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The Construct Validity of Skills for Learning Questionnaire to Measure the Skill Gap in Vocational High School

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Abstract: Using Confirmatory Factor Analysis (CFA), this research aims to test the construct validity of Skills for Learning Questionnaire to measure the gap of skill for learning among students of vocational school in Special Region of Yogyakarta context. The researchers used Normed Chi-square (χ^2/df), RMSEA (Root Mean Square Error of Approximation), Standardized RMR (Root Mean-square Residual), GFI (Goodness-of-Fit Index), NFI (Normed Fit Index), NNFI (Non-Normed Fit Index), and CFI (Comparative Fit Index) as the criteria to evaluate the overall model fit. The standardized factor loading and the t-value provide evidence of the construct validity. 26 items in the developed Skills for Learning Questionnaire instrument have loading factor > 0.3 and t-Value > 1.96 except the three first items in Communication Skill Indicator.

1 INTRODUCTION

The essence of vocational were established is to prepare the middle level of employee that responsible and competent in any several field. It means that the vocational school has obligation to prepare the student with specific skill so that they will ready for the job demand. The preparing role means to adopting the holistic approach that contain the soft skills and hard skills (Sudjimat, 2011), which the graduates of vocational schools will have not hard skills only, but adequate soft skills too. Sailah (2008) said that the present educational system only has 10% of soft skills and 90% of hard skills.

The implementation of vocational education that only concern to hard skills development will be not relevant with the job demand especially in industrial / entrepreneurship field. The fact is too much of entrepreneur was beefed about the employee from the higher education that lack of soft skills (Schultz, 2008). It shows that the gap of skills they were concern not the hard skills, but the soft skills (Taylor 2016). These things always be the focused of job recruiter after years (Russell, Russell, &Tastle, 2005). The need of soft skills will determine the achievement of employee where 80% influent by the soft skills and 20% from hard skills (Neff & Citrin, 2001).

Consider to that condition, educational area must to make sure the vocational student could be mastering the soft skills aspect through learning process. Characterizing the soft skills baseline is important thing to identify the level of students' soft skill (Arnata & Surjoseputro, 2014). Many teachers may could not understand what baseline of soft skills they must decide as priority because the several of element and attribute on it.

Based on that previous problem, it necessary to have an instrument tool as guideline for teacher to decide the baseline of soft skills and valid constructively to measure it. The construct validity is appropriate and needful to conduct because it will define how well our instrument can measure what to be measuring (Cronbach & Meehl, 1955). Construct validity is associated with factor analysis that firstly discussed by Guilford (1946). He was said:

Validity, in my opinion, is of two kinds: factorial and practical. The factorial validity of a test is given by its loadings in meaningful, common, reference factors. This is the kind of validity that is really meant when the question is asked "Does this test measure what it is supposed to measure?" A more pertinent question should be "What does this test measure?" The answer then should be in terms of factors and their loadings. (J. P. Guilford 1946, 428)

After two decades since the theory about factorial validity, Jöreskog (1969) finally introduce a general procedure of factor analysis that is Confirmatory Factor Analysis (CFA) that used to determine an appropriate number of factors to use and a preliminary interpretation of the data. It means that the researcher can observe whether measures of item are appropriate with the construct (factor) theory.

Confirmatory Factor Analysis generally known as a part of Factor Analysis beside Exploratory Factor Analysis (EFA). CFA are different with EFA where the EFA may include all of indicator to all factors (Hendryadi & Suryani, 2014), in other words, the researcher did not use certain theory to measure the latent variable. On the CFA, measurement model is based on of certain theory so that the number of factors has been determined. The general aim of CFA is to confirm or examine a measurement model that formulated by theory. It means that CFA has two focus studies: (1) is the conceived indicators are unidimensional, appropriate, and consistent and (2) what indicators may dominantly build the construct.

Generally, there are two methods in CFA, they are first order confirmatory factor analysis (1st order CFA) and second order confirmatory factor analysis (2nd order CFA). The first order CFA is measurement model that has indicator as item and directly measures the construct whereas in the second order CFA, the latent variable is measure by several dimensions and those dimensions still need several indicators to measure it (Hendryadi & Suryani, 2014).

This research will explore the construct validity of an instrument tool called Skills for Learning Questionnaire and was adapted from College of Physiotherapist of Ontario. The instrument has a baseline or indicator of soft skills and was developed to measure the gap of skill that students need in learning process. At this point, the researcher will try to examine:

1.Is the instrument has fit measurement model to measure the construct of skill gap of vocational students in Yogyakarta context?

Is the instrument valid constructively to measure the gap skill that students need in Yogyakarta's vocational school context?

2 RESEARCH METHODS

This research is developmental research that intent to explore the construct validity of Skills for Learning Questionnaire that developed by College of Physiotherapists of Ontario on vocational school of Special Region of Yogyakarta context. This research was conduct in four public and private vocational school on Special Region of Yogyakarta. The respondents for this research consist of 323 students from four vocational school, e.g. SMK Negeri 2 Yogyakarta, SMK Negeri 1 Godean, SMK Muhammadiyah Prambanan, SMK Muhammadiyah 3 Yogyakarta.

The download-able instrument was adapted from College of Physiotherapists of Ontario's website namely Skills for Learning Questionnaire instrument. The instrument was adapted by translating it from English to Bahasa Indonesia keeping in mind that this study conducted to explore the Skills for Learning Questionnaire instrument in Yogyakarta context. After translating and proofreading it, 39 items of Skills for Learning Questionnaire then the researcher reduced it to 29 items and omitting ten items without compromising its validity to prevent the respondent dropouts during data collecting. The final instrument then distributed to the respondent. and distributed to the respondent. The instrument consists of various skills needed for practice (e.g., communication, interpersonal, and self-management) and skills that assist in learning (e.g., intellectual and learning skill). The instrument had three parts, that is: a) How important they think it is that they should possess/acquire the skills; b) The extent to which they think they already possess the skills; c) the skills gap or the score for question part A minus the score for question part B.

Using first order confirmatory factor analysis, the researcher then analyzed the construct validity of data by using LISREL 8.80. Firstly, the overall model fit was conduct to examine the fit of the model based on the goodness fit indices then measure the "measurement model fit". The criteria that were used to evaluate the goodness of fit are: p-value, normed Chi-square (χ^2/df), RMSEA (Root Mean Square Error of Approximation), RMR (Root Mean-square Residual), GFI (Goodness-of-Fit Index), NFI (Normed Fit Index), Non-Normed Fit Index (NNFI), and CFI (Comparative Fit Index). The Factor loading and t-Value are criteria that used to analyze the "measurement of fit". The standard of significance value for the validity based on Hair, Black, Babin, & Anderson (2010) were factor loadings ± 0.3 to 0.4 are minimally acceptable.

2.1 Overall Model Fit

There are several fit indices that we can use to evaluate the overall model fit. The fit indices are generally separated to three measures, absolute fit measure, incremental fit measure, and parsimony fit measure (Hooper, Coughlan, and Mullen, 2008; Hendryadi & Suryani, 2014). In this research, researcher used the absolute fit measure and incremental fit measure because the framework of this study is only using first order CFA.

2.1.1 Absolute Fit Measure

In the previous section the absolute fit measure is used to determine the proposed model and how well the proposed theory (construct) fits the data. The several fit indices in absolute fit measure that researcher uses to evaluate the overall model fit are normed χ^2, Root Mean Square Error of Approximation, Goodness of Fit Index, and Standardized Root Mean Square Residual.

Normed χ^2 – Normed χ^2 is a ratio between the Chi-Square and degree of freedom. It is an alternative index to assess the model fit that can minimize the impact of sample size on the Model Chi-Square. The recommendation of cut-off scores for this index range as low as 2.0 to as high as 5.0 (Hooper, Coughlan, and Mullen, 2008).

Root Mean Square Error of Approximation – RMSEA is a measure that tries to fix the tendency of Chi-Square statistic to reject the model with large sample size. If the score is less than 0.05 (Ghozali&Fuad, 2014) it is indicate a good fit and if the score is less than or equal to 0.08 it is indicate the model is fit enough (Byrne, 1998).

Goodness of Fit Index – GFI is an index that describes the overall suitability of the model or in other words, GFI is a measure about the precision of the model to generate the observed covariance matrix. The recommendation of cut-off scores for this index is greater than 0.9 as a good fit model (Ghozali&Fuad, 2014).

Standardized Root Mean Square Residual – SRMR are the square root of the difference between the residual of the observed covariance matrix and the hypothesized covariance model. SRMR is useful when the instrument like questionnaire contains items with varying range. The values of SRMR less than 0.08 are deemed acceptable (Hu &Bentler, 1999).

Table 1. Cut-off Value for Absolute Fit Measure Indicate Good Fit of Model.

Goodness of Fit Criteria	Cut-off Value
Normed χ^2	$2.0 \geq$ Normed $\chi^2 \geq 5.0$
RMSEA	≤ 0.08
SRMR	≤ 0.08
GFI	≥ 0.9

2.1.2 Incremental Fit Measure

Incremental fit measure indicate the relative improvement in fit of proposed model compared with a independence (null) model, which assumes zero population covariances among the observed variable (Kline, 2011). In this case, the observed variables are items of the instrument. In general, the measures in incremental fit are Normed Fit Index, Non-Normed Fit Index, and Comparative Fit Index.

Normed Fit Index and Non-Normed Fit Index – Normed Fit Index (NFI) is a measure that compares the proposed model and the null model (Ghozali & Fuad, 2014). Non-Normed Fit Index (NNFI) is used to overcome the problem due to the complexity of the model. Hopper et al. (2008) have suggested the cut-off score of NFI is greater than or equal to 0.9 and NNFI as low as 0.8.

Comparative Fit Index – Comparative Fit Index (CFI) is measure that can overcome the small sample size problem. This measure is revised from NFI which has a tendency to lowering the fit value in small sample size (Ghozali & Fuad, 2014). Minimum cut-off score for this measure is as low as 0.9 (Hooper, Coughlan, and Mullen, 2008).

Table 2. Cut-off Value for Incremental Fit Measure Indicate Good Fit of Model.

Goodness of Fit Criteria	Cut-off Value
Normed Fit Index	NFI ≥ 0.9
Non-Normed Fit Index	NNFI ≥ 0.8
Comparative Fit Index	CFI ≥ 0.9

After analyzed the data several measures or indices seemly satisfy the minimum cut-off score for the absolute fit measure and incremental fit measure. Table 3 shows the overall model fit value after the data was analyzed using LISREL 8.80.

Table 3. Result of Overall Model Fit Indices.

Goodness of Fit Criteria	Result	Level of Fit Category
Normed χ^2	3.17	Good Fit
RMSEA	0.08	Marginal Fit
SRMR	0.092	Marginal Fit
GFI	0.82	Marginal Fit
NFI	0.91	Good Fit
NNFI	0.92	Good Fit
CFI	0.94	Good Fit

The normed χ^2 suggests the minimum score to satisfy the model fit must be range from 2.00 to 5.00. Because the score is 3.17 so the normed χ^2 is in good fit category. RMSEA scored 0.08 and it is equal to the cut-off value (RMSEA $\leq$ 0.08), so the level of fit is in good fit category. The result of standardized RMR (SRMR) 0.092, the model is in marginal fit level (Standardized RMR $\leq$ 0.08). The score of NFI, NNFI, and CFI have more than the cut-off value (NFI, NNFI, and CFI $\geq$ 0.9), so the criteria are in good fit category. Meanwhile, the GFI with the cut-off value must be greater than 0.9 and the result shows 0.82 for so the index is in marginal fit level. Considering the condition above, the overall model is fit to measure the construct validity of the instrument. The condition shows that the covariance matrix of population indifferent with covariance matrix of sample so that the model is basically can be generalized.

2.2 Structural Model Fit

After evaluate the overall model fit, and then the research will continue to evaluate structural model fit (Hendryadi & Suryani, 2014). Structural model fit was conducted by using first order confirmatory factor analysis or 1st order CFA. The criteria for construct validity are factor loading and t-Value (Yuniarti & Soenarto, 2016). If factor loading is greater than 0.5 and t-Value more than 1.96 or less than -1.96 then the item will categorized as valid item. Those criteria refer to assumption that "factor loadings ± 0.3 to 0.4 are minimally acceptable." (Hair, Black, Babin, & Anderson, 2010).

Here the description of each latent variable in the instrument. Communication skill (COM) aspect consists of 10 items i.e., Oral, Oral Presentation, Listening, Written, Reading, Visual, Numeracy, Information Skills, Computer Literacy, and Foreign Languages. Interpersonal Skill (INT) aspect consists of 4 items i.e., Social Competence, Assertiveness, Group/Teamwork, and Leadership. Intellectual skill (ITL) aspect consists of three items i.e., Creativity, Critical/Analytical Thinking, and Problem-Solving. Self-Management skill (MNG) aspect consist 6 items i.e., Self-Assessment, Self-Confidence, Self-Presentation, Responsibility, Self-Discipline, and Proactive Approach. Learning skill (LRN) aspect consists of 5 items i.e., Active Learning, Learning Diagnosis, Learning Planning, Learning Resources, and Learning Reflection.

The path from LISREL 8.80 after analyzing the data, the researcher obtains the value for standardized solution and t-Value that tabulated below.

Table 4. Structural Model Fit Indices

Indicator	Items	Factor Loading	t-Value	Criteria
Communication (COM)	COM1	0.09	1.51	Not Valid
	COM2	0.17	2.93	Not Valid
	COM3	0.10	1.69	Not Valid
	COM4	0.36	6.32	Valid
	COM5	0.52	9.41	Valid
	COM6	0.57	10.71	Valid
	COM7	0.74	14.97	Valid
	COM8	0.72	14.23	Valid
	COM9	0.78	15.70	Valid
	COM10	0.77	15.50	Valid
Interpersonal (INT)	INT1	0.71	14.24	Valid
	INT2	0.70	13.88	Valid
	INT3	0.64	12.55	Valid
	INT4	0.62	11.81	Valid
Intellectual (INTL)	INTL1	0.68	13.12	Valid
	INTL2	0.73	14.59	Valid
	INTL3	0.74	14.63	Valid
Self-Management (MNG)	MNG1	0.79	15.85	Valid
	MNG2	0.80	16.33	Valid
	MNG3	0.66	12.39	Valid
	MNG4	0.54	9.45	Valid
	MNG5	0.52	9.44	Valid
	MNG6	0.47	7.84	Valid
Learning (LRN)	LRN1	0.61	10.96	Valid
	LRN2	0.71	13.22	Valid
	LRN3	0.67	12.44	Valid
	LRN4	0.68	12.62	Valid
	LRN5	0.74	14.14	Valid

Table 4 shows the summary structural model fit by using 1st order CFA analysis and the table also tell us the construct validity of the instrument. It

shows that the items of the instrument have loading factor more than 0.35 except item COM1, COM2, and COM3, and the result of t-Value there are 2 items is not satisfy the cut-off value that less 1.96. So it means that the instrument has 4 items that not valid to measure the skills gap of vocational student in Yogyakarta context.

The three items that not constructively valid are three items from Communication indicator. The reason that makes the three items are not valid is because the factor loading of it not satisfy the cut-off score for 323 sample size (Hair, Black, Babin, & Anderson 2010). Even the t-Value for item COM2 satisfy the cut-off score, the factor loading shown the lack of correlation between the item and the factor (Indicator). So it concludes that the three items cannot to measure utterly the skill gap for Communication indicator. Different cases with another item where the factor loading and the t-Value are significant, then the 26 items are valid constructively to measure the skill gap skills of vocational student in Yogyakarta context.

Three items that we can omit in this developed instrument are oral skill item, oral presentation skill item, and listening skill item. In this instrument we can think that the three items are relatively important in communication skill but somehow those three items are not satisfy and did not pass the cut-off value. It is not the mistake of the original instrument, maybe because the original instrument is not good enough to translate it in Bahasa Indonesia and it confusing the student to understand what the meaning of the items.

After the construct validity of developed instrument was conducted, researcher tries back to distributed to the respondent. The reason why researcher redistributed the developed instrument is to give a simple descriptive result of how the instrument works to give information about the skill gap of the student. The table 1 shows that the highest gap percentage is in the Learning skill that shows 11.59% and the lowest gap is Communication skill that shows 6.40%.

Table 5. Skills Gap Percentage

Skills Indicator	Percentage
Communication	6.40%
Interpersonal	6.66%
Intellectual	8.28%
Self-Management	9.51%
Learning	11.59%

The table shows relatively small gap between the level of important skill that student should possess and the level of current skill that they think already possess. By this simple descriptive statistic, the teacher can try to evaluate the process of student learning skill and increase the learning skill that student should possess, especially about Active Learning, Learning Diagnosis, Learning Planning, Learning Resources, and Learning Reflection.

3 CONCLUSION

Based on the analyses, this research defined conclusions as follow: 1) the 26 items in the developed Skills for Learning Questionnaire instrument have loading factor > 0.3 and t-Value > 1.96 except the three first items in Communication Skill Indicator. It means that the 26 items in the instrument was valid constructively and could measure the gap of skills of vocational students and assist the teacher to define the baseline of soft skill that they need to develop the student; 2) The higher percentage of skill gap of students in 4 vocational school on Special Region of Yogyakarta is Learning Skill with 11.59% of skill gap.

The Skills for Learning Questionnaire instrument could be used to assess the gap of skills for vocational student. The limitations on this research are the proofreading of the instrument into Bahasa Indonesia and the lack sample size. For the future research, the empirical study may to conduct in another region context with bigger population of student to get better sample size and develop the Skills for Learning Questionnaire by using all 39 items and proofreading it better.

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