An Indonesian Adaptation of The Students' Preparedness for University e-Learning Environment Questionnaire

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Abstract

Although most students are digital natives, online learning requires different skills as compared to conventional face-to-face learning. This paper aims to adapt and test the reliability and validity of the Students' Preparedness for the University e-Learning Environment questionnaire developed by Parkes et al. into Bahasa Indonesia. The original questionnaire covers a wide range of competencies relevant to e-learning preparedness for university e-learning environments in three dimensions. Prior to reliability and validity checking, pilot testing is conducted to test the unidimesionality of the instrument and the rating scale. An item-match analysis test is also carried out to observe the suitability of each item. Then, the final version of the questionnaire is administered to a large representative sample of respondents for whom the questionnaire is intended. The results show that, with a total of 1446 students from a public university in Indonesia as respondents, the adapted questionnaire is valid and reliable.

Keywords: preparedness, e-learning, item-match analysis, rasch model, validity test, reliability test

Introduction

Despite students being digital natives, the results of implementing e-learning in higher institutions do not always support the attainment of the learning objectives. Online learning requires different skills compared to traditional learning. In addition to technical skills, students must be able to interact with teaching materials in various formats and communicate virtually without the help of non-verbal languages, e.g., intonation, facial expressions, and body language. While in most cases students show

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competencies to use computer technology and able to effectively access and navigate course content, previous findings show that students remain relatively unprepared in some non-technical skills, such as for giving and receiving critique or other critical thinking skills (Parkes et al. 2015).

Pandemic COVID-19 escalate utilization of e-learning in various education degree of education, leaving a question whether the students were prepared for e-learning. Are students competent to adapt new directions in learning in both of technical and non-technical skills? As reported by World Economic Forum, online learning platform Coursera has recorded 20 million new student registrations in 2021 (Wood 2022). The highest rate of new learner growth came from emerging economies, such as Paraguay, Lebanon, Philippines, Guyana, and Indonesia, with more than 60% growth in 2021.

To be effectively implement e-learning, lecturers must understand the level of students' e-learning readiness. Accordingly, instruments in the form of a student learning readiness questionnaire are needed to assess students' preparedness for university online learning environments. By measuring this level of preparedness, lecturers can define appropriate instructional strategies accordingly.

The terms e-learning readiness or e-learning preparedness were used indistinctly. However, several researchers prefer the term 'e-learning readiness' (Alem et al. 2014; Blankenship and Atkinson 2010; Kaymak and Horzum 2013; Hung et al. 2010; Ilgaz and Gülbahar 2015; Kaur and Wati 2004; Watkins et al. 2008; Yu 2014), while others use 'e-learning preparedness' (Hong and Gardner 2018; Parkes et al. 2015). They have defined contextual differences between those terms. Watkins et al. (2008) described e-learning readiness as the level of readiness of certain institutions or organizations regarding various aspects of the technology of e-learning in advance of the entire e-learning environment being applied for a range of purposes. Other researchers employed the term 'preparedness' to focus on what students need to do, rather than what students have to be (Hong and Gardner 2018; Parkes et al. 2015), as in the current study.

Previous studies have worked on developing an instrument to measure the e-learning readiness or e-learning preparedness (Alem et al. 2014; Kaymak and Horzum 2013; Hong and Gardner 2018; Hung et al. 2010; Parkes et al. 2015; Smith 2005; Watkins et al. 2008; Yu 2014). Among those of questionnaires, the current study selected the instrument developed by Parkes et al. (2015) for translation and adaptation into Bahasa Indonesia, the Indonesian national language, for the following reasons. First, it includes a wide range of competencies relevant to e-learning preparedness for university e-learning environments, including competencies associated with online collaborative learning. Through online collaborative learning, 'students are encouraged and supported to work together to create knowledge: to invent, to explore ways to innovate, and, by doing so, to seek the conceptual knowledge needed to solve problems rather than recite what they think is the right answer' (Harasim 2017). Second, the e-learning competencies identified in the study described in observable and measurable terms the requisite knowledge, understandings, skills, attitudes and behaviours students required for effective performance (Parkes et al. 2015).

The original preparedness questionnaire was developed in an English-speaking country. A cross-cultural adaptation of the instrument was necessary to maintain the validity of the original questionnaire for application in another country and another language, such as Bahasa Indonesia. Cross-cultural adaptation is a process that considers language (translation) and cultural adaptation issues in the process of preparing a questionnaire for use in another setting (Beaton et al. 2000). This study recommended the six stages in the adaptation process to include forward translation, synthesis of the translations, back translation, expert committee review, pre-testing and submission and appraisal of all written reports by developers or a committee (Beaton et al. 2000). Beaton et al. (2000) suggested that this thorough adaptation process is designed to maximize the realization of semantic, idiomatic, experiential, and conceptual equivalence between the source and target questionnaire.

After the translation and adaptation process, further testing of the adapted instrument was also suggested to measure the properties needed for the designed application using conventional statistical approaches (Beaton et al. 2000; Gjersing et al. 2010; Sousa and Rojjanasrirat 2010). Some measures were evaluated during pre-testing; however, larger sample sizes from the target population are encouraged. The final

instrument should establish internal consistency reliability, stability reliability, homogeneity, construct validity, criterion validity, factor structure, and the model fit of the instrument (Beaton et al. 2000; Sousa and Rojjanasrirat 2010).

Literature Review

Definition of E-learning Readiness, Preparedness, or Competencies

Prior to introducing the instruments for adaptation in this paper, we briefly discuss some of the contextual terms that often arise, i.e., e-learning readiness, e-learning preparedness, and e-learning competencies. Readiness (for something) is the state of being ready or prepared for something ("Readiness" n.d.). Watkins et al. (2004) defined e-learning readiness as the level of readiness of certain institutions or organisations regarding various aspects of the technology of e-learning in advance of the entire e-learning environment being applied for a range of purposes. E-learning readiness includes human resources (learners/students, teachers, management, staff and planners), infrastructure and all factors that affect the development of the e-learning environment (Hashim and Tasir 2014).

A term that closely follows readiness is preparedness. Preparedness (to do something) is defined as the state of being ready or willing to do something ("Preparedness" n.d.). In the context of the study, preparedness is defined in terms of readiness. On the other hand, some experts define e-learning readiness in terms of preparedness, where the former can be expressed as the 'mental or physical preparedness of an organization for some e-learning experience or action' (Borotis and Poulymenakou 2004). Several researchers prefer the term 'e-learning readiness' (Alem et al. 2014; Blankenship and Atkinson 2010; Kaymak and Horzum 2013; Hung et al. 2010; Ilgaz and Gülbahar 2015; Kaur and Wati 2004; Watkins et al. 2008; Yu 2014), while others use 'e-learning preparedness' (Hong and Gardner 2018; Parkes et al. 2015). In this paper, we use 'preparedness' as a synonym of 'readiness' to focus on what students need to do, rather than what students have to be (Hong and Gardner 2018; Parkes et al. 2015). The context of this study is the e-learning environment within a higher education system. Watkins et al. (2004) defined e-learning readiness as the level of readiness of certain institutions towards various aspects of the technology of e-learning.

Readiness or preparedness is different from competency. Competency (in something) or competency (in doing something) is the ability to do something well. In developing an instrument for measuring e-learning preparedness, experts refer to the corresponding competency categories as the dimensions or factors of preparedness.

Assessment of E-learning Preparedness/Readiness

Assessments of students' preparedness for e-learning provide valuable information for institutions and students. Alem et al. (2014) conducted a systematic literature review on student preparedness for e-learning assessment tools between 1990 and 2010. The results showed that a standard tool does not exist in this regard. Only 10 instruments for assessing students' online preparedness have been developed and published during that period.

Watkins et al. (2008) proposed self-assessment questionnaires comprising 27 items. The instrument includes six dimensions, i.e., technology access, online skills and relationships, motivation, online audio/video, internet discussion and importance to personal success. Unfortunately, data collected to support the external validity of the instrument could not be analyzed due to technical problems.

Smith (2005) tested the readiness for online learning questionnaire for reliability and factorability on a sample of 314 Australian university students. The study concluded that the instrument shows promise in both research and practice contexts. Blankenship and Atkinson (2010) replicated the previous study by Smith (2005) with 146 undergraduate students at a mid-sized public university in the United States of America as respondents. The study proposed the revision of the 'comfort with e-learning' factor to 'comfort with non-face-to-face communication'. The questionnaires included a total number of 13 items. The findings indicated that students may have believed their background and experience with

using the internet helped them with self-management related to learning and made them more comfortable with non-face-to-face communication; accordingly, these characteristics were found to be beneficial to their studies.

Hung et al. (2010) expanded the concept of e-learning readiness developed before by adding new facets included additional dimensions. The final instrument comprised five dimensions, i.e., computer/internet self-efficacy, self-directed learning, learner control, motivation for learning, and online communication self-efficacy. Data was gathered from 1051 college students in five online courses in Taiwan. The findings revealed that, in general, the higher grade (junior to senior) students exhibited significantly greater readiness in the dimensions of self-directed learning, online communication self-efficacy, motivation for learning, and learner control compared to lower grade students (freshmen and sophomores). The results of the study also revealed that two readiness dimensions required special attention (learners' control and self-regulated learning). The authors suggested that teachers may need to help students develop self-directed learning and learner-control skills and attitudes for engaging in online learning (Hung et al. 2010).

Kaymak and Horzum (2013) reported that a correlation existed between the readiness levels of students for online learning and the perceived structure and interaction in online learning environments. The study employed a cross-sectional survey model. The survey utilized the readiness scale for online learning and adapted it into Turkish (Hung et al. 2010). The preferred sampling method was convenience sampling. The sample comprised 320 online-learning postgraduate students among 1,180 students completing postgraduate learning programs at Sakarya University's Institute of Social Sciences. The study revealed that readiness for online learning is important in terms of its structure, which can affect learning results and interaction factors. It should be noted that the participants were postgraduate students, who may have embodied different characteristics from undergraduate students.

Yu (2014) proposed the student online learning readiness (SOLR) scale with 22 self-reported items categorized into four dimensions: technical competencies, social competencies with class peers, social competencies with the instructor and communication competencies. The study tested the instrument using exploratory factors and reliability analyses. The findings confirmed the four-factor structure of the instrument. Its four categories are: (1) technical competencies, (2) social competencies with classmates, (3) social competencies with the instructor and (4) communication competencies. Communication competencies include the ability to express opinions in writing to others, respond to other people's ideas, express opinions in writing so that others can understand what he/she means and providing constructive and proactive feedback to others even when he/she disagrees.

A study conducted by Hong and Gardner (2018) was triggered by conflicting results from existing studies. On the one hand, there is the general view that students are 'digital natives' and have high expectations that technology will play a significant role in their education. On the other hand, studies have suggested that even though they may be technically competent in terms of using fashionable and up-to-date tools such as social media, learners may not be well-prepared for using e-learning tools (Boud 2014). Students were not well-prepared for activities such as reading and writing, providing clear and concise responses, synthesizing ideas, planning strategies, formulating arguments and team work (Parkes et al. 2015).

Incorporating the community of inquiry model, Learning Process and Learning Outcome (LEPO) and additional frameworks, Parkes et al. (2015) listed eight relevant constructs as signifying the dimension of the instrument, i.e. learners' characteristics (e.g. self-efficacy, self-regulation, social competence, digital competence), engagement in blended activities, the learning facilitators' presence and the learning environment (e.g. learning and technology design). The study aimed to explore the online learning (e-learning) preparedness of first-year students by using a blended learning approach and reviewing its effectiveness in facilitating their transition from high school to the university learning environment. The findings of the study showed that students possessed good regulatory skills. Most of the respondents stated that they were comfortable contributing to online discussions and able to work well in and enjoyed group work.

One of the strengths of online learning is that it facilitates online collaborative learning. Online learning competencies include the ability to participate in online discussions and other group work. Student preparedness for university online learning environments that also emphasizes interaction among learners, and between learners and instructors, was proposed by Parkes et al. (2015). The objective of this study was to identify and rank the importance of the competencies required by students for effective performance in a university e-learning environment using Learning Management System (LMS) and situating it within the social constructivist learning paradigm. The Hybrid BARS process used in the study was implemented in five stages as follows. Stage one: selection and formation of two expert panels; stage two: the generation of e-learning competencies by these panels; stage three: the amalgamation of lists affected by the researcher; stage four: verification of an amalgamated list by panel members; stage five: the external validation of the e-learning competencies. The identified competencies were grouped into three categories based on groupings used by Birch: (a) management of learning and the e-learning environment; (b) interaction with the learning content; (c) interaction with the e-learning community (Parkes et al. 2015).

Two expert panels identified 58 e-learning competencies considered essential for e-learning. Among these, 22 competencies are related to the use of technology, and the remaining 36 competencies encapsulate a range of practices considered to be essential for learning within a social constructivist framework (e.g., online discussion). Six of the competencies were either newly added or substantially different from competencies identified in the existing literature. These areas were as follows: (1) acknowledgement of the facilitative role of the lecturer in the learning environment; (2) critiquing a website concerning content; (3) critiquing the responses of others constructively; (4) evaluating a set of search results critically; (5) making allowances for the virtual nature of the learning environment; (6) recognizing the lecturer's response as a contribution and not the final word on an issue.

Parkes et al. (2015) utilized the instrument they developed to explore student and staff perceptions of the level of preparedness among students for a university e-learning environment mediated by a learning management system. The respondents were students, staff, and e-learning stakeholders at a regional university in New South Wales, Australia. The study showed that it can be challenging to develop e-learning environments that accommodate social constructivist principles. Four important issues emerged from the study. First, students perceived themselves to be poorly prepared in terms of balancing academic and social work. Second, in the competencies associated with interactions with content, the study identified low levels of student preparedness. Third, in general, students were considered to have relatively high levels of preparedness for technical competences or competencies associated with the use of technology and the internet. Fourth, they were not well prepared in the competencies involving working with others but appeared to be reasonably prepared for dealing with responding to others. These competencies are essential in online collaborative learning (Parkes et al. 2015).

Methodology

This study adopted the English version of the Students' Preparedness in the University e-Learning Environment questionnaire developed by Parkes et al. (2015). Competency categories were included in the questionnaire as follows:

1. The management of learning and the e-learning environment
2. Interaction with the learning content
3. Interaction with the e-learning community

Each category included 20, 13, and 21 items, respectively. The adaptation of the instrument was conducted based on the guidelines of adaptation proposed by Sousa and Rojjanasrirat (2010) to ensure the translation result was valid, reliable, and consistent with the original questionnaire.

Adaptation Process

Initial Process

The initial process consists of five stages, as follows:

a) Forward translation
This process began by translating the original questionnaire), i.e., the English version, into Bahasa Indonesia by two people, a professional translator, and an expert, as well as an instructor in the field of online learning. They conducted the initial translations independently. The results of the translations of these two translators were discussed together with the researchers to produce the first draft in Bahasa Indonesia (Draft v1).

b) Backward translation
Draft v1 was translated back into English by a different expert from the expert who carried out the forward translation. The expert was fluent in the original language and had a good understanding of the target language. This stage produced Questionnaire v1.

c) Expert committee review
For finalization of the draft, the research team compared Questionnaire v1 and the original questionnaires to identify the differences. The researcher then discussed the differences with the assistance of experts to revise Draft v1 to Draft v2. The experts were including the instructors in the field of online learning in higher education. The only differences found related to word choice, where some words had similar meanings (synonyms).

d) Instrument pre-tested
In this phase, a readability and face validity test were conducted. Draft v2 was distributed to 15 students (the target respondents). The respondents were asked to read the questionnaire items and asked what they thought about the items, their choice of answers, and whether the questions about the items were confusing; they were also asked for suggestions when they were confusing. All respondents completed the test. Three students were somewhat confused by long sentences and suggested breaking these into simpler ones. The final draft resulted from the revision of Draft v2 based on the analysis of the face validity test and the respondents' suggestions. The final draft of this stage was used in the pilot testing to discover rating scales and the unidimensionality of the questionnaire; item fit was evaluated using the Rasch model.

Pilot Testing

The final draft was administered to a large representative sample of respondents for whom the questionnaire was intended. If the pilot test was conducted using small samples, relatively large sampling errors may have reduced the statistical power needed to validate the questionnaire. The purpose of pilot testing is to test the unidimensionality and rating scale of the questionnaire. An item match analysis test was also carried out to review how suitable each item was for the questionnaire. Tests were carried out using Winstep (3.73) and were based on the Rasch model. The questionnaire was distributed to 73 students from the university's Faculty of Computer Science who had been randomly selected. However, only 55 students completed the questionnaires and informed consent.

Data processing was completed using Winstep software (Linacre 2020). The answer choices on the questionnaire represented ordinal data provided as a five-point Likert scale. Because the data were ordinal, it was transformed into a logit function to formulate it as interval data. Data analysis was performed using this logit data. Data transformation was carried out using the Rasch model (Boone et al. 2013). The first test conducted after the data had been converted into a logit function was to test the suitability of the model, a reliability test related to respondents, items and person–item interactions. Next, the instrument's unidimensionality, the validity of the rating scale and item fit were tested.

Unidimensionality test. The unidimensionality test measured the extent to which the diversity of instruments measured what needed to be measured. The test provided information as to whether the

instrument met the requirements of unidimensionality, i.e., the instrument items did not cluster into several different dimensions, thereby ensuring the measurement of instruments according to measurement objectives.

The format and rating scale test. This test checked whether the format and rating scale were suitable for the target population. In other words, the rating scale test was employed to verify whether the ranking used was in any way confusing to the participants. The item format was represented by a five-point rating scale: (1) strongly disagree, (2) disagree, (3) uncertain, (4) agree, (5) strongly agree. The test was conducted by considering the order of the average observed values. If the observed values are ordered it indicates that the respondents are not confused about the order of choices. The test can also indicate whether the scales required simplification. Next, fit analysis for each item was performed. After the items satisfied the above analysis tests, a further validity test was performed.

Validity and Reliability Checking

After the translated questionnaire items passed the rating scale and unidimensionality test, the validity and reliability checking were conducted. We distributed the questionnaire to the students of Universitas Indonesia, a large public university in Indonesia and gathered 1446 respondents. Afterwards, we conducted validity and reliability checks by applying the factor and item validity tests for each part of the questionnaire. Once the questionnaire had passed the validity test, the reliability test was conducted by measuring the Cronbach Alpha's values to investigate the consistency of each part and the questionnaire. We summarized the adaptation process in the following figure (Figure 1).

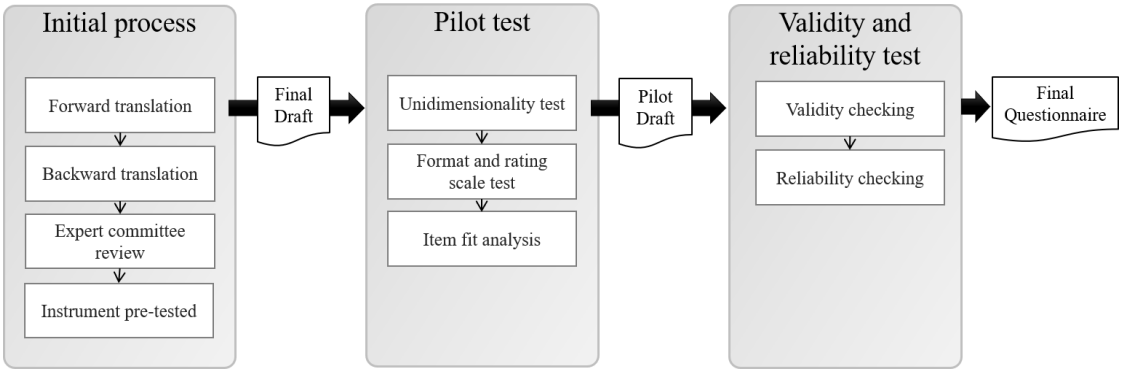

Figure 1. A summary of the adaptation process

Results and Discussion

This section presents the results of research and discussion. Results can be presented in figures, graphs, tables and others that make the reader understand easily (Beaton et al. 2000; Hashim and Tasir 2014). Following the results in each subsection, we discuss the findings.

Preliminary testing

Fit Analysis of the Rasch Model

Data fit evaluation of the Rasch model is identified from the values of infit, outfit and person reliability, item and person–item interaction. The infit is the value of how close the item measures with the person measure, while the outfit is the value of how far the item measures to the person measure. The values used to test the suitability of the data against the model were MEAN (MNSQ and ZSTD) infit and outfit and item reliability. These values were compared to the fit criteria as presented by Sumintono and Widhiarso (2014). Table 1 presents statistics of the overall fit of the questionnaire items compared to the accepted values presented in Bond and Fox (2013) and Sumintono and Widhiarso (2014).

Table 1. The Fit Statistics of Items Based on The Rasch Model

Criteria	Statistics	Accepted value	Result	Ideal value
infit	1.00	0.5 - 1.5	ideal	1.00
infit ZSTD	-0.4	-2 - +2	fit	0.0
outfit MNSQ	1.00	0.5 - 1.5	ideal	1.00
outfit ZSTD	-0.4	-2 - +2	fit	0.0
item reliability	0.90	> 0.7	high	

The MNSQ (mean squared) infit value is close to ideal, and the MNSQ (mean square) outfit value is equal to the ideal one. The ZSTD (Z-standard) infit and outfit values are close to the ideal value of 0.00, and the item reliability is good. In conclusion, the data fits the model. Additionally, based on the overall suitability of the data with the model, the fit-test can be conducted up to the item level, person reliability, and person–item interactions. A summary of the initial statistical data is presented in Figure 2.

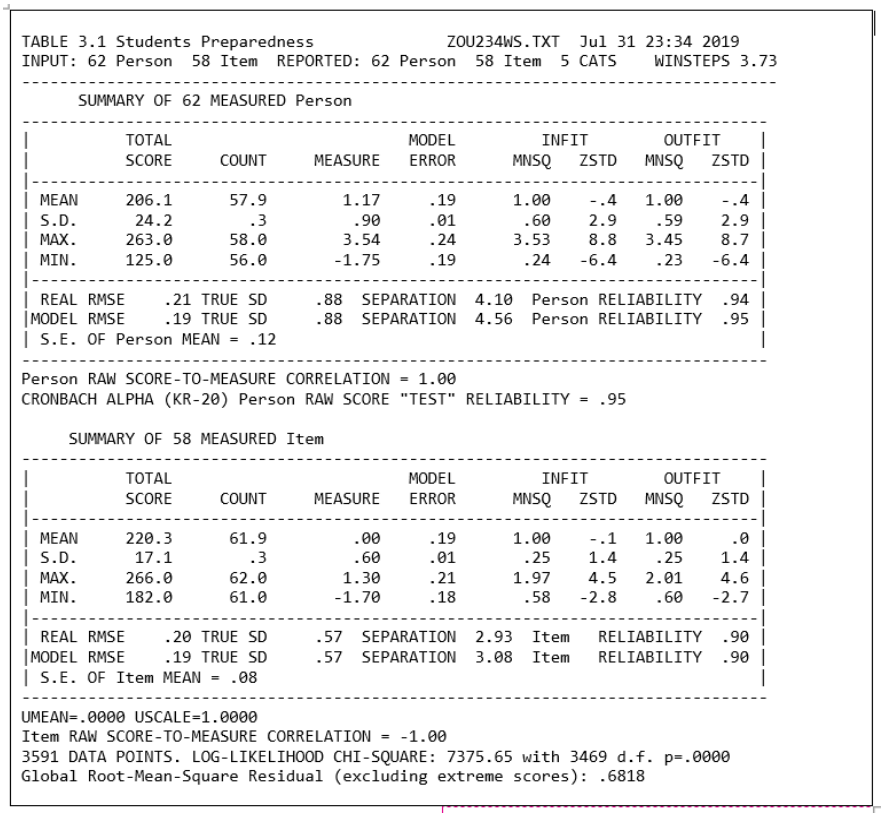

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TABLE 3.1 Students Preparedness              ZOU234WS.TXT  Jul 31 23:34 2019
INPUT: 62 Person  58 Item  REPORTED: 62 Person  58 Item  5 CATS    WINSTEPS 3.73
-------------------------------------------------------------------------------
      SUMMARY OF 62 MEASURED Person
-------------------------------------------------------------------------------
|          TOTAL                          MODEL         INFIT        OUTFIT    |
|          SCORE     COUNT     MEASURE   ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN     206.1      57.9        1.17     .19      1.00    -.4   1.00    -.4 |
| S.D.      24.2        .3         .90     .01       .60    2.9    .59    2.9 |
| MAX.     263.0      58.0        3.54     .24      3.53    8.8   3.45    8.7 |
| MIN.     125.0      56.0       -1.75     .19       .24   -6.4    .23   -6.4 |
|-----------------------------------------------------------------------------|
| REAL RMSE    .21 TRUE SD     .88  SEPARATION  4.10  Person RELIABILITY  .94 |
|MODEL RMSE    .19 TRUE SD     .88  SEPARATION  4.56  Person RELIABILITY  .95 |
| S.E. OF Person MEAN = .12                                                   |
-------------------------------------------------------------------------------
Person RAW SCORE-TO-MEASURE CORRELATION = 1.00
CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .95

     SUMMARY OF 58 MEASURED Item
-------------------------------------------------------------------------------
|          TOTAL                          MODEL         INFIT        OUTFIT    |
|          SCORE     COUNT     MEASURE   ERROR      MNSQ   ZSTD   MNSQ   ZSTD |
|-----------------------------------------------------------------------------|
| MEAN     220.3      61.9         .00     .19      1.00    -.1   1.00     .0 |
| S.D.      17.1        .3         .60     .01       .25    1.4    .25    1.4 |
| MAX.     266.0      62.0        1.30     .21      1.97    4.5   2.01    4.6 |
| MIN.     182.0      61.0       -1.70     .18       .58   -2.8    .60   -2.7 |
|-----------------------------------------------------------------------------|
| REAL RMSE    .20 TRUE SD     .57  SEPARATION  2.93  Item   RELIABILITY  .90 |
|MODEL RMSE    .19 TRUE SD     .57  SEPARATION  3.08  Item   RELIABILITY  .90 |
| S.E. OF Item MEAN = .08                                                     |
-------------------------------------------------------------------------------
UMEAN=.0000 USCALE=1.0000
Item RAW SCORE-TO-MEASURE CORRELATION = -1.00
3591 DATA POINTS. LOG-LIKELIHOOD CHI-SQUARE: 7375.65 with 3469 d.f. p=.0000
Global Root-Mean-Square Residual (excluding extreme scores): .6818
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Figure 2. Summary Statistics

Figure 2 shows the participant's reliability and the validity of items in the questionnaire, and the interaction between persons and items (Cronbach's Alpha). Overall, the average participant's score (person mean measure) is 1.00; this is higher than the average item score (item mean measure) of 0.0, indicating that the respondents tended to have a good understanding of the questionnaire, therefore the probability of the question answered correctly by the respondents can be related to the ability of the respondent. Figure 2 also shows that person and item reliability are, respectively, 0.94 (very good) and 0.90 (good). The Cronbach's Alpha value of 0.95 exhibits excellent interaction between the respondents and items.

Unidimensionality Test

The Rasch model is useful to test the unidimensionality of items, one of the fundamental tests needed. To investigate whether the items of the questionnaire are unidimensional, the raw variance and the unexplained variance of the data are compared to the acceptable values. The information about the two types of variances is shown in the Figure 3.

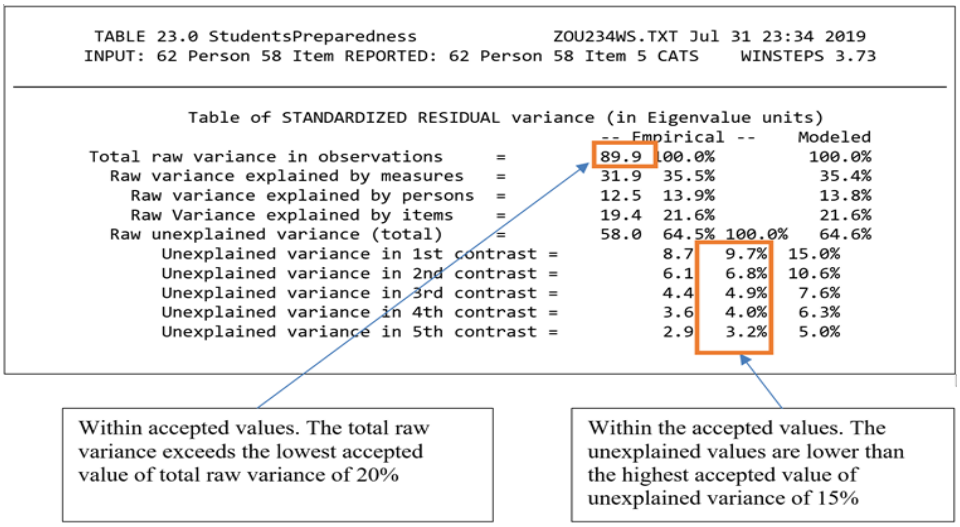

Figure 3. The Unidimensionality Test

The raw variance of 35.5% exceeds the lower limit of the lowest accepted value of 20%. The raw variance is used to show that the data distribution is close to the data central. In addition, all unexplained variances are less than the highest accepted value of 15%. Therefore, the instrument meets the unidimensional requirements, i.e., the instrument items do not cluster into two or more different dimensions. Therefore, the instrument is functional according to the measurement objectives.

Rating Scale Validity Test

The choices for the rating scale on the e-learning readiness questionnaire are: (1) unprepared; (2) not very prepared; (3) somewhat prepared; (4) prepared; (5) very prepared. The rating scale measurement (RSM) validity test was conducted to check whether the respondents understood the order of choices well.

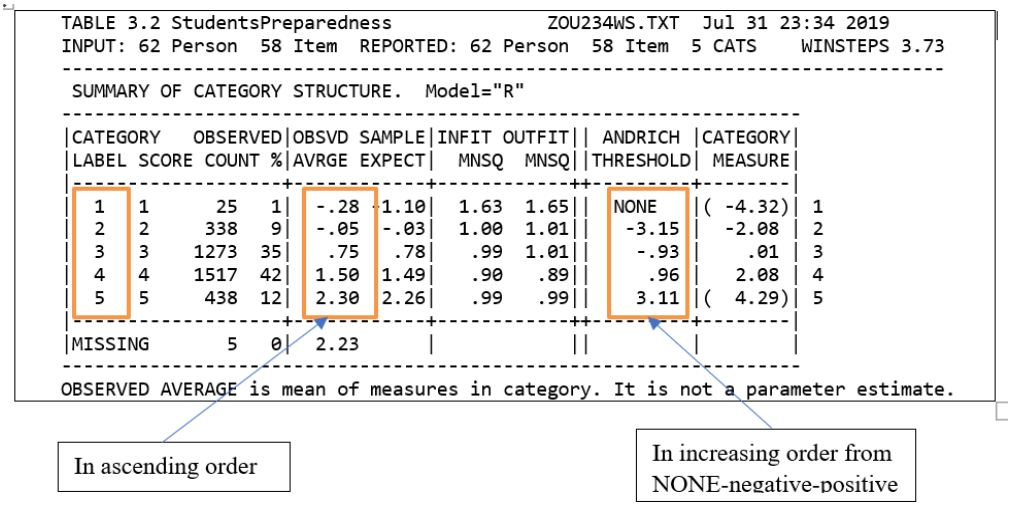

Figure 4. Statistics for Rating the Scale Test

Figure 4 shows the value is sorted to positive value, it indicated that the rating scale was valid, and the respondents were not confused about the order of choices. Figure 4 also shows that each choice of the rating scale was selected by participants. The choices were well understood by the respondents. They were able to distinguish between choices 1, 2, 3, 4 and 5. In addition, the table provides the Andrich threshold values are: NONE, -3.15, -0.93, 0.96 and up to 3.11. The values are in an orderly manner to positive numbers. It indicates that the choices are valid and do not need to be simplified.

Item-fit Statistics

To test whether each item fit the model, the item measure scores are compared to the standard item match values. Item C14, i.e., 'encourages others to post through positive responses' (*mendorong orang lain untuk memberi tanggapan positif*) does not fit the model. The MNSQ INFIT value of 1.97 was greater than 1.25, (MEAN + SD MNSQ INFIT); the MNSQ OUTFIT value of 2.01 was greater than the acceptable limit, i.e., 1.5; the ZSTD OUTFIT value of 4.6 exceeded the upper limit accepted value of 2; the Pt values measuring CORR. was 0.23, less than the acceptable lower limit of 0.4. This misfit may have been caused by the meaning of the item coming across as ambiguous and open to more than one interpretation (Boone et al. 2013). In-depth interviews with selected respondents revealed that they were confused about the meaning of 'positive responses' as 'providing encouragement or appreciation', or narrowly interpreted this as 'responses about positive aspects only'. The sentence for item C14 was then simplified to, *'mendorong orang lain memberi tanggapan yang bermakna'*, which has a slightly different meaning, 'Encouraging others to give meaningful responses', 'Meaningful responses' has neutral and a more general meaning. It may refer to types of critiques about failures (e.g., indicating misconceptions) or to comments about achievements. The final questionnaire contains 3 latent variables: (A) Management of e-learning and e-learning environment that have 24 indicator variable, (B) Interaction with e-learning content that have 13 indicator variable, and (C) Interaction with e-learning community that have 21 indicator variable (see Appendix).

Validity and Reliability Checking

The translated questionnaire items passed the rating scale and unidimensionality tests. Subsequently, a test was conducted among intended populations for validation.

SAF Data Collection and Analysis

The data was collected in May 2019, in the middle of the second semester of the 2019/2020 academic year. The sampling method used is proportional random sampling by each faculty. The sample size of 1446 included first-year students from Universitas Indonesia, a large public university in Indonesia, who completed the questionnaire and signed the informed consent form. Initially, 2081 respondents participated; however, some of them did not complete the questionnaire. Table 2 shows total number of participant and age qualification of the participant.

Table 2. Study Participants

Total number of participants	**Age**
1446 students	18-23 years old

The questionnaire comprised three parts. Part A included the management of learning and the e-learning environment. Part B addressed interaction with the learning content. Part C represented interaction with the e-learning community. Validity and reliability checks were applied for each part of the questionnaire (factor and item validity).

The factor validity measured the validity of the items throughout the corresponding part (A, B, or C) and for the entire questionnaire. The item validity measured the validity of each item throughout the corresponding part. Once the questionnaire had passed the validity test, the reliability test was conducted to investigate the consistency of each part and the questionnaire.

The Validity and Reliability of Items in Part A: Management of Learning and E-learning Environment

The validity test for the items in Part A was carried out by observing the 'Corrected Item-Total Correlation' column in Table 3. The value in this column was the calculated r-value of each item in Part A. If the r-value of an item is greater than the R Table, the item is deemed valid. The R Table value used for DF = n-2 = 1466-2 = 1464, and of alpha = 0.05, is 0.0512. Table 3 summarizes the results of the validity tests for each item of Part A.

Table 3. The Validity of Items in Part A

Item-Total Statistics							
Item	***Scale Mean if Item Deleted***	***Scale Variance if Item Deleted***	***Corrected Item-Total Correlation (r-value)***	***Squared Multiple Correlation***	***Cronbach 's Alpha if Item Deleted***	***R Table***	***Output***
A1	185.82	366.663	.466	.334	.930	.0512	Valid
A2	185.13	375.056	.404	.389	.931	.0512	Valid
A3	185.63	366.787	.514	.484	.930	.0512	Valid
A4	186.03	360.137	.567	.497	.929	.0512	Valid
A5	185.59	366.561	.535	.517	.929	.0512	Valid
A6	187.37	350.843	.549	.414	.930	.0512	Valid
A7	186.28	357.099	.681	.561	.927	.0512	Valid
A8	185.65	362.907	.655	.625	.928	.0512	Valid
A9	185.99	362.653	.656	.502	.928	.0512	Valid
A10	185.68	365.771	.583	.454	.929	.0512	Valid
A11	186.90	350.717	.586	.492	.929	.0512	Valid
A12	186.29	353.378	.661	.594	.927	.0512	Valid
A13	185.97	363.387	.544	.398	.929	.0512	Valid
A14	186.46	357.330	.673	.549	.927	.0512	Valid
A15	186.15	356.281	.554	.441	.929	.0512	Valid
A16	186.40	357.018	.587	.449	.929	.0512	Valid
A17	185.89	361.726	.643	.494	.928	.0512	Valid
A18	186.39	361.702	.543	.384	.929	.0512	Valid
A19	186.49	352.756	.693	.567	.927	.0512	Valid
A20	186.20	357.658	.593	.478	.929	.0512	Valid
A21	186.20	358.744	.529	.418	.930	.0512	Valid
A22	186.15	358.395	.661	.481	.928	.0512	Valid
A23	186.43	358.497	.579	.622	.929	.0512	Valid
A24	186.53	355.592	.612	.661	.928	.0512	Valid

The reliability test of items in Part A was carried out by considering the value in 'Cronbach's Alpha based on standardized items' (see Table 5). If the Cronbach's Alpha value was greater than 0.7 the items were reliable (Bolarinwa and others 2015). A low Cronbach's Alpha value indicated a low correlation between items. It should be noted that Cronbach's Alpha is not an estimate of reliability for a questionnaire under all circumstances; it only indicates the extent to which the questionnaire is reliable for a population.

Table 4 shows that the Cronbach's Alpha value is 0.934, higher than the lower limit of 0.7, it indicates the items in Part A are reliable.

Table 4. Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.931	.934	24

Had the value been greater than the Cronbach's Alpha in the reliability statistics table (Table 4), the item should have been excluded. Consider the column 'Cronbach's Alpha if item deleted' in Table 3. All items should be included in Part A since the value of Cronbach's Alpha in this column is smaller than the Cronbach's Alpha in Table 4. In other words, the questionnaire will be more reliable if this item is deleted from Part A. In conclusion, based on the results of Table 3 and Table 4, the items in Part A are valid and reliable for measuring students' readiness in terms of management of learning and the e-learning environment.

The Validity and Reliability of Items in Part B: Interaction with the Learning Content

Part B comprised 13 items related to competencies for accessing, managing, and utilizing teaching materials in various formats. The validity of the items in Part B was identified by observing the 'corrected item-total statistics' column of Table 6. Consider the column 'Cronbach's Alpha if item deleted' in Table 5. All values in this column are lower than 0.907 and the "Corrected Item-Total Correlation" value in each item is higher than R table (0.502); therefore, all items should be included in Part B, all items were valid.

Table 5. Validity Items of Part B

Item-Total Statistics							
Item	***Scale Mean if Item Deleted***	***Scale Variance if Item Deleted***	***Corrected Item-Total Correlation (r-value)***	***Squared Multiple Correlation***	***Cronbach's Alpha if Item Deleted***	***R Table***	***Output***
B1	113.6088	141.794	.617	.517	.897	.0512	Valid
B2	113.7108	140.392	.681	.571	.894	.0512	Valid
B3	113.4372	139.779	.580	.522	.898	.0512	Valid
B4	113.4454	142.626	.580	.388	.898	.0512	Valid
B5	113.5075	140.161	.659	.566	.895	.0512	Valid
B6	113.5089	139.499	.626	.516	.896	.0512	Valid
B7	113.0655	142.861	.629	.534	.896	.0512	Valid
B8	113.4441	142.609	.604	.464	.897	.0512	Valid
B9	113.6596	140.598	.673	.586	.895	.0512	Valid

Item-Total Statistics							
Item	***Scale Mean if Item Deleted***	***Scale Variance if Item Deleted***	***Corrected Item-Total Correlation (r-value)***	***Squared Multiple Correlation***	***Cronbach's Alpha if Item Deleted***	***R Table***	***Output***
B10	113.6965	143.298	.556	.406	.899	.0512	Valid
B11	113.6576	141.202	.685	.532	.894	.0512	Valid
B12	113.5089	141.990	.593	.400	.897	.0512	Valid
B13	113.8315	140.456	.563	.357	.899	.0512	Valid

Table 6. Reliability Statistics Part B

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.904	.907	13

Table 6 shows the reliability test for part B. As shown in Table 6, the value of Cronbach's Alpha was 0.904, greater than 0.7. Therefore, the items in Part B are reliable. In conclusion, the items in Part B are valid and reliable for measuring students' preparedness in interacting with the learning content.

The Validity and Reliability of Items in Part C: Interaction with E-learning Community

Part C of the preparedness questionnaire focuses on interactions between the student and other participants (other students, tutors, and instructors) in an online discussion forum and other types of group work. Table 7 presents the validity test results for each item of Part C. The final column (output) indicates that each item is valid.

Table 7. The Validity of Items in Part C

Item-Total Statistics							
Item	***Scale Mean if Item Deleted***	***Scale Variance if Item Deleted***	***Corrected Item-Total Correlation (r-value)***	***Squared Multiple Correlation***	***Cronbach's Alpha if Item Deleted***	***R Table***	***Output***
C1	173.1760	352.224	.564	.430	.933	.0512	Valid
C2	173.1561	347.915	.259	.099	.944	.0512	Valid
C3	173.3894	346.752	.590	.434	.932	.0512	Valid
C4	174.1248	330.436	.654	.548	.931	.0512	Valid
C5	173.4556	342.420	.677	.586	.931	.0512	Valid
C6	174.0357	338.571	.648	.532	.931	.0512	Valid
C7	173.5934	341.845	.710	.607	.930	.0512	Valid
C8	173.1844	348.681	.620	.512	.932	.0512	Valid
C9	172.9338	351.314	.605	.550	.932	.0512	Valid
C10	173.6442	341.944	.688	.589	.931	.0512	Valid
C11	173.6843	343.015	.744	.640	.930	.0512	Valid

Item-Total Statistics							
Item	***Scale Mean if Item Deleted***	***Scale Variance if Item Deleted***	***Corrected Item-Total Correlation (r-value)***	***Squared Multiple Correlation***	***Cronbach's Alpha if Item Deleted***	***R Table***	***Output***
C12	173.4986	342.272	.729	.610	.930	.0512	Valid
C13	173.3485	346.632	.650	.523	.932	.0512	Valid
C14	173.9140	340.865	.643	.538	.931	.0512	Valid
C15	173.6899	345.171	.697	.609	.931	.0512	Valid
C16	173.6304	344.726	.673	.516	.931	.0512	Valid
C17	174.4368	332.236	.636	.534	.932	.0512	Valid
C18	173.4921	343.977	.662	.515	.931	.0512	Valid
C19	173.6855	341.618	.713	.612	.930	.0512	Valid
C20	173.7073	341.616	.701	.566	.931	.0512	Valid
C21	174.1954	337.886	.632	.531	.932	.0512	Valid
C22	173.4655	343.567	.512	.433	.934	.0512	Valid

Overall, the items in Part C were reliable as shown by the value of Cronbach's Alpha at 0.934 (Table 8).

Table 8. Reliability Statistics in Part C

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.934	.944	22

Note that the value of 'Cronbach's Alpha if item deleted' for item C2 was 0.944, greater than 0.934. It indicates that Part C of the questionnaire will be more reliable if item C2, 'seeks information through either own enquiries or the questioning of others' is removed. In this case, Cronbach's Alpha value from 0.934 will rise to 0.944. However, we also can use the column "Cronbach's Alpha Based on Standardized Items", by comparing the Cronbach's Alpha value in Table 8 with Cronbach's Alpha C2 in Table 7, the value is equal. It indicates that overall, the items (including item C2) were reliable. Next, the validity and reliability of parts A, B, and C were tested against the questionnaire.

The Validity and Reliability of Parts A, B, and C

After each indicator in part A, B, C was tested by validity and reliability test. Table 9 is present the validity test for each part. The values of R-Count were greater than the R Table. Therefore, all parts of the questionnaire are valid.

Table 9. The Validity of Parts A, B and C

Part	R-Count	R Table	Output
Part A	.806	.0512	Valid
Part B	.817	.0512	Valid
Part C	.770	.0512	Valid

Furthermore, Table 10 is shown the reliability statistic test for overall parts. The Cronbach's Alpha presented in the reliability statistics table is 0.897 higher than 0.7, indicating that all parts of the questionnaire were reliable. We concluded that parts A, B and C of the questionnaire were valid and reliable for measuring students' preparedness to study in an e-learning environment.

Table 10. Reliability of Parts A, B and C

Cronbach's Alpha	N of Items
.897	3

The correlation between each pair of parts of the questionnaire is important to ensure the impact of a change in certain items on others. Next, we investigate the correlation among parts of the questionnaire.

Correlations Among Parts A, B, and C

The correlation among parts A, B and C is shown in Table 11. Table 11 shows the correlation between the pairs of the three parts. The correlation score between Part A and Part B is 0.782. This indicates that the items of Part A had a strong relationship with the items of Part B. Similarly, the correlation score between Part A and Part C is 0.719, indicating that the items of Part A had a strong positive relationship with the items of Part C. Items of Part B and items in Part C have strong correlation as indicated by the correlation score of 0.735. In conclusion, the items of parts A, B and C have a positive and strong correlation.

Table 11. Correlations between the three questionnaire parts

Part		A	B	C
A	Pearson Correlation	1	.782**	.719**
	Sig. (2-tailed)	-	.000	.000
	N	1466	1466	1466
B	Pearson Correlation	.782**	1	.735**
	Sig. (2-tailed)	.000	-	.000
	N	1466	1466	1466
C	Pearson Correlation	.719**	.735**	1
	Sig. (2-tailed)	.000	.000	-
	N	1466	1466	1466

** Correlation is significant at the 0.01 level (2-tailed).

Summary of Results

Based on the fit statistics of all items in Table 1, the data fits the model. The summary statistics in Figure 2 shows the respondents tended to have a good understanding of the questionnaire and the person and item reliability are very good and good. Furthermore, the Cronbach's Alpha value exhibits excellent interaction between the respondents and items.

The unidimensionality test in Figure 3 depicts that the instrument is functional according to the measurement objectives. Rating scale validity test indicated that it is valid, and the respondents do not confuse about the order of choices (Figure 4). Moreover, item fit statistics shows all items fit except item C14; this was due to the multi-interpretational nature of the item. The item was included in the following revision (pilot questionnaire).

After passing the rating scale and unidimensionality tests, a test was conducted among intended populations (n = 1446) for validation and reliability checking. The results show that the items in each part (A, B, or C) are valid and reliable for measuring students' preparedness in terms of management of learning and the e-learning environment, interaction with the learning content, and interaction with the learning community. All parts of the questionnaire are also valid and reliable for measuring students' preparedness to study in an e-learning environment. Additionally, the items of parts A, B and C have a positive and strong correlation.

Conclusion

The current study selected the instrument for translation and adaptation into Bahasa Indonesian based on its wide range of competencies coverage, including online collaborative learning competency. In addition, the e-learning competencies identified in this study described in observable and measurable terms the requisite knowledge, understanding, skills, attitudes, and behaviors students require for effective performance in the university e-learning environment. The adaptation process followed the following steps: forward translation, backward translation, expert committee review for the finalization of the draft and instrument pre-testing.

Pilot testing was conducted to test the unidimensionality, rating scale validity, and item fit of the questionnaire. The results showed that the instrument was unidimensional and that the respondents understood the rating scale well. Following the pilot testing, the validity and reliability tests for items in parts A, B and C concluded that the items of each part are valid and reliable. Likewise, parts A, B and C of the questionnaire were deemed valid and reliable. The items in these three parts also indicated a positive and strong correlation. Therefore, the final questionnaires can be used to measure student preparedness to learn in an e-learning environment in the perception of students. It is well suited for Indonesian because it considers language (translation) and cultural adaptation issues.

By understanding students' level of readiness for the university e-learning environment, lecturers can design proper instructional strategies accordingly and help them to improve their readiness. Additionally, the cross-cultural adaptation method used in this study can be applied in different context of translation to increase its validity and reliability. The limitation of the present study was that the participants, despite being multi-ethnic, all studied at the same university. Further questionnaire adoption involving several universities from different regions or educational degrees may serve as a potential research topic in the future.

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Appendix

Code	Competencies (Original version)	Kompetensi (Bahasa Indonesia version)
A	**management of e-learning and e-learning environment**	***pengelolaan pembelajaran daring dan lingkungan pembelajaran daring***

A1	downloads and uploads information and resources	*mengunggah dan mengunduh informasi dan sumber bela jar*
A2	uses search engines effectively	*menggunakan mesin pencari secara efektif*
A3	uses a web browser with skill and purpose	*menggunakan webbrowser dengan terampil sesuai tujuan*
A4	integrates a variety of software applications to create a product	*mengintegrasikan berbagai aplikasi perangkat lunak untuk menciptakan suatu luaran/produk*
A5	uses technology to assist in the construction of knowledge	*menggunakan teknologi untuk membantu pemahaman da n pembentukan pengetahuan*
A6	works to a disciplined timeframe	*belajar/ bekerja secara disiplin dan terjadwal*
A6	adapts learning style to the e-learning environment	*beradaptasi dengan gaya belajar yang sesuai dengan lingkungan pembelajaran daring*
A7	uses technology to support own learning style	*menggunakan teknologi untuk mendukung pembelajaran sesuai dengan gaya belajar*
A8	identifies the requirements necessary to complete a task	*mengidentifikasi semua kebutuhan untuk menyelesaikan tugas*
A9	searches the Internet strategically	*mencari informasi menggunakan Internet dengan strategi yang baik*
A10	anticipates and makes allowances for "wait time" in asynchronous discussions	*mengantisipasi dan memberikan waktu tunggu (jeda waktu menunggu tanggapan) dalam diskusi asinkron*
A11	demonstrates knowledge and use of the Learning Management System	*menunjukkan pengetahuan dan kemampuan menggunakan Learning Management System*
A12	undertakes set tasks independently	*mengerjakan tugas secara mandiri*
A13	uses problem solving strategies	*menerapkan strategi penyelesaian masalah*
A14	priorities competing tasks within the time available	*membuat skala prioritas dalam mengerjakan tugas-tugas yang harus diselesaikan secara bersamaan*
A15	uses feedback to evaluate own performance (self-critique)	*memanfaatkan umpan balik untuk mengevaluasi kinerja diri sendiri (mengritik diri sendiri)*
A16	selects the appropriate technology tool for the task at hand	*memilih teknologi yang sesuai untuk menyelesaikan tuga s yang dihadapi*
A17	employs a logical process to identify and solve a computer problem	*menerapkan tahapan logis untuk menyelesaikan masalah terkait dengan penggunaan komputer*
A19	plans an appropriate strategy to undertake a task	*membuat perencanaan strategi yang sesuai untuk menyelesaikan tugas*
A20	views oneself positively as a learner	*memandang diri sendiri secara positif sebagai pemb elajar*
A21	balances work, social, family and study commitments	*menyeimbangkan beban kerja, komitmen belajar dengan kehidupan sosial dan keluarga*
A22	makes allowances for the virtual nature of the learning environment	*menggunakan keleluasaan yang ditawarkan oleh lingku ngan belajar virtual*
A23	engages in the process of reflection	*terlibat dalam proses refleksi (menilai diri sendiri)*
A24	understands own cognitive processes and thinking strategies	*memahami proses berpikir sendiri dan strategi bernalar*
B	**interaction with the learning content**	***interaksi dengan konten pembelajaran***
B1	forms connections between prior knowledge and new knowledge	*mengaitkan antara pengetahuan lama dengan pengetahuan yang baru dipelajari*
B2	able to navigate large bodies of content	*mampu menavigasi konten (materi) pembelajaran dalam jumlah banyak*
B3	presents information in a variety of formats (video, audio, etc)	*menyajikan konten (materi) pembelajaran dalam berbagai format (video, audio, dll)*
B4	reads and writes at an appropriate level	*membaca dan menulis sesuai dengan kebutuhan*
B5	extracts information from a variety of formats	*mengambil intisari dari informasi yang tersaji dalam berbagai format*
B6	cross references between sources to determine accuracy	*membandingkan berbagai sumber informasi untuk menguji akurasinya*
B7	accesses information from a variety of sources (e.g. web pages, podcasts)	*mengakses informasi dari berbagai sumber (contoh: halaman web, podcast)*
B8	able to distinguish between relevant and irrelevant items	*mampu membedakan informasi mana yang relevan dengan yang tidak relevan*

B9	evaluates a set of search results critically	*mengevaluasi hasil penelusuran secara kritis*
B10	identifies and rectifies gaps in one's own understanding	*mengidentifikasi kesenjangan pemahaman sendiri dan berupaya memperbaikinya*
B11	develops responses which synthesize a range of ideas	*mengembangkan respons/tanggapan yang meramu dan mengintegrasikan berbagai gagasan*
B12	goes outside the technology and learning community to seek information	*mencari informasi dari luar tidak terbatas pada teknologi dan komunitas belajar daring*
B13	critiques a web site in relation to content	*mengritik website berkenaan dengan konten yang dimuatnya*
C	**interaction with the e-learning community**	***interaksi dengan komunitas pembelajaran daring***
C1	responds to others with respect)	*menanggapi anggota lain dengan rasa hormat kepada a nggota lain*
C2	seeks information through either own enquiries or the questioning of others	*menggali informasi dengan bertanya pada diri sendiri atau orang lain*
C3	applies the rules of netiquette consistently	*menjunjung etika dalam berkomunikasi lewat internet dengan konsisten*
C4	uses interpersonal communication skills	*menerapkan kemampuan komunikasi interpersonal*
C5	considers and acts upon feedback from members of the learning community	*mempertimbangkan dan menggunakan umpan balik dari komunitas belajar*
C6	shares personal experiences in responses when relating to topic and others	*berbagi pengalaman pribadi yang terkait dengan topik bahasan atau anggota lain*
C7	works with others to collaboratively construct knowledge	*bekerjasama secara kolaboratif untuk membentuk pengetahuan*
C8	willing to have ideas challenged	*bersedia gagasannya dikupas dan dikritisi*
C9	acknowledges the facilitation role of lecturer in the learning environment	*menghargai dan mengakui peran dosen sebagai fasilitator dalam lingkungan belajar*
C10	contributes new ideas to a discussion	*berkontribusi dengan mengajukan ide baru dalam diskusi*
C11	provides responses in clear, concise and unambiguous language	*memberi tanggapan dengan jelas, tepat, dan tidak ambigu (bermakna ganda)*
C12	views oneself as a member of the learning community	*memandang diri sebagai bagian dari komunitas belajar*
C13	asks for guidance or seek clarification for misunderstandings	*meminta pendapat atau menglarifikasi pemehaman yang salah*
C14	encourages others to post through positive responses	*mendorong anggota lain untuk memberi tanggapan yang bermakna*
C15	justifies own stance on an issue	*mengajukan justifikasi pendapat atau pendirian terhadap masalah*
C16	determines when it's time to 'listen' to or contribute a response	*menentukan kapan 'mendengar' dan kapan berkontribusi memberi tanggapan*
C17	arranges schedule to allow for regular online sessions	*mengatur waktu untuk mengikuti sesi daring secara teratur*
C18	recognizes lecturer's response as a contribution and not final word on an issue	*memahami bahwa tanggapan dosen merupakan kontribusi dan bukan keputusan akhir dalam menyelesaikan masalah*
C19	critiques the responses of others constructively	*mengajukan kritik konstruktif terhadap tanggapan orang lain*
C20	seeks interaction with other members of the learning community	*berupaya berinteraksi dengan anggota lain dalam komunitas belajar*
C21	comments upon or critiques a response made by the lecturer	*memberi komentar atau mengritisi tanggapan yang diberikan dosen*

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