



Development Instruments Through Confirmatory Factor Analysis (CFA) in Appropriate Intensity Assessment

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Instrument Development of Entrepreneurship Intention Measurement; Confirmatory Factor Analysis (CFA); Construct Reliability (CR)

Abstract

The research aims to develop the valid and reliable measurement instruments of entrepreneurship intention in vocational secondary school students. Multi stage random sampling was used as the technique to determine sample (300 respondents). The research method used research and development with confirmatory factor analysis (CFA). Result of confirmatory factor analysis (CFA) at the second order with robust maximum likelihood method shows that valid and reliable instrument with the acquisition value of loading factor is more than 0.5 ($> 0,5$) and a significance value of t is more than 1,96 ($> 1,96$). Reliability test results shows that the value of the combined construct reliability (CR) of 0.97 and a variance value extract (VE) to 0.52 is greater than the limit of acceptance $CR \geq 0.70$ and $VE \geq 0.50$. The conclusion of the measurement instruments of entrepreneurship intention with three dimensions and 31 items met the standards of validity and reliability in accordance with the instrument development process.

How to Cite

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INTRODUCTION

Vocational High School (SMK) is one of the educational levels that produce ready-to-work graduates either working in companies or other institutions or working independently as an entrepreneur. Thus SMK must be able to produce the graduates according to the needs of the world of work that has the competence in accordance with the needs of employment, adaptability, high competitiveness and self-employment. According to Oktarina (2006), it is caused by the emergence of the era of globalization that requires SMK to continuously improve the quality of human resource graduates in order to compete in the national and international arena. This is in line with the increasing number of workforce in Indonesia, so the role of entrepreneurs to help the government in overcoming the increase in the number of workers who are not comparable with employment needs to be boosted strongly even more by starting to be invested in the level of SMK (Kusumantoro, 2007).

The quality of education itself has become a major issue for the governments in the developing countries, motivated by the low levels of educational achievement (Miller & Elman, 2013). Hung and Thuki (2010) concluded that the teachers' high ability can improve the students' achievement, and that the teachers' higher qualify can produce the students' higher achievement. The quality of education by Adam (1993) is defined as a consensus based on some basic dimensions of educational quality. The dimensions of qualified education include: (1) Students who are healthy, well nourished, and ready to participate and learn, and supported in learning by their families and communities; (2) An environment that is healthy, safe, protective, gender-sensitive, and provides adequate resources and facilities; (3) Contents that are reflected in the curriculum and relevant materials for the acquisition of basic skills, especially in the field of literacy, numeracy and life skills, and knowledge in the areas like gender, health, nutrition, and prevention of HIV / AIDS; (4) The process of trained-teacher applying the centered-teaching on children in the class and at school that is well-managed and has good assessment in order to facilitate the learning and to reduce the disparity; (5) The results that include knowledge, skills and attitudes, and that are related to the national goals for education and positive participation in the society.

One of the successful achievements of the competence of graduates is influenced by the assessment used, which is expected to improve the

quality of process and learning result. This is in accordance with the opinion of Djemari Mardapi (2012) that the efforts to improve the quality of education can be achieved through improving the quality of the learning process and assessment system or assessment. According to Yulista and Kusumantoro (2015), the purpose of improving the quality of human resources itself is to deliver the young generation of the nation that are able to maintain the continuation of national development in all fields so it is possible to make them the hope of the nation in order to achieve a just and prosperous society in the future. In addition, the efforts to improve the quality of education involve the development of schools those are reciprocal interaction of learning and professional leadership that show the complexity and non-linear nature (Hargreaves & Fullan, 2012). But frequently the problems arise to pay attention to the real especially regarding the realization of high-quality education because of the pressure imposed by the external regulations and accounting that conflict with the internal conditions desired by the school (Hooze & Honingh, 2014). Mardapi (2012), also explained that the learning process and the assessment system are interrelated, in which a good learning system will produce a good quality of learning. The quality of good learning can be seen from the assessment results. Likewise a good assessment system can encourage the educators to use good learning strategies and to motivate the students to learn better.

According to Sudijono (2009), basically there are two techniques of the evaluation of learning process those are test and non-test techniques. Using the test technique, the evaluation of learning process at school is conducted by testing the students while using the non-test technique, the evaluation is conducted without testing the students but through observation, interview, questionnaire, and document checking. Therefore, this research develops the assessment instruments that can measure the success of entrepreneurship education on the students in SMK as a complement in measuring their learning achievement including the academic ability and entrepreneurship ability. Academic ability includes cognitive, affective, and psychomotor aspects, while entrepreneurial ability includes attitudes, intentions, and entrepreneurial behaviors.

In the field of education, good judgment requires reliable or credible measurement. According to Margono (2013), anything used to perform the measurement is called a measuring instrument that should first be validated before being used. The purpose of measurement through

the development of assessment instruments is not to know the students' ability but to assess what trends that will be done by the students. In scientific researches, good instruments are obtained only through data and interpreted better when obtained through an objective, valid and reliable measurement process.

This research is focused on the preparation and development of entrepreneurship intention measurement instrument of the SMKN students in DKI Jakarta SMK by using assessment scale. Validation use factor analysis to analyze the interrelationship among the variables and explain the interconnection in the form of limited variable group and called factor. This research aims to produce an entrepreneurship intention assessment instrument on the SMK students who meet the criteria of procedure, validity, and reliability. This research needs to be conducted because the Vocational High School (SMK) students need to have entrepreneurial mentality, because in the curriculum taught in SMK there are Entrepreneurship (KWU) subject that can form entrepreneurial mentality, which is expected to be a motivation that after graduating from SML the students can work as an entrepreneur (Desy et al., 2015) (Prihantoro & Syamsuhadi, 2015).

The instrument plays a very important role in determining the quality of research, therefore, the development of instrument must be carried out in accordance with the criteria of both the criteria of procedure and of validity and reliability. Based on the opinion of experts like Cronbach (1984), Djaali and Pudji Muljono (2008), Sugiyono (2011), Suryabrata (2003), it can be concluded that an instrument is a tool of research in collecting data from natural phenomena, psychological attributes, and other research variables.

Based on the study of instrument development concept by Gable and Wolf (2012), Mardapi (2012), Djaali and Muljono (2008), the instrument development procedure to be conducted in this research are: (1) identification of problems and needs, (2) determination of variables, (3) study of concept or theory of intent entrepreneurship (4) constructs: conceptual definition and entrepreneurship intent operational, (5) development of dimension and indicators, (6) determination of instrument type, (7) instrument grille preparation, (8) first stage of instrument statement item arrangement, (9) validation of concepts by panelists and experts, (10) analysis of expert and panelist analysis results both qualitatively and quantitatively, (11) revisions and selection of point statements based on expert review and panelist, (12) first stage empirical test, (13) selecting points

based on validity and reliability test, (14) second stage empirical test using LISREL 8.8 application. (15) finalization of the instrument.

Specifically the developmental stages using the scoring scale as written by Henerson, Morris, and Fitz-Gibbon (1978) are as follows: (1) determining the object of attitude to be examined, (2) choosing the two-polar adjective pair (3) writing words or phrases from the above attitude object and then writing the words or phrases below it randomly, (4) making a clue how to fill in and where the respondent gives a rating, and (5) calculating the score of respondents between 1 up to 5 or vice versa.

This validity test refers to the opinion of Aiken (1994), Gable and Wolf (2012). Construct validity in the development of this instrument is conducted through: (1) Expert study with the aim of studying how the content, accuracy, and suitability between the variables and the dimension. The indicators of entrepreneurship intent are conducted by several professional experts who master the content of the variables to be measured. It is also reviewed by the panelists, using Aiken's index, (2) Empirical trials in the field use factor analysis.

The instrument developed in entrepreneurship intent measurement is using questionnaires with rating scale. According to Hisrich, et al. (2008), entrepreneurial intentions show motivational factors that influence behavior and are an indication of someone who is willing to try and how much effort he plans to implement the entrepreneurial behavior. Entrepreneurship intention is represented by four factors: desires, preferences, plans, and behavior expectancies. Desire is something that someone wants to start a business. Preference is someone who wants to shows that entrepreneurship is an option that must be achieved. Plan is someone's planning to start a business in the future. While behavior expectancies is a possibility for entrepreneurship followed by the target of starting a business. According to Soderlund and Ohman (2003), intentions are intention as expectations, intention as plans, and intention as desires.

Based on the concept of entrepreneurship intention that has been suggested by experts, it can be synthesized that entrepreneurship intention is someone's choice that is accompanied by the commitment to entrepreneurship as indicated by the desire to start entrepreneurship, the need for entrepreneurship, the effort to start entrepreneurship, the preparations to start entrepreneurship, the possibility to start entrepreneurs, and the targets to start entrepreneurship.

Dimensions and indicators of entrepreneurial intentions include: (1) preferences: desire to start an entrepreneurship and need for entrepreneurship; (2) plans: effort to start entrepreneurship and prepare to start entrepreneurship; (3) expectations: possibility to start entrepreneurship and target to start entrepreneurship.

Chaney, Wallen, and Birch (2011) conducted a research on Advocacy Intention Assessment Instrument Development in Health Education Schools. The development of this instrument is based on the Theory of Planned Behavior by using Confirmatory Factor Analysis that examines the relationship among the items of instrument to construct the theory of Planned Behavior. This research produces valid and reliable instruments in measuring the effectiveness of advocacy training.

The next research was conducted by Burn et al. (2006), who conducted research on Instrument Construction for Measuring Intention for Getting AED Training. The purpose of this research is to develop a measuring instrument to measure the strongest factors that influence a person to obtain AED training. The development of instrument uses confirmatory factor analysis.

METHODS

The method used in this research is adapting research and development method known as Research and Development (R & D). R & D research method is used to produce a particular product and test the effectiveness of product. This research approach is appropriately used for the development of the entrepreneurship intention assessment instrument because the resulting product is a valid and reliable instrument, which is conducted through a systematic and scientific procedure.

The number of samples in this research used Gable and Wolf (2012), which suggested a representative sample size of six to ten times of the number of items of the instrument. The number of samples in this research is nine times of the number of items of the instrument that is 300 respondents with multistage random sampling technique.

RESULT AND DISCUSSION

Development Research

The development of instruments is based on correct and scientific processes and procedures. Based on the instrument development procedure, after the items of instrument have been ar-

ranged, the next stage is the validity of construct through qualitative study by five experts that aims to review the instruments that have been prepared. After the qualitative expert review, the next stage is assessment through expert panel quantitatively. The result of panelist assessment was analyzed using Aikens Index. Based on the analysis using Aikens Index, it indicated that all items of entrepreneurship intention instrument have Aiken index value above 0.66, which means that all the items are appropriate or can be used without improvement.

Testing Validity and Calculating Reliability of Entrepreneurial Intention Variables

In this research, the standardization of entrepreneurship intention instrument uses confirmatory factor analysis. The analysis factor in this research uses Confirmatory Factor Analysis (CFA) with the help of Lisrel Program 8.72 full Version. The measurement model is based on the goodness of fit criteria that is to test the fit of the theoretical model with empirical data.

Measurement Model

Based on the results of the measurement model analysis in Figure 1, it shows that all items of statement have a factor (λ) > 0.5, which means that the items are valid and fit to be used for data collection in accordance with the opinion of Hendryadi and Suryani (2014: 17).

Figure 2 shows that all manifest variables have a value of $t > 1.96$ at $\alpha = 0.05$, which means that the relationship between manifest variables and factors or indicators is significant. The indicator of entrepreneurship intention consists of six items: desire to start, need of entrepreneurship, effort to start entrepreneurship, readiness to start entrepreneurship, possibility to start entrepreneurship, and target to start entrepreneurship.

Measurement of Second Order Confirmatory Factor Analysis model without indicating indicator can be shown in the Figure 3. Figure 3 shows that there is no change in which all items of the statement have a factor load of > 0.5, which means that all the statements are valid.

Structural Model

This structural model is used to determine whether a construct built or shaped by dimensions is valid or not. Figure 4 shows that the factor load on the dimensions that make up the construct is valid, with the loading factor value > 0.5. The preferred load factor dimensions are 0.68, plan dimensions 0.88, and expectations dimension 0.91. The higher the value of the factor

load indicates the more reliable the dimensions form the construct.

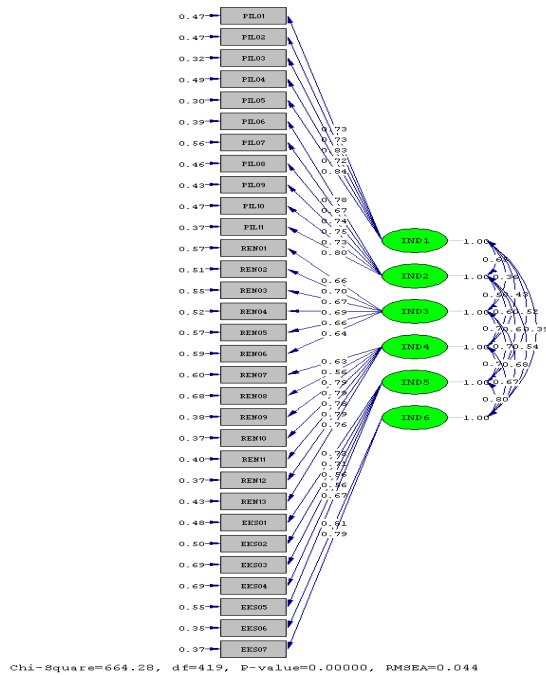


Figure 1. First Order Confirmatory Factor Analysis Model, Standardized Solution, Entrepreneurship Intention Variables

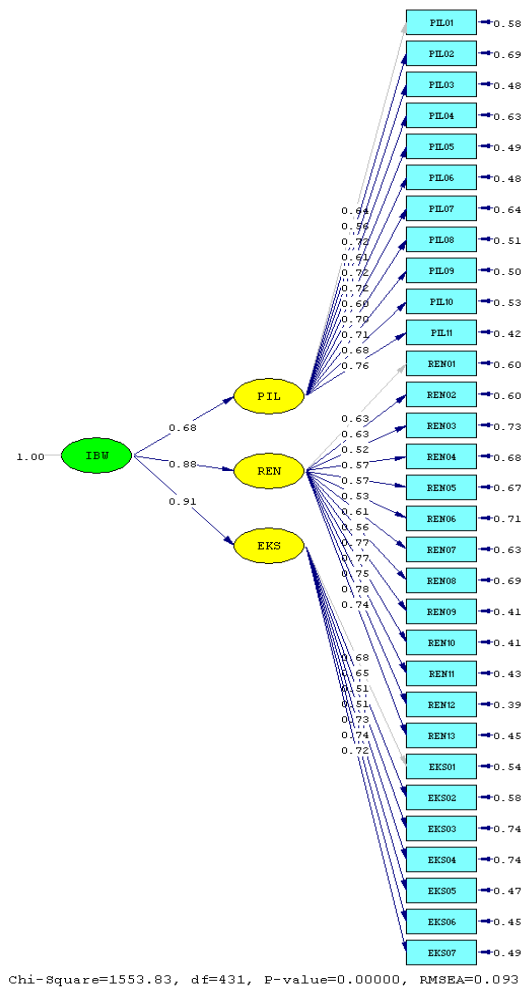


Figure 3. Second Order Confirmatory Factor Analysis Model, Standardized Solution Entrepreneurship Intention Variables

Through the value of factor loaded on the structural model of Intention Entrepreneurial Variable in Figure 5, the value of reliability and variance extract can be determined. The calculation of Construct Reliability (CR) = 0.868963 and Variance Extracted (VE) = 0.691782

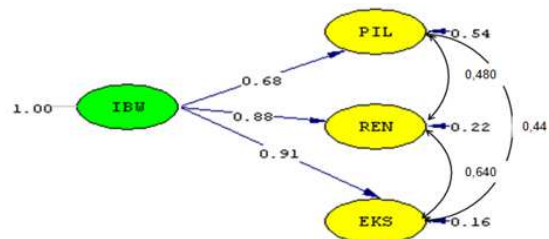


Figure 4. Structural Model of Entrepreneurship Intention Variable

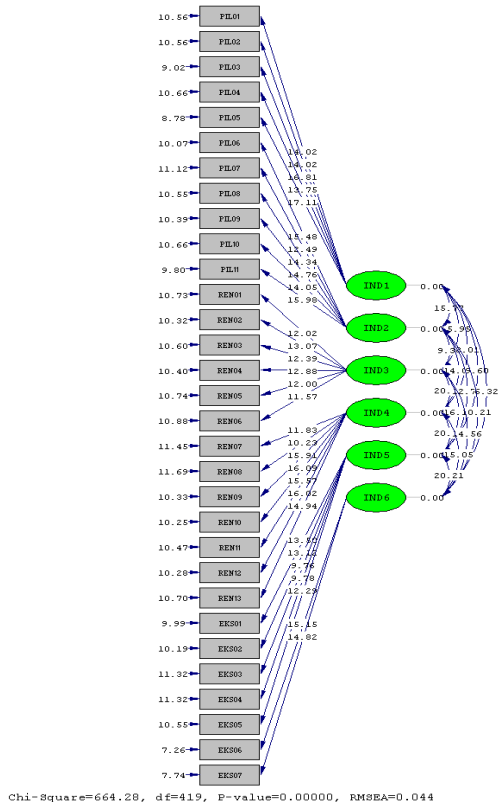


Figure 2. First Order Confirmatory Factor Analysis Model, t-Value, Entrepreneurship Intention Variables

Goodness of Fit of All Models

Goodness of fit of all models is used to compare whether the model is theoretically similar the empirical model. The fit model is an indication of the comparison between the model specified with the covariant matrix between the indicators or the observed variables. According to Latan (2014), the use of 4-5 criteria of goodness of fit is considered sufficient to assess the feasibility of a model, provided that each criterion of goodness of fit those are absolute fit indices, incremental fit indices, and parsimonious fit indices are represented. The first criterion of goodness of fit is absolute fit indices, which consists of absolute chi-square (χ^2), goodness of fit indices (GFI), root mean square of approximation (RMSEA). The second criterion of goodness of fit is incremental fit indices, consisting of adjusted goodness of fit (AGFI), normed fit index (NFI), comparative fit index (CFI), incremental fit index (IFI), relative fit indices (RFI). The third criterion of goodness of fit is parsimony fit indices, consisting of akaike's information criterion (AIC) and consistent akaike information criterion (CAIC), expected cross validation index (ECVI), parsimonious goodness of fit index (PGFI).

Based on the criteria of goodness of fit of the model, there are ten measurements of goodness of fit (GOF) showing fit and each criterion of goodness of fit those are absolute fit indices, incremental fit indices, and parsimony fit indices are represented, so it can be concluded that the fit of model overall is good.

CONCLUSION

This research aims to develop the students' entrepreneurship intention instruments, which can be concluded as follows: (1

1. The development stage of dimension and indicator is conducted based on the synthesis of theory and concept of entrepreneurship intentions to obtain the dimensions and indicators as follows: (1) preferences: the desire to start entrepreneurship and the need for entrepreneurship; (2) plans: effort to start entrepreneurship and preparation to start entrepreneurship; (3) expectations: possibility to start entrepreneurship and target to start entrepreneurship.
2. The validity of construct of entrepreneurship intention instrument is conducted through stages of theoretical and empirical validity. Theoretical validity is conducted by involving the experts to examine and assess the theoretical instruments before an empirical fit test.

The review and panel of experts provide recommendation of revision or improvement to the statement items that have been arranged by the researcher.

3. The empirical validity of construct of entrepreneurship intention instrument of the students is conducted through a fit test in two stages with the respondents of SMK students in DKI Jakarta with the sample of 300 students. The validity testing is conducted using Structural Equation Model (SEM) approach with LISREL 8.80. The method of data analysis use confirmatory factor analysis (Confirmatory Factor Analysis). The fit test of model uses a measure of goodness of fit (GOF).
4. The reliability test results indicate that the entrepreneurship intention assessment instrument of the students has good reliability because the calculation results show that CR is 0.87 and VE is 0.69. The value is already qualified and far exceeds the critical limit that is Construct Reliability (CR) ≥ 0.70 or Variance extracted (VE) ≥ 0.5 .
5. The entrepreneurship intention assessment instrument of the students consists of three dimensions, six indicators, and 31 items, which both theoretically and empirically has met the validity and reliability standards.

Based on the conclusions and implications of the research described earlier, there are some suggestions as follows: (1) For the academics or instrument developers: the results of the development of this instrument can be used as a reference in the development of similar instruments. In addition, these instruments still need to be tested again with larger area and sample by using various other methods and analytical techniques in order to obtain a standardized instrument; (2) For the teachers: the assessment of success of entrepreneurship subjects cannot only be done on aspects of cognitive and psychomotor, but also the affective aspect one of them is the intention of entrepreneurship; (3) For the Headmaster: the results of entrepreneurship intention assessment can be used as a reference in determining the policy in increasing the formation of entrepreneurship for the students.

REFERENCES

- Adams, D. (1993). *Defining educational quality. Improving Educational Quality Project Publication #1: Biennial Report*. Arlington, VA: Institute for International Research.
- Aiken, L. R. (1994). *Psychological Testing and Assessment*. Boston: Allyn and Bacon Inc.

- Blackburn, M. L., & Waite, P. J. (2006). Instrument construction for measuring intention to obtain AED training. *American Journal of Health Studies*, 21(3/4), 133.
- Chaney, B., Wallen, M., & Birch, D. A. (2011). The development of an instrument to assess advocacy intentions for school health education. *American Journal of Health Education*, 42(5), 286-295.
- Cronbach, L. J. (1984). *Essentials of Psychological Testing*. New York: Harper & Row Publisher.
- Djaali & Muljono, P. (2008). *Pengukuran dalam Bidang Pendidikan*. Jakarta: Grasindo.
- Gable, R. K., & Wolf, M. B. (2012). *Instrument development in the affective domain: Measuring attitudes and values in corporate and school settings (Vol. 36)*. Springer Science & Business Media.
- Van Gelderen, M., Brand, M., van Praag, M., Bodewes, W., Poutsma, E., & Van Gils, A. (2008). Explaining entrepreneurial intentions by means of the theory of planned behaviour. *Career Development International*, 13(6), 538-559.
- Hargreaves, A., & Fullan, M. (2012). *Professional capital. Transforming teaching in every school*. London: Taylor & Francis Ltd..
- Hendryadi & Suryani. (2014). *Structural Equation Modeling dengan Lisrel 8.8: Pedoman untuk Pemula*. Yogyakarta: Kaukaba Dipantara.
- Henerson, M. E., Morris, L. L. & Fitz-Gibbon, C. T. (1978). *How to Measure Attitudes*. California: Sage Publications, Inc.
- Hisrich, R. D. (2008). *Entrepreneurship*. New York: McGraw Hill.
- Hooge, E. H., & Honingh, M. E. (2014). Are school boards aware of the educational quality of their schools? *Educational Management Administration & Leadership*, 42(4), 139-154.
- Hungi, N. & Thuki, F. W. (2010). Differences in pupil achievement in Kenya: implications for policy and practice. *International Journal of Educational Development*, 30(1), 33-43.
- Kusumantoro. (2007). Beberapa Faktor Yang Mempengaruhi Minat Siswa SMK Koperasi Yogyakarta Untuk Berwiraswasta. *Dinamika Pendidikan*, 2(2)
- Latan, H. (2013). *Structural Equation Modeling: Konsep dan Aplikasi Menggunakan Program Lisrel 8.80*. Bandung: Alfabeta.
- Mardapi, D. (2012). *Pengukuran, Penilaian dan Evaluasi Pendidikan*. Yogyakarta: Nuha Medika.
- Margono, G. (2013). *The Development of Instrument for Measuring Attitudes toward Statistics Using Semantic Differential Scale*, 2nd International Seminar on Quality and Affordable Education (ISQAE).
- Miller, G., & Elman, E. (2013). Improving the quality of education: Kenya's next challenge. *Geography*, 98, 24.
- Oktarina, N. (2006). Pengembangan Emotional Intelligence Dalam Pembelajaran Ekonomi Di SMK Untuk Mempersiapkan Peserta Didik Dalam Menghadapi Tantangan Kerja Di Era Globalisasi. *Dinamika Pendidikan*, 1(2)
- Prihantoro & Syamsuhadi. (2015). Pengaruh Pendidikan Kewirausahaan, Motivasi Berwirausaha dan Lingkungan Keluarga Terhadap Sikap Mental Kewirausahaan. *Economic Education Analysis Journal*, 5(2).
- Soderlund, M., & Ohman, N. (2003). Behavioral intentions in satisfaction research revisited. *Journal of Consumer Satisfaction, Dissatisfaction and Complaining Behavior*, 16, 53.
- Sudijono, A. (2009). *Pengantar Evaluasi Pendidikan*. Jakarta: RajaGrafindo Persada.
- Sugiyono. (2011). *Metode Penelitian Pendidikan: Pendekatan Kuantitatif, Kualitatif, dan R & D*. Yogyakarta: Alfabeta.
- Yulista & Kusumantoro. (2015). Kualitas Layanan Pendidikan di SMK Muhammadiyah Batang. *Economic Education Analysis Journal*, 4(1).