

# CONFIRMATORY FACTORS ANALYSIS OF STUDENTS PERCEPTION, COMMUNICATION, COLLABORATION, PROBLEM SOLVING AND INNOVATIVE CREATIVE IN E-LEARNING

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## Abstract

The Covid-19 pandemic has shifted the educational paradigm from face-to-face learning to a distance learning. E-learning has a vital role in distance learning. This research aim is to validate the instrument by using Confirmatory Factor Analysis (CFA) to determine students' perceptions of e-learning as an effort to improve students' communication, collaborative, problem solving and innovative creative thinking skills. This research was conducted for three months with a total sample of 407 students consisting of 219 males and 188 females. The instrument used a questionnaire with a Likert scale. The collected data were analyzed using multivariate statistics with the help of the AMOSS 22 program. The results showed that the instruments of communication skills, problem solving and innovative creative thinking and student responses were declared valid and reliable. The implementation of instruments in learning shows that e-learning has a significant effect on the ability to communicate, problem solving and innovative creative thinking of students, but does not affect the abilities and collaborative skills of students.

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**Keywords:** *E-learning, Confirmatory Factor Analysis, Communication, Collaborative, Problem Solving, and Creative Innovative*

## INTRODUCTION

The validity and reliability of the instrument are urgent matters in supporting the credibility and success of the research (Mohajan and Haradhan, 2018). The success of a research is determined by the quality of the instruments used in data collection (Creswell, 2014). The quality standard of research instruments is determined by at least two factors, this is validity and reliability (Said, *et al.*, 2011; Yildiz, *et al.*, 2019). Validity is a standard measure that shows permanence, meaningfulness, benefits that lead to the accuracy and appropriateness of what should be measured according to measurement objectives) (Drost, 2011; Kusaeri and Suprananto, 2012; Creswell, 2014). Validity elements include (a) content validity, (b) productive validity, (c) construct validity (Creswell, 2014). Validity is divided into four components (a) statistical conclusion validity, (b) internal validity, (c) construct validity and (d) external validity (Drost, 2011). Reliability is a series of measurements or a series of tools. measure that has consistency if the measurement is carried out with the measuring instrument repeatedly (Sugiono, 2009). The reliability component includes (a) internal consistency, (b) consistency of test and retest, (c) consistency of testing and scoring

(Creswell, 2014) and become (a) internal consistency, (b) equivalence, (c) stability over time (Drost, 2011).

Validity and reliability test of the instrument, used as a measure of the meaningfulness of the research conclusions. The statistical test of the validity and reliability of the instrument used factor analysis, namely multivariate analysis, which was used to find factors that could explain the relationship or correlation between the various observed independent indicators. The statistical test of factor analysis that is often used is the Pearson correlation and Cronbachs Alpha, but both tests have several limitations (Said, *et. al.*, 2011) among others (a) the research data must be interval and ratio data, meaning that if the nominal and ordinal data the two analyzes are not compatible; (b) difficulties in analyzing data on the relationship between indicators to indicators and the variables if the number of indicators and variables is large. Solving the problem of these limitations is used Confirmatory Factor Analysis (CFA) in Structural Equation Modeling (SEM) to test the validity and reliability of the instrument (Said, *et. al.*, 2011).

Structural Equation Modeling (SEM) is a statistical technique that is capable of (a) analyzing the pattern of the relationship between latent constructs and indicators, latent constructs with one another, and direct measurement errors, (b) thoroughly explaining the relationship between variables in the research, (c) allows testing of a series of relatively complex relationships simultaneously. Complicated in the sense that simultaneous models are formed through more than one dependent variable which is described by one or more independent variables and in which a dependent variable at the same time acts as an independent variable for another tiered relationship (Santoso, 2011). SEM is an alternative method for examining the hypothesized relationship among the observed variables (Lam and Maguire, 2012). SEM is a statistical model that attempts to explain the relationship between many unobserved variables and other observably factors (Bag, 2015).

The instrument that was tested for validity and reliability was students' perceptions of the use of e-learning related to communication skills, exploration, problem solving and students' innovative creative thinking after participating in learning. E-learning has a big role in learning at schools (Drost, 2011; Zimlich, 2015; Norhailawati, *et al.*, 2019) to realize the achievement of these four competencies. Meanwhile Arkorful and Abaidoo (2014) it is said that e-learning is a learner-centered learning medium which has an impact on increasing the collaborative nature of students. E-learning can facilitate the interaction and have a better level of collaboration between instructors/educators and peers, than traditional learning environments (Tao, *et al.*, 2006). E-learning can be used as a medium of communication (Zimlich, 2015). The ability to communicate through e-learning is in the form of (a) having the skills to utilize various media of information and technology to communicate, (b) being able to determine the attitude of how to assess the effectiveness and impact of using technology in communication, and (c) having knowledge of using communication technology for various purposes (for example to inform, instruct, motivate and persuade). E-learning allows students to explore and find information both individually and in groups to be creative in finding solutions to the problems faced, support the creation of collaborative learning, and increase students' creative and innovative thinking (Pozzi and Ott, 2009; Stary and Weichhart, 2012).

Through e-learning students are expected to be able to communicate and explore freely via the internet to find information that can be used to solve the problems at hand. To measure students'

perceptions of the use of e-learning in learning related to the ability to communicate, explore, solve problems and think creatively through the internet, several statements have been made. To find out how far the relationship between students' perceptions and the ability to communicate, explore, solve problems and think creatively through the internet, used SEM analysis. Therefore the focus of the following discussion is to test students' perceptions of the ability to communicate, explore, solve problems and think creatively through e-learning using SEM statistics.

## 1. MATERIALS AND METHODS

### *Participants*

This research is a population research because the research was carried out on all elements in the research area (Arikunto, 2006). The research was conducted in June 2020 on seven and eight grader students of Junior High School 1 Bandung in the 2020/2021 academic year. Seven and eight grade are each divided into six parallel classes, and each class consists of 34 students. The total population of the research was 407 students with 219 male students and 188 female students. There were 216 students in grade 7 with 118 male students and 98 female students. There are 191 grade 8 students with 101 male students and 90 female students. The research population had followed pure online learning for four months due to the Covid-19 pandemic. The population is between 11 and 14 years old.

### *Instruments.*

The research instrument was an attitude scale test consisting of five points, strongly agree, agree, neutral, disagree, strongly disagree. Likert scale is a scale used to measure perceptions, attitudes or opinions of a person or group regarding an event or social phenomenon (Pranatawijaya, *et al.*, 2019). The attitude scale test is used to measure the ability to communicate, collaborative, problem solving, creatively innovative through e-learning and students' perceptions of e-learning. The attitude scale test is made of questionnaire form. The questionnaire is to measure communication skills consists of four statements. The questionnaire is to measure collaborative ability that consisted of three statements, the questionnaire measures problem-solving abilities consisted of three statements, the questionnaire measure problem-solving abilities consisted of three statements, a questionnaire measure creative and innovative thinking skills consisted of three statements and a questionnaire for students' perceptions consisted of three statements. The questionnaire was validated by experts before it was implemented (Kereh, *et al.*, 2015). Validation was carried out through FGD (Focus Group Discussion) and was tested in small groups, so that at the time the questionnaire was implemented to students. The result it got the valid criteria in terms of language, content and writing procedures of the questionnaire.

### *Data Collection & Techniques Analysis*

Questionnaires are given to students after taking the final assessment of the semester on the last day. Students are given the questionnaires and given the opportunity to fill in without any intervention from the teacher and then collected them directly. For students who are late in collecting the questionnaire, they are given limited time for two weeks. From 407 students who were given a questionnaire, all were filled out and submitted back. The collected questionnaires were inputted into a table using a microofft excell, then copied and stored in the SPSS sheet. The data stored in the SPSS file is inputted into the AMOS 22 program for analysis. Multivariate analysis techniques can

use the Amos program (Waluyo, 2019; Malkanthie, 2015). The accepted values listed in Table 1 have to be fulfilled if we were to gain a good or perfect fit model (Ghazali, 2016).

Table 1. Goodness-of-fit Indices

| Goodness-of-fit Index                           | Acceptable Value            | Comments   |
|---|-----------------------------|--|
| hi-square ( $X^2$ )                             | $p > 0.05$ (non-ignificant) | Indicates exact fit of the model. Value is sensitive to large sample size                |
| Practical indices of fit:                       |                             |  |
| normed chi-square ( $X^2/df$ )                  | [ 2.00, 5.00 ]              | This is to reduce the sensitivity of $X^2$ to sample size<br>$X^2/df < 3.0$ : good fit   |
| Absolute fit index:                             |                             |  |
| The Goodness-of-Fit Index(GFI)                  | [ 0.00, 1.00 ]              | GFI = 1.00: perfect fit<br>GFI > 0.9: good fit   |
| The Adjusted GFI (AGFI)                         | [ 0.00, 1.00 ]              | Values close to 1.00: good fit<br>GFI > 0.9: good fit                                    |
| Root Mean Square Error of Approximation (RMSEA) | $RMSEA \leq 0.08$           | RMSEA < 0.05: good fit<br>RMSEA 0.05 - 0.08: adequate fit<br>Values up to 0.10: poor fit |
| Incremental fit indices:                        |                             |  |
| Normed Fit Index (NFI)                          | $NFI \geq 0.90$             | NFI = 1.00: perfect fit<br>Values close to 0.00: poor fit                                |
| Comparative Fit Index (CFI)                     | $CFI \geq 0.90$             | 0.00 > CFI > 1.00 for acceptance   |
| Tucker-Lewis Index (TLI)                        | $TLI > 0.90$                | 0.0 > TLI > 1.00 for acceptance  |

## 2. RESULTS AND DISCUSSIONS

There are five variables tested for validity and reliability, namely, the ability to communicate with four statements, the ability to collaborate, the ability to solve problems, the ability to think creative and innovative and the perceptions of students with each of the three statements. Validity and reliability tests were used to CFA with the help of the AMOSS 22 program. The CFA AMOS 22 output is presented in Figure 1.

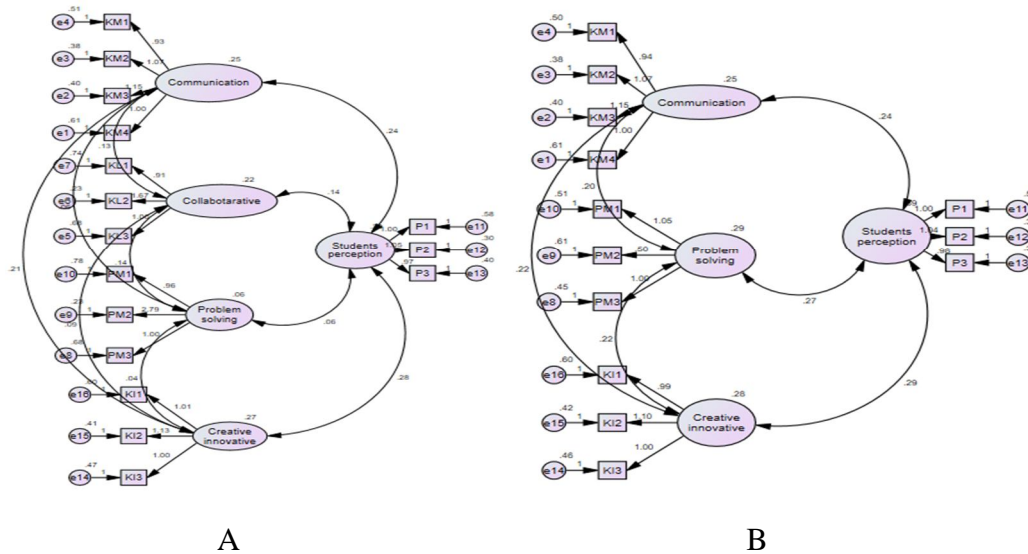


Figure 1. Measurement Model Validity  
(Initial Model [A] and Final Model [B])

The output of AMOS 22 can be shown that Probability = 0.000, CMIN / DF = 7,060; GFI = 0.852; AGFI = 0.785; NFI = 0.783; CFI = 0.806; TLI = 0.753 and RMSEA = 0.122 and look at the Note for Model, it can be concluded that the selected model is not suitable or bad. To overcome a bad model, a Modification of Indices (MI) is done, which is to reduce or remove the largest MI value. Modification indices are carried out continuously until the probability value of the Fit Model is greater than 0.05. The items received and reduced are shown in Table 1.

Table 2. Research Instruments

| No                          | Original Statement   | Item Label | Recieved/ deleted |
|-----------------------------|--|------------|-------------------|
| <b>Communication</b>        |  |            |                   |
| 1.                          | Learning using online (e-learning) helps me to communicate with the other teachers | e4         | recieved          |
| 2.                          | E-learning can be a good communication tool with friends                           | e3         | recieved          |
| 3.                          | E-learning can be used as an online discussion tool                                | e2         | recieved          |
| 4.                          | I can communicate with other via e-learning easily                                 | e1         | recieved          |
| <b>Collaboration</b>        |  |            |                   |
| 5.                          | I can joint a groups disscusion through e-learning                                 | e7         | deleted           |
| 6.                          | E-learning can be used to cooperate with others in doing assignments               | e6         | deleted           |
| 7.                          | E-learning makes easier to complete the tasks together                             | e5         | deleted           |
| <b>Problem Solving</b>      |  |            |                   |
| 8.                          | E-learning helps me solve problems in doing assignments                            | e10        | recieved          |
| 9.                          | E-learning can find solutions in learning problems via the internet                | e9         | recieved          |
| 10.                         | E-learning can make easier to find problems answers                                | e8         | recieved          |
| <b>Creative Innovative</b>  |  |            |                   |
| 11.                         | Through e-learning I can think more creatively than before                         | e16        | recieved          |
| 12.                         | Through e-learning I get new innovations in learning                               | e15        | recieved          |
| 13.                         | Through e-learning T find different ways of doing assignments                      | e14        | recieved          |
| <b>Student's perception</b> |  |            |                   |
| 14.                         | Learning to use e-learning is very fun   | e 11       | recieved          |
| 15.                         | E-learning adds new insights about learning  | e12        | recieved          |
| 16.                         | E-learning can be used as a new means of learning                                  | e13        | recieved          |

From the final calculation it is obtained Probability = 0.085, CMIN / DF = 1.262; GFI = 0.973; AGFI = 0.958; NFI = 0.947; CFI = 0.988; TLI = 0.985 and RMSEA = 0.025.

The final measurement model (Figure 1 B) shows that there are three item statements from the reduced collaborative variables. In other words, collaborative variables do not have a correlation with communication variables, problem solving, innovative creative thinking, students' perceptions of e-learning and its variables. Thus the variables that have a correlation between one variable and another are communication variables, problem solving, innovative creative thinking, students' perceptions of e-learning and its variables. Based on the AMOS output, it can be stated that the five variables are valid and reliable for further testing.

The results of further tests to determine the effect of student perceptions on of e-learning on communication variables, problem solving, and innovative creative thinking are shown in Figure 2.

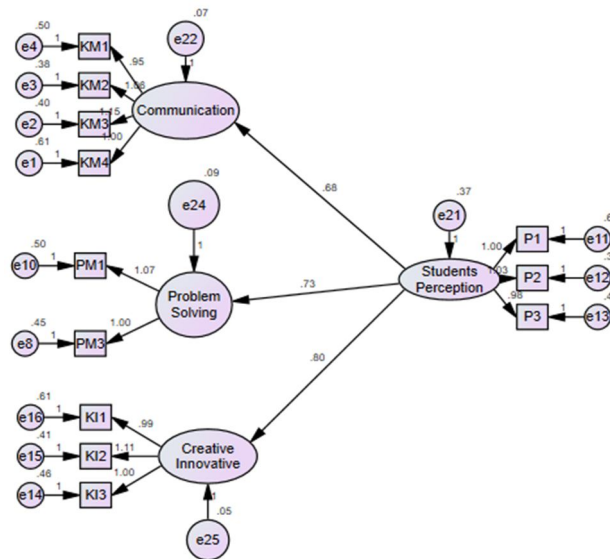


Figure 2. Implementation Instruments in Learning

The output of AMOS 22 shows that the probability value = 0.057, CMIN / DF = 1.332; GFI = 0.974; AGFI = 0.960; NFI = 0.950; CFI = 0.987; TLI = 0.983 and RMSEA = 0.029. The magnitude of the influence of students' perceptions on communication skills was 68%, problem solving 73% and creative innovative 80%.

The results of this analysis indicates that the model used is appropriate. The AMOS output shows that the e-learning system can help to find solutions to problems via the internet has no impact to other variables so that it is discarded or reduced.

E-learning is a learning system that utilizes technology that is not limited by time and space. With the meaning of the word, learning can be carried out synchronously and asynchronously. Synchronous is learning process that is carried out at the same time while asynchronous is learning process that is carried out at different times (Rausch and Levi, 2008; Malik, *et al.*, 2017). E-learning is a communication medium between teachers and students. Subject matter is taught face-to-face can be accessed and asked again if you have difficulty when you get home. Teachers and students can communicate openly and freely, ask questions until they really understand the material that has been taught. E-learning was very appropriate to use during the Covid 19 pandemic (Shahzad, *et al.*, 2020; Irfan, *et al.*, 2020). What kind of e-learning used during the Covid-19 pandemic, they are Google Classroom and Google Meet. The implementation of e-learning starts from March to June 2020. Even though it has only hold for three months, it has changed the thinking patterns of students. Those who previously did not understand about doing and sending assignments through the google classroom media became aware and were skilled at using the media. As a result, they gain broad and new insights in learning methods and resources. Teachers are not the only one source of learning, but internet is also too. There are cheap, efficient and abundant learning



resources in cyberspace (the internet). Through e-learning students can also communicate in various ways, both written and verbal in cyberspace (Irfan, *et al.*, 2020). They can communicate more effectively with oral and written through multimedia (Cimermanova, 2013). The applications in education world provide innovation in communication, interaction so as to contribute to the positive impact of the teaching and learning process (Zaheer, *et al.*, 2018). The internet is also used to communicate and express ideas, both when discussing with friends and when solving problems from teachers. Students should not refuse the presence of e-learning, but they must be able and used to communicate through technology. So it is not surprising that the responses of students feel happy and attracted to e-learning as a learning medium. Online learning has a positive impact on students (Cakrawati, 2017).

Through e-learning students are given the confidence to find other learning sources except handbooks. The internet is used to explore web-pages from one site to another. During the deep exploration, students can find new things and experiences. Online learning provides new experiences for students (Alchamdani, *et al.*, 2020). Problems or difficulties in answering questions, defining a term, ways of making reports, finding the desired secondary school are all available on the internet. E-learning has made it easier for students to get answers to the problems faced.

Searching for information through the internet provides new knowledge and skills and has changed students' thinking patterns. Students play more active role in participating in learning, especially when is given the opportunity to bring cellphones at school (Engle, *et al.*, 2015; Yilmaz, 2016). When students are asked to find out answers of vibration material (for example), they browse with their cellphones quickly. Through observation, students have a variety of ideas in finding a given topic, namely vibration. Students are able to develop a searching process, be able to convey new ideas to other students, and be more open and responsive to given problems. The difference in finding the topic of vibration is a form of creative and innovative thinking process of students. The longer they practiced, the more creative they were in finding answers. The length of time and frequency of internet use, will affect attitudes in using the internet (Sugito, *et al.*, 2017; Yildiz, *et al.*, 2019). In accordance with the statement in the questionnaire which states through e-learning, students can think more creatively than before, bring up new innovations in learning, and find different ways of doing assignments. Thus e-learning can lead to a diversity of ideas in solving a problem and is able to make students more creative and innovative (Songkram, 2017; Sharoff, 2017) that compared to students who only learn with face-to-face learning.

In fact, the use of elearning in this research cannot be used as a communication medium to collaborate with other students. Students have not been able to use e-learning to work together to complete assignments. It should be realized that to be able to work together or research in groups via the internet, it takes longer and consumes more packages. This is of course what students avoid. They will use the data package as economically as possible, so that the use of e-learning has not had a real effect on students. Other ways and methods are needed to be able to optimize e-learning which can be used to improve collaborative learners.



### **3. CONCLUSIONS & RECOMMENDATIONS**

Based on the results of the discussion as described above, it can be concluded that the research instrument is valid and reliable to evaluate the use of e-learning as a learning medium. From product implementation it can be shown that according to students' perceptions the use of e-learning has an influence on the ability to solve problems, especially problems in relating to the teaching and learning process and students' innovative creative thinking skills. However, e-learning cannot be used as a learning medium to collaborate and cooperate in completing school assignments.

### **REFERENCES**

- [1] Mohajan and Haradhan, "Two Criteria for Good Measurements in Research : Validity and Reliability," *Annals of Spiru Haret University*, vol. 17, pp. 58-82, Oct 2018.
- [2] J. W. Creswell, *Research Design, IV*. Yogyakarta: Pustaka Pelajar, 2014.
- [3] H. Said, et, al., "Confirmatory Factor Analysis (CFA) for Testing Validity And Reliability," *Instrument in the Research of Education*, no. January, 2011.
- [4] E. P. Yildiz, et al., "Social Media Attitudes Among Vocational School Students," *Int. J. Eval. Res. Educ*, vol. 8, no. 3, pp. 384–391, Sep 2019, doi: 10.11591/ijere.v8i3.20248.
- [5] E. A. Drost, "Validity and Reliability in Social Science Research," *Education Research and Perspectives*, vol.38, no.1, pp.105-123, January 2011.
- [6] Kusaeri and Suprananto, *Pengukuran dan Penilaian Pendidikan*. Yogyakarta: Graha Ilmu, 2012.
- [7] Sugiono, *Metode Penelitian Kuantitatif Kualitatif Dan R & D*. Bandung: ALFA BETA, 2009.
- [8] S. Santoso, *Structural Equation Modeling (SEM) Konsep dan Aplikasi dengan AMOS 18*. Jakarta: Penerbit PT Elex Media Komputindo, 2011.
- [9] T. Y. Lam and D. A. Maguire, "Structural Equation Modeling : Theory and Applications in Forest Management," *International Journal off orestry Research*, vol. pp. 1-16, 2012, doi: 10.1155/2012/263953.
- [10] S. Bag, "A Short Review on Structural Equation Modeling : Applications and Future Research Directions," *Journal of Supply Chain Management System*, vol 4, no. 3, pp. 65-69, July, 2015, doi: 10.21863/jscms/2015.4.3.014.

- [11] S. L. Zimlich, "Using technology in Gifted and Talented Education Classrooms: The teachers' Perspective," *J. Inf. Technol. Educ. Innov. Pract.*, vol. 14, no. 1, pp. 101–124, 2015, doi: 10.28945/2209.
- [12] M. Norhailawati, et al., "The Power of Social Networking Sites : Student Involvement Toward Education," *Int. J. Eval. Res. Educ.*, vol. 8, no. 3, pp. 549–556, Sep 2019, doi: 10.11591/ijere.v8i3.20352.
- [13] V. Arkorful and N. Abaidoo, "The Role of E-Learning, The Advantages and Disadvantages of Its Adoption in Higher Education.," *Educ. Technol.*, vol. 2, no. 12, pp. 397–410, 2014.
- [14] Y. Tao, et al., "Improving Training Needs Assessment Processes Via The Internet : System Design and Qualitative Research," *Internet Research*, vol. 16, no. 4, pp. 427–449, May, 2006, doi: 10.1108/10662240610690043.
- [15] F. Pozzi and M. Ott, "Fostering Creativity in online Collaborative Learning Environments," Sep 2009. Available: <https://www.researchgate.net/publication/257141715>
- [16] C. Stary and G. Weichhart, "An E-learning Approach to Informed Problem Solving," *Knowledge Management & E-Learning: An International Journal*, vol. 4, no. 2 vol. 4, pp. 195–216, 2012.
- [17] S. Arikunto, *Prosedur Penelitian*. Jakarta: Rineka Cipta, 2006.
- [18] V. H. Pranatawijaya, et al., "Penerapan Skala Likert dan Skala Dikotomi Pada Kuesioner Online," *J. Sains dan Inform.*, vol. 5, no. 2, pp. 128–137, Nov 2019, doi: 10.34128/jsi.v5i2.185.
- [19] C. T. Kereh, et al., "Validitas dan Reliabilitas Instrumen Tes Matematika Dasar yang Berkaitan dengan Pendahuluan Fisika Inti," *J. Inov. dan Pembelajaran Fis.*, vol. 2, no. 1, pp. 36–46, Mei 2015.
- [20] M. Waluyo, "Mudah Cepat Tepat Penggunaan Tools Amos Dalam Aplikasi ( SEM )." Available <https://core.ac.uk/download/pdf/43007241.pdf>
- [21] A. Malkanthie, "The Basic Concepts of Structural Equation Modeling," *L. Lambert Acad. Publ.*, vol. 1, pp. 55. January, 2015, doi: 10.13140/RG.2.1.1960.4647.

- [22] N. H. C. M. Ghazali “Confirmatory Factor Analysis of the School-Based,” *Ta’dir: Journal of Islamic Education*, vol. 21, no. 1, pp. 73–86, Juni 2016.
- [23] W. A. Rausch and P. Levi, “Asynchronous and Synchronous Cooperation,” *Distrib. Auton. Robot. Syst.* pp. 245–256, January 2008, doi: 10.1007/978-4-431-66942-5\_22.
- [24] M. Malik, et al., “E-learning: Students’ Perspectives About Asynchronous and Synchronous Resources at Higher Education Level,” *Bull. Educ. Res.*, vol. 39, no. 2, pp. 183–195, Aug 2017.
- [25] A. Shahzad, et. al., “Effects of COVID-19 in E-learning on Higher Education Institution Students: The Group Comparison Between Male and Female,” *Qual. Quant.*, 2020, doi: 10.1007/s11135-020-01028-z.
- [26] M. Irfan, et al., “Challenges During The Pandemic: Use of E-Learning In Mathematics Learning In,” *Journal of Mathematics Education*, vol. 9, no. 2, pp. 147–158, Sep 2020.
- [27] G. Mayende, et al., “Improving Communication in Online Learning Systems,” *CSEDU 2017 - Proc. 9th Int. Conf. Comput. Support. Educ.*, vol. 1, pp. 300–307, Des 2017, doi: 10.5220/0006311103000307.
- [28] I. Cimermanova, “Ecommunication in Elearning,” *Eur. Sci. J.*, vol. 9, no. 28, pp. 445–455, Oct 2013.
- [29] S. Zaheer, et al., “Do Mobile Technology in the Classroom Really Improve Learning Outcomes?,” *Int. J. Eval. Res. Educ.*, vol. 7, no. 3, pp. 188–193, Sep 2018, doi: 10.11591/ijere.v7.i3.13426.
- [30] L. M. Cakrawati, “Students’ Perceptions on the Use of Online Learning Platforms in EFL Classroom,” *English Lang. Teach. Technol. J.*, vol. 1, no. 1, pp. 22–30, 2017.
- [31] A. Alchamdani, et al., “The Impact Of Covid19 Pandemic on Online Learning Process in the College at Southeast Sulawesi,” *Jurnal Kesehatan Lingkungan*, vol. 12, no. 1, pp. 129-36, Sep 2020, doi: 10.20473/jkl.v12i1si.2020.129-136.
- [32] L. Engle, et al., “Smartphone as an e-Learning Resource,” *International Journal of Social Science and Humanities Research*, vol. 3, no. 3, pp. 175–180, Sep 2015.

- [33]O. Yilmaz, "E-Learning: Students Input for Using Mobile Devices in Science Instructional Settings," *J. Educ. Learn.*, vol. 5, no. 3, p. 182, 2016, doi: 10.5539/jel.v5n3p182.
- [34]S. Sugito, S. M. E. Susilowati, H. Hartono, and S. Supartono, "The Learning Syntax Through Edmodo in the Beginners Class," *Int. J. Eval. Res. Educ.*, vol. 6, no. 4, p. 299, 2017, doi:10.11591/ijere.v6i4.
- [35]N. Songkram, "Online Course Design for Creativity and Innovative Skills in Virtual Cultural ASEAN Community," *International Journal of Emerging Technologies in Learning*, vol. 12, no. 1, pp. 4-20, 2017.
- [36]L. Sharoff, "Creative and Innovative Online Teaching Strategies : Facilitation," *Journal of Educators Online*, 2017. DOI: 10.9743/JEO.2019.16.2.9