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Factor analysis and leveling of the analytical and planning skills of pre-service college administrators: A study in undergraduate administration

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ABSTRACT

The study addresses the crucial yet under-researched analytical and planning skills of pre-service college administrators (APsCA) necessary for effective educational leadership. It pioneers by developing a situational judgment test (SJT) to evaluate these skills, given the absence of suitable assessment tools. Focusing on three constructs—cause/goal analysis, constraint analysis, and planning—the research utilizes exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), along with Fornell's discriminant validity test, to establish and confirm the psychometric properties of the SJT. Through regression and correlation analyses, it assesses the impact of demographic and academic variables on APsCA, particularly highlighting the different effects in urban versus rural environments. The EFA and CFA results with factor loadings above 0.30 and the average variance extracted (AVE) over 0.50 confirm the test's validity. Significant findings reveal a strong influence of urban settings in enhancing APsCA, underscored by a statistical significance of $p < 0.05$. Administrators' capabilities in cause/goal analysis are predominantly high, whereas constraint analysis varies, and planning skills need bolstering. Overall, the APsCA levels are classified as high to very high, suggesting a promising baseline for future educational leaders but also indicating specific areas for targeted skill development.

Contribution/Originality: This study introduces a validated situational judgment test to evaluate key skills in future college administrators, revealing strong analytical abilities but highlighting a need for improved planning skills, with environmental factors, such as urban or rural settings, influencing these competencies.

1. INTRODUCTION

Higher education plays a crucial role in producing high-quality human resources capable of facing complex demands in various professional fields (Keinänen, Ursin, & Nissinen, 2018; McGunagle & Zizka, 2020; Mohiuddin, Hosseini, Faradonbeh, & Sabokro, 2022) one of which is administration. In the context of administration, one college program that produces graduates for this profession is the vocational education administration program. They play a frontline role in preparing future administrators to face continuous challenges and changes in the working world. Specifically, administrative work involves significant complexity due to its focus on providing the

best service (Clément, 2021; Elena, Oksana, Larisa, & Olga, 2015; Ongena, 2023). Therefore, it is essential to ensure that pre-service administrators are equipped with strong analytical and planning skills, enabling them to make appropriate and strategic decisions in the job market (Janovac, Orlandić, & Vukčević, 2023; Mumford, Higgs, Todd, & Elliott, 2019; Stoddard & Spanagel, 2019).

Improving the quality of skills for future administrators is a matter that needs serious attention (Botlíková, Botlík, & Václavínková, 2013; Ozkeser, 2019; Rosenbloom, Kravchuk, & Clerkin, 2022). However, on the other hand, individual characteristic differences may influence the development of these skills. Demographic factors such as age, gender, education expenses (scholarship or non-scholarship), and academic experience can play a significant role in realizing the potential of skills for future administrators. This aspect needs to be thoroughly considered, as previous research has yielded mixed findings on how demographic factors affect students' skills, such as the ability to work as part of a team (Hotapeti, K., & Joshi, 2020; Kulkarni, Kaushik, & Joshi, 2016), information literacy (Atikuzzaman & Ahmed, 2023; Soroya, Iqbal, Soroya, & Mahmood, 2021) critical thinking (Ahmad & Duskri, 2018; Zuriguel-Pérez et al., 2019), and other skills (Susantiningrum, Siswandari, Joyoatmojo, & Mafruhah, 2023) while some earlier studies have found the opposite (Aharony & Gazit, 2020; Liu, Hsu, Hung, Wu, & Pai, 2019; Naveed & Mahmood, 2022; Seng, Carlon, & Cross, 2021). Therefore, in-depth research is needed to identify and understand the impact of demographic factors on analytical and planning skills in the administrative sector.

In the field of research, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) have been proven to be practical tools in identifying skill dimensions and measuring them validly and reliably (Hwang & Kim, 2022; Ji, DuBois, & Flay, 2021; Karyaningsih, Wibowo, Saptono, & Narmaditya, 2020; Leach, Immekus, French, & Hand, 2020; Sosu, 2013). A study conducted by Leach et al. (2020) has demonstrated the effectiveness of EFA and CFA in developing and confirming critical thinking instruments (Karyaningsih et al., 2020; Leach et al., 2020; Sosu, 2013) with entrepreneurial knowledge (Karyaningsih et al., 2020; Susantiningrum et al., 2023), the e-learning satisfaction scale (Hwang & Kim, 2022), the social-emotional scale (Ji et al., 2021) and others. Exploratory factor analysis provides initial insights into the underlying factor structure of prospective administrator skills. In contrast, CFA validates the proposed factor structure and provides empirical support for the instrument's validity.

Despite numerous studies on skills in various sectors (Cadorin, Bortoluzzi, & Palese, 2013; Hwang & Kim, 2022; Leach et al., 2020; Polizzi, 2020; Sosu, 2013; Tang, Vezzani, & Eriksson, 2020; Van Laar, Van Deursen, Van Dijk, & de Haan, 2020) research specifically targeting future college administrators in Indonesia is sparse. Moreover, many of these studies predominantly rely on Likert scales for their assessment tools. It's important to recognize that while Likert scales are designed to categorize responses, they fall short in justifying individual skill levels. This limitation arises as these scales lack values that can distinctly differentiate between agreement or disagreement with a given response (Bernstein, 2005; Harpe, 2015; Weijters, Millet, & Cabooter, 2021).

Andrade (2019) conducted research stating that Likert scales in assessments are not used to differentiate one student's abilities from another. Still, teachers or instructors can use them for initial evaluations with the condition that students answer honestly and without the desire to obtain a specific score. Thus, there is a need for a tool that can justify professional skill levels. Some experts argue that Situational Judgment Tests (SJTs) are valid and reliable when used to measure attributes such as professionalism in the field studied by students (Goss et al., 2017; Patterson, Zibarras, & Ashworth, 2016; Smith et al., 2020). Furthermore, an SJT is a form of assessment designed to measure individuals' abilities to evaluate and respond to realistic work situations (McDaniel, Finnegan, Morgeson, Campion, & Braverman, 2001; Wang, Oostrom, & Schollaert, 2023; Wolcott, Hahn, McLaughlin, & Cox, 2022). Therefore, research that uses exploratory and confirmatory factor analyses to measure the skills of prospective administrators in Indonesia and identify the influence of demographic factors on these skills using the SJT instrument would be a valuable contribution to developing the educational administration system in Indonesia.

Through the presented background, this research can provide a deeper understanding of the skills of prospective administrators in Indonesia and encourage efforts to enhance the overall quality of higher education.

The results of this study are expected to serve as the basis for designing competency development programs for prospective administrators and assist universities in formulating more effective and adaptive management strategies based on the individual characteristics of future administrators. Additionally, the theoretical contribution of this research is expected to enrich the literature on factor analysis, administrative skills, and relevant demographic factors in higher education. The research questions are:

1. What factors influence the analytical and planning skills of pre-service college administrators in the undergraduate administration program?
2. How can pre-service college administrators' analytical and planning skills be categorized or grouped by proficiency?

2. THE COMPREHENSIVE THEORETICAL BASIS

2.1. Analytical and Planning Skills Pre-Service College Administrators

The research on the analytical and planning skills of pre-service college administrators (APsCA) in this study adapted a portion from the research on "The Nine Critical Skills" by Mumford, Todd, Higgs, and McIntosh (2017) which focused on the skills of cause/goal analysis, constraint analysis, and planning. Cause/goal analysis refers to the ability to analyze relevant causes and goals to address problems. Constraint analysis is the ability to identify constraints affecting each feasible solution to a problem. Planning is the ability to formulate plans, mentally simulate, and provide a basis for actions arising from goal and constraint analysis (Mumford et al., 2017). These three skills are essential foundational elements in the administrator profession.

The administrator profession is complex and demanding due to its association with service delivery that constantly requires the best (Clément, 2021; Elena et al., 2015; Ongena, 2023). Additionally, considering complex changes in the issues is highly uncertain. Therefore, it is crucial to ensure that prospective administrators are equipped with strong analytical and planning skills so that they can identify, analyze, and plan for the issues they encounter, enabling them to make appropriate and strategic decisions in the face of frequent changes (Janovac et al., 2023; Mumford et al., 2019; Mumford et al., 2017; Stoddard & Spanagel, 2019). These skills are pivotal for administrators due to the intricate nature of their roles and the unpredictability of challenges. While the study provides an in-depth look at these skills and underscores their relevance, it could be enhanced with more background for a broader investigation, details of research methods, and practical examples. This research offers valuable insights but has room for further context and application.

2.2. Leveling Analytical and Planning Skills for Pre-Service College Administrators

Assessment is a relatively novel concept within educational circles, particularly concerning the cultivation of future leaders' capabilities. It is characterized by an orderly method for gathering, interpreting, and leveraging detailed information and empirical evaluations to guide decision making (Stufflebeam, 1971; Stufflebeam & Zhang, 2017). Love (2010) stated that an assessment's utility covers monitoring student progress, educational reform, and increasing outcome accountability. Typically, its role in education is to ascertain student success and employ this high-stakes information to inform strategies that bolster academic results, whether through interventions already in place or those planned for future enhancement.

The objective of this study is to create a tool that effectively measures the analytical and planning skills of those training to become college administrators. The use of instruments developed by previous research (Cadorin et al., 2013; Hwang & Kim, 2022; Leach et al., 2020; Polizzi, 2020; Sosu, 2013; Tang et al., 2020; Van Laar et al., 2020) based on Likert scales or similar methods are not suitable for achieving this goal. Therefore, this research develops an SJT, a type of evaluation known to simulate real-world, work-based scenarios to measure job-relevant competencies (McDaniel et al., 2001; Wang et al., 2023; Wolcott et al., 2022). SJTs are recognized as valid and reliable for assessing qualities such as professionalism among students, as observed in various studies (Goss et al.,

2017; Patterson et al., 2016; Smith et al., 2020). Specifically, Lievens and Motowidlo suggested that SJTs can predict job performance by gauging one's procedural knowledge—the understanding of how to act effectively in diverse workplace scenarios. This knowledge encompasses general domain knowledge about the appropriateness of exhibiting certain traits at work, a knowledge base not necessarily derived from specific job experiences but rather from broad socialization and personal dispositions. Such knowledge is indicative of performance in work contexts and hence should be deliberately assessed using SJTs (Lievens & Motowidlo, 2016). By focusing on the analytical and planning skills of pre-service college administrators, this study seeks to authenticate the competency levels within this group. Moreover, with prior research on the application of SJTs in the field of administration being scant, the development of such an instrument tailored to this context stands to significantly enhance the educational administration landscape in Indonesia.

Educational evaluation is transforming, with traditional Likert scale-based methods revealing limitations in assessing the prowess of future administrators. This research shifts the focus to a situational judgment test, a tool known for its efficacy in predicting job performance by measuring an individual's ability to handle real-life work situations. Scholars including Lievens and Motowidlo champion SJTs for their depth in capturing procedural knowledge and inherent personal traits. By addressing the specific needs of Indonesia, the study aims to craft an SJT instrument tailored to gauge the analytical and planning skills of pre-service college administrators. This innovative approach, largely unexplored in Indonesia's administrative domain, promises to revolutionize the country's educational administration evaluation, setting new standards and potentially influencing broader educational strategies.

2.3. Demographic Characteristics & Academic

Several factors, such as motivation and educational policies, can influence students' skills. Additionally, other factors often investigated by researchers include student demographics, such as gender, environment, education costs, and college entrance pathways. Morley and Lugg argued that gender should be considered in every investigation or study as it can significantly affect research outcomes (Morley & Lugg, 2009). Some researchers found that gender has an impact on students' skills (Ahmad & Duskri, 2018; Atikuzzaman & Ahmed, 2023; Hotapeti et al., 2020; Kulkarni et al., 2016; Soroya et al., 2021), while others did not find such an association (Aharony & Gazit, 2020; Liu et al., 2019; Naveed & Mahmood, 2022; Seng et al., 2021). In addition to gender, students' environmental background should also be examined, as whether they come from a rural or urban area may also influence their skills (Hotapeti et al., 2020; Kulkarni et al., 2016); however, some researchers did not find this relationship (Chowdhury, 2020; Ghatol, 2017).

Regarding education costs, Ghatol (2017) highlighted this aspect but found no significant influence. On the other hand, Duflo, Dupas, and Kremer (2021) found a significant correlation between scholarships and students' skills, while Kaushal and Ali (2020) found that providing scholarships can enhance student loyalty. In the context of college entrance pathways, a study by Hardinger, Schauner, Graham, and Garavalia (2013) compared two college entrance pathways to determine what causes student failure (Hardinger et al., 2013). Meanwhile, Kamis, Pan, and Seah (2023) compared two college entrance pathways and found that one pathway indicated significantly higher participation in academic and non-academic activities and increased post-graduation employability (Kamis et al., 2023). Regarding academics, earlier research indicates that this component could influence students' skills. Several studies (Carter, Creedy, & Sidebotham, 2018; Changwong, Sukkamart, & Sisan, 2018; Nold, 2017) have investigated the relationship between critical thinking and grade point average (GPA) and found a significant correlation. However, recent studies (Dyer & Hall, 2019; Shirazi & Heidari, 2019) found no significant relationship between GPA and critical thinking skills. This study utilizes the demographic variables of gender, environment, education costs, and college entrance pathways. Academic performance will be reflected in students' GPA. The findings, which are relatively scarce in the administration field, will contribute valuable insights into the development of the

administrative education system in Indonesia by identifying the influence of demographic factors on the analytical and planning skills of pre-service college administrators.

The content thoroughly examines determinants that influence the analytical and planning skills of pre-service college administrators, covering a range of intrinsic and extrinsic factors. Notably, it delves into the role of gender, the impact of environmental backgrounds (rural vs. urban), the implications of education costs and scholarships, and the significance of college entrance pathways in shaping student abilities and outcomes. Additionally, the evolution in understanding the relationship between GPA and critical thinking is highlighted, suggesting a dynamic academic perspective. This exploration promises valuable insights into the nuances of administrative education in Indonesia; however, it could benefit from more explicit synthesis and definitions.

3. METHOD

This research was conducted from March 2023 to June 2023 and involved 150 participants. Valid data from 126 participants was used as 24 data points were eliminated due to incomplete responses. The participants were pre-service college administrators from several universities in Indonesia. Their participation was voluntary, and the research team contacted them to obtain consent. Once consent was obtained, the participants independently answered the questions within a time limit of 15 minutes.

The research instrument (see Table 1) was developed by adapting "the nine critical skills" (Mumford et al., 2017) using a situational judgment test (SJT) with five answer options. The responses that best reflected the situation or provided the best solutions were given a grade of 5, while the worst responses were given a grade of 1. The SJT was chosen as the basis for developing this instrument because several experts agree that SJTs are valid and reliable for measuring attributes such as professionalism in a student's field of study (Goss et al., 2017; Patterson et al., 2016; Smith et al., 2020). Furthermore, an SJT is a form of assessment designed to measure an individual's ability to evaluate and respond to realistic work-related situations (McDaniel et al., 2001; Wang et al., 2023; Wolcott et al., 2022).

Table 1. Sample questions.

Item code	Question	
Q1	You are assigned to prepare the annual financial report. How would you ensure the accuracy and reliability of the report?	Response options A, B, C, D, E
Q2	You are tasked with managing a project to develop a new curriculum. How would you analyze and plan the curriculum development?	
Q3	You are responsible for analyzing the performance reports of staff in your department. How would you analyze their performance?	

Note: The SJT-based questions presented here are the only valid ones. The participants answered a total of 16 questions within a 15-minute time limit. Thirteen questions are not shown as they were found to be invalid based on the research report's suitability test and efficiency considerations. For the complete version, interested readers can correspond with the research team.

The methodological approaches in this study encompass a range of statistical techniques, including exploratory factor analysis (EFA), confirmatory factor analysis (CFA), Fornell's test for discriminant validity, linear regression, correlation analysis, and descriptive statistics. EFA was used to ascertain which items accurately represent the underlying constructs. CFA and Fornell's test for discriminant validity were applied to validate the efficacy of the items in measuring the pre-defined constructs. Linear regression and correlation analysis were conducted to examine the effects of demographic factors and academic achievements on the constructs. Descriptive statistics provide a summary of how frequently the constructs occurred. The criteria for applying EFA were guided by the methodologies established by Joseph, William, Barry, and Rolph (2010), while Schermelleh-Engel, Moosbrugger, and Müller (2003) guided the confirmatory factor analysis, and Fornell and Larcker (1981) provided the framework for the discriminant validity test. The leveling skills analysis was adapted from the research by Susantiningrum et al. (2023).

4. RESULTS AND DISCUSSION

4.1. Result of Exploratory Factor Analysis

The 126 participants in the group were pre-service college administrators actively enrolled in various universities in Indonesia. Approximately 61.3% were aged 17–19, while the remaining were aged 20–22. The participants were predominantly female (79.4%) and the male participants constituted (21.6%). Regarding university admission, 41.3% entered through government-provided pathways, while 58.7% entered through university-provided pathways. More than half of the participants came from rural areas (54%) and the rest were from urban areas (46%). Regarding financial support for their studies, 62.7% were self-funded, while 37.3% received scholarships.

Interestingly, the majority of the participants in this research achieved a cum laude GPA, with only 9% not receiving the cum laude predicate. Consequently, the researchers divided the GPA into three categories based on the mean and standard deviation. The first GPA category was < 3.52 (11.1%), the second was > 3.78 (15.9%), and the third was 3.52 < GPA < 3.78 (73%). Data suitability for exploratory factor analysis was tested using the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy (MSA) with a required value of > 0.50. Bartlett's test of sphericity was also applied with a significance value of < 0.05. If an item did not meet the requirements, it was eliminated. The results indicated that three items survived the tests, with a KMO value of 0.608 and a significant Bartlett's test of sphericity value of 0.000 (Joseph et al., 2010). The questions had MSA values of 0.595 (Q1), 0.594 (Q2), and 0.650 (Q3). These three items formed a component that fits the "analytical and planning skills of pre-service college administrators' identity."

Table 2. Exploratory factor analysis results.

Item code	KMO	Bartlett's test of sphericity		MSA	Loading factor
		Sig.	Chi-square		
Q1	0.608	0.000	25.405	0.595	0.744
Q2				0.594	0.742
Q3				0.650	0.662

In the EFA analysis in Table 2, Q1 and Q2 had factor loading values above 0.50. We followed the recommendation of Turner and Carlson (2003) who stated that factor weights should be above 0.50. Furthermore, our categorization agrees with Hair, Bush, and Ortinau (2010) who stated that factor loadings above 0.70 are considered very good. Although Q3 obtained a factor loading below 0.70, it still met the value required by Turner Carlson.

In this section, the researchers answered, "What items can reflect the formed construct?" through the responses from each of the three questions in Table 1. These three items form one construct with the identity of "analytical and planning skills of pre-service college administrators." Subsequently, this construct is further examined in the CFA analysis and Fornell's test of discriminant validity.

4.2. Confirmatory Factor Analysis Results for the APsCA

Confirmatory factor analysis (CFA) evaluates the construct validity of every factor within the model, checking if the factors conform to the theoretical and conceptual foundation upon examination with real-world data. The statistical congruence is gauged using the criteria for a good fit: Chi-square (χ^2) $0 \leq \chi^2 \leq 2$df, Chi-square relatives (χ^2/df) $0 \leq \chi^2/df \leq 2$, root mean square error of approximation (RMSEA) $0 \leq RMSEA \leq 0.05$, normed fit index (NFI) $0.95 \leq NFI \leq 1{,}00$, comparative fit index (CFI) $0.97 \leq CFI \leq 1.00$, goodness of fit (GFI) $0.95 \leq GFI \leq 1.00$, and the adjusted goodness of fit index (AGFI) $0.90 \leq AGFI \leq 1.00$ (Schermelleh-Engel et al., 2003).

Table 3. Confirmatory factor analysis results for the APsCA.

Code item	LO	df	χ^2	χ^2/df	P	RMSEA	NFI	CFI	GFI	AGFI
Q1	0.500	1	1.240	1.240	0.266	0.044	0.952	0.989	0.993	0.961
Q2	0.700									
Q3	0.310									

Table 3 presents the results of the confirmatory factor analysis of the APsCA. From the chi-square to the adjusted goodness of fit index, the APsCA model has met the consistency values required by Schermelleh-Engel et al. (2003) and is categorized as a good fit. The smallest loading factor was found in Q3 with a value of 0.310, while the highest was 0.700 for Q2. In the CFA analysis, these values still meet the required threshold of above 0.300 (Kim & Mueller, 1978). Therefore, the loading factors (see Figure 1 and Table 2) of the three questions reflecting the APsCA have met the minimum value required for CFA loading factors.

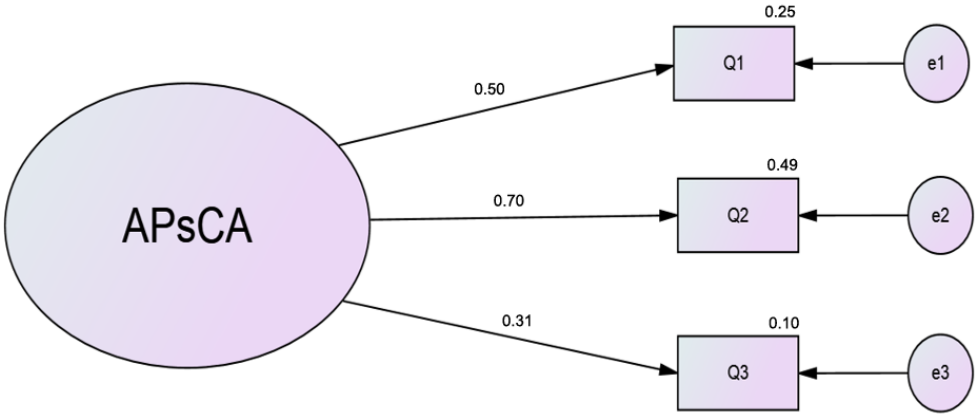

Figure 1. APsCA structural model.

Subsequently, discriminant validity was applied, as detailed in Table 4, to verify the precision of the instrument's attributes in alignment with established theoretical constructs. The process of discriminant validity adhered to the guidelines put forth by Fornell and Larcker (1981) which propose that the average variance extracted (AVE) should exceed 0.50, indicating that the AVE should be greater than the intercorrelations among the factors. The findings confirmed that each question satisfied the validity criteria. Specifically, Q1, which targets the cause/goal analysis, was found to be distinct in measurement from Q2, which focuses on planning and did not overlap with Q3, which is concerned with constraint analysis. The associations among the remaining items were also found to be appropriate.

Table 4. Discriminant validity analysis.

Item code	Mean	Std. deviation	Q1	Q2	Q3
Q1	4.936	0.352	0.744		
Q2	3.198	0.456	0.328**	0.742	
Q3	4.015	1.050	0.241**	0.244**	0.662
The reliability value after the validation test was 0.755					

Note: ** indicates a 0.01 significance level. Values in parentheses represent the square root of the average variance extracted (AVE).

This section answers the research questions regarding how the formed items effectively measure the established construct. The question items are composed of elements related to cause/goal analysis, planning, and constraint analysis. Next, we analyze the impact of demographic characteristics on the APsCA (see Table 5).

4.3. Regression of the Impact of Demographic Characteristics and Academic Criteria on the APsCA

We investigated the impact of demographic characteristics on the APsCA using regression and Pearson correlation techniques. We examined each variable's relationship (see Table 5) with each skill separately and collectively with the APsCA. A p-value of < 0.05 and a correlation of $r > 0.176$ were considered significant. The joint analysis results showed no significant impact between demographic characteristics and cause/goal analysis, planning, constraint analysis, and the APsCA. This means that changes in pre-service college administrators' scores in the skills related to cause/goal analysis, planning, and constraint analysis are unrelated to demographic characteristics.

Table 5. Regression results of the impact of demographic characteristics on APsCA.

Demo/Aca	Cause/Goal analysis	Planning	Constraint analysis	APsCA	Gen	Env	GPA	AdmPath	Sch
Gen	0.092 (0.346)	0.036 (0.766)	-0.008 (0.567)	0.006 (0.932)	0.715	0.159	0.034	0.011	0.15
Env	0.076 (0.450)	0.017 (0.878)	0.229* (0.012)	0.161 (0.034)	0.159	0.614	0.117	0.067	0.054
GPA (Academic)	0.096 (0.260)	0.025 (0.702)	0.012 (0.806)	0.016 (0.550)	-0.034	-0.117	0.504	-0.007	-0.171
AdmPath	0.106 (0.307)	-0.011 (0.999)	0.141 (0.132)	0.097 (0.167)	0.011	0.067	0.007	0.802	0.253*
Sch	-0.046 (0.828)	0.048 (0.614)	0.012 (0.624)	0.047 (0.632)	0.15	0.054	0.171	0.253*	0.741
R-square	0.034	0.004	0.073	0.056	We confirmed these results through logistic regression testing and found consistency with the model fit, where < 0.00 indicates a poor fit and > 0.50 indicates a good fit. The urban environment (Env) was significantly better than the rural environment, with a significance level of 0.00 and a Cox & Snell R-square of 15% for Model 3 achievement. These findings will be further analyzed and reported in subsequent articles.				
F stats (Prob.)	0.515	0.990	0.103	0.216					

Note: * Significant at the 0.05 level (2-tailed). The values inside parentheses are regression coefficients, and the values outside parentheses are correlation results. Gen represents gender; Env represents the environment; GPA represents grade point average, which is academic variables; AdmPath represents the admission pathway; and Sch represents scholarship. The dummy variables being compared are: Gen = Male, Env = Urban, GPA = Max GPA, AdmPath = Government-supported admission pathway, Sch = Scholarship recipients.

The regression results of the impact of demographic characteristics on the APsCA show that the empirical data of the gender, GPA, admission pathway, and scholarship variables have no significant effect on the skills of cause/goal analysis, planning, constraint analysis, and the APsCA. However, it was observed that the environment variable provides empirical data indicating a positive and significant effect on constraint analysis and the APsCA. This data suggests that changes in the specific skills of constraint analysis and the APsCA are influenced by the environment variable, where participants from urban environments have a higher impact than those from rural environments. This finding has been confirmed through logistic regression, which supports the results. However, no significant impact was found between the environment and the skills of cause/goal analysis and planning, indicating that changes in these specific skills are not affected by the environment variable. We also found that participants who enter college through the government-supported admission pathway have the potential to become scholarship recipients, as indicated by the correlation value between admission pathway and scholarship.

4.4. Level of Analytical and Planning Skills of Pre-Service College Administrators

To examine the analytical and planning skills among pre-service college administrators, we adopted the evaluation norms set by the Indonesian Ministry of Education and Culture (Minister of Education and Culture, 2020). According to Article 26 of these guidelines, tertiary education institutions classify achievement levels from E

to A, which correspond to a spectrum from very low to very high proficiency. The grading scale is defined as follows: a score greater than 80 is categorized as Grade A or Very High; a score between 70 and 80 is Grade B or High; Grade C or Medium corresponds to a score between 60 and 70; a score between 50 and 60 is Grade D or Low; and a score below 40 is marked as Grade E or Very Low.

Table 6. Level of analytical and planning skills of pre-service college administrators.

Criteria	Cause/Goal analysis		Planning		Constraint analysis		APsCA	
	N	%	N	%	N	%	N	%
Very low (E)	1	0.8	3	2.4	4	3.2	2	1.6
Low (D)	1	0.8	95	75.4	56	44.4	0	0
Middle (C)	0	0	0	0	0	0	4	3.2
High (B)	3	2.4	28	22.2	0	0	56	44.4
Very high (A)	121	96	0	0	66	52.4	64	50.8
Total	126	100	126	100	126	100	126	100

Table 6 presents the level of analytical and planning skills of pre-service college administrators. This table shows the categorization of levels of analytical and planning abilities among respondents. The results for the analytical and planning skills of pre-service college administrators in cause/goal analysis show that 121 participants (96%) have a level that is very high or Grade A, while the remaining participants have high, low, or very low levels. This indicates that pre-service college administrators possess a very high level of cause/goal analysis skills. In contrast, for planning skills, the majority of participants are at a low level or Grade D. This is evident from the assessment data, where 75.4% of participants are at a low level. In comparison, only 22.2% achieved a high level or Grade B. Regarding the level of constraint analysis skills, the participants with very high and low levels are almost balanced. However, the very high level is slightly higher (52.4%) compared to the low level (44.4%), with the remainder at a very low level (3.2%). For the total score or APsCA, the dominant levels are very high and high, with 50.8% achieving a very high level or Grade A, and 44.4% achieving a high level or Grade B, while the rest are at the middle and very low levels. This indicates a positive outcome, as most APsCA have achieved high or very high levels.

5. DISCUSSION

The analysis of the APsCS is based on the findings by Mumford et al. (2017) who investigated "The nine critical skills." (Mumford et al., 2017). These nine skills are: 1) problem definition, 2) cause/goal analysis, 3) constraint analysis, 4) planning, 5) forecasting, 6) creative thinking, 7) idea evaluation, 8) wisdom, and 9) sensemaking/visioning. In this research, three components were investigated, namely the skills of cause/goal analysis, planning, and constraint analysis. These components were derived from the results of the EFA analysis, then confirmed through CFA analysis, and the robustness was tested through discriminant validity using the AVE from the Fornell test. The results indicate the formation of a construct with the identity of the APsCS, consisting of three question items. These three items were found to be unrelated to each other, meaning that they identify different skills.

Mumford stated that a cause/goal analysis analyzes the relevant causes and objectives to address a problem. They also emphasized that a cause/goal analysis is distinct from goal setting. Goal setting is defined as the outcome of applying various leadership skills, such as planning and forecasting, whereas cause/goal analysis focuses more on identifying valid and potentially worthy objectives from a more extensive set of potential goals (Marcy & Mumford, 2010; Mumford et al., 2017; Strange & Mumford, 2005). Furthermore, planning is defined as the skill of formulating plans, mental stimulation, and grounding actions on analyzing goals and constraints (Mumford et al., 2017). This variable is considered highly important when complexity arises in problem solving, as this skill plays a significant role in organizing activities to effectively solve problems (Antes & Mumford, 2012; Marta, Leritz, & Mumford,

2005). Moreover, constraint analysis identifies constraints that influence each viable problem solution (Mumford et al., 2017). This variable is crucial in problem solving because accurately analyzing constraints is essential before making plans to resolve the problem. This aligns with Medeiros' findings, which state that when the presented constraints are embrace and participants genuinely engage with these constraints, solutions with better quality, originality, and elegance are obtained (Medeiros, Partlow, & Mumford, 2014).

In addition to the EFA, CFA, and discriminant analysis, the impact of demographic characteristics was also analyzed. This was performed using the regression of the impact of demographic characteristics on the APsCA (see Table 5). The results indicate that, except for the environment variable, which shows significance toward constraint analysis and APsCA skills, the other variables, from gender to scholarship recipients, are not significant toward cause/goal analysis, planning, constraint analysis, and APsCA skills. Pre-service college administrators from urban environments showed more positive results than those from rural environments regarding constraint analysis and APsCA skills. This could be due to urban environments in Indonesia having better access to information compared to rural environments. Therefore, pre-service college administrators in urban areas may adapt better in constructing constraint analyses, resulting in higher scores. We also found a relationship between entry pathways and scholarship recipients, where pre-service college administrators who entered through regular/non-scholarship entry pathways had better relationships with those who received scholarships. Lastly, we examined the level of analytical and planning skills of pre-service college administrators. We found positive results for cause/goal analysis, constraint analysis, and APsCA skills, as their levels were high or very high. However, in contrast, we found a low level of planning skills, indicating that the planning skills of pre-service college administrators need improvement while maintaining their cause/goal analysis, constraint analysis, and APsCA skills.

6. CONCLUSION

This research has resulted in three questionnaire items reflecting the APsCA construct. These three items reflect the skills of cause/goal analysis, planning, and constraint Analysis. Cause/goal analysis analyzes relevant causes and objectives to address a problem. Planning is the skill of formulating plans, mental simulations, and grounding actions for analyzing goals. Constraint analysis is identifying constraints that influence each viable solution to a problem. The variables of gender, grade point average, admission pathway, and scholarship do not significantly affect cause/goal analysis, planning, constraint analysis, and APsCA skills. However, the environment variable significantly impacts constraint analysis and APsCA skills, with an urban environment being more favorable than a rural environment for pre-service college administrators in developing constraint analysis and APsCA skills. Finally, we found that the level of planning skills for pre-service college administrators is at a low level and needs improvement through education while maintaining the already high to very high level of cause/goal analysis, constraint Analysis, and APsCA skills. Other researchers can utilize these findings for further studies, and these results can offer guidance to policymakers, educators, and students in enhancing the quality of education, especially for pre-service college administrators.

7. IMPLICATIONS

This study aimed to simplify intricate skills into essential elements for more straightforward measurement and comprehension. It could pinpoint various proficiency levels in these skills, distinguishing between more and less skilled individuals. The results primarily pertain to the specific group studied and may not apply to current administrators or other fields. The research emphasizes the initial stages of administrative education. Its outcomes are particularly pertinent to the curriculum of undergraduate administration courses. The study sought to grasp the essential elements of analytical and planning competencies for upcoming college administrators, gauge their skill levels, and provide guidance to enhance undergraduate training for future administrators.

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