

Adaptation and Validation of Motivation to Learn Online Questionnaire (MLOQ) and Differential Item Functioning (DIF) Analysis at Islamic University Student

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ABSTRACT

This research aims to test the reliability and validity of the motivation to learn online questionnaire (MLOQ) by adding an analysis related to the evaluation of the psychometric characteristics of the test instrument, namely the differential item functioning (DIF) test. DIF uses to measure the bias that affects the validity, DIF also uses to test the fairness of an item of a test instrument in different groups. The MLOQ validity test carries out with a cross-cultural validation step. The subjects of this study were Indonesian Islamic university students with total amount of participants were 339 students. Confirmatory factor analysis (CFA) and identification of DIF were analyzed by using M-Plus software. Results and educational implications are described.

Keywords: *Adaptation scale, Construct validity test, Confirmatory factor analysis, Differential item functioning, Islamic University Student, Motivation to learn online questionnaire.*

1. INTRODUCTION

The urgency of online education during COVID-19 pandemic becomes an important discourse to study. The pandemic has an influence in Indonesian higher education system where lecturers and university student have to move online teaching and learning process [1]. Distance learning creates a new alternative way for education during pandemic COVID-19[2]. The emergence on using technology seems to be compulsory [3]. This condition drives student into new behavior in learning.

Distance learning is different from face-to-face learning [4]. The factors that affect the quality of face-to-face learning do not necessarily impact the distance learning process [5]. In the midst of increasing distance

learning, educators need a measuring scale that can measure the level of student motivation in participating in distance learning. Thus, this study is expected to provide a valid scale or questionnaire for researcher and educator who concern in the field of motivation to learn online. Hopefully the result can be used as a measuring scale to test what factors influence online learning motivation and the quality of distance learning in Indonesian Islamic university student subjects, especially during COVID-19 pandemic era.

Previous research indicates that motivation has a crucial role in improving academic achievement [6]. Motivated students will be actively involved with the subject matter for a longer period time, these students will show more persistence when faced with difficulties, and achieve higher levels of understanding than less

motivated students [7]. Previous research on learning motivation scale was only carried out in the context of face-to-face education or offline. Meanwhile, research reference on how motivation plays a role in the context of online education especially for online motivation scale is not fully understood and established [8].

Some researchers conducted studies on student engagement in online learning environments, but they have limitations in terms of student engagement whose indicators are measured by the number of online activity such as logins, the number of questions asked, lessons taken, articles posted, and the duration of student participation in online discussions [5]. Some modify the instruments developed for the face-to-face environment, but some of the efforts above have not been able to reflect the unique characteristics of involvement in online learning circumstances [5].

This study aims to develop an appropriate measuring scale to measure student motivation in an online learning environment with the title adaptation and validation of Motivation to Learn Online Questionnaire (MLOQ) and differential item functioning (DIF) analysis at Islamic university student.

2. METHODS

2.1. Online Learning Motivation

Digital learning was initially introduced by Yoon et al [9]. By the development of communication and technology equipment, it is known with different elaborations and terminology, such as internet based training, web based training, or online learning and distance learning, network learning, and distance learning [10]. Research known that motivated learners are more likely to be engaged in many challenging activities, be actively involved various activity, enjoy and adopt an immersive approach to learning and demonstrate increased performance, persistence and creativity. With the important of interrelationships between the motivation and learning, it is not shocked that motivation has been actively studied in a variety of traditional educational settings [6]. However, studies who explore the motivation to learn in online contexts are very limited in number and scope, as others have noted [11]. In the current research trend in learning motivation limited in offline or traditional learning context, there is a drift to adopt a limited outlook of motivation that does not recognize the complexities and dynamic interactions of the factors that underlie and influence in online learning motivation [12].

2.2. Motivation to Learn Online Questionnaire (MLOQ)

The Motivation to Learn Online Questionnaire (MLOQ) is designed to assess students' motivation to

learn in online classes [5]. The MLOQ was adapted in part, from the Motivated Strategies for Learning Questionnaire (MSLQ), and several of its concepts was designed to assess, such as goal orientation, control of learning beliefs, and task grades. Here are four aspects of student motivation [5].

2.2.1. Control of learning beliefs

Control in learning beliefs refers to students' confidence in mastering the class material. As a construct, the control of learning beliefs is closely related to attribution theory [5]. Specifically, controlling for learning beliefs involves the distinction between internal and external learning attributions. A student who has an internal learning attribution tends to attribute academic achievement to several factors that are inherent to him. "*I got good grades because I was smart*" and "*I got bad grades because I was stupid*" are the examples of statements of a student might make that has an internal learning attribution. External learning attribution exists when a student relates academic performance to some external factor. "*I failed the exam because the room was too cold*" and "*I got an A on the exam because I was lucky*" are both examples of statements a student might make with external learning attributions [5].

2.2.2. Task value

Task Value refers to an individual's subjective perception of the value of a particular task. Most of the work on value assignments is based on the Value-Expected framework of motivation [13]. There are four main factors in Task Value: achievement value, intrinsic value, utility value, and cost [5].

2.2.3. Teacher Support

Teachers play an important role in the success of students in learning. From the theoretical perspective, teacher facilitate or thwart motivation by creating an environment that influences the three basic psychological needs. Instructors may encourage the satisfaction of autonomy by engaging in behaviors that promote autonomy, such as offering choices in assignments and tailoring instructions or assignments to student interests. By interacting with students in ways that support autonomy, instructors may create classroom conditions that make students comfortable enough to engage in agent behavior, such as asking questions and communicating their opinions [5].

2.2.4. Social Engagement

The learning environment is an ongoing, collectively-defined interaction in which instructors and students engage with one another. When it is analyzed from the perspective of both social cognitive theory and self-

determination theory, motivation is not a factor that only exists within the individual, but also involves the environment. In the concept of education, the environment is a classroom. In traditional classrooms, social dynamics influencing motivation are researched and understood quite well. However, the introduction of new social contexts – in the form of online classrooms – will certainly require further research, to understand how it affects students’ social dynamics [5].

The type of research used in this research is quantitative research by using Confirmatory Factor Analysis (CFA) in data analysis. Confirmatory factor analysis was used to confirm the factors in the questionnaire [14]. In this case MLOQ which had been adapted for Indonesian subjects. Meanwhile, the DIF analysis was carried out with the M-Plus software application. Quantitative data were obtained through the subject’s answers by analyzing the scores on the subject’s answers through the MLOQ questionnaire. Participant of the study were student of an Islamic university with the total amount 339 participants.

2.2.5. Cross-Cultural Adaptation Process Scale

The adaptation scale process that the researchers did in this study refers to the journal Guidelines for the Process of Cross-Cultural Adaptation of Self-Report Measures formulated by Beaton [15]. The adaptation process that the researchers did was as many as 6 stages. The description of the process is as follows in Figure 1.

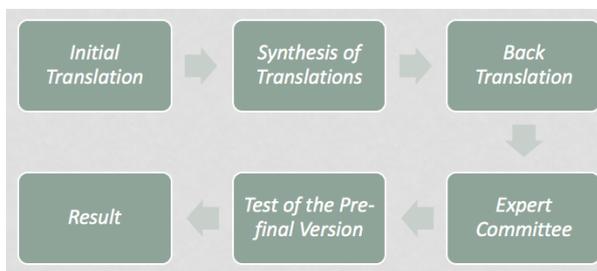


Figure 1 Cross-cultural adaptation process Cross-cultural adaptation process.

3. RESULT AND DISCUSSION

After the researchers tested whether the 41 items that measure MLOQ are unidimensional, which means that they only measure MLOQ. It is known that the results of the CFA analysis carried out with the one-factor model, it turns out that the model is fits, with Chi-square = 500.144, df = 315, P-value = 0.0000, and RMSEA value = 0.041. After obtaining the RMSEA value < 0.05, it can be stated that the model with one factor is acceptable. This means that all items only measure one factor, namely MLOQ. Then the author sees whether the item measures the factor to be measured significantly and at the same time determines whether the item needs to be

Table 1. Loading factor of the 1st order

Item	Estimate	Standard error	Z -value	Description
Y1	0.350	0.056	6.255	Valid
Y2	0.353	0.054	6.532	Valid
Y3	0.469	0.047	9.977	Valid
Y4	0.375	0.056	6.630	Valid
Y5	0.460	0.051	8.957	Valid
Y6	0.405	0.055	7.402	Valid
Y7	0.421	0.059	7.186	Valid
Y8	0.464	0.053	8.783	Valid
Y9	0.604	0.042	14.300	Valid
Y10	0.385	0.052	7.426	Valid
Y11	0.549	0.045	12.317	Valid
Y12	0.380	0.052	7.315	Valid
Y13	0.625	0.042	14.783	Valid
Y14	0.562	0.047	12.066	Valid
Y15	0.624	0.046	13.451	Valid
Y16	0.616	0.043	14.250	Valid
Y17	0.674	0.038	17.667	Valid
Y18	0.612	0.041	14.997	Valid
Y19	0.701	0.032	21.632	Valid
Y20	0.678	0.037	18.510	Valid
Y21	0.621	0.040	15.727	Valid
Y22	0.634	0.041	15.495	Valid
Y23	0.664	0.037	18.086	Valid
Y24	0.711	0.031	22.776	Valid
Y25	0.635	0.037	17.093	Valid
Y26	0.622	0.046	13.618	Valid
Y27	0.031	0.062	0.493	Not Valid
Y28	0.557	0.045	12.463	Valid
Y29	0.551	0.046	11.853	Valid
Y30	0.479	0.050	9.604	Valid
Y31	0.542	0.041	13.126	Valid
Y32	0.559	0.047	11.791	Valid
Y33	0.551	0.048	11.601	Valid
Y34	0.624	0.040	15.525	Valid
Y35	0.588	0.047	12.535	Valid
Y36	0.590	0.054	11.015	Valid
Y37	0.564	0.056	10.009	Valid
Y38	0.641	0.053	11.996	Valid
Y39	0.590	0.054	11.015	Valid
Y40	0.564	0.056	10.009	Valid
Y41	0.641	0.053	11.996	Valid

dropped or not, the test is carried out by looking at the z value for each factor loading coefficient.

The z value for the factor load coefficient on 40 items is significant because $z > 1.96$, while one item, item number 27, is invalid because it does not meet the criteria. Item number 27, namely “I feel *disconnected*

from my teacher and fellow students in classes” from the item question above it can be concluded why the item invalid because during pandemic students are carrying out online learning [3]. It is known that the condition of online learning does not allow students to connect with

Table 2. Parameter estimation results of the MIMIC model

Items	Estimate	Standard error	Z -value	Description
Y1	0.350	0.056	6.259	Valid
Y2	0.353	0.054	6.537	Valid
Y3	0.469	0.047	9.978	Valid
Y4	0.374	0.056	6.636	Valid
Y5	0.460	0.051	8.956	Valid
Y6	0.405	0.055	7.402	Valid
Y7	0.421	0.059	7.184	Valid
Y8	0.464	0.053	8.782	Valid
Y9	0.604	0.042	14.301	Valid
Y10	0.385	0.052	7.431	Valid
Y11	0.549	0.045	12.323	Valid
Y12	0.380	0.052	7.315	Valid
Y13	0.625	0.042	14.776	Valid
Y14	0.562	0.047	12.075	Valid
Y15	0.624	0.046	13.449	Valid
Y16	0.616	0.043	14.259	Valid
Y17	0.674	0.038	17.665	Valid
Y18	0.612	0.041	15.071	Valid
Y19	0.701	0.032	21.634	Valid
Y20	0.678	0.037	18.503	Valid
Y21	0.621	0.040	15.743	Valid
Y22	0.634	0.041	15.512	Valid
Y23	0.664	0.037	18.092	Valid
Y24	0.711	0.031	22.819	Valid
Y25	0.635	0.037	17.089	Valid
Y26	0.622	0.046	13.643	Valid
Y28	0.557	0.045	12.463	Valid
Y29	0.551	0.046	11.855	Valid
Y30	0.479	0.050	9.600	Valid
Y31	0.542	0.041	13.116	Valid
Y32	0.559	0.047	11.791	Valid
Y33	0.551	0.048	11.602	Valid
Y34	0.624	0.040	15.527	Valid
Y35	0.588	0.047	12.541	Valid
Y36	0.590	0.054	11.020	Valid
Y37	0.564	0.056	10.040	Valid
Y38	0.641	0.053	12.002	Valid
Y39	0.590	0.054	11.020	Valid
Y40	0.564	0.056	10.040	Valid
Y41	0.641	0.053	12.002	Valid

teachers and other students fully connected such offline learning [4], online learning is less social engagement because carrying out virtually.

Next, the researcher looked at the factor load of the items, whether there were negative score or not, the factor score of 41 items was positive. So that in the analysis that will be carried out to test subsequent models in this study these items were excluded, because they were invalid items.

After getting 40 valid items through first order CFA testing, the next researcher will detect DIF using the MIMIC model on a set of valid items [16]. Testing is done by looking at the coefficients which will be explained below [17].

From the results of simultaneous analysis, there are fundamental differences from the MIMIC model when compared to the previous model where in this model, there are covariates that will be tested for their effects on items that are proven to measure MLOQ where the covariate in question is gender which consists of two categories, namely male who are coded 1 and women are coded 0. If the direct effect of gender gives a significant result, then this indicates that there is a DIF on the items being tested because there is a significant difference between the male sex groups when compared to the male gender group [18].

The estimation method used in the MIMIC model is a robust maximum likelihood (MLR) estimation method, which will produce estimation results but with a robust model fit index [19]. What is meant by the robust, that this estimation method can still function well even though there are basic assumptions that are not suitable, then this method produces a much better and corrected model fit index.

Based on the table above, we got the significance of each item from the MIMIC model, which is theorized to measure one factor, namely MLOQ so that, after proofing using the first-order model described previously, MLOQ can be persistent to 1 to test whether gender is the only one [20]. The causes of the variety of existing items where it aims to test the DIF where the test results are described in the Table 3.

Table 3. DIF Testing with MIMIC model

Item	Estimate	Standard error	Z -value	p-value
Quality of life ON Jenis Kelamin (JK) R ² = 0.012, p=0.000	0.124	0.038	3.269	0.000
Item 8 ON JK	0.220	0.044	4.989	0.000
Item 18 ON JK	0.140	0.042	3.318	0.000
Item 21 ON JK	0.211	0.047	4.478	0.000

Based on table 3, there are three items that contain DIF, namely items 8, 18 and 21. The test criteria are by looking at the estimation results obtained by making a model where there is a direct effect of gender on each item [21]. Significant estimation results indicate that the item functions differently between the male and female groups, in other words the item contains DIF [22]. Then looking at the direct effect of gender on the latent variable MLOQ, there is a significant effect with a significant magnitude of $R^2 = 0.012$ and a significant regression coefficient of 0.124 with a positive direction, which means that there is a difference in the mean between men and women in the context of responding to MLOQ items [23].

Item number 8 measures extrinsic goals. It can be understood that men and women have differences in extrinsic goals in terms of I "want to do well in my classes because it's important to show my ability to my family, friends, employer, or others [24]. It's also in line with item number 18 which measure self-efficacy in term of expect do well, as known that men and women have different perspectives in motivating themselves [25]. Lastly, item number 21 tries to measure task value in context of that he or she will able to use what they learn in the course to other courses. Men and women have different perspective on the thing that he or she will apply the course that she or he take to be used in another courses [24].

4. CONCLUSION

Although this research still the literature review about gender equality and quality from Sustainable Developments (SDGs) goals as a worldwide call to every country listed under United Nations to the context of Indonesian policy regarding the implication of gender equality policies in the educational setting, the data statistics collected from the latest higher education database 2019 to investigate the woman representation as students in different program level and as lecturers in academic careers at North Sumatera University.

Indonesian young women representative through data collected from universities in North Sumatra has increased to the level diploma, bachelor, profession, and specialist; however, for the future program level, the gender disparity still needs to be improved and at the professional career level. The pyramid-shaped challenges as the future direction of representation of women bring into the structural positions. If two out of five of gender mainstreaming central area is about the increasing capacity of policymakers and planners on educational programs or innovation, how does the woman representation still exist as ideal fifty to fifty to the men representation?

So, suppose we want to strengthen human resources and science and STEM education capability as the SDGs

goals. In that case, we must seriously consider women as a source of future scientists, technologists, engineers, and mathematicians; increasing the women's role as equal partners of men should be directed at increasing their active participation in all levels and development programs. Lack of representation of women from science and STEM education is a waste of human resources from a national investment development, career discrimination, organizational culture are important issues. There is a lot of accumulated evidence that organizations with women as team leaders perform better [23–26], this momentum to increase the advancement of women into senior roles. Notably, women in the science sector or the professional STEM sector from different fields come together to be networked and connected as gender role models.

AUTHORS' CONTRIBUTIONS

The emergence of measuring the motivation to learn online is compulsory during pandemic COVID-19[3]. The reality that online learning is different with offline learning is pushed the researcher to make a scale which could measure the student motivation in following online learning. In this case, the author successfully adapted and validated the MLOQ to use in Islamic University student. It is hoped to be useful during distance learning in pandemic COVID-19.

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