



2020 the third International Conference
on Vocational Education and Electrical Engineering
(ICVEE)

NO. 45512/UN38.1/DL.01.02/2020



CERTIFICATE

TO:

I.G.P. Asto Buditjahjanto

as Presenter

**Factor Analysis that Influences CPL/Pilot License Commercial Phase Technical Knowledge of Cadets
of Official Aviation School Vocational Education**

in 2020 the third International Conference on Vocational Education and Electrical Engineering (ICVEE).
With the theme "Strengthening the Framework of Society 5.0 through Innovations
in Education, Electrical Engineering, and Informatics Engineering".

Surabaya, October 3-4, 2020

Chairman of ICVEE



Prof. Dr. Bambang Suprianto, M.T.



Director of UNESA

Prof. Dr. Bambang Yulianto, M.Pd.



Factor Analysis that Influences CPL/Pilot License Commercial Phase Technical Knowledge of Cadets of Official Aviation School Vocational Education

Ahmad Hariri
Surabaya State University
ahmadhariri.pnb@gmail.com

Arie Wardhono
Surabaya State University
ariewardhono@unesa.ac.id

Bambang Suprianto
Surabaya State University
bambangsuprianto@unesa.ac.id

I Gusti Putu Asto B
Surabaya State University
asto@unesa.ac.id

Abstract— Ability competencies conduct performances based on knowledge, skills, and attitudes according to performances required. The research analyzes the factors that can influence CPL/pilot license commercial phase technical knowledge of cadets of official aviation school vocational education. The research uses a quantitative approach by using the Data Analysis Technique of factor analysis. The population in this research consists of cadets available in Indonesian Aviation Academy and Indonesian Aviation Polytechnique Curug as 180 cadets, whereas the sampling technique uses a total sampling of 180 cadets. The data collection uses questionnaires. The results in this research find five factors, they are performance ability factors, performance attitude and communication factors, performance moral factor, performance factual factor, and performance mental factor.

Keywords—Competency, Performance Ability, Performance Attitude and Communication, Performance Moral, Performance Factual, and Performance Mental

I. INTRODUCTION

To result in human resources and synergies nationally, government integrates educational and training regulations regulated in Laws, it purposes to fill inadequacies from each educational council, it is conducted through the programs related to employment. As the implications, formal educational council [in school line] and educational and training council [outside school line] professionally and proportionally will achieve recognitions and certifications parallel and proper with the competencies proposed by the independent council.

According to [1] based on National Educational System Law Number 20 In 2003 Clause 15, vocational education in high school that orients to graduate preparation for coming into the career world in certain skills. Besides vocational education, there are vocations at the higher level available in high institutions formed in diploma education. Vocational learning is the capability developmental leaning of learner performance competency that is ready to solve many problems in society and career world, take positions in the career world, and develop the career professionally and continually [2]. Graduate preparation in coming into the career world in certain skills needs high competences in one. Competency is defined by Virkus in [3] as ability in certain professional or academic domains to use what has been learned and new knowledge and skill.

Vocational learning design in century 21 needs future vision enforcement according to skill or ability needs [2]. According to Anttiroiko, et al in [3] skills involve abilities for applying pragmatically, consciously, or even unconsciously, our knowledge in practical regulations.

The International Civil Aviation Organization (ICAO) in 2015 clarified the scope of article 12 of the Chicago Convention which stipulates that air rules apply to all aircraft, both manned and unmanned. However, these regulations do not take into account that aviation regulations have been designed for manned flights and associated features or properties, thus causing problems. This is due to some regulations which are not necessarily compatible with future unmanned participants on civil aviation [4].

Airline airlines and air traffic controllers have destination flight procedures. Aircraft operations that meet expectations for repeatability and predictability into performance levels that are more adequate to support performance-based operations in the National Airspace System (NAS). Sometimes, the development of nearly independent procedure design criteria and aircraft performance standards results in the paths of the various aircraft under the same procedure not overlapping and not meeting the procedure designer expectations. This underlies a pilot to have sufficient competence [5].

According to Slamet in [6], the competency main characteristics are abilities in doing something. Therefore, ability level in doing something is often used as a graduate quality level measurer. Competencies are habits that must be conducted consistently and continually, and abilities to conduct adjustments to many changes that happen in life, both professions, skills, and others. According to [7], competencies involve duties, skills, attitudes, and appreciations that must be owned by the student to conduct the tasks learned in school according to the abilities needed by the career world. Indicators in achieving competencies entirely can be applied in learning activities flexibly and adaptively according to local conditions and needs, both student needs and people need, so they can give rooms for teachers to conduct maneuvers and innovations to achieve effective, efficient, and relevant learnings.

The knowledge dimension is important in measuring competencies in education. According to Anttiroiko et al in [3], knowledge can be seen as understanding how the world is formed daily and how are the working methods. Knowledge plays the main role in people's development

continues as the most important and the most significant assets from some organizations (Sargit et al in [8]).

According to Crick in [9] competencies are defined as complex combinations from knowledge, skills, understandings, values, attitudes, and wills that refer to someone's actions. Performance attitudes are actions taken by the worker and all cases that must be conducted by the worker, and the results are parallel with the efforts conducted [10]. According to Finch and Crunkilton in [11], competencies are masteries toward some duties, skills, attitudes, and appreciations needed to support successes. This case shows that competencies involve duties, skills, attitudes, and appreciations that must be owned by learners to be able to implement the learning tasks according to certain job types. Therefore, competencies are the tonal characteristics that underlie someone and indicate the ways of acting, thinking, or generalizing situations properly for the long-term.

Competencies in [2], be seen through performance morals such as that performance morals are related to loyal attitudes to the job, appreciate achievements, environmental care is an important part of someone's performance successes. Performance morals are developed through value application. Good performance morals show competencies owned by someone. [12] Moral competencies are defined as emotional tendencies for doing altruistic attitudes toward other people, and abilities in evaluating moral problems and dimensions logically and consistently in the level of advanced growth and development. Moral competencies are the ability to integrate cognition, actions, and ideas into comprehensive units, besides the ability to understand choices and actions, and self-understandings as independent entities.

[13] Variables using knowledge, skills, and attitudes as three integration processes that finally refer to vocational competences. The research is different from the research conducted by [8], he entered knowledge, attitudes, and characteristics as dimensions for analyzing the relations toward manager performances of human resources. Whereas the research of [12] explores teacher attitudes, competencies, knowledge, and practices toward educational evaluation. The other opinion is also expressed by Finch and Crunkilton in [11] who stated that there are five competition indicators, they are motives, traits, self-concept, knowledge, and skills.

Indonesian Aviation Academy Banyuwangi is one of the official high institutions that are under the Indonesian Transportation Ministry. This case is seen from many graduates who have not gotten jobs or they are jobless. This case is explained by Dwiwand Ako in [14] who said that approximately 2,000 pilots are not used by Indonesian aerospace aviation industries, they are graduates of aviation schools. This school teaches pilot students, so they achieve flight licenses, basically from PPL (Private Pilot License) to CPL (Commercial Pilot License) that become licenses obligated to work as professional pilots by airlines. CPL (Commercial Pilot License) has bigger values than PPL license (Private Pilot License), in which if he/she wants to achieve PPL, cadets must have flight hours of 40 to 60 hours. Whereas for CPL, the must-have 140 to 160 flight hours. Therefore, prospective cadets must know previously about licenses prepared by a pilot school to be able to select the best aviation schools and they have good chances in the career world.

This research originality is viewed from Research Form in 2017 it uses variables of attitudes, knowledge, skills, and competencies, then [15] uses variables of moral competencies, moral intelligence. The research will give new methods in improving cadet competencies through 4 aspects researched, they involve performance skills, performance knowledge, performance attitudes, performance morals. The contributions in this research are hoped to give new knowledge and insights related to educational management and they can be used for input materials or references for the parties of Official Aviation School to undergo the roles of the vocational educational council. Besides that, it is hoped to be able to give contributions to Indonesian Aviation Academy Banyuwangi in improving cadet competencies that involve performance skills, performance knowledge, performance attitudes, performance morals. The five cases are important to be owned by cadets of prospective pilots in the study when they will achieve flight licenses, basically from PPL (Private Pilot License) to CPL (Commercial Pilot License)

II. METHODS

A. Research Design

The research type used in this research is associative, i.e. the research that aims to know the relations between two variables or more [16]. The method used to conduct the research is quantitative research. The research design that uses a quantitative approach must be structured, valid, formal, and designed as best as possible before. Design characterizes as specific and detailed because the base is some research design that will be conducted really [17].

B. Population and Samples

Population refers to the entire group of people, events, or things of interest that the researcher wishes to investigate [18]. The population in this research consists of cadets of Indonesian Aviation Academy and Indonesian Aviation Polytechnique Curug as 180 cadets.

The sample is the collection determination of the total respondents is conducted by the total sampling technique, i.e. sample determination technique is a sample collection technique in which the total samples are the same as the population [18]. Based on this case, there are 180 cadet samplings taken.

C. Variable Operational Definition

An operational definition is one concept or something that can be measured and can be seen in dimensions of attitudes, aspects, or characters shown by the concept. So, the variable operational definitions in this research are:

1. Performance Skills

Performance skills are measured through the indicators as follows: Motoric, Intellectual, Mental.

2. Performance Knowledge

Performance knowledge in this research is measured through several indicators, they are: Factual, Conceptual, Procedural, Metacognitive.

3. Performance Attitudes

Performance attitudes in this research are measured through several indicators, they are: Responsive, Communicative, Adaptive.

4. Performance Morals

Performance morals in this research are measured through several indicators, they are: Respecting achievement and Environmental care.

D. Data Types and Sources

The data types in this research are based on the research methods used in the previous discussions, by quantitative research. The data sources used are primary data. Primary data is a way in which data collected from sources on the variable of interest for the specific purpose of the study [18]. Primary data in this research are gotten from questionnaire distributions.

E. Data Collection Method

The data collection method is a systematic procedure by caring about hatching that has been determined. The method used for getting the data required are by using questionnaires. A questionnaire is a list that contains a set of questions arranged by the researcher to be filled by respondents such as written questions for asking for notes or answers and information required [16].

F. Data Analysis Technique

The data analysis technique used is factor analysis. Analisis faktor beroperasi pada gagasan bahwa variabel yang dapat diukur dan diamati dapat direduksi menjadi lebih sedikit variabel laten yang berbagi varian yang sama dan tidak dapat diamati, yang dikenal sebagai pengurangan dimensi [19].

III. RESULTS

A. Data Analysis

As we explained in Chapter III, i.e. in the first step, it will conduct factor analysis toward 25 items from all variables for finding factor analysis that can influence CPL/pilot license commercial phase technical knowledge of cadets of official flight school vocational education, before we conduct the factor analysis as follows, it is conducted assumption test if the factors are proper to be used or not.

B. Intercorrelations Analysis Inter-Factor

The analysis toward suitability uses factor analysis approaches for ensuring that factor analysis can be conducted by seeing the value of testing hypothesis that variables do not correlate in one population.

$$H_0 = r = 0$$

$$H_1 = r \neq 0$$

The analysis results by *Barlett's test of sphericity* and measurement of *Kaiser Meyer Olkin (KMO)* can be seen in table 1. From *Barlett's test of sphericity* = 2221.176, the error probability happens and the significance level is 0.000, so H_0 is rejected and H_1 is accepted.

So, it can be concluded that there are no intercorrelation inter-variables in one population, therefore, the factor analysis can be conducted. Besides that, the result of *Kaiser Meyer Olkin (KMO)* about sample suitability shows the

TABLE I. FACTOR ANALYSIS SUITABILITY TEST

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.844
Bartlett's Test of Sphericity	Approx. Chi-Square	2221.176
	df	300
	Sig.	.000

TABLE II. ANTI IMAGE MATRICES

	Indicator	MSA Value
SK1	Dexterity in applying Valid Operational Procedure application of flight	0.712
SK2	Accuracy in understanding flight operational plan	0.926
SK3	Ability in identifying Principle of flight and Aerodynamic	0.799
SK4	Ability in renewing flight plan in emergency condition	0.858
SK5	Ability in identifying plane care requirement problems	0.888
SK6	Ability in thinking critically about plan operations	0.773
SK7	Spirit in conducting duties	0.832
SK8	Ability in controlling emergency condition	0.732
SK9	Ability in Aircraft General Knowledge	0.828
SK10	Self-confidence owned related to commercial plan operation	0.887
PK1	Understanding in operating plane as commercial flight	0.790
PK2	Ability in remembering again about Meteorology materials	0.835
PK3	Ability in solving problems of weather phenomena	0.901
PK4	Ability in doing duties according to work steps of flight emergency condition	0.852
PK5	Discipline in undergoing duties	0.840
PK6	Actions conducted based on understandings about commercial pilot duties	0.878
SiK1	Responsiveness in responding time availability made in flight plan	0.845
SiK2	Giving response if there are weather changes	0.874
SiK3	Ability in making good communication to Cabin Crews	0.848
SiK4	Ability in making communication for getting information	0.855
SiK5	Attitude in self-adjustment toward plane condition	0.864
SiK6	Attitude in self-adjustment toward flight emergency condition	0.761
MK1	Respecting achievement achieved by cabin crews	0.803
MK2	Appreciating skills owned by cabin crews	0.862
MK3	Care toward the cases that happen to passengers	0.730

result of 0.844, because the result of KMO is bigger than 0.5, so the factor analysis can be processed furtherly.

Factor analysis calculation by entering 25 sub-variables shows the calculational results by the better MSA values above 0.5, so the variable collection can be processed furtherly. The MSA values for the 25 indicators can be seen in Table 2 as follows:

Because the MSA values from all indicators are bigger than 0.5, so there is no item removed, according to [20] the MSA-value is bigger than 0.5 show adequate sample collection processes.

C. Conducting Main Component Analysis

The analysis purpose is for determining the factors that become determinants in the purchase decisions of Garnier products. For summarizing the information contained in origin variables, the total factors must be filtered. The total factors filtered are determined by eigenvalues from the factors. The factors that have eigenvalues bigger than 1.0 are maintained in the model. Eigenvalues explain the total variation parts contributed by the factors toward all variation values observed.

D. Determining Rotated Component Matrix

The factor analysis results are factor matrices that contain coefficients used to state standard variables that are called factors. The analysis uses varimax rotation procedures, i.e. some procedures minimize the total variables that have high loadings toward the factors, so it enables the interpretations.

It is known that the eigenvalues bigger than 1.0 are factor 1 to factor 5. The conclusions are 5 factors that can influence CPL/pilot license commercial phase technical knowledge of cadets of official flight school vocational education by variance cumulative as 68.932%.

IV. DISCUSSIONS

A. Factor I

The first factor is the factor that has the first biggest eigenvalue as 8.970 and the first biggest variance value as 35.881%. The factor I is a factor formed by variables considered. The loading factor values from variables that form factor I are bigger than 0.55 and the variable is a factor I that can influence CPL/pilot license commercial phase technical knowledge of cadets of official aviation school vocational education, so it can be called as performance base ability of commercial pilot license.

B. Factor II

The second factor is the factor that has the second biggest eigenvalue as 3.196 and the second biggest variance value as 12.784%. Factor II is a factor formed by variables considered, it involves Dexterity. The loading factor values from variables that form factor II are bigger than 0.55 and the variables are factor II that can influence CPL/pilot license commercial phase technical knowledge of cadets of official aviation school vocational education, so it can be called performance attitude and communication factors.

C. Factor III

The third factor is the factor that has the third biggest eigenvalue as 1.899 and the third biggest variance value as 7.595%. Factor III is a factor formed by variables considered, it involves Spirit. The loading factor values from variables that form factor III are bigger than 0.55 and the variables are factor III that can influence CPL/pilot license commercial phase technical knowledge of cadets of official aviation school vocational education, so it can be called performance moral factors.

D. Factor IV

TABLE III. FACTOR ANALYSIS RESULTS

Factor	Eigen Value	Variation Value (%)	Cummulative Variation (%)	Variable That Forms Factor	Loading Value
I	8.970	35.881	35.881	Accuracy in understanding flight operational plan (SK2)	0.529
				Ability in renewing flight plan in emergency condition (SK4)	0.796
				Ability in identifying plane care requirement problems (SK5)	0.730
				(SK6) Ability in thinking critically about plan operations	0.831
				Ability in solving problems of weather phenomena (PK3)	0.613
				Actions conducted based on understandings about commercial pilot duties (PK6)	0.645
II	3.196	12.784	48.664	Responsiveness in responding time availability made in flight plan (SiK1)	0.906
				Dexterity in applying Valid Operational Procedure application of flight (SK1)	0.831
				Ability in doing duties according to work steps of flight emergency condition (PK4)	0.514
				Discipline in undergoing duties (PK5)	0.615
				Ability in making good communication to Cabin Crews (SiK3)	0.662
				Ability in making communication for getting information (SiK4)	0.839
III	1.899	7.595	56.259	Attitude in self-adjustment toward plane condition (SiK5)	0.541
				Attitude in self-adjustment toward flight emergency condition (SiK6)	0.712
				Spirit in conducting duties (SK7)	0.514
				Ability in Aircraft General Knowledge (SK9)	0.401
				Appreciating skills owned by cabin crews (MK2)	0.661
				Care toward the cases that happen to passengers (MK3)	0.848
IV	1.733	6.931	63.190	Ability in identifying Principle of flight and Aerodynamic (SK3)	0.791
				Understanding in operating plane as commercial flight (PK1)	0.526
				Ability in remembering again about Meteorology materials (PK2)	0.753
				Respecting achievement achieved by cabin crews (MK1)	0.391
V	1.435	5.742	68.932	Ability in controlling emergency condition (SK8)	0.779
				Self-confidence owned related to commercial plan operation (SK10)	0.536

The fourth factor is the factor that has the fourth biggest eigenvalue as 1.733 and the fourth biggest variance value as 6.931%. Factor IV is a factor formed by variables considered, it involves Ability. The loading factor values from variables that form factor IV are bigger than 0.55 and the variables are factor IV that can influence CPL/pilot license commercial phase technical knowledge of cadets of official aviation school vocational education, so it can be called performance factual factors.

E. Factor V

The fifth factor is the factor that has the fifth biggest eigenvalue as 1.435 and the fifth-biggest variance value as 5.742%. Factor V is a factor formed. The loading factor values from variables that form factor V are bigger than 0.55 and the variables are factor V that can influence CPL/pilot license commercial phase technical knowledge of cadets of official aviation school vocational education, so it can be called performance mental factors.

V. CONCLUSIONS

The conclusions from this research are the factors that can influence CPL/pilot license commercial phase technical knowledge of cadets of official aviation school vocational

education consists of 5 factors that really and influence CPL/pilot license commercial phase technical knowledge of cadets of official aviation school vocational education. The five factors are performance ability factors, performance attitude and communication factors, performance moral factors, performance factual factors, and performance mental factors.

REFERENCES

- [1] W. S. Kuswana, *Taksonomi Berpikir*. Bandung: PT. Remaja Rosdakarya, 2011.
- [2] R. Iskandar and P. Sudira, "Model-Model Pembelajaran Vokasional 4Cs Pada Sekolah Menengah Kejuruan," *J. Univ. Negeri Semarang*, vol. 8, no. 2, pp. 40–47, 2019.
- [3] C. V. Anunobi and O. K. Udem, "Information Literacy Competencies: A Conceptual Analysis," vol. 7, no. 2, pp. 64–80, 2014, DOI: 10.31229/osf.io/bsza6.
- [4] M. Finke and P. B. Sinapius, "Application of visual and instrument flight rules to remotely piloted aircraft systems: A conceptual approach," *AIAA/IEEE Digit. Avion. Syst. Conf. - Proc.*, vol. 2016-December, pp. 1–10, 2016, DOI: 10.1109/DASC.2016.7778015.
- [5] A. A. Herndon, M. Cramer, T. Nicholson, and S. Miller, "Analysis of Advanced Flight Management Systems (FMS), Flight Management Computer (FMC) field observations trials: Area Navigation (RNAV) holding patterns," *AIAA/IEEE Digit. Avion. Syst. Conf. - Proc.*, pp. 1–16, 2011, DOI: 10.1109/DASC.2011.6096065.
- [6] A. H. S. Irianti, "Peningkatan Kompetensi Bagi Siswa Sekolah Menengah Kejuruan (Smk) Program Keahlian Busana Butik Melalui Pemilihan Tempat Praktik Kerja Industri Yang Relevan," no. 5, pp. 1–13, 2019, doi: 10.31227/osf.io/9gq4b.
- [7] R. Lapisa, I. Y. Basri, A. Arif, and H. D. Saputra, "Peningkatan Kompetensi Siswa Melalui Pelatihan Auto Cad," *INVOTEK J. Inov. Vokasional dan Teknol.*, vol. 17, no. 2, pp. 119–126, 2017, doi: 10.24036/invotek.v17i2.82.
- [8] P. Rastgoo, "The role of human resources competency in improving the manager performance," *Acta Univ. Agric. Silvis. Mendelianae Brun.*, vol. 64, no. 1, pp. 341–350, 2016, DOI: 10.11118/actaun201664010341.
- [9] V. Gulevska and T. Atanasoska, "Enhancing teacher competencies with emotional and ethical capacity," *Int. J. Cogn. Res. Sci. Eng. Educ.*, vol. 3, no. 2, pp. 85–90, 2015.
- [10] S. Purwanto, "Sikap Kerja Perawat," *Klinis Wordpress*, 2008. .
- [11] S. H. Manurung, "ANALISIS FAKTOR-FAKTOR YANG MEMPENGARUHI KEEFEKTIFAN BELAJAR MATEMATIKA SISWA MTs NEGERI RANTAU PRAPAT PELAJARAN 2013/2014.," *J. EduTech*, vol. 1, no. 1, pp. 1–16, 2015, doi: https://doi.org/10.30596/edutech.v1i01.269.
- [12] H. Alkharusi, S. Aldhafri, H. Alnabhani, and M. Alkalbani, "Educational Assessment Attitudes, Competence, Knowledge, and Practices: An Exploratory Study of Muscat Teachers in the Sultanate of Oman," *J. Educ. Learn.*, vol. 1, no. 2, 2012, DOI: 10.5539/jel.v1n2p217.
- [13] L. K. J. Baartman and E. De Bruijn, "Integrating knowledge, skills, and attitudes: Conceptualising learning processes towards vocational competence," *Educ. Res. Rev.*, vol. 6, no. 2, pp. 125–134, 2011, DOI: 10.1016/j.edurev.2011.03.001.
- [14] S. M. Jannah, "Biang Keladi Ribuan Pilot Muda Menganggur," *Tirto.id*, 2020. <https://tirto.id/biang-keladi-ribuan-pilot-muda-menganggur-eBpp>.
- [15] S. A. Abdel-Hadi, "The level of moral competence and its relationship with the variables of, gender, specialization and academic year among Al Falah University students in Dubai," *Int. J. Bus. Soc.*, vol. 18, no. S3, pp. 463–478, 2017.
- [16] J. W. Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 4th ed. Thousand Oaks, CA: Sage.
- [17] A. Tanzeh, *Pengantar Metode Penelitian*. Yogyakarta: Teras, 2009.
- [18] U. Sekaran and R. Bougie, *Research Methods For Business: A Skill Building Approach*, Seventh. Chichester, West Sussex, United Kingdom: John Wiley & Sons, Inc, 2016.
- [19] D. Bartholomew, M. Knotts, and I. Moustaki, *Latent variable models, and factor analysis: A unified approach*, 3rd ed. West Sussex, UK: John Wiley & Sons, Inc, 2011.
- [20] M. Wocken and J. Loy, "Evaluation of eLearning – A study of Undergraduate Agricultural Economics course," 2011.