Zainuddin, Mahmud, A., Muris (2016). Examining Model Development of Learning Physics through Multi-intelligence to Nurture Independent Learners. *Journal of Education and Learning.* Vol. 11 (2) pp. 208-212. DOI: 10.11591/edulearn.v11i2.5864

Examining Model Development of Physics Learning through Multi-intelligence to Nurture Autonomous Learners

Zainuddin[*]
Universitas Negeri Makassar

Alimuddin Mahmud[**]
Universitas Negeri Makassar

Muris[***]
Universitas Negeri Makassar

Abstract
This study aims at examining a model of learning physics through multi-intelligence, which are valid, practical, and effective to enhance learners' autonomy. The authors developed instruments and learning media to obtain a valid, practical, and effective model using research and development design. The results showed that this lack of autonomy of learners in learning physics. The experiment showed that the physics learning through multi-intelligence met the criteria of valid, practical and effective. All the aspects of physics learning with multi-intelligence run well. The ability of teachers to manage learning was at the high category. The physics learning with multi-intelligence was in the medium category. The activities of learners in learning fulfilled the ideal time and learners responded positively to the learning model of physics through multi-intelligence.

Keywords*: Physics learning model; multi-intelligence; the learners' autonomy*

[*]Zainuddin, Doctoral Student of Graduate Program, Universitas Negeri Makassar, Makassar 90222, Indonesia. Email: drs.zainuddin@gmail.com
[**] Prof. Dr. Alimuddin Mahmud, Professor in Education Psychology and Counselling, Universitas Negeri Makassar, Makassar, 90222, Indonesia.
[***]Prof. Dr. Muris. Professor in Physics Education, Universitas Negeri Makassar, Makassar, 90221, Indonesia.

Received February 27, 2017; Revised April 2, 2017; Accepted April 22, 2017

Introduction

In the learning of Physics, the ability of concept understanding comprises a prerequisite for success to learn Physics. Learning of Physics is not about memorized but understanding of the concept even more demanding applications of the concept. However, Physics is considered as the frightening subject. As a result, the expected learning goals of Physics become difficult to achieve. Physics also become a plague for the learners as closely related to Mathematics. Learners who are poor at Maths always find difficulty in understanding the Physics because most of the completion of the problems of Physics conducted through mathematical approach. There is a tendency of a learner who has intelligence in the field of numbers or logic can understand the Physics lessons well. Though, not all students have the sufficient competence or intelligence in the field of Mathematics.

Every student has a different level of intelligence, hence the majority of students feel difficult to understand the concept and work individually on the problems of physics. Individual differences in intelligence need to know and understand by the teacher, especially in conjunction with the grouping of learners (Genovese, 2005). In addition, teachers must adapt learning goals with learners' intelligence ability. Differences in learners' intelligence should encourage teachers to help all learners. However, intelligence is not the only factor affecting the success of students in their learning. A teacher must be judicious in teaching students with multiple-intelligence (Gardner & Hatch, 1989; Grigorenko & Sternberg, 2016; Lazear, 2003).

Learning of Physics at secondary school should be continuously assessed and developed to produce a contemporary model of learning as well as contextual and understandable by stakeholders in education area. Intelligence identification of learners is still infrequently used as the basis of each learning design, strategies, and approaches, as well as the implemented evaluation system (Armstrong, 2009; Barrington*, 2004; Brualdi, 1996; Gupta, 2016; Lai & Yap, 2016; Lazear, 2003; Macnamara, 2016; Mettetal, Jordan, & Harper, 1997; Silver, Strong, & Perini, 2000). (Gardner, 2006) added existential intelligence as one part of multi-intelligence by Howard Gardner that categorized multiple intelligence in eight aspects (Gardner & Hatch, 1989); they are verbal-linguistic, logical-mathematical, visual-spatial, musical, kinaesthetic, interpersonal, intrapersonal, and naturalistic intelligence. The tendency of the interest, talent, intelligence, and basic skills still less important part in the development and selection as well as the design of teaching media that enables the establishment of developed patterns to promote learners autonomy. Learning of Physics should have an obvious experience of the learners to add the ability to construct, understand, and devoted the learned concepts.

The learning models of Physics, which is considerably appropriate to develop learners' autonomy that is heterogeneous learners, are learning Physics with multi-intelligence model. By Physics learning with multi-intelligence model, students are expected to be actively involved in the learning process to understand concepts and solve problems independently of learning Physics. This study aims at producing Physics learning with multi-intelligence model which is expected to enhance autonomy of learners at secondary school level. In addition, this study also is expected to contribute to educators at secondary school level on Physics learning model with multi-intelligence.

Method

Based on the purpose of this study, the authors used exploratory study design with the ultimate aim is to produce Physics learning model with multi-intelligence (Van den Akker, Gravemeijer, McKenney, & Nieveen, 2006). However, this study is focusing on data collection and data analysis. This study was conducted in secondary school 11 of Makassar, South Sulawesi, Indonesia. These schools were selected on the consideration that the students in this school are very heterogeneous from intelligence. The instrument used to collect data in this study is based on the objective of study and the type of desired data. In assessing a model, it suggested to measure the validity, practicality, and effectiveness of the model (Nieveen, 1999). The collected data were analysed to measure whether the learning of Physics with multi-intelligence and the developed learning set meet the criteria of valid, practice, and effective.

Results and Discussions

To gather data about the process and results of the development of Physics learning with multi-intelligence model along with appropriate learning media required well prepared research instruments. In other words, to decide that the Physics learning model with multi-intelligence as well as the media is valid, practical and effective required relevant instruments. The designed instruments include aspects of validity, practicality, and effectiveness. After going through the stages of identification and analysis of learning problems as well as planning and project development management of learning, the next model

was developed through a series of stages of development as the focus of this study are validity, practicality, and effectiveness.

Validity test results

Validity results model of learning Physics with multi-intelligence

Table 1. Summary of validity results of Physics learning of multi-intelligence.

No	The validated aspects	Average Score ($\overline{X}$)	Notes
1	Language	3.33	Validated
2	Related theory	3.60	Highly validated
3	Syntax	3.50	Validated
4	Social system	3.50	Validated
5	Reaction principle	3.33	Validated
6	Related system	3.50	Validated
7	Instructional and supporting impact	3.50	Validated
	Average score Total	**3.47**	**Validated**

Instruments that have been developed include instrument validity, practicality, and effectiveness. At the design stage has also been addressed general picture of these instruments. The results of the needs assessment analysis sheet model development PF-BMI validator scored an average total $\overline{X}$ = 3.29 rated valid with reliability coefficient R=0.780. The results of the model Physics learning using multi-intelligence assessment by the validator scored an average total $\overline{X}$ = 3.47 rated valid with reliability coefficient R = 0.872.

Validity results of practicality model of Physics learning of multi-intelligence

Test result of practicality model

The results of the analysis each component Physics learning models using multi-intelligence. The analysis of syntax components during the test gained an average score of 1.82 out of four meetings. Although the component of syntax was fully implemented, the syntax only reached 1 at the first meeting at the step of stimulation. In this case the teacher reasoned that the first meeting was conducted with the model adaptation process that considers new learners learning model of physics using the multi-intelligence.

The results of the analysis of social interaction component during the test, obtained an average score of 1.85 out of four meetings. It can be concluded that the social interaction component of learning physics models using multi-intelligence carried out entirely. The analysis of adherence to the principle component of reaction during test, obtained an average score of 1.83 out of four meetings. It can be concluded that the principle component reaction physics-based learning model implemented multi-intelligence entirely. The analysis of the impact component instructional enforceability and impact accompanist during the test, the average score obtained was 1.82 out of four meetings. It can be concluded that on average the impact component instructional and accompanist impact physics-based learning model implemented multi-intelligence entirely. The analysis of the components learning media support (support system) during the test, the average score obtained is M = 1.96 out of four meetings. It can be concluded that the average component of the learning media physics-based learning model supporting multi-intelligence carried out entirely.

Observation sheet learning management observed in test was a physics-based learning management of multi-intelligence was the ability of teachers to preliminary activities, the core activities, the closing, the ability to manage classes and aspects of classroom atmosphere. The average value of a teacher's ability to manage learning in preliminary events during the test, obtained an average score of teachers' competence 3.57, including the very high category (3.5 < (average teachers' competence ≤ 4.0). The average value of a teacher's ability to manage learning in its core activities during the trial, obtained an average score of teachers' competence equal to 3.57 including very high category. The average value of a teacher's ability to manage learning in the closing during the test, obtained an average score of teachers' competence was equal to 3.69 including very high category. The average value of a teacher's ability to manage learning on aspects of the ability to manage time during the test, obtained an average score of teachers competence was equal to 3.75 including very high

category. The average value of a teacher's ability to manage learning on aspects of classroom atmosphere during the test, obtained an average score of teachers' competence was equal to 3.57 including very high category. Thus, in terms of the ability of teachers to manage learning in the test, the physics-based model of multi-intelligence meets the criteria of practicality.

The results of effectiveness of Physics learning using multi-intelligence

The results of the effectiveness of learning physics-based model of multi-intelligence in the test were analysed by observing confidentially the autonomous of learners and the results of questionnaire responses of learners. The observation of autonomous learners on test showed that tolerance, working on the worksheet, honest, capable of doing tasks, gives guidance to other learners or carries out activities which benefit the group. The autonomous criteria of learners can be concluded that the achievement of the autonomous ideal time of learners during the learning with physics-based learning model multi-intelligence achieved. This study showed that in terms of the aspects of the autonomous of learners, learning model physics-based multi-intelligence in the test met the criteria of effectiveness.

Based on data from the response of students, this study found that from 34 students, there were 99% of students were delighted to component on student's worksheets, tests of learning physics, learning atmosphere in the classroom and how teachers teach. There was 97% of learners who felt new to the learning component. Generally, 97% of learners can clearly understand the language used in the learning media, and 97% were interested in the appearance of text, illustrations/pictures and layout of the images within the media. From the aspect of implementation of learning, there were 97% of students were interested in participating in learning activities with learning physics-based model of multi-intelligence and all students or 100% were interested in participating in learning activities for further Physics learning. For clarity aspects of the guidance given by the teacher, there were 97% of learners understand clearly and all the students were delighted conducting an experiment/observation during the lesson. The results of data analysis can be concluded that the response of students to the use of learning Physics-based model of multi-intelligence generally give a positive response. This shows that in terms of the response aspect of learners, learning model physics-based multi-intelligence in the test met the criteria of effectiveness.

Conclusions

The learning model Physics-based multi-intelligence to develop autonomous of learners' secondary school met the criteria of validity based on the results of the validation by experts and practitioners. The components of the model and learning tools were developed and meet the criteria of practicality. The implementation of learning Physics-based multi -intelligence has been accomplished entirely and teachers' ability to manage learning physics was at very high category. The learning model physics-based multi-intelligence to nurture self-reliance of secondary school's learners met the criteria of effectiveness due to the activity of autonomous learners achieved based on the criteria of achieving the ideal time. In general, students responded positively the learning model of physics-based multi-intelligence that nurtures the autonomous of learners.

References

Armstrong, T. (2009). *Multiple intelligences in the classroom*. BOOK, Ascd.

Barrington, E. (2004). Teaching to student diversity in higher education: How multiple intelligence theory can help. *Teaching in Higher Education*, *9*(4), 421–434. JOUR.

Brualdi, A. C. (1996). Multiple Intelligences: Gardner's Theory. ERIC Digest. JOUR.

Gardner, H. (2006). *Multiple intelligences: New horizons*. BOOK, Basic books.

Gardner, H., & Hatch, T. (1989). Educational implications of the theory of multiple intelligences. *Educational Researcher*, *18*(8), 4–10. JOUR.

Genovese, J. E. C. (2005). Why educational innovations fail: An individual difference perspective. *Social Behavior and Personality: An International Journal*, *33*(6), 569–578. JOUR.

Grigorenko, E., & Sternberg, R. (2016). *Teaching for Successful Intelligence: To Increase Student Learning and Achievement*. BOOK, Skyhorse Publishing, Inc.

Gupta, S. K. M. (2016). Effect of Family Variables on Multiple Intelligences of Secondary School *Students* of Gujarat State. *The International Journal of Indian Psychology, Volume 3, Issue 3, No. 4*, 10. JOUR.

Lai, H.-Y., & Yap, S.-L. (2016). Application of Multiple Intelligence Theory in the Assessment for Learning. In *Assessment for Learning Within and Beyond the Classroom* (pp. 427–436). CHAP, Springer.

Lazear, D. (2003). *Eight ways of teaching: The artistry of teaching with multiple intelligences*. BOOK, ERIC.

Macnamara, J. (2016). Multiple intelligences and minds as attributes to reconfigure PR—A critical *analysis*. *Public Relations Review*, *42*(2), 249–257. JOUR.

Mettetal, G., Jordan, C., & Harper, S. (1997). Attitudes toward a multiple intelligences curriculum. *The Journal of Educational Research*, *91*(2), 115–122. JOUR.

Nieveen, N. (1999). Prototyping to Reach Product Quality. In *Design Approaches and Tools in Education and Training* (pp. 125–135). Dordrecht: Springer Netherlands. http://doi.org/10.1007/978-94-011-4255-7_10.

Silver, H. F., Strong, R. W., & Perini, M. J. (2000). *So each may learn: Integrating learning styles and multiple intelligences.* BOOK, ERIC.

Van den Akker, J., Gravemeijer, K., McKenney, S., & Nieveen, N. (2006). *Educational design research*. GEN, Routledge.