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Development and validation of a self-assessment-based instrument to measure elementary school students' attitudes in online learning

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ABSTRACT

Online learning during the COVID-19 pandemic makes it difficult for teachers to assess student learning attitudes. Limited availability of instruments to measure attitudes of students when they are engaged in online learning leads to difficulty of teachers to conduct appropriate assessments on that measure. The current study, therefore, mainly was intended to produce a self-assessment-based instrument that is feasible to use to measure students' attitudes in online learning. In order to produce such instrument, we used developmental research method by following steps in the instrument design that is proposed by McCoach, Gable, and Madura. Furthermore, in order to provide feasibility of our instrument, we provided evidence of content validity through experts' judgment data as well as evidence of construct validity with confirmatory factor analysis (CFA) and reliability estimation with Cronbach's α through a limited trial and an expanded trial using response data of sixth graders of elementary school engaged in online learning. Our study has produced a self-assessment-based instrument that uses a summated rating scale and is composed of six components (i.e., honest, disciplined, responsible, polite, caring, and self-confident) and 24 items that have demonstrated evidence of content validity, stable factor structure, and high reliability estimates.

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INTRODUCTION

Learning activities have a very essential position in educational activities, and subsequently it will determine the extent of the success of education organized. Given the essential position of these learning activities, the learning process should be carefully planned and implemented as much as possible in accordance with what has been planned by taking into account many things. The implementation of the learning process in schools is certainly inseparable from the curriculum as its basis which at least regulates how the standard process or learning activities should be carried out, regulates what students should learn and master through learning organized at school, and how measurement, assessment, and evaluation of learning are carried out to determine the extent to which the achievement of learning objectives and improve the quality of learning. To support students to achieve learning objectives, the Indonesian government through the national curriculum suggests a number of strategies, approaches or methods that teachers can apply to facilitate

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their students' learning that are adjusted to the level of education. For example, at the elementary school level the government suggests the use of an integrated thematic learning approach to facilitate student learning. This learning approach allows students to master a number of basic competencies in cognitive, affective, and psychomotor aspects through their engagement in associating several topics (or even subjects) integrated in a particular theme that is close to students' authentic real-life issues (Drake & Reid, 2020; Ghunu, 2022). It has also been suggested that the application of this learning approach, which emphasizes positioning students as active constructors and interpreters of knowledge, is a relevant and potential way to promote 21st century competencies such as critical thinking skills in students as well as promoting competencies in the affective domain such as self-regulation, attitudes, and emotional health (Drake & Reid, 2020).

Although previous studies have demonstrated the benefits of integrated thematic learning such as achieving learning outcomes and developing students' personal aspects (Drake & Reid, 2020), the implementation of this learning approach inevitably brings its own challenges for teachers, especially during the COVID-19 pandemic that required learning to be carried out online. Numerous studies have revealed various challenges in online learning during the COVID-19 pandemic at the elementary school level, which include limited and unequal access of students to the technological tools or devices needed to engage in online learning, designing and implementing online learning while focusing on student-centered learning, increasing students' active engagement in online learning, managing students' learning motivation and attitudes, and conducting learning assessments (Abdurrahmansyah et al., 2022; Erawati et al., 2021; Masry-Herzallah & Stavissky, 2021). It is undeniable that in the midst of the COVID-19 pandemic that requires learning to be carried out online, teachers face more challenges in monitoring students, whether students are serious in participating in the learning that the teacher facilitates and working on an assessment, test, or assignment that the teacher provides as a means of identifying the extent to which students master the competencies they are expected to master and as a means of improving the quality of online learning itself (Abdurrahmansyah et al., 2022). The challenges that arise from online learning lead teachers at elementary school to focus more on assessing cognitive aspects than psychomotor and affective aspects; and subsequently this can hinder the development of competencies in the attitude domain in students (Abdurrahmansyah et al., 2022). This phenomenon is not only triggered by the shift in learning mode but also due to the difficulty of teachers in elementary schools in conducting assessments targeting affective aspects such as student attitudes in learning activities due to the lack of standardized instruments that they can refer to or use (Fauzani et al., 2021; Prihatni et al., 2019) and the inadequate ability of teachers to develop instruments to measure student competencies in the affective domain that are valid and reliable (Abdurrahmansyah et al., 2022; Erawati et al., 2021; Fauzani et al., 2021).

The competence of elementary school students in the affective aspect should also receive the same attention as the cognitive aspect because, as we have mentioned earlier, most subjects in schools tend to overlook affective aspects and prioritize cognitive and psychomotor aspects (Wu et al., 2019) and the prior is more difficult to assess through traditional assessment methods than the latter (Reeves, 1990; Wu et al., 2019). This affective aspect represents the unique or distinctive characteristics of a person, which means that between one person and another person will have a large possibility of difference, in feeling or expressing emotions towards a situation (Anderson & Bourke, 2000). It has also been noted by Anderson and Bourke (2000) that rather than being constant, this affective aspect varies from situation to situation, so to identify it we need to focus more on how feelings or emotions are typically expressed by a person when faced with similar conditions. Furthermore, in the affective aspect, the feelings or emotions shown by a person must show how strong or weak the feelings or emotions are, in the positive or negative direction of the feelings or emotions, and to what or whom the feelings or emotions are directed (Anderson & Bourke, 2000).

Among the various objectives in education or learning that fall under the affective aspect; attitudes, interests, and values are considered to be the most important to be addressed (Anderson

& Bourke, 2000). Among the three focuses on affective aspects, the current study then focused more on attitudes. We follow what Eagly and Chaiken (2007) have provided to the definition of attitude, which is that attitude is "a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor." (p. 598). The attitude referred to in this study is more of attitudes that consist of being honest, disciplined, responsible, polite, caring, and confident (Setiawan et al., 2019). These six types of attitudes are considered competencies that should be the focus of affective aspects in accordance with the national curriculum and are attitudes that need more attention in the midst of online learning as happened during the COVID-19 pandemic. Teachers can use various techniques to assess students' competence in affective aspects, especially when investigating attitudes in learning. One such technique is self-assessment. Self-assessment, that is basically an important component of formative assessment when it is used to improve learning quality (Black & Wiliam, 2010) and promote learning outcomes (Andrade, 2019), refers to assessment techniques that require students to be involved in making judgments on their own learning outcomes and achievements (Andrade, 2019; Boud & Falchikov, 1989) in cognitive, psychomotor and affective aspects. The information obtained from this self-assessment can be used by teachers to determine the extent of achievement or learning outcomes compared to a set criterion or standard and to set a criterion or standard (Boud & Falchikov, 1989). Furthermore, the self-assessment can be used with some adjustments to integrate an integrated thematic learning approach in elementary schools with online learning during the COVID-19 pandemic.

Considering that online learning brings its own challenges for teachers to facilitate learning in order to promote students' competence in cognitive, psychomotor, and affective aspects and conduct assessments on all three aspects, especially the affective aspect, the use of self-assessment techniques can be seen as an alternative to overcome these challenges. In addition, given that previous studies, as we mentioned earlier, showed that measurement on affective aspects including attitudes is not easy to do and instruments focused on measuring students' attitudes on online learning are still scarce (Fauzani et al., 2021; Prihatni et al., 2019), especially when it is targeted at elementary school students, our study thus focused on developing an instrument with self-assessment technique to measure elementary school students' attitudes in their engagement in online learning. In order to ensure that the instrument produced from this development is of good quality, validation was also conducted in this study.

METHOD

Design of the Study

This is a development study that focuses on producing a self-assessment-based instrument that teachers can use to measure student attitudes in online learning. In order to produce such a self-assessment-based instrument, we followed the steps in the process of designing an instrument, particularly one that focuses on measures on affective aspects, proposed by McCoach et al. (2013) with some adjustments. Following these steps, the steps that we operationally applied in our study are as follows. The first step we took, of course, was to specify the purpose of the instrument that would be produced through our study. As mentioned in the statement of purpose, we determined that the instrument we developed was specifically to measure elementary school students' attitudes towards online learning. Having established the purpose of the instrument, we then conducted a literature review to identify what previous studies have done with instruments to reveal students' attitudes towards online learning, particularly at the elementary school level. In addition, we also conducted a field study to investigate the availability and use of instruments that are relevant to the instrument we intend to develop. We used the results of the literature review and field study to provide conceptual meaning of students' attitudes towards online learning and operational meaning by defining the components of these attitudes and the conceptual and operational meaning of each component. The components of the attitudes are the essential attitudes that students need to have

in online learning. The essential attitudes include honesty, discipline, responsible, polite, caring, and self-confident.

Once we defined the essential attitudes that are expected to represent the elementary school students' attitudes in engaging in online learning, we then determined the operational definitions for each of the essential attitudes and constructed the statement items that correspond to each of the essential attitudes or components of students' attitudes in online learning. The next step was to select and determine the response scale that matches the purpose of the measurement. We then ensured the matching or representativeness between the items we made and the operational meaning of the components corresponding to the items. Our next step was to recruit a number of experts to receive their judgment on the items we had constructed. After we made a number of revisions based on the expert judgment, we then constructed the instructions for responding to the instrument and formatted the instrument. After that step, before conducting the pilot study, we conducted a readability assessment. The feedback we obtained from the readability assessment was used to make revisions to our instrument so that it was ready to be used in the pilot study or limited trial. We then conducted a pilot study with a representative sample of the population for whom the instrument was targeted. McCoach et al. (2013) suggested that after the data from pilot study is collected, the next step is to conduct exploratory factor analysis (EFA), estimate reliability, and reveal item properties. However, since we had already defined the components of attitudes in online learning exactly including the items for each component, we did not conduct EFA, instead we performed confirmatory factor analysis (CFA). We used the results of CFA and item properties analysis on the pilot study data to improve the instrument. We then administered the revised instrument to students in an expanded or large-scale trial. Data from the expanded trial was analyzed through CFA to provide construct validity evidence of the instrument we developed. Once the CFA results show the structural stability of the factors or components of attitudes in online learning and the items are valid, the instrument we developed in this study has thus reached the final version; and subsequently it can be used to measure elementary school students' attitudes in online learning.

Participants and Data Collection

Our study involved a number of steps of developing a self-assessment-based instrument and assuring the quality of the instrument through providing evidence of content validity and construct validity. In order to provide evidence of content validity, we asked a number of experts via Delphi technique to provide quantitative and qualitative judgments on the initial version of our instrument. These expert judgments mainly focused on investigating the extent to which the components or aspects of attitudes corresponded to the conceptual and operational meanings of attitudes in online learning itself, the alignment between the indicators and the components that encompass them, the alignment between the items and the components or aspects they encompassed, and the clarity of the items that made up the instrument. In addition, to make it easier for experts to give their judgment, we also provided a blueprint containing the objective of the instrument, the conceptual and operational meanings of students' attitudes in online learning, and the components or aspects composing the attitudes in online learning and their respective descriptions or meanings.

Once evidence of content validity was available and revisions to the initial version of the instrument based on expert feedback had been made, before the instrument was used in a pilot study or limited trial, a readability assessment was conducted involving 15 sixth graders and three elementary school teachers. This readability assessment focuses on investigating three aspects, namely the ease of the instrument items to be understood by students, the clarity of the writing on the instrument so that it is easy to read, and the attractiveness of the instrument presentation. The expected responses from the teachers were in the form of suggestions or feedback on the three aspects. Meanwhile, students' responses on the three aspects of the readability test were categorized into decent, moderate, and deficient. After revisions were made based on the readability assessment results, the self-assessment-based instrument was administered to 180 sixth graders in elementary schools in Sleman Regency, Yogyakarta City, and Gunung Kidul Regency, Indonesia, in the limited

trial or pilot study. They engaged online learning due to the COVID-19 pandemic. After analyzing the data collected from the limited trial and making necessary revisions based on the results of the analysis, we came up with an initial version of the self-assessment-based instrument which then we administered to 390 sixth graders in several elementary schools in the Special Region of Yogyakarta. Students responded to the instrument targeted to measure attitudes towards online learning in the limited and expanded trials by providing one option out of four (i.e., always, often, sometimes, and never) indicating their intensity in demonstrating a particular attitude based on the statement items on the instrument. The scoring that we provided based on the responses that students gave to the favorable statements contained in the self-assessment-based instrument is as follows: always = 4, often = 3, sometimes = 2, and never = 1. The scoring applied in reverse for unfavorable statements.

Data Analysis

The data collected in this study include quantitative data on expert judgment for the purpose of providing content validity evidence, student and teacher ratings on the readability assessment, and student responses on the instrument to measure attitudes in online learning in the limited and expanded trials. We analyzed the quantitative data that we obtained from the experts' judgment by determining the V coefficient (Aiken, 1985) to investigate how well the indicators of a component of attitudes in online learning match the component and the items on the instrument match their corresponding indicators. However, instead of using the statistical significance proposed by Aiken (1985) to justify the adequacy of the validity evidence of the indicators against the underlying component and the items against the underlying indicator, we used the categorization of the V coefficient indicating the strength of validity proposed by Retnawati (2016). She categorizes the strength of validity into 'low' when $V \leq 0.4$, 'medium' when $0.4 < V \leq 0.8$, and 'high' when $V > 0.8$. We decided that the validity evidence we obtained was acceptable when the magnitude of the V coefficient fell at least in the 'medium' category.

We descriptively analyzed the data we collected from the readability assessment provided by students to obtain an overview of the readability quality of our instrument, whether it generally was decent, moderate, or deficient. We used the data collected in the limited trial and expanded trial respectively to provide evidence of construct validity which represents the fit of the structure or model of the components, indicators, and items of the instrument to measure attitudes in online learning with the data through second-order confirmatory factor analysis (CFA). We performed CFA with Lisrel 8.80 (Jöreskog & Sörbom, 2006). The overall or global model-fit was evaluated through chi-square (χ^2) statistics with the expectation of an insignificant chi-square value (i.e., $p > 0.05$) indicating a good fit and through root mean square error of approximation (RMSEA) with the expectation of an estimate value below 0.06 indicating a good fit (Hooper et al., 2008; Hu & Bentler, 1999). Furthermore, to provide evidence for the construct validity of each item, the factor loading (λ) representing the strength of the relationship between the item and its corresponding factor or component was evaluated. The significance of the estimated factor loadings was evaluated through the t-value (called t_{loading}) associated with the ratio of the factor loading to the standard error of loading under a significance level of 0.05. We expected a factor loading of greater than 0.3 (Hair et al., 2009; Tavakol & Wetzel, 2020) and/or such loading demonstrates that an item contributes significantly to the latent factor (i.e., $|t_{\text{loading}}| > 1.96, p < 0.05$) (Hair et al., 2009). Lastly, we used the data collected from the two trials to evaluate internal consistency (i.e., a measure of reliability or measurement consistency) through Cronbach's α, where it is preferred that the estimated value be at least 0.7 to demonstrate sufficient reliability (Borožová & Rydval, 2014).

FINDINGS AND DISCUSSION

The current study focused on producing a self-assessment-based instrument that can be used by teachers to determine the extent of attitudes that elementary school students have in their involvement in online learning. Once we have determined the purpose of this development study, we

then identified what types of attitudes need to be included as part of the attitudes or what types of attitudes need to be addressed in online learning. The observations that Setiawan et al. (2019) conducted suggested a lack of honesty, discipline and responsibility shown by elementary school students, even though these three attitudes are seen as crucial to creating a moral generation through education organized in schools (Setiawan et al., 2019). These three attitudes are thus considered to be the attitudes that should be the focus of education without excluding other noble attitudes. In online learning that occurred in the midst of the COVID-19 pandemic, a study by Bali and Musrifah (2020) managed to identify several challenges in the affective domain faced in the implementation of online learning. Besides the low interest of students in online learning as shown by the low participation and interaction in learning activities, the lack of attitudes such as discipline, responsibility, and honesty were also challenges that deserve teachers' attention. The same results were also obtained by Fauzani et al. (2021) which showed the lack of honesty and responsibility of elementary school students in participating in online learning. Furthermore, the study conducted by Apriyanti and Burhendi (2020) which focused on investigating students' character in online learning implicitly suggested a number of attitudes that are part of the affective domain that need attention in online learning; they are responsibility, discipline, honesty, hard work, independence, and showing high curiosity towards knowledge. The need for more attention to attitudes in online learning such as honesty, discipline, and responsibility was also emphasized by Damanhuri and Lestari (2021) and Hidayat and Listya (2021), where they recommended that the three types of attitudes can become a habit and be internalized in students along with four other attitudes, namely polite, caring, confident (Damanhuri & Lestari, 2021), and tolerant (Hidayat & Listya, 2021). Given the results of the literature review, we decided that the components of attitudes that are the focus of this study consist of honest, disciplined, responsible, polite, caring, and self-confident.

Once we had identified the components of attitudes in online learning that we deemed worthy of concern, we constructed indicators for each component to make it measurable. There were two indicators that we constructed for each component, so there was a total of 12 indicators that we needed to turn into measurable statement items. We then asked a number of experts to give their judgment on the degree of fit between the indicators and the corresponding component or how well the indicators reflect the corresponding component. We used the coefficient V (Aiken, 1985) to determine the level of agreement of the expert judgment, where the higher the value of V, the better an indicator reflects the corresponding component. Table 1 shows that the V values we obtained range from 0.667 to 1.000 which leads to medium and high validity with the majority being in the high category. These results provide evidence that all the indicators we constructed have properly reflected the corresponding components.

Table 1. Alignment Between Indicators and the Corresponding Component Based on Aiken's V

Component	Indicator	V	Validity
Honest	Indicator 1	0.833	High
	Indicator 2	0.917	High
Discipline	Indicator 1	1.000	High
	Indicator 2	1.000	High
Responsible	Indicator 1	1.000	High
	Indicator 2	0.750	Medium
Polite	Indicator 1	1.000	High
	Indicator 2	1.000	High
Caring	Indicator 1	1.000	High
	Indicator 2	1.000	High
Self-confident	Indicator 1	0.667	Medium
	Indicator 2	0.833	High

Table 2. Alignment Between Items and the Corresponding Indicator Based on Aiken's *V*

Component	Indicator	Item	*V*	Validity
Honest	Indicator 1	Item 1	0.833	High
		Item 2	0.917	High
	Indicator 2	Item 1	0.833	High
		Item 2	0.917	High
Discipline	Indicator 1	Item 1	1.000	High
		Item 2	1.000	High
	Indicator 2	Item 1	1.000	High
		Item 2	0.750	Medium
Responsible	Indicator 1	Item 1	1.000	High
		Item 2	1.000	High
	Indicator 2	Item 1	1.000	High
		Item 2	1.000	High
Polite	Indicator 1	Item 1	0.667	Medium
		Item 2	0.833	High
	Indicator 2	Item 1	0.833	High
		Item 2	0.917	High
Caring	Indicator 1	Item 1	1.000	High
		Item 2	1.000	High
	Indicator 2	Item 1	1.000	High
		Item 2	0.750	Medium
Self-confident	Indicator 1	Item 1	1.000	High
		Item 2	1.000	High
	Indicator 2	Item 1	1.000	High
		Item 2	1.000	High

In addition to providing support for the adequacy of evidence of content validity in terms of the alignment between indicators and their corresponding components, we also use coefficient *V* (Aiken, 1985) and its categories (Retnawati, 2016) to reveal the evidence that can be provided on the alignment between items and their corresponding indicators. As we mentioned earlier, evidence of congruence between items and their corresponding indicators is considered sufficient when the *V* value for congruence falls at least in the medium category. The agreement of the experts' judgments about the suitability, represented by the coefficient *V* ranging from 0.667 to 1.000 (Table 2), suggests that there is sufficient evidence of content validity in terms of the suitability between the items to reveal elementary school students' attitudes in online learning and their corresponding indicators. The availability of evidence of judgmental content validity in terms of the compatibility between indicators and their corresponding components and the compatibility between items and their corresponding indicators shows that the instrument we developed has fulfilled the initial and main requirements in developing a quality instrument focusing on the affective domain. McCoach et al. (2013) emphasized that the most crucial thing in the early stages of the process of developing an instrument, including an instrument that focuses on the affective domain, is to ensure the availability of evidence of validity in terms of the content of the instrument; which in this study we have succeeded in providing this evidence. Furthermore, the satisfaction of the evidence of content validity in this study provides support for the appropriateness of the items contained in the instrument we developed reflecting the operational definition of attitudes to online learning via indicators conceptually defined through the six components of the attitudes (McCoach et al., 2013). As a consequence of this evidence, we therefore can more accurately derive inferences about elementary school students' attitudes to online learning from the items contained in the instrument.

After we provided content validity evidence and made revisions based on expert feedback or suggestions, we conducted a readability assessment by requiring 15 sixth grade students and three elementary school teachers to give their evaluation on the instrument. While teachers gave their evaluation qualitatively, students gave their evaluation on our instrument by rating our instrument based on three aspects: (1) the ease of the instrument items to be understood by students; (2) the clarity of the writing on the instrument so that it is easy to read; and (3) the attractiveness of the

instrument presentation. From this readability assessment, our instrument has adequate quality in terms of readability. This was demonstrated by 10 (66.67%) students giving a 'decent' rating and 3 (20%) students giving a 'moderate' rating for the first aspect. Meanwhile, for the second aspect, 9 (60%) students gave a 'decent' rating and 3 (20%) students gave a 'moderate' rating. In the third aspect, 11 (73.33%) students gave a 'decent' rating and 3 (20%) students gave a 'moderate' rating. Readability assessment is an integral part of the expert judgment process on the items (McCoach et al., 2013) on our instrument, which in this study the assessment was conducted based on the evaluations that a number of students and teachers provided. We conducted this assessment to ensure that the statements on the items in our self-assessment-based instrument did not lead students to understand or give meanings to the items that were not what we intended (Calderón et al., 2006). In addition, this assessment was also critical because through the assessment we could ensure that the complexity of the sentence structure used in the instrument was appropriate for the reading ability level of sixth graders (Calderón et al., 2006; McCoach et al., 2013).

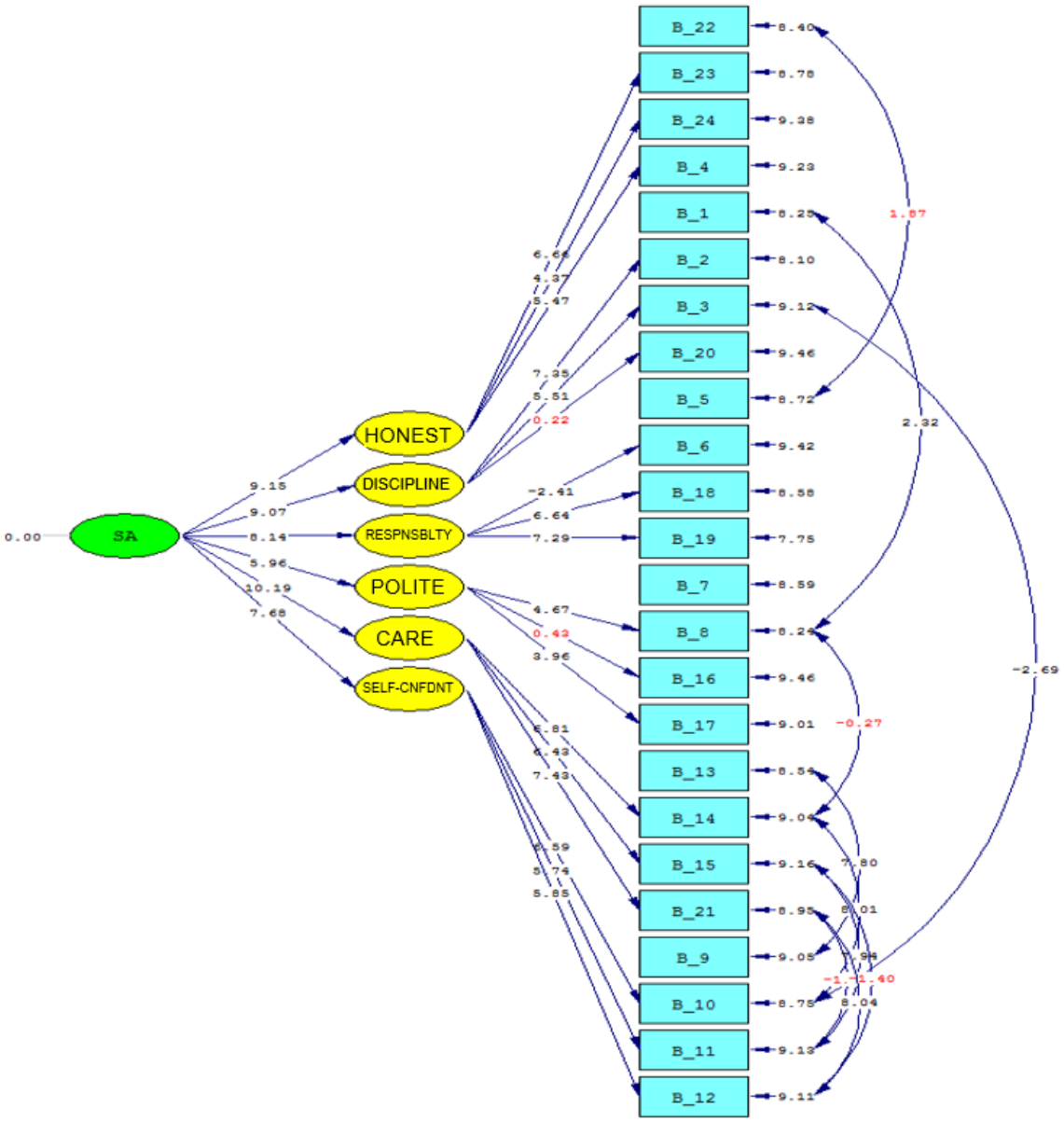

Figure 1. Second-Order CFA Model of Attitudes in Online Learning Based on Limited Trial

Table 3. Results of Factor Loading in the Second-Order CFA Model

Component	Item	Factor loading	Validity
Honest	Item 22	0.61	Valid
	Item 23	0.56	Valid
	Item 24	0.34	Valid
	Item 4	0.44	Valid
Disciplined	Item 1	0.62	Valid
	Item 2	0.64	Valid
	Item 3	0.45	Valid
	Item 20	0.02	Invalid
Responsible	Item 5	0.58	Valid
	Item 6	–0.19	Invalid
	Item 18	0.61	Valid
	Item 19	0.70	Valid
Polite	Item 7	0.44	Valid
	Item 8	0.48	Valid
	Item 16	0.03	Invalid
	Item 17	0.37	Valid
Caring	Item 13	0.68	Valid
	Item 14	0.54	Valid
	Item 15	0.51	Valid
	Item 21	0.59	Valid
Self-confident	Item 9	0.54	Valid
	Item 10	0.64	Valid
	Item 11	0.52	Valid
	Item 12	0.53	Valid

After providing evidence of the validity of our instrument based on its content, conducting a readability assessment, and making some minor revisions from the results of both assessments, we conducted a limited trial. This limited trial was conducted by administering the instrument to 180 sixth grade students who were engaging in online learning. We used the data collected from the limited trial to provide evidence for a structural model of attitudes to online learning via a second-order confirmatory factor analysis (CFA) that empirically shows the relationships between items, indicators, and components of the measure. Figure 1 presents the structural model of the measure based on the second-order CFA. The results of the goodness-of-fit test indicate a good fit of the overall model, $\chi^2(236) = 261.69$, $p = 0.1205$, RMSEA = 0.025 (Hair et al., 2009; Hooper et al., 2008; Hu & Bentler, 1999). Furthermore, these results demonstrate empirical support for the concordance between the structure of the model and the connections among the items, indicators, and components of attitudes in online learning that we have previously constructed.

In addition to providing evidence that the overall model shows a good fit, we also needed to provide evidence that the paths in the second-order CFA model were statistically significant or demonstrated adequate contribution as emphasized by McCoach et al. (2013). Table 3 presents in detail the factor loadings that indicate the extent of association between items and their respective corresponding components. When the factor loading indicated by a path of association between an item and its corresponding component is less than or equal to 0.3 or when $|t_{\text{loading}}|$ of the path are less than or equal to 1.96, the path is not meaningful (Hair et al., 2009; Tavakol & Wetzel, 2020); or in this study the path is said to be invalid. Figure 1 and Table 3 show three non-significant paths contained in the second-order CFA model. The three paths indicate that item 6, item 16, and item 20 have statistically non-significant paths with their corresponding hypothesized components, namely responsible, polite, and disciplined, respectively. Whenever such paths are identified, it is recommended that the item should be removed or considered to be moved to another component that may better represent the item (McCoach et al., 2013). However, given that we considered these three items to be essential, instead of removing them, we preferred to revise them and include them in the expanded trial. By revising these three items, we hoped that the empirical data obtained from the expanded trial would show the paths of the items and components that are essentially related.

Lastly, we found from Figure 1 that the six paths representing the associations between the six components of attitudes in online learning and attitudes in online learning itself are all statistically significant or essentially related.

The data on students' responses to the self-assessment-based instrument in the limited trial were not only used to demonstrate evidence of construct validity, but also to provide information on the extent of the instrument's consistency as reflected by the consistency of students' responses. Internal consistency suggests that the instrument we developed up to the limited trial stage is reliable (Cronbach's $\alpha = 0.886$) (Borožová & Rydval, 2014; Mardapi, 2004; Nunnally & Bernstein, 1994). The reliability estimate indicates that the instrument is able to capture students' responses reflecting their attitudes in online learning with a relatively high level of consistency or stability. This characteristic is crucial since it is a prerequisite for obtaining accurate information or inference (McCoach et al., 2013) about elementary school students' attitudes in online learning.

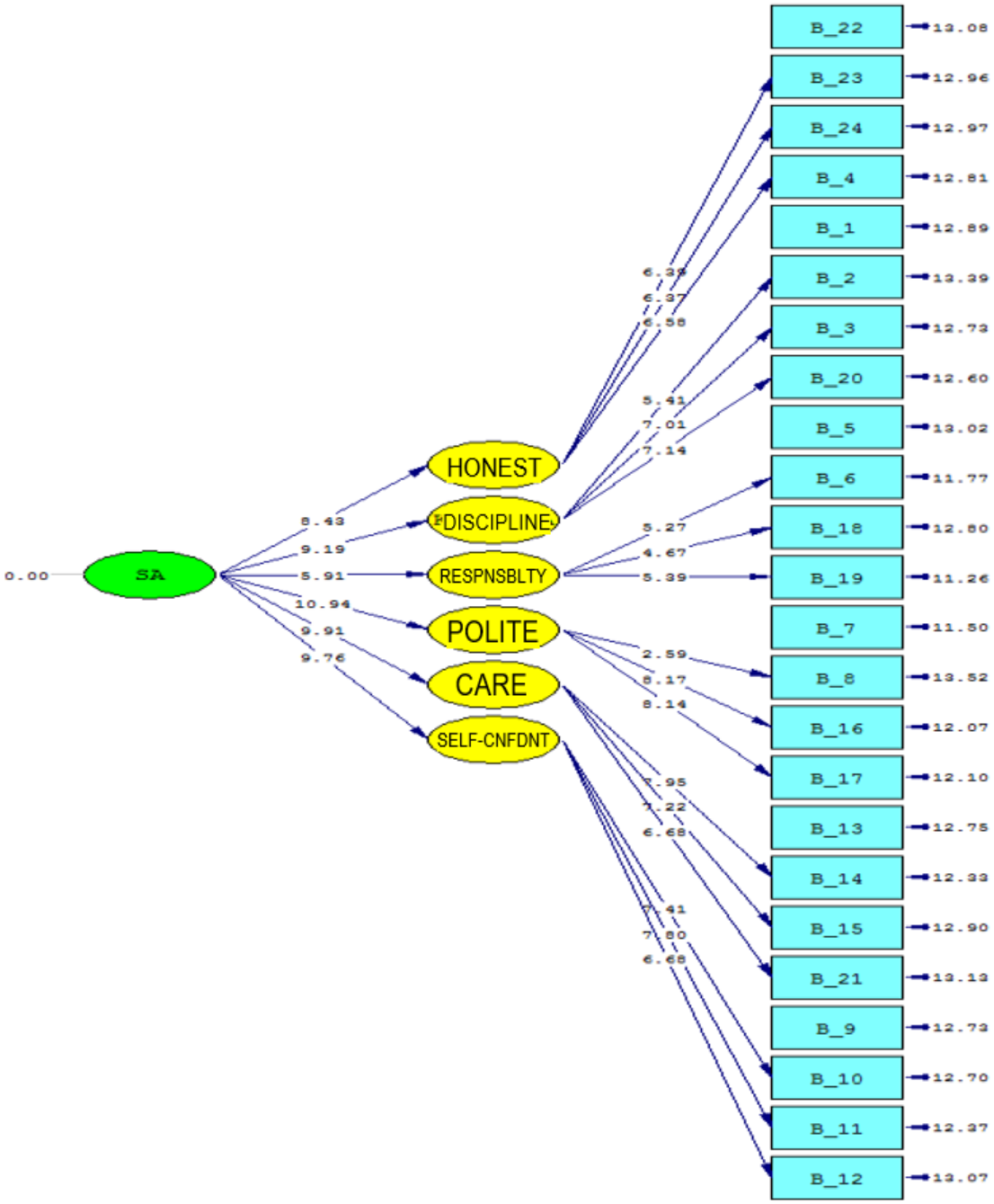

Figure 2. Second-Order CFA Model of Attitudes in Online Learning Based on Expanded Trial

Table 4. Results of $t_{loading}$ in the Second-Order CFA Model

Component	Indicator	Item	$t_{loading}$	Validity
Honest	Indicator 1	Item 22	6.31	Valid
		Item 23	6.39	Valid
	Indicator 2	Item 24	6.37	Valid
		Item 4	6.59	Valid
Disciplined	Indicator 1	Item 1	5.43	Valid
		Item 2	5.41	Valid
	Indicator 2	Item 3	7.01	Valid
		Item 20	7.14	Valid
Responsible	Indicator 1	Item 5	5.53	Valid
		Item 6	5.27	Valid
	Indicator 2	Item 18	4.67	Valid
		Item 19	5.39	Valid
Polite	Indicator 1	Item 7	8.20	Valid
		Item 8	2.59	Valid
	Indicator 2	Item 16	8.17	Valid
		Item 17	8.14	Valid
Caring	Indicator 1	Item 13	7.65	Valid
		Item 14	7.95	Valid
	Indicator 2	Item 15	7.22	Valid
		Item 21	6.68	Valid
Self-confident	Indicator 1	Item 9	7.20	Valid
		Item 10	7.41	Valid
	Indicator 2	Item 11	7.80	Valid
		Item 12	6.68	Valid

An expanded trial was then conducted involving a larger sample size representing a wider area to provide evidence of the construct validity and reliability adequacy of the instrument to be produced through this study. Through second-order CFA, the empirical data gathered in the expanded trial demonstrated a good fit model of attitudes in online learning as presented in Figure 2, $\chi^2(246) = 257.76$, $p = 0.29048$, RMSEA = 0.011 (Hair et al., 2009; Hooper et al., 2008; Hu & Bentler, 1999). Furthermore, by taking into account the meaningfulness of the paths in the second-order CFA in Figure 2 and $t_{loading}$ of the paths in Table 4 representing the associations between the items and their corresponding components, we have found that all the paths were statistically significant. In other words, the empirical data from the expanded trial provides support for the evidence of an essential association between the items in the instrument to measure elementary school students' attitudes in online learning and their corresponding components; thus, it can be said that all items are valid. Evidence of statistically essential paths in the second-order CFA model (Figure 2) was also demonstrated in the paths representing the relation between the six components of attitudes in online learning and the measure itself (i.e., $t_{loading} > 1.96$). The estimation of reliability through Cronbach's α using empirical data collected from the expanded trial suggests that our instrument is able to reveal elementary school students' attitudes in online learning consistently or stably to a relatively high degree (Cronbach's α = 0.866) (Borožová & Rydval, 2014; Mardapi, 2004; Nunnally & Bernstein, 1994). Our study, thus, has managed to produce a self-assessment-based instrument to reveal elementary school students' attitudes in online learning and to demonstrate its quality as indicated by the availability of evidence of content and construct validity as well as relatively high reliability.

CONCLUSION

The COVID-19 pandemic has brought its own challenges in education in the form of shifting the learning mode from face-to-face in schools to online. Online learning has also brought a number of challenges, especially at the elementary school level. One of these challenges was conducting assessments in the affective domain with the condition of the inadequate ability of

teachers to develop quality instruments focusing on the affective domain, one of which is attitudes, and the scarcity of quality instruments that teachers can directly use or adapt. Therefore, this study seeks to minimize these challenges by developing a quality self-assessment-based instrument to measure students' attitudes in online learning. By following the steps of developing an instrument for measurement in the affective domain, we have produced a quality self-assessment-based instrument to measure students' attitudes in online learning as indicated by the availability of evidence of content and construct validity and relatively high reliability estimates. Through the instrument we have produced, students' attitudes in online learning can be revealed based on six components (i.e., honest, disciplined, responsible, polite, caring, and self-confident) which are operationally constructed into favorable and unfavorable items with a total of 24 items. Revealing the attitudes of elementary school students in online learning through the use of the instrument we developed is expected to support teachers in developing students' noble attitudes and improving learning, especially online learning. Lastly, we reveal the limitations of this study to be noted. The limitation is that the samples participating in the limited trial and expanded trial were from only one region or province, which may not be representative enough of all possible conditions in online learning. Therefore, the involvement of samples from a wider or diverse area deserves attention. In addition, given that the COVID-19 pandemic is now over and learning activities have fully shifted back to face-to-face mode in schools, this instrument remains relevant (given the components that make it up) to be adopted or adapted into that mode of learning or in blended-learning mode that combines online and offline modes of learning.

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