Pre-Service Teachers’ Perceptions of Blended Learning on Mathematics Learning Based on Gender

Aina Azka  
University of Muhammadiyah Prof. Dr. Hamka, ainaazka16@gmail.com  

Ayu Faradillah*  
University of Muhammadiyah Prof. Dr. Hamka, ayufaradillah@uhamka.ac.id  
*Corresponding Author

ABSTRACT

The research aims to analyze pre-service teachers’ perceptions about the application of the blended learning model in mathematics learning. The total research subjects were 254 pre-service teachers from 12 different universities in Indonesia. Furthermore, this research method is a survey with a qualitative approach where data are analyzed using the Rasch Model (WinSteps). The instrument of this study was a questionnaire consisting of 20 statements and divided into four indicators. Based on the Wright maps table on WinSteps, women pre-service teachers prefer the blended learning model in learning mathematics more than men pre-service teachers. Meanwhile, when viewed in terms of grade, fourth year pre-service teachers like the application of the blended learning model the most. In addition, it is also known that the most disliked thing in understanding mathematics by using blended learning is the difficulty to access assignments online and it requires internet quotas.

Keywords: Blended Learning, Perception, Rasch Model

INTRODUCTION

Blended Learning (BL) is a learning model provided by face-to-face and online so that it is flexible and convenient (Al-Furaih, 2017; Bicen, Ozdamli, & Uzunboylu, 2014; Kuo, Belland, Schroder, & Walker, 2014; Vaughan & Lawrence, 2013). Face-to-face learning can provide...
experience and optimize ideas about previously learned mathematical concepts (Bicen et al., 2014; Faradillah & Hadi, 2020). Meanwhile, online learning facilitates pre-service teachers to study anywhere and anytime so they can learn mathematics repeatedly as they wish (Bicen et al., 2014; Borba et al., 2016).

When studying mathematics through face-to-face learning, pre-service teachers can ask questions directly to the lecturers. However, pre-service teachers are easy to forget the previous material when discussed in the next meeting. Therefore, the BL model can improve the understanding of the material and pre-service teachers can relearn the material that has been discussed so that they can remember the material better (Sandi, 2005). Online learning at BL provides various benefits, one of which is that pre-service teachers can access and complete assignments without having to face-to-face and make them more disciplined in collecting assignments (Bicen et al., 2014; Bidder, Mogindol, & Saibin, 2016; Elyakim, Reychav, Offir, & McHaney, 2017; Wai & Seng, 2015). Thus, BL learning effectively used during learning where online learning activities make a positive contribution to pre-service teacher.

Some researchers have observed pre-service teacher perceptions of the implementation of the BL model Kuo et al., 2014; Simanjuntak, Hia, & Manurung, 2020. Revealed students were satisfied and happy to interact with the teacher and his friends when using the BL model in understanding the material (Kuo et al., 2014). Furthermore, research revealed that there was no significant difference between the motivation of learning for female and male pre-service teachers when the BL model was applied (Simanjuntak et al., 2020). Based on some of these studies, no one has discussed the perception of pre-service teachers on the use of BL in learning mathematics. In addition, the study of Simanjuntak et al found that there were no differences in motivation based on gender, so the researchers limited it to discuss based on gender and lecture level.

The formulation of the problem of this research is how the perception of pre-service teachers about the use of the BL model is limited by gender and lecture level. Therefore, the main purpose of this study is to analyze pre-service teachers’ perception about the application of the Blended Learning model in deeper mathematics learning that is limited by gender and lecture level.

**METHOD**

The research method used was a survey where it could provide strong results and knowledge when performed with proper statistical analysis (Roberts, 1999; Stern, Bilgen, & Dillman, 2014). The research instrument was developed from a number of previous instruments that were adapted to mathematics learning and language structure (Bidder et al., 2016; Davidson, 2011; Ellis, Pardo, & Han, 2016; Francis & Shannon, 2013; Hsu, 2011; Limniou & Smith, 2010). The instrument has been stated to be valid and reliable but it uses English so the researcher translates and adjusts the language that can be understood by the subjects of this study. Furthermore, the researcher conducted language validation on two validators, namely lecturer and teacher where the instrument had passed the revision process, and was declared eligible for testing by both validators. The total subjects in this study were 254 pre-service teachers from twelve universities with 199 women and 55 men.
The instrument consists of four indicators namely material presentation, material understanding, access facilities, and assignments. Data tabulated in Ms. Excel Software was then converted and analyzed with the Rasch assisting model of WinSteps software. According to (Edwards & Alcock, 2010), Rasch analysis is a statistical technique that is usually used to analyze test data and Likert survey data to construct and evaluate problems. In this study, the researchers categorized the subject’s demographic data into two parts, including gender and semester.

RESULT AND DISCUSSION

Figure 1. Wright Map of The Pre-Service Teachers' Perception Based on Gender
The data obtained were analyzed using the Rasch Model (WinSteps) where the analysis was viewed from two aspects namely gender and lecture level. The Rasch model analysis is a formal test for the scale results introduced by Georg Rasch to provide an opportunity to test how far the response of the scale that closes the pattern needed in the measurement (Tennant & Conaghan, 2007). Pre-service teachers’ perceptions in learning mathematics with the BL model based on gender can be seen as in Figure 1.

Based on the results of Wright Maps on WinSteps, 34 women pre-service teachers (13.38%) prefer the application of BL in mathematics learning. Women are more motivated to be able to communicate in online learning (Bostock & Lizhi, 2005; González-Gómez, Guardiola, Martín Rodríguez, & Montero Alonso, 2012; McSporran & Young, 2001). Meanwhile, men spend more time playing games on computer use, so they don’t really like spending a lot of time learning online (Dang, Zhang, Ravindran, & Osmonbekov, 2016; McSporran & Young, 2001). Further, we discuss the pre-service teachers’ perceptions based on their lecture level.

Figure 2. Wright Map of The Pre-Service Teachers’ Perceptions Based on Lecture Level
According to Wright Maps on WinSteps shown in Figure 2, Pre-service teachers who most liked the implementation of BL in mathematics learning were in the fourth year, namely 18 pre-service teachers (7.08%). In the fourth year, pre-service teachers have more experience related to face-to-face and online learning so that they have had a positive impact (Bibi, Jati, & Yogyakarta, 2015; Pibriana & Ricoida, 2017). Meanwhile, pre-service teachers in the third year were the subjects who most disliked the use of BL in learning mathematics (seven pre-service teachers). The material learned by pre-service teachers at this level is the most difficult material compared to the previous level so it affects the achievements of the subjects (Setiyani, 2010). Furthermore, a discussion of the reasons for pre-service teacher preferences in learning mathematics using BL can be seen based on Figure 3.

FIGURE 3. Item Distribution Map
According to (Lamb, Annetta, Meldrum, & Vallett, 2012), Figure 3 shows the subjects’ scores and the relative difficulty of items on a calibrated Rasch scale. The left side of the plot shows the participants’ responses, while the right side of the plot shows the difficulty of the item. Respondents indicate the highest level of participation with the most difficult items at the peak and the least level of participation displayed at the bottom of the plot.

Based on the analysis, it was found that the statements most disliked by subjects about the application of BL in understanding mathematics were P12 and P16 were statements contained about problems in accessing tasks through online learning and the need for a lot of internet quota respectively. There are many pre-service teachers whose internet facilities are not yet available in their domiciles and lack of skills in operating online learning (Chandrawati, 2010). This is one of the obstacles in implementing BL learning due to the unavailability of wifi as a public facility (Hasrul, Suharianto, Lubis, & Marbun, 2019).

Meanwhile, the most preferred item when learning mathematics using BL is P10 where the statement states that they can ask the lecturer directly when there is material that is not understood in face-to-face learning. Pre-service teachers feel that the teaching approach enables them to ask more questions in class (Ogden, 2015). In online learning, the lack of interaction slows the learning and teaching process (Utami, Alan, Cahyono, & Indonesia, 2020). Therefore, pre-service teachers prefer to interact face to face.

Based on the above analysis, pre-service teachers have difficulty when accessing assignments through online learning and require greater internet quota in learning mathematics online. In BL, they like learning mathematics face to face because they can ask questions directly to the lecturers when they do not understand. Details of the summary of statistical instruments are explained in Table 1.

| Table 1. The Summary of Statistical Instruments: Reliability of Person and Item |
|---------------------------------|-----------------|-----------------|--------------|-----------------|
|                                  | Mean     | Separation  | Reliability | Cronbach’s α  |
| Person                          | 0.05     | 1.46         | 0.68         | 0.50           |
| Item                            | 0.26     | 9.72         | 0.99         |                |

In Table 1, the Cronbach’s α coefficient has a value of 0.50. It indicates a large truth. In conclusion, the results show reliable interactions between people and questionnaire items. The item’s acceptance score is 0.99, indicating that the item’s attributes used have very good consideration. The value of the item’s separation is 9.72 (rounded up to 10), indicating that the respondents consisted of 10 level based on the level of difficulty for respondents to agree (Lah Che & Tasir, 2018; Mohamad, Sulaiman, Sern, & Salleh, 2015; Wibisono, 2014).

CONCLUSION

Based on the analysis, the women pre-service teachers like the Blended Learning model in mathematics learning more than men pre-service teachers with a presentation of 13.38%. Meanwhile, in terms of the year, fourth-year pre-service teachers most like the application of the blended learning model with a percentage of 7.08%. In addition, it is found that the thing most disliked
by pre-service teachers when lecturers apply blended learning in mathematics learning is the difficulty to access assignments online and it requires a large quota. Therefore, to solve mathematical problems, pre-service teachers prefer face to face learning because they can ask questions directly to their lecturers who do not understand.

REFERENCES

Al-Furaih, S.A.A (2017). Perceptions of pre-service teachers on the design of a learning environment based on the seven principles of good practice. Springer Science+Business Media New York. Educ Inf Technol DOI 10.1007/s10639-017-9580-7

Bauk, S. I. (2015). Assessing Students’ Perception Of E-Learning In Blended Environment: An Experimental Study. Procedia - Social and Behavioral Sciences, 191, 323–329. https://doi.org/10.1016/j.sbspro.2015.04.393

Bostock, S.J., & Lizhi, W (2005) Gender in student online discussions, Innovations in Education and Teaching International, 42:1, 73-85, DOI: 10.1080/1470329050048978

Bibi, S., Jati, H. (2015). Efektivitas Model Blended Learning Terhadap Motivasi dan Tingkat Pemahaman Mahasiswa Mata Kuliah Algoritma dan Pemrograman. Pendidikan Vokasi. 5:1, 74-87

Bidder, C., Mogindol, H.S., Saibin, T.C., Andrew, S.A., & Naharu, N (2016) Students’ Perceptions of Blended Learning and Achievement. Envisioning the Future of Online Learning, DOI 10.1007/978-981-10-0954-9

Borba, M.C., Askar, P., Engelbrecht, J., Gadanidis, G., Linares, S., & Aguilar, S.M (2016). Blended learning, e-learning and mobile learning in mathematics education. ZDM - Mathematics Education 48:5, 589-610 DOI 10.1007/s11858-016-0798-4

Chandrawati, Sri Rahayu. (2010). Pemanfaatan E-Learning dalam Pembelajaran. Cakrawala Kependidikan 8(2). 172–181.

Davidson, L.K.(2011). A 3-year experience implementing blended TBL: Active instructional methods can shift student attitudes to learning. Medical Teacher, 33(9),750-753. https://doi.org/10.3109/0142159X.2011.558948

Dang, Y., Zhang, Y., Ravindran, S., Osmompekov, T. (2016). Examining Student Satisfaction and Gender Differences in Technology-Supported, Blended Learning. Journal of Information Systems Education, Vol. 27(2) Spring 2016

Edwards, A., & Alcock, A. (2010). Using Rasch analysis to identify uncharacteristic responses to undergraduate assessments. Teaching Mathematics and Its Applications, 29(4), 165–175. https://doi.org/10.1093/teamat/hrq008

Elyakim, N., Reychav, I., Offir, B., & McHaney, R (2017). Perceptions of Transactional Distance in Blended Learning Using Location-Based Mobile Devices. Journal of Educational Computing Research DOI: 10.1177/0735633117746169

Ellis, R.A., Pardo, A., & Han, F. (2016). Quality in blended learning environments – Significant differences in how students approach learning collaborations. Computers and Education, 102(March 2018), 90-102. https://doi.org/10.1016/j.compedu.2016.07.006
E. Roberts (1999) In defense of the survey method: An illustration from a study of user information satisfaction. *Accounting and Finance* 39–(53-77) DOI: 10.1111/1467-629X.00017

E Simanjuntak, Y Hia, N Manurung (2020). The Differences in Students Learning Motivation Based On Gender Using Blended Learning Models of Mathematics Learning. *Journal of Physics: Conference Series* 1462 (2020) 012040 doi:10.1088/1742-6596/1462/1/012040

Faradillah, A. & Hadi, W. (2020). Educators’ Perception of Blended Learning Models on Mathematics Learning. Kalamatika: Jurnal Pendidikan Matematika, 5(1), 83-92

Francis, R., & Shannon, S.J.(2013). Engaging with blended learning to improve students’ learning outcomes. *European Journal of Engineering Education*, 38:4, 359-369, DOI: 10.1080/03043797.2013.676679

González-Gómez, F., Guardiola, J., Rodríguez, O.M., Alonso, M.A.M. (2012). Gender differences in e-learning satisfaction. *Computers & Education* 58 (2012) 283–290 https://doi.org/10.1016/j.compedu.2011.08.017

Goktalay, S.B., & Ozdilek, Z (2010). Pre-service teachers’ perceptions about web 2.0 technologies. *Procedia Social and Behavioral Sciences* 2 (2010) 4737–4741. DOI: 10.1016/j.sbspro.2010.03.760

Hasrul, M. I, Suharianto, J., Lubis, R.A., Marbun, M. (2017) Revolusi Industri 4.0 dalam Dunia Pendidikan Dari Sisi Pembelajaran Berbasis Blended Learning. Prosiding Seminar Nasional Teknologi Pendidikan Pascasarjana UNIMED

Hüseyin Bicen, Fezile Ozdamli & Hüseyin Uzunboylu (2014) Online and blended learning approach on instructional multimedia development courses in teacher education, *Interactive Learning Environments*, 22:4, 529-548, DOI: 10.1080/10494820.2012.682586

Hsu, L.L. (2011). Blended learning in ethics education: A survey of nursing students. *Nursing Ethics*, 18(3),418-430. https://doi.org/10.1177/0969733011398097

Jillian J. Downing & Janet E. Dyment (2013) Teacher Educators’ Readiness, Preparation, and Perceptions of Preparing Preservice Teachers in a Fully Online Environment: An Exploratory Study, *The Teacher Educator*, 48:2, 96-109, DOI: 10.1080/08878730.2012.760023

Kuo, Y., Belland, B.R., Schroder, K.E.E., & Walker, A.E. (2014). K-12 teachers’ perceptions of and their satisfaction with interaction type in blended learning environments, *Distance Education*, 35:3, 360-381. http://dx.doi.org/10.1080/01587919.2015.955265

Lamb, R. L., Annetta, L., & Meldrum, J. (2011). Measuring science interest: Rasch validation of the science interest survey. *International Journal of Science and Mathematics Education* https://doi.org/10.1007/s10763-011-9314-z

Lah Che, N.H., & Tasir, Z. (2018). Measuring Reliability and Validity of Questionnaire on Online Social Presence : A Rasch Model Analysis. *Advanced Science Letters* 24(11), 7900-7903 DOI: 10.1166/asl.2018.12452

Linacre, J.M. (2006). A User’s Guide to WINSTEPS. Chicago: Winsteps.com.

Limniou, M., & Smith,M. (2010). Teachers’ and students’ perspectives on teaching and learning through virtual learning environments. *European Journal of Engineering Education*, 35(6),645-653. https://doi.org/10.1080/03043797.2010.505279
McSporran, M., Young S (2001) Does gender matter in online learning? ALT-J, 9:2, 3-15, DOI: 10.1080/0968776010090202

Mohamad, M.M., Sulaiman, N.L., Sern, L.C., Salleh, K.M (2015) Measuring the Validity and Reliability of Research Instruments. *Procedia - Social and Behavioral Sciences* 204 (2015) 164 – 171 DOI: 10.1016/j.sbspro.2015.08.129

Ogden, L. (2015). Student perceptions of the flipped classroom in college Algebra. Primus, 25(9), 782–791. https://doi.org/10.1080/10511970.2015.1054011

Pibriana, D., Ricoida, D.I. (2017). Analisis Pengaruh Penggunaan Internet Terhadap Minat Belajar Mahasiswa. *Jatisi*, 3(2) DOI: https://doi.org/10.35957/jatisi.v3i2.72

Roberts, E.S., (1999). In defence of the survey method: An illustration from a study of user information satisfaction. *Accounting and Finance*, 39 53-77 DOI: 10.1111/1467-629X.00017

Sad, S.N., & Göktas, O (2014). Preservice teachers’ perceptions about using mobile phones and laptops in education as mobile learning tools. *British Journal of Educational Technology* Vol 45 No 4 2014 606–618 doi:10.1111/bjet.12064

Sandi, G.(2005). Pengaruh Blended Learning Terhadap Hasil Belajar Kimia Ditinjau dari Kemandirian Siswa. *Pendidikan dan Pengajaran*, Jilid 45, Nomor 3, hlm.241-251

Setiyani, R. (2010) Pemanfaatan Internet Sebagai Sumber Belajar. *Dinamika Pendidikan* Vol. V, No. 2 DOI: 10.15294/dp.v5i2.4921

Simanjuntak, E., Hia, Y., Manurung, N. (2020). The Differences in Students Learning Motivation Based On Gender Using Blended Learning Models of Mathematics Learning. *Journal of Physics: Conference Series* doi:10.1088/1742-6596/1462/1/012040

Stern, M. J., Bilgen, I., & Dillman, D. A. (2014). The State of Survey Methodology: Challenges, Dilemmas, and New Frontiers in the Era of the Tailored Design. *Field Methods*, 26(3), 284–301. https://doi.org/10.1177/1525822X13519561

Tennant, A., & Conaghan, P. G. (2007). The Rasch measurement model in rheumatology: What is it and why use it? When should it be applied, and what should one look for in a Rasch paper? *Arthritis Care and Research*, 57(8), 1358–1362. https://doi.org/10.1002/art.23108

Utami, Y. P., Alan, D., Cahyono, D., & Indonesia, U. T. (2020). Study at Home: Analisis Kesulitan Belajar. *Jurnal Ilmiah Matematika Realistik (JI-MR)* 1(1), 20–26.

Vaughan, N & Lawrence, K (2013). Investigating the role of mobile devices in a blended pre-service teacher education program. Canadian Journal of Higher Education Revue Canadienne d’enseignement supérieur 43(3), 56-77 DOI: 10.4018/978-1-4666-6343-5.ch006

Wai, C.C., & Seng, E.L.K (2013). Measuring the effectiveness of blended learning environment: A case study in Malaysia. *Springer Science+Business Media New York.Educ Inf Technol* DOI:10.1007/s10639-013-9293-5

Wibisono, S. (2014). Aplikasi Model Rasch untuk Validasi Fundamentalisme Agama bagi Responden Muslim. *Jurnal Pengukuran Psikologi dan Pendidikan Indonesia* 3(3), 729-748