

Molekuler Method of Portofolio Resume Assignment to Improving Students Concept Comprehension Towards Molecular Cellular Biology Class

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Abstract: Cell and molecular biology are among the topics that have led to the application of molecular technology. Problems arise when learners lack understanding of concepts or even frequent misconceptions due to many abstract concepts. This study aims to determine the level of student understanding through a resume in the form of a portfolio. The research method used descriptive approach. The population of the study is the students of Biology Education study program which has taken the subject of cell Biology and molecular number of 102 students, and the sample determination using random cluster so that 40 students are obtained. Data were analyzed descriptively-quantitative. Based on the findings in the field, it is known that the average value of the resume portfolio of 71.60 and categorized high. Thus, the students' concept of understanding is in the high category so that the assignment method makes the resume in the form of portfolio able to give better understanding of the concept of lecture material of Cell and Molecular Biology, with the average value of concept understanding through portfolio is in high category.

Keywords: Cell and molecular biology; Concept understanding; Portofolio; Resume task

Introduction

The concept of learning according to constructivist theory is a learning process that conditions students to carry out an active process of building new concepts, new understandings, and new knowledge based on data (Supriyadi, 2018). The purpose of constructivism learning is determined on how to learn, namely creating new insights that require productive creative activities in real contexts that encourage learning to rethink and demonstrate (Riyanto, 2018).

In the view of constructivism, students are central in the learning process so it is important for students to be able to build their own learning patterns, so that students have the habit of thinking and freedom in expressing ideas or arguments (Bullen, 2001). Therefore, the learning process must be designed and managed in such a way as to be able to encourage students to organize their own experiences into meaningful knowledge (Admiraal, 2014).

Biology is a branch of science that has a very large role for life, because biology learns everything about living things (Aryani et al., 2018). Science learning (specifically) as the purpose of education in blooming taxonomy, is expected to provide knowledge in learning (Holbrook et al., 2009). The type of knowledge in question is basic knowledge, principles and concepts that are useful for everyday life. Knowledge outline describes the facts that exist in nature to be understood and deepened further, and see the existence of information and order (Chen et al., 2022).

The many biological problems in everyday life, one of which is the field of cell and molecular biology studies. Cell and molecular biology is a lively topic of discussion because it has led to the application of molecular technology (Istiningrum et al., 2016). However, problems in the study of cell biology and molecular biology arise when students lack understanding of concepts or even frequent misconceptions (Pakpahan et al., 2020). Concepts in the

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study of Cell Biology and Molecular Biology made students confused in understanding and studying them, so the study of cell biology and molecular biology was difficult for students to understand (Veselinovska et al., 2011).

This Cell and Molecular Biology course is one of the compulsory subjects in various majors in Biology or Biology Education, and one of them is the Biology Education Study Program FKIP UHAMKA. Competencies that must be achieved in this course are students able to understand and master the concepts of cells, cellular metabolism, and the molecularity of a cellular mechanism. Study of cell biology as a very interesting aspect of biology to study, and always experiences developments in accordance with the development of the age (technology) (Veselinovska et al., 2011).

The concept is the essence of a series of experiences in describing the characteristics and characteristics of an object or fact, both in the form of processes and different mechanisms between groups (Rustaman et al., 2005). That way, students must be able to understand and master the concepts (studies) of cell biology and abstract and complicated molecular biology as a provision to teach or teach these concepts to prevent dislike of cell and molecular biology, and avoid misconceptions (Ammase et al., 2019).

There needs to be a change in the way of teaching to attract students' attention so students are interested in learning and like the concept of the lesson even though it is abstract or complicated (Ellizar et al., 2018). Accuracy in using learning methods that are in accordance with a concept or subject matter will be able to improve understanding of concepts and encourage maximum cognitive learning outcomes (Velly, 2021). One learning method that is able to improve learning outcomes is the assignment method. The assignment method is a way of presenting learning material where the teacher gives a specific task so that students do learning activities (Oktavianty, 2018). The portfolio-based assignment method is an alternative that can be used in learning. Portfolio assignment method can improve student learning activities and outcomes (Oktavianty, 2018). In addition, the portfolio can be useful so that students have the ability to express and express themselves as individuals or groups. Portfolios can also increase students' knowledge, understanding, understanding, and reasoning abilities that are increasingly creative and critical-analytic (Ford, 2009).

Learning experience theory, it is known that rewriting from what is heard and seen gives an increase in learning memory by 70%, so that it will give outcomes at the level of thinking analyzing, defining, creating, and evaluating (Tay et al., 2019). By assigning students to make resume topics on molecular cell biology studies in

the form of portfolios, it is expected to explore students' understanding of molecular cell biology studies (Wakao et al., 2012). Therefore, researchers are interested in analyzing the level of concept understanding through portfolio resume assignment methods in the Cell and Molecular Biology course. The hope is that the assignment in the form of a portfolio can improve students' understanding of the concepts of cell and molecular biology, and avoid misconceptions (Pastore, 2018).

Method

This study aims to measure and describe the level of student understanding seen from the results of the understanding test and the results of the portfolio resume assignment. The research method used is a descriptive approach. This study describes or delineates the research outcome variables of the instrument. The data source used is the result of portfolio resume assignment. Then the data is interpreted and analyzed so that understanding of the concept can be known.

The population in this study were all Biology Education study program students who had taken cell and molecular biology courses (semester IV) totaling 102 people. The sample used in the study was taken by cluster random sampling and selected as many as 40 students. The research instrument analyzed was the results of the portfolio resume. Assessment of the results of resume assignments in the form of portfolios using score rubrics, aspects assessed include: the suitability of the content of the material/content (understanding) with the concept of Molecular Cell Biology being taught; systematic writing and drawing; the timeliness of collecting, as well as the originality and creativity of the portfolio designs presented.

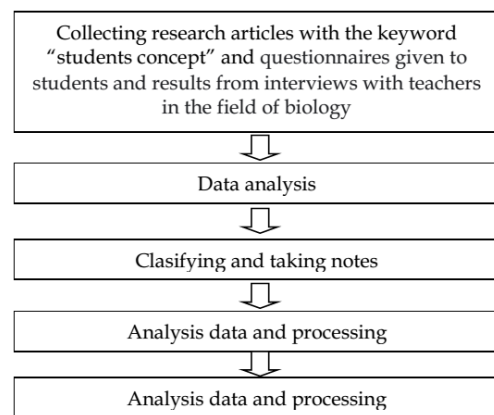


Figure 1. Research procedures

The collected data is analyzed descriptively-quantitative, that is to describe or describe the data as it is without intending to generalize. Existing data are

processed using percentage techniques (average value) so that data presentation is obtained in the form of tables, graphs, diagrams (Sugiyono, 2019). The average value that has been converted into a percentage is converted into the category of achieving success.

The data that has been collected will be analyzed by comparing the number of answer scores obtained from respondents with the total score multiplied by 100%, the data is expressed in percentage form. The calculation formula according to Ali (2013) is as follows:

$$p = \frac{\sum F}{\sum N} = 100 \% \tag{1}$$

Information: % = Achievement percentage; n = Sum of scores on an item; and N = Sum of maximum scores on an item.

Result and Discussion

Based on the results of portfolio resume assessments made by students, it can be seen that students' understanding of concepts shows the average value which is classified as high in the category of 71.60. And when viewed from each topic of molecular cell biology lecture material made resumes show the average value of understanding concepts that are also in the high category. Figure 2 shows the comparison of the average scores of student portfolio resume results in presenting cell and molecular biology concepts.

Understanding the concept is interpreted as the ability of students to grasp the meaning or concept (material) that they have learned (Bayyat, 2020). Understanding of this concept can be seen from how the learning process has been carried out by students (Boelens et al., 2018). By giving assignments to students in the form of making a resume topic Molecular Cell Biology lectures in the form of a portfolio turned out to have an impact on increasing understanding of student concepts. Portfolios are an alternative means of assessment that can describe the process of what they already know, understand, and do, so that learning objectives are achieved in an appropriate form of assessment (Hamalik, 2019).

The assignment method in the form of a portfolio gives a positive impact on students. Figure 2 shows that the assignment method to create a resume formed in the end result of a portfolio is able to provide better understanding of the concept of Molecular Cell Biology lectures, with the average value of concept understanding through portfolios being in the " High" category for each subject. discussion in Molecular Cell Biology lectures.

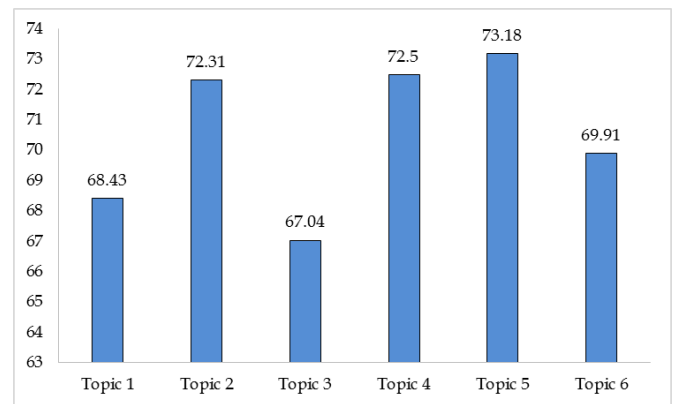


Figure 2. Comparison diagram of the average value of resume tasks in portfolio form

The result of a good understanding of the concept of students is certainly due to the benefits of resume assignments in the form of a portfolio. Wiggins (1990) explains that portfolios are proven to be able to improve student learning outcomes and abilities. Portfolios can be a reference to measure student abilities (Clarke et al., 2018). The use of portfolios is as an assessment for learning so as to make students able to reflect on what they think, and pour (rewrite) their thought processes at the time or end of learning (Klenowski, 2018).

Portfolios prepared by students are facilities that can be used to reflect the process of teaching and learning activities (Clement et al., 2018). For lecturers, the portfolio will help clarify and visually articulate how the conditions of the process have been carried out (Hamalik, 2019). Apart from being an alternative assessment method, the use of portfolios can help the process of developing insight and learning experiences in students to compile and evaluate related concepts that have been learned (Riyanto, 2018).

Therefore, the portfolio can be useful to train students' thinking skills in exploring the tasks that become bills in lectures. Portfolio implementation can be a method to improve students' understanding of biological concepts (Ziegler et al., 2012). Learning experience theory, that rewriting from what is heard and seen gives an increase in learning memory by 70%, so that it will provide outcomes at the level of thinking analyzing, planning, creating, and evaluating (Pastore, 2018).

Meanwhile, by giving assignments to resume lecture topics in the form of portfolios can affect the quality of the resulting portfolio because it relates to understanding the concept of what he has learned. Hamalik (2019) said that external factors that influence one's understanding one of which is the way of delivery, and learning environment. And this means that making a resume in the form of a portfolio is one of the ways in which students convey an understanding of the concepts they know during the lecture process (Alam et al., 2015).

Conclusion

Based on the results of the research that has been done it can be concluded that the resume assignment method in the form of a portfolio is able to provide a good understanding of concepts for students, so that it can be used as an alternative method of learning and assessment in lectures. Suggestions that can be given to follow up on the results of this study are the need for a learning approach for students to be able to enrich concepts and understand independently related to concepts in Molecular Cell Biology as an important concept to support the next level of Biology material. And the need for habituation by providing study bills to students in order to practice their thought process skills.

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References

- Admiraal, W. (2014). Meaningful learning from practice: web-based video in professional preparation programmes in university. *Technology, Pedagogy and Education*, 23(4), 491–506. <https://doi.org/10.1080/1475939X.2013.813403>
- Alam, F., Chowdhury, H., Kootsookos, A., & Hadgraft, R. (2015). Scoping e-portfolios to engineering and ICT education. *Procedia Engineering*, 105(4), 852–857. <https://doi.org/10.1016/j.proeng.2015.05.102>
- Ali, M. (2013). *Penelitian Kependidikan Prosedur & Strategi*. Bandung: CV. Angkasa.
- Ammase, A., Siahaan, P., & Fitriani, A. (2019). Identification of junior high school students' misconceptions on solid matter and pressure liquid substances with four tier test. *Journal of Physics: Conference Series*, 1157(2), 22–34. <https://doi.org/10.1088/1742-6596/1157/2/022034>
- Aryani, R., Nugroho, R. A., Manurung, H., Rudianta, R., Auliana, A., & Prahastika, W. (2018). Enhancing Biology Molecular Laboratory Practice for Senior High School of Biology Teachers from Samarinda and Tenggarong City. *Pelita Eksakta*, 1(02), 75. <https://doi.org/10.24036/pelitaeksakta/vol1-iss2/30>
- Bayyat, M. (2020). Blended Learning: a New Approach To Teach Ballet Technique for Undergraduate Students. *Turkish Online Journal of Distance Education*, 21(2), 69–86. <https://doi.org/10.17718/tojde.727979>
- Boelens, R., Voet, M., & De Wever, B. (2018). The design of blended learning in response to student diversity in higher education: Instructors' views and use of differentiated instruction in blended learning. *Computers and Education*, 120(2), 197–212. <https://doi.org/10.1016/j.compedu.2018.02.009>
- Bullen, M. (2001). E-Learning and Internationalization Technology. *Journal of Educational Technology Malaysian*, 1(1), 37–46.
- Chen, S. Y., Lai, C. F., Lai, Y. H., & Su, Y. S. (2022). Effect of project-based learning on development of students' creative thinking. *International Journal of Electrical Engineering and Education*, 59(3), 232–250. <https://doi.org/10.1177/0020720919846808>
- Clarke, J. L., & Boud, D. (2018). Refocusing portfolio assessment: Curating for feedback and portrayal. *Innovations in Education and Teaching International*, 55(4), 479–486. <https://doi.org/10.1080/14703297.2016.1250664>
- Clement, A., & Murugavel, T. (2018). English for the Workplace: The Importance of English Language Skills for Effective Performance. *The English Classroom*, 20(1), 41–50. Retrieved from <https://www.researchgate.net/publication/328353901>
- Ellizar, E., Hardeli, H., Beltris, S., & Suharni, R. (2018). Development of Scientific Approach Based on Discovery Learning Module. *IOP Conference Series: Materials Science and Engineering*, 335(1). <https://doi.org/10.1088/1757-899X/335/1/012101>
- Ford, B. J. (2009). On intelligence in cells: The case for whole cell biology. *Interdisciplinary Science Reviews*, 34(4), 350–365. <https://doi.org/10.1179/030801809X12529269201282>
- Hamalik, O. (2019). *Psikologi Belajar Mengajar*. Teaching and Teacher Education.
- Holbrook, J., & Rannikmae, M. (2009). The Meaning of Scientific Literacy. *International Journal of Environmental & Science Education*, 4(3), 275–288. Retrieved from <https://eric.ed.gov/?id=ej884397>
- Istiningrum, R., Amin, M., & Lestari, U. (2016). Pengembangan Buku Ajar Biologi Sel Berbasis Bioinformatika. *Jurnal Pendidikan*, 1(9), 1963–1966. <https://doi.org/10.17977/jp.v1i9.6717>
- Klenowski, P. M. (2018). Emerging role for the medial prefrontal cortex in alcohol-seeking behaviors. *Addictive Behaviors*, 77, 102–106. <https://doi.org/10.1016/j.addbeh.2017.09.024>
- Oktavianty, W. (2018). Pengaruh Metode Penugasan berbasis Portofolio Terhadap Kompetensi Kewirusahaan (Studi Quasi Eksperimen) Siswa Kelas XI SMKN 1 Kedawung Kab. UPI Bandung.

- Pakpahan, T. R., Hernawati, D., & Ardiansyah, R. (2020). Analysis Of Students' Misconceptions On The Nervous System Materials Using the Four-Tier Diagnostic Test. *BIOEDUSCIENCE: Jurnal Pendidikan Biologi Dan Sains*, 4(1), 27-36. <https://doi.org/10.29405/j.bes/4127-364844>
- Pastore, R. (2018). *Dale's Cone Experience. Associate Professor of Education*. In Bloomberg University.
- Riyanto. (2018). *Paradigma Baru Pembelajaran Sebagai Referensi Bagi Pendidikan dalam Implementasi Pembelajaran yang Efektif dan Berkualitas*. Kencana Prenanda Media Group.
- Rustaman, N., Dirdjosoemarto, S., Yudianto, S. A., Achmad, Y., Subekti, R., Rochintaniawati, D., & Nurjhani, M. (2005). *Strategi belajar mengajar biologi*. Malang: UM press.
- Sugiyono. (2019). *Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif dan R & D)*. Alfabeta.
- Supriyadi, E. (2018). Penerapan Teori Konstruktivisme Untuk Meningkatkan Prestasi Belajar Materi Nilai Kebersamaan Dalam Merumuskan Pancasila pada Siswi SD. *Briliant: Jurnal Riset Dan Konseptual*, 3(1), 101-112. <https://doi.org/10.28926/briliant.v3i1.147>
- Tay, Z. M., Lin, W. H., Kee, Y. H., & Kong, P. W. (2019). Trampoline Versus Resistance Training in Young Adults: Effects on Knee Muscles Strength and Balance. *Research Quarterly for Exercise and Sport*, 90(4), 452-460. <https://doi.org/10.1080/02701367.2019.1616045>
- Velly, D. (2021). Increasing the Motivation and Learning Outcomes of Students through the Application of the Problem Based Learning Model in Learning Physics. *Journal of Science and Science Education*, 2(1), 52-57. <https://doi.org/10.29303/jossed.v2i1.719>
- Veselinovska, S. S., Gudeva, L. K., & Djokic, M. (2011). Applying appropriate methods for teaching cell biology. *Procedia - Social and Behavioral Sciences*, 15, 2837-2842. <https://doi.org/10.1016/j.sbspro.2011.04.199>
- Wakao, S., Kuroda, Y., Ogura, F., Shigemoto, T., & Dezawa, M. (2012). Regenerative effects of mesenchymal stem cells: Contribution of muse cells, a novel pluripotent stem cell type that resides in mesenchymal cells. *Cells*, 1(4), 1045-1060. <https://doi.org/10.3390/cells1041045>
- Wiggins, G. (1990). The Case for Authentic Assessment. *Practical Assessment, Research, and Evaluation*, 2. <https://doi.org/10.7275/ffb1-mm19>
- Ziegler, B. B., & Montplaisir, L. (2012). Measuring Student Understanding in a Portfolio-Based Course. *Journal of College Science Teaching*, 42(1), 16-25. Retrieved from <https://www.proquest.com/docview/1038451739>