Oktober 2017)

[30] Lufri. 2008. Pendidikan dan Pembelajaran Biologi Bernuansa IESQ. Padang: UNP Press.

[31] Lufri dan Ardi. 2017. Buku Ajar Metodologi Penelitian: Penelitian Kuantitatif, Penelitian Tindakan Kelas & Penelitian Pengembangan: Padang: UNP Press.

[32] Movahedzadeh, F. Patwell, R. Rieker, J.E. Gonzalez, T. 2012. “Project-Based Learning to Promote Effective Learning in Biotechnology Courses”. Hindawi Publishing Corporation Education Research International, (Online), Vol. 2012., (https://www.hindawi.com/, diakses 7 Juli 2018).

[33] Muliyardi. 2006. Pengembangan Model Pembelajaran Matematika Menggunakan Komik di Kelas I Sekolah Dasar. Disertasi. Program Pascasarjana Universitas Negeri Surabaya.

[34] Narvaez, D., Nucci, LP. 2014. Hand Book Pendidikan Moral dan Karakter. Bandung: Nusa Media.

[35] Nieveen, N. 1999. Prototyping to Reach Product Quality. Dalam Plomp, T. Nieveen, N. Gustafson, K. Branch, R.M. dan Van Den Akker, J (Ed). Design Approaches and Tool in Education and Training. London: Kluwer Academic Publisher.

[36] Nieveen, N. 2010. Formative Evaluation in Education Design Research. Dalam Plomp, J. And Nieveen, (Ed).In Introduction to Educational Design Research. Netherlans in (http://www.slo.nl/, diakses 1 Agustus 2018).

[37] Plomp, T. 2013. Educational Design Research: an Introduction. Dalam Plomp, T. Nieveen, N. (Ed). An Introduction Design Research. Netherlans in (http://www.slo.nl/, diakses 1 Agustus 2018).

[38] Putra. H. 2016. Dasar Penelitian dan Pengembangan. Bandung: Nusa Media.

[39] Ristekdikti. 2015. Visi, Misi, Strategi Ristekdikti. (Online), (https://ristekdikti.go.id/, diakses 10 Oktober 2017).

[40] Ristekdikti. 2018. Pengembangan Iptek dan Pendidikan Tinggi di Era Revolusi Industri4.0. (Online), (https://www.ristekdikti.go.id/, diakses Oktober 2017).

[41] Rita C. Richey, J. D. K., Wayne A. Nelson. (2009). Developmental Research : Studies of Instructional Design and Development.
[42] Robert C. Bogdan. dan Biken. 1982. Qualitative Research for Education, An Introduction to Theory and Methods. Massachusetts: Allyn and Bacon.

[43] Roessingh, H dan Chambers, W. 2011. “Project-Based Learning and Pedagogy in Teacher Preparation: Staking Out the Theoretical Mid-Ground”. International Journal of Teaching and Learning in Higher Education, (Online), Vol. 23, No. 1, (http://www.isetl.org/, diakses 20 Juli 2018).

[44] Sari, M. 2019. Pengembangan Model BL-FB. Ilmu Pendidikan, PPS, UNP, Padang (Disertasi).

[45] Spradley, J.P. 1980. Participant Observation. Newyork: Holt, Renehart and Winston.

[46] Subramaniam, S. Fang Chua, F. Yee Chan, G. 2017. “Project-based Learning for Software Engineering - An Implementation”. Journal of Telecommunication, Electronic and Computer Engineering (JTEC), (Online), Vol. 9, No.3-4, (http://journal.utm.edu.my/, diakses 16 Juli 2018).

[47] Thomas.J.W. 2000. A Review of Research on Project Based Learning, (Online), (http://www.bie.org/, diakses 18 Desember 2018).

[48] Turgut. H. 2008. Prospective Science Teachers’ Conceptualizations About Project Based Learning. International Journal of Instruction, (Online), Vol. 1, No. 1, (https://core.ac.uk/, diakses 10 Juli 2018).

[49] Urwatin, W.I. 2014. Upaya Mendorong Kemampuan Berfikir Kreatif Mahasiswa dalam Inovasi Konservasi Pangan. Indonesian Journal of Conservation. Vol. 3 No. 1 - Juni 2014 [ISSN: 2252-9195]. Hlm. 75—82

[50] Warsono dan Hariyanto. 2013. Pembelajaran Aktif. Bandung: Remaja Rosdakarya Offset.

[51] Wen, S. 2003. Future of Education (Masa Depan Pendidikan). Batam: Lucky Publisher.

[52] Wena.M. 2013. Strategi Pembelajaran Inovatif Kontemporer. Jakarta: Bumi Aksara.

[53] Yanto. S. 2019. Pengembangan Model Pembelajaran Berbasis Masalah. Ilmu Pendidikan, PPS, UNP, Padang (Disertasi).

[54] Zubaidah, S. 2017. Berpikir Kritis: Keterampilan Berpikir Tingkat Tinggi yang Dapat Dikekmabangkan melalui Pembelajaran Sains. (Online), (https://www.researchgate.net/, diakses 8 Juli 2018)