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Design Features for Gender-specific Differences in Blended Learning within Higher Education in Indonesia

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Abstract—**Blended learning offers learning solutions for higher educational institutions facing the industrial revolution 4.0. In this study, we investigated the influence factors student perceptions of blended learning based on gender-specific differences in Indonesia. We applied a research model to systematically assess the effect of design features on the effectiveness of blended learning indicators (intrinsic motivation and student satisfaction). Moreover, we evaluated the research model for both genders separately. Based on the quantitative survey of 223 Indonesian students, our study confirms that the design features significantly influence the effectiveness of blended learning for male and female students.**

Keywords—blended learning, gender difference, higher education, Indonesian student.

I. INTRODUCTION

The impact of the industrial revolution 4.0 has put pressure on the higher education sector to use digital technology in the education system [1]. In recent years, the blended learning approach has become a solution for higher education to respond to this impact [2]. Briefly stated, providing an effective blended learning program in higher education is a must [3].

The success of implementing blended learning lies not only in the use of learning technology but also in the way students can be successful and commit themselves to use it [4][5]. The effectiveness of blended learning will undoubtedly depend on many factors [6], however, one of the biggest challenges in achieving the effectiveness of blended learning in the difference in individual characteristics of learners in adopting blended learning [7]. According to [8], one of the characteristics of students who play an important role in assessing student academic achievement is a gender factor. This is also consistent with the study [9], which shows that gender factors can influence students' attitudes and intentions towards technology, in this case, male students are more

influenced by perceived usefulness, while women are more influenced by attitude toward using the system.

Gender factors and their relevance in the use of educational technology have become interesting issues in recent years. Even though it is recognized that male students can make better use of educational technology than female students, the reality is not always the same. This is reflected in some of the research gender factors. Research conducted by [10] shows that male students are better than female students. Research conducted by [11], on the other hand, shows different things; notably, those female students are better than male students. Moreover, other research shows that male and female students are equal in their use of educational technology [6][12]. In other words, there are still differences in the results of research on the influence of gender factors in the effectiveness of blended learning.

In Indonesia, where the trend towards implementing blended learning in higher education institutions continue to increase [13], and the number of male and female students is currently uneven (the female students population dominates the male students population) [14], it becomes essential to examine whether gender factors influence the effectiveness of blended learning in Indonesia. In the context of blended learning system design, different studies were carried out on the general design principles for virtual classrooms in Indonesia [3] and other context or scope [15][16][17], which unfortunately focused only on the evaluation of the criteria required by universities or local authorities without identifying gender differences and design characteristics. Interestingly, to the best of our knowledge, there are no studies that discuss gender factors and their relevance for the effectiveness of blended learning features for students in Indonesia. Therefore, the purpose of this research is to understand and analyze how gender differences play a role in the effectiveness of design features applied in the design of blended learning in the context of students in Indonesia.

In the following section we first present the applied quantitative research method. The results are then presented on the basis of quantitative data analysis. Next, the results and paper contributions, including the limitation, are discussed, leading to a summary of the study in the last section

II. RESEARCH METHOD

The blended learning effectiveness model used in this study is the result of the integration of design features of Learning Management System (LMS) and effectiveness indicators that refer to the model that has been developed by [6]. In this study, the research design focused on the influence of design features on student motivation and student satisfaction in the context of gender differences in male and female students in Indonesia, as shown in Figure 1 and Table 1.
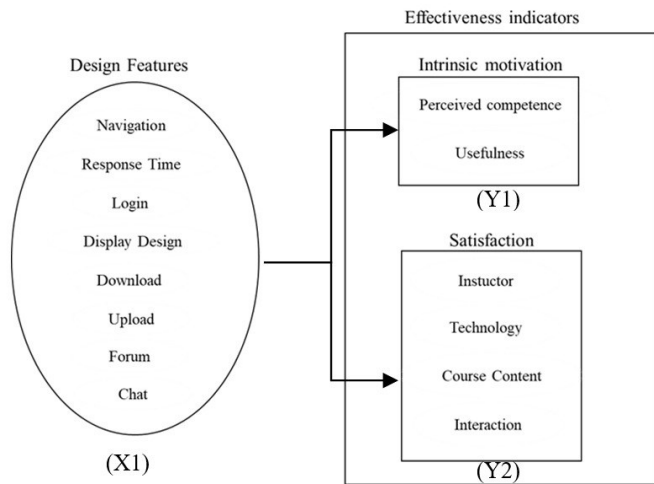

Fig. 1. Blended learning effectiveness model

The data collection tool in this study is in the form of a questionnaire given to students to assess their perspective on the effectiveness of blended learning (items in the questionnaire questions can be seen in Table 1). Besides, the content of the questions was designed using a Likert scale (1-5) [18].

TABLE I. THE VARIABLES USED IN THE STUDY

Questions	Variables	Items
Design Features		
1	Navigation	LMS navigation key
2	Response Time	LMS system response time
3	Login	LMS login process
4	Display Design	LMS layout design
5	Download	The process to download a learning material content on LMS
6	Upload	The process to upload tasks on LMS
7	Forum	Forum feature in LMS
8	Chat	Chat feature in LMS
Student Motivation		
9	Perceived	I am confident of myself being able to
	competence	carry out the learning process using e-learning
10	Usefulness	I was helped in the learning process which became easier with e-learning
Student Satisfaction		
11	Instructor	I am satisfied with the instructor's performance during the implementation of e-learning
12	Technology	I am satisfied with the support of technology infrastructure in implementing e-learning
13	Course Content	I am satisfied with the teaching content provided in the application of e-learning
14	Interactions	I am satisfied with the interaction during the implementation of e-learning

The test of validity and reliability of the questionnaire design has been done using the help of Microsoft Excel software. The validity test results state that all questions are valid (corrected item value-total correlation> 0.514) [19]. As for the reliability test results that use the split-half technique, it is found that reliability is high (reliability coefficient values between 0.6 and 0.8) [20].

Furthermore, in this study, data analysis was performed using several statistical methods. To find out which items differ significantly between male and female students using z-test two samples for means ($\alpha = 5\%$) [21]. Whereas to determine the effect of design features on student motivation and student satisfaction in the context of gender differences using the t-test for multi-group path analysis [22].

III. RESULT

Based on the results of the data collection, which began in August 2018 and ended on November 2018, the number of students participating was 223 Indonesian students who had become active participants in the blended learning system on their respective campuses. The profile of respondents' data can be seen in Table 2.

TABLE II. STATISTICS OF THE PERSONAL DATA OF RESPONDENTS

Personal Details	Number of Respondents	Percentage of respondents
Gender		
Male	111	49.78%
Female	112	50.22%
Age		
16-18	29	13.00%
19-21	187	83.86%
22-24	7	03.14%
Year of study		
Year 1	197	88.34%
Year 2	26	11.66%
Type		
Public	145	65.02%
Private	78	34.98%

Based on Table 2, the number of male and female respondents is balanced. The age of the respondents is at most

19-21 years. Also, 65.02% of the sample came from the public university, and 34.98% came from private campuses.

The summary of gender statistics in all items based on differences between means can be seen in Table 3.

Item	Mean (Female)	Mean (Male)	Significance	Differences between means
Navigation	3.5357	3.4324	0.3864	Not Significant
Response Time	3.8750	3.8378	0.7568	Not Significant
Login	3.7143	3.6577	0.6205	Not Significant
Display Design	3.5268	3.4054	0.2786	Not Significant
Download	3.6696	3.5405	0.2721	Not Significant
Upload	3.5179	3.3063	0.0648	Not Significant
Forum	3.5625	3.6486	0.4935	Not Significant
Chat	3.1071	2.9459	0.1446	Not Significant
Perceived competence	3.4554	3.2883	0.1485	Not Significant
Usefulness	4.1339	3.9189	0.0418	**Significant**
Instructor	3.7589	3.8829	0.2013	Not Significant
Technology	3.7054	3.7477	0.6911	Not Significant
Course Content	3.1786	2.8649	0.0262	**Significant**
Interaction	3.3750	3.2162	0.1779	Not Significant

Based on Table 3, although female students have a higher rating than male students for almost all measured variables. However, it can be seen that only two variables differ significantly between male students and female students, in this case, the usefulness and course content.

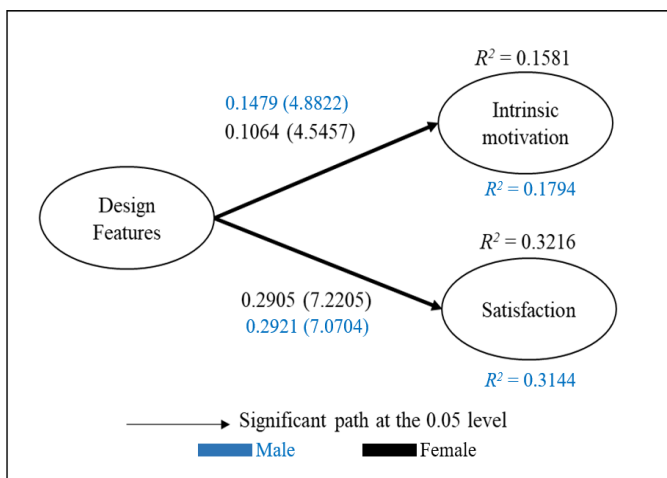The summary of the result of the path analysis can be seen in Fig 2.

Fig. 2. Estimated blended learning effectiveness model for male and female students

As can be seen in Fig 2, it was observed that for male students, design features could significantly influence both their intrinsic motivation (path coefficient = 0.1469, t = 4.8822) and satisfaction (path coefficient = 0.2921, t = 7.0704). For the value of R-squared related to intrinsic motivation and satisfaction are 0.1794 and 0.3144.

Fig 2 also shows that for female students, design features could significantly influence both their intrinsic motivation (path coefficient = 0.1064, t = 4.5457) and satisfaction (path coefficient = 0.2905, t = 7.2205). For the value of R-squared related to intrinsic motivation and satisfaction are 0.1581 and 0.3216.

The summary of the hypotheses testing can be seen in Table 4.

Hypothesis	Male	Female
Design Features → Motivation	Significantly influence	Significantly influence
Design Features → Satisfaction	Significantly influence	Significantly influence

Based on Table 4, it can be seen that the positive relationship between design features and motivation, as well as design features and satisfaction, were found significant in both samples.

The summary of the t-test for multi-group path analysis can be seen in Table 5.

Path	BMales	BFemales	Significance	Differences between paths
Design Features → Motivation	0.1479	0.1064	0.2789	Not Significant
Design Features → Satisfaction	0.2921	0.2905	0.9777	Not Significant

Based on Table 5, it can be seen that there are no significant differences in the path of the proposed model.

IV. DISCUSSION

This paper analyzes gender differences (male and female students) concerning the effectiveness of blended learning. This study focuses on any aspect of the effectiveness of blended learning that can be improved to improve the learning outcome of male and female students in Indonesia.

a) Gender differences for design features: Based on the results of data analysis, it can be seen that there is no significant difference between the assessment of male and female students towards all design features (navigation features, response time, login process, display design, download process, upload process, forum features, and chat

features). In other words, the results of this study confirm that there is no gap between male and female students in Indonesia in their assessment of design features.

b) Gender differences for student motivation: Based on the results of data analysis, from two indicators of assessment of the variable student motivation, it appears that one indicator shows that there is no significant difference between the assessment of male and female students (perceived competence). Whereas the usefulness factor shows that there are significant differences. In other words, the results of this study indicate that there are still gaps between male and female students in Indonesia in their assessment of usefulness.

c) Gender differences for student satisfaction: Based on the results of data analysis, from the four indicators of assessment of the student satisfaction variable, it can be seen that the three indicators show that there is no significant difference between the assessment of male and female students on the 3 indicators (instructor, technology, and interactions). Whereas for course content factors indicate that there are significant differences. In other words, the results of this study indicate that there are still gaps between male and female students in Indonesia in their assessment of course content.

d) Model of the influence between design features and student motivation of male vs. female students: Based on the results of data analysis, it can be seen that the design features could significantly influence student motivation on both gender. In other words, the results of this study indicate that design features have an important role in influencing the motivations of male and female students in Indonesia.

e) Model of the influence between design features and student satisfaction of male vs. female students: Based on the results of data analysis, it can be seen that the design features could significantly influence student satisfaction on both genders. In other words, the results of this study indicate that design features have an important role in influencing the satisfaction of male and female students in Indonesia.

By comparing the results of the analysis between male and female students, this study raises several contributions in the field of blended learning and education in general. First, this study systematically and empirically examined what aspects could be improved to increase the effectiveness of blended learning from the perspective of students in Indonesia based on gender differences (male and female students). Second, this study examines the impact of various factors on the effectiveness of blended learning (design features, student motivation, and student satisfaction).

Although the design features examined in this study (related to navigation, response time, login, display design, download, upload, forum, and chat) show several differences in design features compared to other studies [23], the findings presented in this paper support the results of previous studies which showed that design features generally had a significant impact on both genders [23]. Besides, motivation is not only related to extrinsic factors, in this case, system design features, but also intrinsic factors. In this study, we show how

motivation caused by the feeling of "being able" to use the system offered and the usefulness of a system, both of which have a significant effect on both men and women [24]. Previous studies show how social features have more influence on female student motivation [25], but generally, usefulness and competency are things that are not related to gender. Both of them have the same effect on the motivation of male and female students. Another contribution generated in this study is the identification of gender differences from the proposed research model. By examining the models for male and female students separately and in multi-groups, we found no significant gender differences in the effect of feature design on effectiveness indicators.

Practically, the results of this study can provide some insight for system designers who are interested in developing blended learning (especially in Indonesia). As the results of the analysis show, students (independent of male and female) believe that design features can significantly influence their motivation and satisfaction in learning. Therefore, system designers need to pay attention to designs that not only focus on functionality but generally offer design features that can facilitate meaningful and "flow" user experience [26][27].

Also, on the one hand, the system can provide aesthetics in the main functional features of the learning system, on the other hand, the proposed systems also provide a "wow" effect supporting flow condition [28]. In this way, there is a balance between the existing competencies, the difficulties to use the system, and the goals to be achieved by the learners in the proposed system [29].

This research also has several limitations, which can then be improved for further research. First, this study only tested the proposed research model still limited to small samples. Second, this study only uses a single survey instrument, which is only quantitatively, so it cannot explore the reasons behind the evaluation of design features for male and female students qualitatively.

V. CONCLUSIONS

This research develops a research model to systematically and empirically investigate the factors influencing student learning effectiveness in a blended learning environment in Indonesia based on a gender perspective. In particular, this research focuses on design features and their impact on student motivation and student satisfaction. The results of data analysis related to gender differences indicate that a significant difference between male and female students lies in the usefulness factors and course content factors. As for other factors, there is no difference between the assessment of male and female students. Furthermore, the comparison of models by gender shows that design features can significantly influence the effectiveness of blended learning (both student's motivation and satisfaction).

REFERENCES

[1] M. Baygin, H. Yetis, M. Karakose, and E. Akin, "An Effect Analysis of Industry 4.0 to Higher Education", 15th International Conference on

Information Technology Based Higher Education and Training (ITHET), 2016.

[2] M. L. Hung and Chou, "Students Perceptions of Instructors Roles in Blended and Online Learning Environments: A Comparative Study", Computers & Education, vol. 81, pp. 315-325, 2015.

[3] B. R Aditya, I. Nurhas, and J. Pawlowski, "Towards Successful Implementation of a Virtual Classroom for Vocational Higher Education in Indonesia", Learning Technology for Education Challenges (LTEC). 2019.

[4] L. De George-Walker, and M. Keeffe, "Self-Determined Blended Learning: A Case Study of Blended Learning Design", Higher Education Research & Development, vol. 29, no. 1, pp. 1–13, 2010.

[5] R. T. Osguthorpe, and C. R. Graham, "Blended Learning Environments: Definitions and Directions", Quarterly Review of Distance Education, vol. 4, pp. 227-233, 2003.

[6] M. J. Kintu, C. Zhu, and E. Kagambe, "Blended Learning Effectiveness: The Relationship Between Student Characteristics, Design Features and Outcomes", International Journal of Educational Technology in Higher Education, vol. 14, no 7, pp. 1-20, 2017.

[7] J. Hofmann, "Solutions to the Top 10 Challenges of Blended Learning", Top 10 Challenges of Blended Learning, 2014.

[8] Oxford Group, "Blended Learning-Current Use, Challenges and Best Practices", 2013.

[9] T. R. Guskey, "Evaluating Professional Development", Thousands Oaks: Corwin Press, 2000.

[10] Yau. H. K, and Cheng. A. L, "Gender Difference of Confidence in Using Technology for Learning", The Journal of Technology Studies, vol. 38, pp. 74−79, 2012.

[11] F. Gonzalez-Gomez, J. Guardiola, O. M. Rodriguez, and A. M. Alonso, " Gender Differences in E-learning Satisfaction", Computers and Education, vol. 58, no.1, pp. 283−290, 2012.

[12] D. Blasco, " Promoting Female Students' Interest in Studying with Educational Technology", International Journal on Technology in Education, vol. 5, no. 2, pp. 19-31, 2016.

[13] Ristekdikti. [Online]. Available: https://risbang.ristekdikti.go.id/wp-content/uploads/2019/07/PERMEN-20-TAHUN-2018-TENTANG-PENELITIAN.pdf. Last accessed 09.10.2019

[14] Ristekdikti. [Online]. Available: https://ristekdikti.go.id/epustaka/buku-statistik-pendidikan-tinggi-2017/. Last accessed on 09.10.2019

[15] B. R. Aditya, and A. Permadi, "Implementation of UTAT Model to Understand the Use of Virtual Classroom Principle in Higher Education", Journal of Physics: Conference Series, vol. 81, no. 1, 2018.

[16] R. Sari, and M. Karsen, "An empirical study on blended learning to improve quality of learning in higher education", International Conference on Information Management and Technology (ICIMTech), pp. 235-240, 2016

[17] B. Anthony, A. Kamaludin, A., Romli, A. et al, "Exploring the role of blended learning for teaching and learning effectiveness in institutions of higher learning: An empirical investigation", Education Information Technologies, pp. 1-34, 2019

[18] R. Likert, "A Technique for the Measurement of Attitudes". Archives of Psychology. vol. 140. pp. 1–55. 1932.

[19] J. P. Guilford. "Fundamental Statistic in Psychology and Education", 3rd Ed. New York: McGraw-Hill Book Company. Inc, 1956.

[20] U. A. Haug, and D. H. Irvine, "Higher Education", vol. 16, issue 1, pp. 33-36, 1987.

[21] R. E. Walpole, R. H. Myers, S. L. Myers, and K. Ye, "Probability & Statistics for Engineers & Scientists", 9th edition. Boston: Prentice-Hall, 2012.

[22] M. J. Sánchez-Franco, and J. L. Roldán, "Web Acceptance and Usage Model: A Comparison Between Goal-Directed and Experiential Web Users", Internet Research, vol. 15, no. 1, pp. 21–48, 2005.

[23] Y. C. Hsu, "Better Educational Website Interface Design: The Implications from Gender - Specific Preferences in Graduate Students", British Journal of Educational Technology, vol. 37, no. 2, pp. 233-242, 2006.

[24] R. M. Ryan, and E. L. Deci, "Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being", American psychologist, vol. 55, no. 1, pp. 68, 2000.

[25] W. H. D. Huang. D. W. Hood, and S. J. Yoo, "Gender Divide and Acceptance of Collaborative Web 2.0 Applications for Learning in Higher Education", The Internet and Higher Education, vol. 16, pp. 57-65, 2013.

[26] R. A. Calvo, and D. Peters, "Positive Computing: Technology for Wellbeing and Human Potential", MIT Press, 2014.

[27] J. M. Pawlowski, S. C. Eimler, M. Jansen, J. Stoffregen. S. Geisler. O. Koch, and U. Handmann, "Positive Computing", Business & Information Systems Engineering, vol. 57, no. 6, pp. 405-408, 2015.

[28] P. M. A. Desmet, R. Porcelijn, and M. B. Van Dijk, "HOW to design WOW Introducing a Layered-Emotional Approach", In Proceedings of the International Conference on Designing Pleasurable Products and Interfaces, 2005.

[29] M. Czikszentmihalyi, "Flow: The Psychology of Optimal Experience", New York: Harper & Row, 1990.