




## Efficacy of educational management and mathematics: Implications for accounting education and practice in Nigeria

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### ABSTRACT

**Purpose:** The main purpose of the research is to confirm whether Mathematics and Educational Management have implications for the effective study of accounting and its practice in Nigeria. These tendencies were understood as an emphasis on making the course learning objectives of accounting relevant in terms of skills and competencies for the labor market, management strategies, fund management, and analyzing complex financial data, among others. The study was therefore aimed at providing answers to seven (7) research questions and testing four (4) hypotheses at a significance level of  $P \leq 0.05$ .

**Design/Methodology/Approach:** The study adopted a survey research design. A self-constructed questionnaire instrument developed by the researchers was used to collect data from a random sample of undergraduates from public and private universities. Mean, standard deviation (SD), and t-test statistics were used to analyze the data.

**Findings:** Results revealed that nine mathematics and statistics topics and nine basic managerial skills/competencies were found to be required for effective accounting professional practice. Both male and female students strongly agreed that eleven mathematics and statistics skills and nine managerial skills contributed significantly ( $P \leq 0.05$ ) to effective performance and practice of accounting. Moreover, students in public and private universities strongly agreed that the nine mathematical skills and nine managerial skills/competencies contribute significantly ( $P \leq 0.05$ ) to the effective performance of practicing accountants.

**Conclusion:** Mathematics and educational management are crucial for the effective study and practice of accounting.

**Research Limitations/Implications:** The study was limited to two schools (one public and one private university) only. The study has implications for the type of school, such that irrespective of whether the school is public or private, the acquisition of mathematics and managerial skills/competencies is paramount to successful accounting practice.

**Practical Implications:** Both male and female undergraduates who successfully acquire mathematics and managerial skills during their schooling will be able to perform effectively in accounting as practicing accountants.

**Contribution to Literature:** The findings of the study will provide updated information on research concerning the efficacy of mathematics and educational management skills/competences in the study of accounting at universities.

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**Keywords:** Accounting, Educational management, Education, Managerial skills, Mathematics, Mathematics skills, Practicing accountants, Undergraduate accounting students, University.

## 1. INTRODUCTION

Mathematics is a core science that all sciences, whether pure or social, technology, and artificial intelligence (AI), including the arts, depend on in one way or another. This may be one reason mathematics is described as the backbone of sciences, the bedrock of scientific and technological breakthroughs, and the queen and language of sciences, among others. Mathematics is a science that deals with quantities, sizes, shapes, numbers, and signs, with the ultimate intention of transforming abstractions and ideas into realities (Unodiaku, 2021). Mathematics has been able to achieve all these goals because of its numerous branches, which include, but are not limited to, calculus, differential equations, linear and abstract algebra, real analysis, trigonometry, probability theory and statistics, mathematical analysis, numerical analysis, topology, discrete mathematics, and mathematical logic. The various branches and quantitative nature of mathematics account for its usefulness in science and technology, ICT, engineering, AI, social science disciplines, environmental sciences, economics, accounting, finance, marketing, among others. The efficacy of mathematics in enhancing the learning of these aforementioned fields of study, especially in the teaching and learning of accounting and in its practice, as well as the management of its teaching and learning, is the focus of this research. Therefore, the major disciplines are needed for national development. According to Uka, Iji, and Ekwueme (2012), mathematics is predominantly a service subject, as it exists as a skill to be applied in other areas of study. Every individual needs mathematical knowledge to function intelligently and efficiently in his or her world. Social science disciplines such as economics, marketing, accounting, management, banking, and finance, among others, need mathematics in order to function efficiently and contribute to the technological, social, economic, and national development of the country. The efficiency and sustainability of any of these disciplines, such as accounting, are dependent on the mathematical and managerial skills acquired by prospective accountants while schooling.

Accounting is a subject that occupies a central position in any business or corporation that must succeed, whether in public or private enterprises or entrepreneurship. According to Investopedia (2022), accounting is defined as the process of recording financial transactions pertaining to a business, while accountancy is the profession or practice of accounting. Accountancy can be understood to mean the practice of classifying, recording, and reporting (in the form of feedback) to management regarding the financial results and status of an organization. The American Institute of Certified Public Accountants (AICPA) defined accounting as the art of recording, classifying, and summarizing in a significant manner and in terms of money, transactions, and events that are, at least in part, of a financial character, and interpreting the results thereof (Byjus (2022)). An accountant may therefore be regarded as someone who has acquired the skills to record, classify, and manage the gains or losses of the financial status of a business or organization. Zandi and Shahabi (2012) reported that the accounting discipline is highly concerned with an accurate numerical measurement of business transactions. The accounting subject encompasses accounting knowledge, skills, and values that focus on financial accounting, management accounting, and auditing fields, which prepare learners for a variety of career opportunities (Department of Education, 2010). There is a need, therefore, to impart such accounting knowledge, skills, and values along with mathematics and management skills to prospective accountants for effective management of financial results and the status of an organization during practice. An accountant is someone who studied accounting in a higher institution and acquired skills that enable them to measure business transactions accurately in numerical terms. The skills that enable an accountant to measure business transactions accurately are mathematics skills. Educational management is paramount in ensuring that the skills, knowledge, competencies, etc., to be transmitted to learners are properly managed, harnessed, and directed in order to yield maximum efficiency, productivity, and sustainability for professionals such as accountants during their period of practice. The lack of empirical evidence on the mathematical and managerial competencies/skills required of a prospective accountant to be acquired during the period of schooling in order to function effectively during practice makes the study worthwhile.

## 2. LITERATURE REVIEW

Literature concerning the relatedness of mathematics and accounting, educational management and accounting, as well as school type and gender variability, was reviewed. Researchers' views and findings were highlighted to lend credence to the study.

The relationship between Mathematics and Accounting is numerous and cannot be overemphasized. Accounting education and its connection to Mathematics have attracted great concern in academia over recent years (Villamar,

Gayagoy, Matalang, & Catacutan, 2020). Several studies have indicated that mathematics has a positive influence on students' performance in learning the accounting subject, thereby enhancing the performance of accountants during practice. For instance, Gholamreza and Alireza (2012) reported that undergraduate accounting students majoring in Mathematics from pre-university institutes perform higher than their counterparts with arts or social sciences backgrounds. Mathematics grades are all significantly positively related to student performance in the financial accounting course (Uyar & Gungormus, 2011). Musa and Musa (2016) found that mathematics skills account for about 55% of the variance in principles of accounting, indicating that the two subjects are positively and highly interrelated. Villamar et al. (2020) reported that Mathematics courses offered in the accountancy discipline at the University of Saint Louis, a university in the Northern Philippines, included College Algebra, Maths of Investment, Business Calculus, and Quantitative Techniques. It is evident that mathematics and the accounting discipline are highly interrelated, and mathematics skills are indispensable in the pursuit of accountancy and accounting practice. These assertions suggest that an accountant's success in practice depends on the volume of mathematics content acquired during schooling. Therefore, there is a need for accounting practitioners to be well-acquainted with mathematical competencies and skills to achieve significant success in accounting practice. Equally important is the need to understand the efficacy of mathematics skills required for prospective accountants' training in school and efficiency in practice.

Furthermore, apart from the relationship between Mathematics and accounting education, education management is another discipline that is crucial for accounting education and practice. The need for management education in accounting and practice cannot be overemphasized. The roles of 'Management Accountants' require new forms of education and training, particularly a greater concentration on the social sciences and management, as well as the development of research, learning, and problem-solving skills (Department of Education, 2010). Such new forms of education and training for prospective accountants should embody various management strategies and skills that can help prepare them for a variety of career opportunities. According to Nwosu, Bechuke, and Wovrosi (2018), a variety of management strategies, which include supporting accounting educators, providing teaching and learning resources to accounting educators and learners, supervising the teaching and learning of accounting in the classroom, and offering exchange programs for accounting learners, were employed by schools to manage the teaching and learning of accounting. The school is the medium through which these management strategies can be employed to transmit management accounting skills to prospective accountants. Obviously, management accounting education is essential for anticipated successful accountants to thrive in practice. Accounting comprises knowledge, skills, and values that focus on financial accounting, management accounting, and auditing fields, which prepare learners for career opportunities (Department of Education, 2010). Clearly, management skills are indispensable in accounting training and practice. However, management accounting is fraught with problems, including a lack of relevant experience and skills to implement or use the techniques, management inertia, poor communication, etc. Probably because of this notion, Arham (2024) listed the skills management accountants require as knowledge of economics and accounting, mathematical knowledge, administrative skills, analytical thinking skills, the ability to work well with others, ambition and a desire to succeed, and excellent verbal communication skills. It is pertinent to find out how well prospective accountants are equipped with these and other management skills that can enable them to cope and function effectively in accounting practice. More crucially, it is important that the study determines the respondents' variability in terms of the type of school they attended (whether public or private universities) regarding how the managerial skills/competencies acquired during schooling account for their effectiveness in accounting learning and practice.

Public and private universities in Nigeria are prone to variations in compositions, academic activities, and modes of operation. Public and private universities differ because public universities are funded by the government, which could be either state or federal, whereas private universities are funded by private individuals and organizations, relying heavily on students' tuition fees, alumni donations, and endowments to support their operations (Tyler, 2023). Public universities are located across the country, such that each state of the federation can boast of a university. This is unlike the establishment of private universities, where the location is dependent on the financial capacity of the owner (Best Colleges, 2020). Moreover, public universities are usually large institutions that are well-equipped, offer a complete range of traditional courses, provide more subject options, promote diversity and multiculturalism, and tend to offer more extracurricular activities, lower tuition fees, and well-developed student services, among other benefits (Elab Education, 2023). Private universities may have a smaller student population

compared to public institutions (Alio, Anibueze, & Ayogu, 2017). Based on the observed differences between the two, it is evident that public and private universities differ in modes of operation, student population, academic activities, staff strength, and distribution. Can these observed differences be interpreted to mean that the mathematics and management courses/topics/skills/competencies acquired by prospective accountants from both public and private universities will vary due to the type of school they attended and during practice? There is a need to investigate the issue of school type variability in this study, as the evidence presented shows that the issue of school type is inconclusive.

Furthermore, Kurumeh and Chianson (2012) noted that private schools seem to retain their staff by paying higher wages/salaries, giving special attention to their staff; staff are under strict supervision and receive incentives during festivities such as Christmas, Easter, New Year, and Sallah celebrations. More crucially, in the private sector, prompt payment of salaries and salary advances are made possible for the staff, and school facilities such as staff accommodation, water, and electricity, among other amenities, are provided more in private schools than in public schools. The results of the study show that students in private schools performed better academically than those in public schools. The researchers concluded that the lack of availability of school facilities hampers the academic achievement of mathematics students in public schools. Nevertheless, some government critics believe that public schools are relatively better than private schools in terms of training and performance in school subjects. They argue that public schools have more qualified personnel and government support to enhance the academic performance of the students. The bottom line is that, considering the highlighted disparities in the composition and activities of public and private schools, it is pertinent to investigate the efficacy of mathematics and educational management in the education of prospective accountants studying in public and private universities for productive efficiency and sustainability in accounting practice.

Gender differences indicate that distinctions between males and females should be considered based on three classifications: actual gender differences, gender roles, and gender stereotypes (Gbenga, 2017). Sex differences in psychology refer to the variations in mental functions and behaviors of the sexes, resulting from a complex interplay of biological, developmental, and cultural factors (Baumeister & Sommer, 1997). The above assertions suggest that gender differences exist and may influence the opinions of males and females regarding the efficacy of mathematics and educational management, as well as their implications for accounting education and practice in Nigeria. The issue of school type and gender variability in relation to the study has yet to be empirically documented. The impact of group-based mastery learning (GBML) strategy on senior secondary school students' trigonometric performance and retention was investigated by Umar (2017). A non-randomized pre-test, post-test, and post-post-test quasi-control group design was used for the study. The population of the study was 26,431, and a sample of 110 students was selected using a stratified simple random sampling technique involving a balloting method from the two sample schools. Four research questions were formulated and answered using descriptive statistics (mean and standard deviation), and four hypotheses were formulated and tested using t-test statistics at a 5% level of significance. The trigonometry performance test (TPT) was used as an instrument for data collection. The results of the study showed that the mean performance of students taught trigonometry using the GBML strategy was in favor of those taught using the GBML strategy compared to the lecture method. Clearly, the method is effective in the teaching and learning of trigonometry. The results also indicated that male students performed better than female students taught using the GBML strategy. Furthermore, male students taught trigonometry using the GBML strategy retained more than female students taught the same trigonometry content using the same strategy. Obviously, the method is not capable of bridging the gap in mathematics performance between male and female students. In other words, the method promotes gender disparity, especially in mathematics learning. Ideally, this situation can extend to their performances in accounting learning and practice.

The above study was contradicted by Muhammad and Bashir (2017) regarding the impact of the Chinese stick method of multiplication on primary five pupils' mathematics achievement. The research design used for the study was quasi-experimental. Two groups (control and experimental) of primary school pupils were involved in the study. The control group was taught using the standard algorithm method of multiplication, while the experimental group was taught using the Chinese stick method of multiplication. The two groups were compared based on achievement and achievement by gender in the experimental group. The instrument used for data collection was the primary five mathematics achievement test (PFMAT), which was administered before and after the intervention. The data obtained were analyzed using analysis of covariance (ANCOVA). The results indicated that primary five pupils taught

multiplication of two- and three-digit numbers using the Chinese stick method achieved significantly better than those taught using the algorithm method of multiplication. Moreover, the results showed that female pupils performed better than male pupils when the Chinese stick method was used in teaching multiplication of two- and three-digit numbers. This finding further confirmed the disparity in performance between female and male students in mathematics learning, with males performing better than their female counterparts. This is attributed to the general belief that males perform better than females in mathematics. This belief affects the attitude of females towards mathematics learning, which subsequently leads to their poor performance in the subject. Consequently, females tend to have lower self-esteem and confidence in mathematics learning than their male counterparts. This situation will invariably affect their performance in accounting education and practice. The issue of gender disparity and the superiority of males or females in mathematics achievement appears to be inconclusive, as depicted from the above results. Based on the foregoing, it appears to suggest that integrating mathematics and educational management in accounting teaching and learning can enhance the performance of accountants during schooling and in practice. The reviewed literature indicates that school type and gender are factors that can influence the integration of mathematics and educational management skills in the effective teaching and learning of accounting for maximum productivity in practice.

Mathematics skills are competences or knowledge of mathematics that are possessed or required to be possessed in order to apply mathematics in problem solving.

Educational Management is a field of study that deals with the operation of educational organizations. It is concerned with planning, organizing, and directing school activities properly by school administrators to ensure that the set objectives of the school are achieved.

Managerial skills are the skills, knowledge, and abilities possessed by school administrators enable them to carry out specific management activities or tasks in schools.

Undergraduate accounting students are students that are still at the terminal or near completion of their training in accounting in the university education.

Practicing accountants are graduates of accounting who are working and occupy position as accountants.

### *2.1. Statement of the Problem*

Despite the well-known influence of mathematics and management on the effective teaching and learning of accounting and in the practice of accounting, there is a persistent notion of poor performance among accountants in the discipline. Several mathematical skills and competencies, such as quantitative analysis—which encompasses probabilities, matrices, calculus, correlation/regression analysis, arithmetic, linear programming, optimization, simulation, etc.—were among the mathematics topics applied in teaching accounting students during their schooling. Management skills offered by prospective accountants include the ability to work harmoniously with others, administrative skills, attention to detail, ambition and a desire to succeed, excellent verbal communication skills, and analytical thinking skills. There has been no documentation or research known to the researchers regarding the extent of, or lack of, acquisition of these skills or competencies that may have contributed to accountants' poor performance in practice. The problem of the study poses the question: how can the efficacy of mathematics and management education and their implications for accounting education and practice be determined?

The following research questions were posed in order to seek answers to the above research problem:

1. What mathematics topics are required for accountants to undertake effective professional practice?
2. What basic mathematics skills are inherent in the topics offered in accounting education?
3. What basic managerial skills are required for competency in accounting practice?
4. How do mathematics skills contribute to the effective performance of practicing accountants based on gender?
5. How do managerial skills contribute to the effective performance of practicing accountants based on gender?
6. How do mathematics skills contribute to the effective performance of practicing accountants based on school type?
7. How do managerial skills contribute to the effective performance of practicing accountants based on school type?

### *2.2. Research Hypotheses*

Four null hypotheses guided the study. The hypotheses were tested at a 0.05 significance level.

H<sub>01</sub>: There is no significant difference between the opinions of accounting undergraduates regarding how mathematics skills contribute to the effective performance of practicing accountants with respect to gender.

H<sub>02</sub>: There is no significant difference between the mean opinions of accounting undergraduates on how managerial skills contribute to the effective performance of practicing accountants with respect to gender.

H<sub>03</sub>: There is no significant difference between the mean opinions of accounting undergraduates on how mathematics skills contribute to the effective performance of practicing accountants based on school type.

H<sub>04</sub>: There is no significant difference between the mean opinions of accounting undergraduates on how managerial skills contribute to the effective performance of practicing accountants based on school type (in terms of whether public or private).

### 3. RESEARCH METHOD

The design of the study was a survey research design. The study was conducted in Enugu State, one of the southeastern states in Nigeria. The population of the study consisted of 131 final-year accounting students of the 2023/2024 academic session who had successfully completed their programs. They were composed of 83 students, with 54 males and 29 females from public universities, and 48 students, with 31 males and 17 females from private universities, who had passed all their courses. A simple random sampling technique was employed to randomly select one public university and one private university from the study area, and all the final-year accounting students who had passed all their courses in the accounting program were used for the study, which yielded 131 respondents. The instrument used for the study was a 38-item self-constructed questionnaire organized into clusters A to C, with each cluster addressing a particular threat. The reliability of the research instrument was computed using the Cronbach alpha ( $\alpha$ ) statistic (KR-21), which yielded 0.81. The instrument was composed of a four-point Likert-type scale of Strongly Agreed (SA), Agreed (A), Disagreed (D), and Strongly Disagreed (SD), with points 4, 3, 2, and 1, respectively.

### 4. RESULTS

Results were presented in the following tables.

Research Question 1: What mathematics topics are accountants required to undertake for effective professional practice?

**Table 1.** Analysis of the mean (X) and standard deviation (SD) responses of accounting students on the mathematics and statistics topics they were required to undertake for effective accounting professional practice.

S/N	Mathematics and statistics topics accounting students were required to undertake	Mean X	SD	Decision
1	Quantitative application in business (Tools and concepts of quantitative analysis – probabilities, matrices, calculus etc.)	3.7	0.14	Agree
2	Correlation/Regression analysis	3.5	0.28	Agree
3	Binary number system	1.2	1.98	Disagree
4	Optimization techniques	3.6	0.94	Agree
5	Complex analysis	1.1	1.81	Disagree
6	Transportation algorithms	3.4	0.88	Agree
7	Simple approaches	2.9	0.13	Agree
8	Markov chain	2.8	0.66	Agree
9	Linear programming technique (Graphical approach)	3.3	0.71	Agree
10	Simulation techniques	3.4	0.49	Agree
11	Accounting arithmetic	3.8	1.03	Agree
12	Bearing	1.4	2.16	Disagree
13	Estimation	3.5	0.73	Agree
14	Geometry (Plane and cyclic)	1.5	1.63	Disagree
	Grand mean	2.8	0.97	Agree

**Table 1** indicated that the accounting students agreed that items 1, 2, 4, 6, 7, 8, 9, 10, 11, and 13 are the mathematics and statistics topics they were required to undertake to enable them to perform effectively in accounting professional practice. The means of items 1, 2, 4, 6, 7, 8, 9, 10, 11, and 13 are all greater than 2.50, which is the criterion mean. However, the means of items 3, 5, 12, and 14 are below 2.50 (the criterion mean), which means that students disagreed that these items are mathematics/statistics courses they offered during their schooling in the accounting program. The standard deviations of the means of the 14 items range from 0.13 to 2.16. The values are small, indicating a closeness of agreement on each item. The grand mean of 2.8 with a standard deviation of 0.97 shows that, in general, the students agreed that they offered most of the mathematics and statistics topics listed in the table.

Research Question 2: What are the basic mathematics skills inherent in the mathematics topics offered in accounting education?

**Table 2.** Analysis of the mean (X) and standard deviation (SD) responses of accounting students regarding the basic mathematics statistics skills required for competency in accounting education and practice.

S/N	Basic Mathematics skills required for competency in accounting education and practice	Mean X	SD	Dec.
1	Ability to apply probability theorems and matrices in problem-solving in accounting.	3.6	0.24	Agree
2	Ability to apply correlation/Regression analysis in determining relationships between variables	3.7	0.44	Agree
3	Ability to apply La Grange models, maximization, and minimization in solving problems.	3.9	0.13	Agree
4	Ability to apply addition, subtraction, multiplication, and division skills in accounting computations	3.8	0.66	Agree
5	Ability to use Transportation algorithms to solve transportation problems in accounting	3.7	0.43	Agree
6	Ability to apply simplex approaches and graphical methods in solving accounting problems involving transformation.	3.2	0.52	Agree
7	Ability to utilize simulation techniques for solving problems in accounting and practice.	3.6	0.47	Agree
8	Ability to apply calculus in accounting problem-solving.	3.8	0.33	Agree
9	Ability to estimate cost behavior patterns in accounting.	3.2	0.51	Agree
	Grand mean	3.61	0.41	Agree

**Table 2** shows that the students agreed that items 1, 2, 3, 4, 5, 6, 7, 8, and 9 are the mathematics and statistics skills they were required to acquire to enable them to cope with accounting practice. The means of the above items range from 3.2 to 3.9, which are all above the criterion mean of 2.50. The standard deviations for the 9 items range from 0.13 to 0.66. The standard deviation values are small, indicating that the candidates have almost similar opinions on the need for the acquisition of the skills for effective performance in accounting practice.

Research Question 3: What are the basic managerial skills required for competency in accounting practice?

**Table 3.** Analysis of the mean (X) and standard deviation (SD) responses of accounting students regarding the basic managerial education skills required for competency in accounting education and practice.

S/N	Basic managerial education skills required for competency in accounting education and practice	Mean X	SD	Decision
1	The management courses offered in accounting at the university are not required for the labor market needs in accounting practice.	1.31	0.25	Disagree
2	The knowledge of management strategies taught in schools helps accounting learners become effective managerial accountants.	3.0	1.02	Agree
3	The knowledge of managerial skills does not matter for an accountant's management of funds.	1.7	0.41	Disagree

S/N	Basic managerial education skills required for competency in accounting education and practice	Mean X	SD	Decision
4	Management skills help accountants identify where bottlenecks occur and calculate the consequences of these constraints on revenue, profit, and cash flow.	2.8	0.5	Agree
5	Managerial skills enable accountants to analyze financial trends, evaluate performance, and develop cost-effective strategies.	3.3	0.05	Disagree
6	Management skills develop in accountants' ability to analyze complex financial data, identify trends, and make informed decisions that can shape the future of a company (analytical thinking skills).	3.4	0.11	Agree
7	Management skills help accountants cooperate with their colleagues and know how to effectively deal with their subordinates, which facilitates the smooth flow of activities within the organization (Administrative skills).	3.6	0.91	Agree
8	Management skills can prevent accountants from formulating comprehensive plans and budgets.	1.6	0.15	Disagree
9	The knowledge of managerial skills helps accountants provide financial information and resources to the internal management of the organization.	3.7	1.04	Agree
	Grand mean	2.7	0.49	

Table 3 shows that the students agreed that the managerial education skills required for competency in accounting practice are items 2, 4, 5, 6, 7, and 9 because their means are above the criterion mean of 2.5. Their means range from 2.8 to 3.7, with standard deviations ranging from 0.05 to 1.04. The low values of the standard deviations indicate that the candidates have almost similar opinions on each of the items. They disagreed that items 1, 3, and 8 are among the managerial education skills required for competency in accounting practice. In other words, they agreed that items 1, 3, and 8 are basic managerial education skills required for competency in accounting practice. The grand mean of 2.7 with a standard deviation of 0.49 indicates that, in general, the accounting students agreed that all the items are basic managerial education skills required for competency in accounting practice.

Research Question 4: How much do mathematics skills contribute to the effective performance of practicing accountants based on gender?

Table 4. Analysis of mean (X) and SD responses of accounting students on the contribution of mathematics skills to the effective performance of practicing accountants based on gender.

S/N	How mathematics skills contribute to the effective performance of practicing accountants based on gender	Gender					
		Male			Female		
		X	SD	Dec	X	SD	Dec
1	Ability to apply probability theorems and matrices in problem-solving in accounting.	3.3	0.14	Agr	2.8	0.09	Agr
2	Ability to apply correlation and regression analysis to determine relationships between variables.	3.0	0.27	Agr	3.4	1.64	Agr
3	Ability to apply La Grange models, maximization, and minimization in solving problems.	2.9	0.31	Agr	3.6	0.41	Agr
4	Ability to apply addition, subtraction, multiplication, and division skills in accounting computations.	2.6	0.9	Agr	2.7	0.16	Agr
5	Ability to use transportation algorithms to solve transportation problems in accounting.	3.5	0.22	Agr	3.4	0.48	Agr
6	Ability to apply simplex approaches and graphical methods in solving accounting problems involving transformation.	3.0	0.12	Agr	3.6	0.9	Agr
7	Ability to utilize simulation techniques for solving problems in accounting and practice.	2.9	0.48	Agr	2.5	1.91	Agr
8	Ability to apply calculus in accounting problem-solving.	3.4	1.09	Agr	3.8	1.22	Agr
9	Ability to estimate cost behavior patterns in accounting.	3.2	0.65	Agr	2.9	0.63	Agr
	Grand mean	3.09	0.56	Agr	3.19	0.83	Agr
	Grand mean difference	0.10					



Table 4 shows that both males and females agreed that mathematics contributes to the effective performance of practicing accountants. This is because males recorded means ranging from 2.6 to 3.7 with standard deviations ranging from 0.14 to 1.09, while females recorded means ranging from 2.5 to 3.5 with standard deviations ranging from 0.09 to 1.91. The mean scores of both males and females are all above the criterion mean of 2.50, with low standard deviation scores across all the items. The grand means and standard deviations of males and females were 3.09 and 3.19, with standard deviations of 0.56 and 0.83, respectively. The grand mean difference was 0.1 in favor of males. This mean difference of 0.10 was further tested for significance using hypothesis one (H01) in Table 8.

Research Question 5: How much do managerial skills contribute to the effective performance of practicing accountants based on gender?

**Table 5.** Analysis of mean (X) and SD responses of accounting students on contribution of managerial skills to effective performance of practicing accountants based on gender.

S/N	How far managerial skills contribute to effective performance of practicing accountants based on gender	Gender					
		Male			Female		
		X	SD	Dec	X	SD	Dec
1	The management courses offered in accounting at the university are not required for the labor market needs in accounting practice.	3.5	0.91	Agree	3.4	0.15	Agree
2	The knowledge of management strategies taught in schools helps accounting learners become effective managerial accountants.	3.6	0.77	Agree	3.8	0.26	Agree
3	The knowledge of managerial skills does not matter for an accountant's management of funds.	3.4	0.21	Agree	3.2	0.17	Agree
4	Management skills help accountants identify where problems occur and then determine the impact of these constraints on revenue, profit, and cash flow.	2.9	0.9	Agree	3.2	0.63	Agree
5	Managerial skills enable accountants to analyze financial trends, evaluate performance, and develop cost-effective strategies.	3.4	0.12	Agree	3.5	0.99	Agree
6	Management skills develop in accountants' ability to analyze complex financial data, identify trends, and make informed decisions that can shape the future of a company (analytical thinking skills).	2.9	0.88	Agree	3.6	0.48	Agree
7	Management skills help accountants relate to their colleagues and understand how to interact well with them, which permits an easy flow of activities in the workplace (Administrative skills).	3.2	0.21	Agree	3.4	0.22	Agree
8	Management skills can prevent accountants from formulating comprehensive plans and budgets.	2.8	0.39	Agree	3.2	0.35	Agree
9	The knowledge of managerial skills helps accountants provide financial information Data and resources to the internal management of the organization	2.9	0.44	Agree	3.6	0.61	Agree
Grand mean		3.12	0.54	Agree	3.07	0.43	Agree
Grand mean difference		0.05					

Table 5 reveals that the mean responses of males and females on items 1 to 9 regarding how far managerial skills contribute to the effective performance of practicing accountants range from 2.6 to 3.8, with standard deviations from 0.12 to 0.91 for males and from 2.8 to 3.9, with standard deviations from 0.15 to 0.99 for females. The mean responses of both males and females on the nine items are all above 2.50, which is the criterion mean, indicating that the respondents agreed that all nine items contribute to the effective performance of practicing accountants, irrespective of gender. The standard deviation scores are low, suggesting that the respondents share a common

agreement on the issue. The grand means of 3.12 and 3.07, along with standard deviations of 0.54 and 0.43 for males and females respectively, show that the grand means are all above the criterion mean, indicating that, in general, both male and female respondents agreed that the nine managerial skills contribute to the effective performance of practicing accountants. The grand mean difference of 0.05 was further tested for significance ( $P \leq 0.05$ ) in Table 9.

Research Question 6: How much does mathematics skill contribute to the effective performance of practicing accountants based on school type?

**Table 6.** Analysis of mean (X) and SD responses of accounting students on contribution of mathematics skills to effective performance of practicing accountants based on school type.

S/N	How far mathematics skills contribute to effective performance of practicing accountants based on school type	School type					
		Public			Private		
		X	SD	Dec	X	SD	Dec
1	Ability to apply probability theorems and matrices in problem-solving in accounting.	2.8	0.21	Agr	3.1	0.24	Agr
2	Ability to apply correlation and regression analysis to determine relationships between variables.	2.6	0.11	Agr	2.5	0.15	Agr
3	Ability to apply La Grange models, maximization, and minimization in solving problems.	2.8	0.05	Agr	3.0	0.7	Agr
4	Ability to apply addition, subtraction, multiplication, and division skills in accounting computations.	2.5	0.13	Agr	3.2	0.29	Agr
5	Ability to utilize transportation algorithms to solve transportation issues in accounting.	3.0	0.15	Agr	3.8	0.33	Agr
6	Ability to apply simplex approaches and graphical methods in solving accounting problems involving transformation.	2.7	0.09	Agr	2.6	0.31	Agr
7	Ability to utilize simulation techniques for problem-solving in accounting and practice.	3.4	0.14	Agr	2.9	0.08	Agr
8	Ability to apply calculus in accounting problem-solving.	2.6	0.13	Agr	2.6	0.26	Agr
9	Ability to estimate cost behavior patterns in accounting.	2.9	0.27	Agr	2.5	0.42	Agr
Grand mean		2.81	0.14	Agr	2.9	0.31	Agr
Grand mean difference		0.09					

Table 6 reveals that the respondents in both public and private universities agreed that the nine items are mathematical skills that contribute to the effective performance of practicing accountants. This is because the means and standard deviations of students' responses range from 2.5 to 3.7 for those in public universities and from 2.5 to 3.8 for those in private universities, with standard deviations from 0.05 to 0.27 and 0.08 to 0.7, respectively. The mean responses across the nine items are all greater than the 2.50 criterion mean, indicating that the respondents from both public and private universities agreed that all the items are mathematical skills that contribute to the effective performance of prospective accountants. The grand means were 3.1 and 2.9, with standard deviations of 0.14 and 0.31 for public and private universities, respectively. The standard deviation scores are small, indicating that irrespective of school type, the respondents share a common view on the subject matter. The grand mean difference of 0.09 was in favor of students in public universities. The mean difference of 0.09 was further tested for significance in Table 10.

Research Question 7: How far do managerial skills contribute to the effective performance of practicing accountants based on school type?

**Table 7.** Analysis of Mean (X) and SD responses of accounting students on contribution of managerial skills to effective performance of practicing accountants based on school type.

S/N	How far managerial skills contribute to effective performance of practicing accountants based on the school type	School type					
		Public			Private		
		X	SD	Dec	X	SD	Dec
1	The management courses offered in accounting at the university are not required for the labor market needs in accounting practice.	2.9	0.05	Agr	2.6	0.17	Agr
2	The knowledge of management strategy courses taught in schools helps make accounting learners into good managerial accountants.	2.6	0.13	Agr	2.8	0.18	Agr
3	The knowledge of managerial skills does not matter for an accountant's management of funds.	2.8	0.41	Agr	2.5	0.11	Agr
4	Management skills assist accountants in identifying where bottlenecks occur and calculating the impact of these constraints on revenue, profit, and cash flow.	2.6	0.28	Agr	2.7	0.31	Agr
5	Managerial skills enable accountants to analyze financial trends, evaluate performance, and develop cost-effective strategies.	3.0	0.33	Agr	2.8	0.38	Agr
6	Management skills develop in accountants' ability to analyze complex financial data, identify trends, and make informed decisions that can shape the future of a company (analytical thinking skills).	3.2	0.25	Agr	2.8	0.35	Agr
7	Management skills help accountants relate to their fellow co-workers and know how to deal effectively with their subordinates, which allows for an easy flow of activities in the organization (Administrative skills).	2.9	1.01	Agr	2.6	0.92	Agr
8	Management skills can prevent accountants from formulating comprehensive plans and budgets.	2.7	0.42	Agr	2.8	1.02	Agr
9	The knowledge of managerial skills helps accountants provide financial information Data and resources to the internal management of the organization.	3.2	1.07	Agr	2.6	0.86	Agr
Grand mean		2.88	0.44	Agr	2.7	0.48	Agr
Grand mean difference		0.08					

Table 7 shows that most of the respondents from both public and private universities agreed that all nine items are managerial skills that contribute to the effective performance of practicing accountants. The means and standard deviations (SDs) of the respondents from public and private universities range from 2.6 to 3.2 and 2.5 to 2.8, with SDs from 0.05 to 1.07 and 0.11 to 1.02, respectively. All the items have mean scores greater than the criterion mean of 2.50, indicating that the respondents from both public and private universities agreed that all nine items are managerial skills that contribute to the effective performance of practicing accountants. The range of SD values is very close to one another, indicating that the mean responses of the respondents are closely related. The grand means and SDs of responses from students in public and private universities are 2.88 and 2.7, with SDs of 0.44 and 0.48, respectively. The grand mean difference is 0.08 in favor of students in public universities. The grand mean difference of 0.08 was further tested for significance in Table 8.

*H<sub>01</sub>: There is no significant difference between the opinions of male and female accounting undergraduates on how mathematics skills contribute to the effective performance of practicing accountants.*

**Table 8.** t-test analysis of the difference in means between male and female undergraduates' responses on how mathematics skills contribute to the effective performance of practicing accountants.

Gender	No	Mean x	SD	df	t <sub>cal.V</sub>	P ≤ 0.05	Dec
Male	85	0.09	0.56	129	0.73	1.96	NS
Female	40	3.19	0.83				

Note: \* Significant at  $p \leq 0.05$ .

Table 8 revealed that  $t_{cal}$  value was significant ( $t_{cal.V} = 0.73, p \leq .05$ ).

That is,  $t_{cal.V} = 0.73 < 1.96 = t_{crit.V} = t, 129$ . The null hypothesis, which states that there is no significant difference between the opinions of male and female undergraduates on how mathematics skills contribute to the effective performance of practicing accountants, was not rejected. This means most of the undergraduates agreed that mathematics skills contribute significantly ( $p \leq 0.05$ ) to their performance in accounting education and practice. There is no significant difference between the opinions of male and female accounting undergraduates on how managerial skills contribute to the effective performance of practicing accountants with respect to gender.

**Table 9.** t-test analysis of the difference in means between the male and female undergraduates' responses on how managerial skills contribute to effective performance of practicing accountants.

Gender	No	Mean x	SD	df	t <sub>cal.V</sub>	P ≤ 0.05	Dec
Male	85	3.12	0.56	129	0.58	1.96	NS
Female	46	3.07	0.83				

Note: \* Significant at  $p \leq 0.05$ .

Table 9 revealed that  $t_{cal}$  Value was significant ( $t_{cal.V} = 0.58, p \leq 0.05$ ).

i.e.  $t_{cal.V} = 0.58 < 1.96 = t_{crit.V} = t, 129$ . The null hypothesis, which states that there is a significant difference between the opinions of male and female accounting undergraduates on how managerial skills contribute to the effective performance of practicing accountants with respect to gender, was not rejected. This means that all the undergraduates agreed that the nine listed managerial skills contribute to their effective performance in accounting and practice.

*H<sub>03</sub>: There is no significant difference between the mean opinions of accounting undergraduates on how mathematics skills contribute to the effective performance of practicing accountants based on school type.*

**Table 10.** t-test Analysis of the difference in means between the undergraduates' responses in public and private universities on how mathematics skills contribute to the effective performance of practicing accountants.

School type	No	Mean x	SD	Df	t <sub>cal.V</sub>	P ≤ 0.05	Dec
Public	83	2.81	0.14	129	0.92	1.96	NS
Private	48	2.9	0.31				

Note: \* Significant at  $p \leq 0.05$ .

Table 10 shows that  $t_{cal}$  value was significant ( $t_{cal.V} = 0.92, p \leq 0.05$ ) i.e.  $t_{cal.V} = 0.73 < 1.96 = t_{crit.V} = t, 129$ . The null hypothesis, which states that there is no significant difference between the mean opinions of accounting undergraduates on how far mathematics skills contribute to the effective performance of practicing accountants based on school type, was not rejected. This means that all the undergraduate accounting students agreed that the nine listed mathematics skills contribute significantly ( $P \leq 0.05$ ) to the effective performance of practicing accountants.

*H<sub>04</sub>: There is no significant difference between the mean opinions of accounting undergraduates on how far management skills contribute to the effective performance of practicing accountants based on school type.*

**Table 11.** t-test Analysis of the difference in means between the undergraduates' responses in public and private universities on how managerial skills contribute to the effective performance of practicing accountants.

School type	No	Mean x	SD	Df	t <sub>cal.V</sub>	P ≤ 0.05	Dec
Public	83	2.88	0.44	129	0.95	1.96	NS
Private	48	2.7	0.48				

Note: \* Significant at  $p \leq 0.05$ .

Table 11 showed that  $t_{cal.}$  value was significant ( $t_{cal.V} = 0.95$ ,  $p \leq 0.05$ ) i.e.  $t_{cal.V} = 0.73 < 1.96 = t_{crit.V} = t$ , 129. The null hypothesis, which states that there is no significant difference between the mean opinions of accounting undergraduates on how far management skills contribute to the effective performance of practicing accountants based on school type, was not rejected. This means that students in both public and private universities agreed that all nine management skills enumerated above contribute significantly ( $P \leq 0.05$ ) to the effective performance of practicing accountants.

## 5. DISCUSSION OF THE RESULTS

Research question one was answered using Table 1. Table 1 indicated that nine (9) out of the fourteen (14) mathematics and statistics topics listed were the topics in mathematics and statistics required for undergraduates of accounting to undertake for effective accounting professional practice. They are probabilities, matrices, calculus, correlation/regression analysis, optimization techniques, transportation algorithms, simplex approaches, Markov chain, linear programming techniques, simulation techniques, accounting arithmetic, estimation, etc. The grand mean response of the students was 2.8 with a standard deviation of 0.97, which clearly indicated that almost all the items were offered with the exception of the Binary number system, Complex Analysis, Bearing, and Geometry. This finding was supported by an earlier report by Villamar et al. (2020), who reported that mathematics courses offered in the accounting discipline at the University of Saint-Louis, a university in the Northern Philippines, included College Algebra, Mathematics of Investment, Business Calculus, and Quantitative Techniques. Furthermore, Uyar and Gungormus (2011) reported that mathematics skills showed 55% of variance in principles of accounting, indicating that the two subjects are positively and highly interrelated.

Research Question two was answered using Table 2. Table 2 indicated that eleven (11) out of fifteen (15) mathematics skills are required for competency in accounting education and practice. The students generally agreed that the basic mathematics and statistics skills required for competency in accounting education and practice include the ability to apply probability theorems, matrices, correlation/regression analysis, La Grande Models, maximization and minimization, arithmetic, transformation algorithms, simple approaches, graphical methods, simulation techniques, calculus, and estimation. The grand mean response of the respondents was 3.1 with a standard deviation of 0.77, which means that almost all the students agreed that the eleven (11) mathematics and statistics skills were necessary for students to perform effectively in accounting education and practice. This report aligns with the notion of Villamar et al. (2020) that accounting education and its connection to mathematics have attracted significant concern in academia in recent times. Similarly, Alio et al. (2017) reported that undergraduate accounting students majoring in mathematics from pre-university institutes perform better than those with backgrounds in arts or social sciences.

Research question three was answered using Table 3. Table 3 indicated that the accounting students agreed that the basic managerial education skills required for competency in accounting practice are nine (9). They are required for labor market needs; helping to make accounting learners good managerial accountants; enabling accountants to manage funds well; determining where bottlenecks occur, analyzing financial trends, evaluating performance, and developing cost-effective strategies; analytical thinking (the ability to analyze complex financial data); relating to their subordinates; formulating comprehensive plans and budgets; and providing financial information/data and resources that are helpful to the internal management of the organization. The grand mean response of the undergraduate accountants was 2.7 with a standard deviation of 0.49, which indicates that almost all the students were of the opinion that the above nine (9) basic managerial education skills were required for competency in accounting education and practice. This finding was supported by an earlier report by Nwosu et al. (2018), who all agreed that various management strategies, which include supporting accounting educators; teaching and learning resources for accounting educators and learners; supervising the teaching and learning of accounting in the classroom; and providing exchange programs for accounting learners, were employed by the schools to manage the teaching and learning of accounting. Obviously, education management is indispensable in effecting the teaching and learning of accounting for competency in accounting practice.

Research question four was answered using Table 4. Table 4 revealed that both males and females agreed that mathematics skills contribute to effective performance for practicing accountants. The grand mean difference in the opinions of males and females was 0.1 in favor of males. This indicates that males have a stronger agreement that mathematical skills contribute to the effective performance of practicing accountants than their female

counterparts. This difference in the opinions of male and female undergraduates could be linked to [Gbenga \(2017\)](#) three classifications: actual gender differences, gender roles, and gender differences. [Merriam-Webster Dictionary \(2024\)](#) pointed out that sex differences in psychology are differences in the mental functions and behavior of the sexes and are due to a complex interplay of biological, developmental, and cultural factors.

Furthermore, the significant difference in the means of the opinions of males and females (i.e., the mean difference of 0.1) was further investigated by testing the significance of the mean difference of 0.1 in [Table 4](#) under the null hypothesis one in [Table 8](#). The hypothesis of no significant difference between the opinions of the accounting undergraduates on how mathematics skills contribute to the effective performance of practicing accountants with respect to gender was not rejected ( $P \leq .05$ ). This means most of the undergraduates agreed that mathematics skills contribute to their performance in accounting education and practice.

Research question five was answered using [Table 5](#). [Table 5](#) indicated that both male and female undergraduates agreed that nine (9) managerial skills contribute to the effective performance of practicing accountants. The males recorded higher mean scores than their female counterparts, with a grand mean difference of 0.05. This mean difference of 0.05, which favored males, clearly revealed that the gender differences observed in this study were in line with the earlier classification of gender differences by [Gbenga \(2017\)](#) as actual gender differences, gender roles, and gender stereotypes.

The gender mean difference of 0.05 was further tested for significance ( $P \leq 0.05$ ) using [Table 9](#). The null hypothesis, which states that there is no significant difference between the opinions of male and female accounting undergraduates on how managerial skills contribute to the effective performance of practicing accountants, was accepted. This means the undergraduates agreed that all nine (9) listed managerial skills contribute to their effective performance in accounting and practice.

Research question six was answered using [Table 6](#). [Table 6](#) revealed that undergraduate students in both public and private universities agreed that the nine (9) mathematical skills listed above contribute to the effective performance of practicing accountants. Undergraduate students in public universities recorded higher mean scores, with a grand mean difference of 0.09. This mean gain difference of 0.09 in favor of students in public universities was supported by the observation of differences between public and private universities, as noted by [Elab Education, \(2023\)](#). [Elab Education \(2023\)](#) reported that public universities offer more courses and disciplines that may not be available in private universities, making them cheaper and more affordable for students across the country. This observed grand mean difference of 0.09 was further tested for significance ( $p \leq 0.05$ ).

The null hypothesis, which states that there is no significant difference between the mean opinions of undergraduate accounting students on how far mathematical skills contribute to the effective performance of practicing accountants based on school type, was accepted ( $p \leq 0.05$ ). This means that undergraduate accounting students agreed that the nine listed mathematical skills contribute significantly ( $p \leq 0.05$ ) to the effective performance of practicing accountants, irrespective of the type of university (whether public or private).

Research question seven was answered using [Table 7](#). [Table 7](#) shows that students in both public and private universities agreed that the nine (9) listed managerial skills above contribute to the effective performance of practicing accountants. A grand mean difference of 0.08 was recorded between the mean responses of students in public and private universities in favor of students in public universities. This means the difference between public and private university accounting students was in line with earlier reports that public and private universities abound ([Elab Education, 2023](#)) and that private universities have a smaller student population compared to public institutions ([Alio et al., 2017](#)). Apart from all these observed differences between the two, tuition is much higher in private universities than in public universities. Public institutions have more qualified and experienced lecturers than private universities.

The observed grand mean difference of 0.08 was further tested for significance ( $p \leq 0.05$ ). The null hypothesis, which states that there is no significant difference between the mean opinions of undergraduate accounting students on how far managerial skills contribute to the effective performance of practicing accountants irrespective of school type, was not rejected. This means students in both public and private universities agreed that all the 9 management skills listed above contribute significantly ( $p \leq 0.05$ ) to the effective performance of practicing accountants.

## 6. CONCLUSION

It can be concluded that mathematics and educational management are crucial and effective for the study and practice of accounting. The study has demonstrated that the mathematical and educational management skills and competencies learned by accountants during their schooling contribute effectively to the performance of prospective accountants during practice.

### 6.1. Suggestions for Further Studies

Based on the results of the study, the following suggestions were made:

1. Efficacy of mathematics and educational management and their implications on financial management can be investigated.
2. Efficacy of mathematics and educational management and their implications on enhanced study of economics and practice can be conducted.

### 6.2. Limitations of the Study

1. The study was limited to two (2) schools (one public and one private universities) due to time and financial constraints.
2. Administrative bureaucracy posed difficulties in accessing the secondary data from the universities.

### 6.3. Recommendations

Based on the findings of the study, the following recommendations are made:

1. The National University Commission should incorporate more mathematics and management topics and skills into the teaching of accountancy in universities.
2. Universities should make it compulsory for accounting students to achieve at least a credit-level pass in mathematics and management-related courses before a prospective accounting student is allowed to graduate.
3. Parents should be made aware of the need for these subjects so that they can make it a point of duty to assist their children by purchasing ready materials on mathematics and management.

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## INSTITUTIONAL REVIEW BOARD STATEMENT

Not applicable.

## TRANSPARENCY

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

## COMPETING INTERESTS

The authors declare that they have no competing interests.

## AUTHORS' CONTRIBUTIONS

All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

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## APPENDIX Presents a Questionnaire Instrument on Mathematics and Managerial Skills

### Cluster: A

S/N	Mathematics and statistics topics accounting students were required to undertake	SA	A	D	SD
1	Quantitative application in business (Tools and concepts of quantitative analysis – Probabilities, matrices, calculus, etc.)				
2	Correlation/Regression analysis				
3	Binary number system				
4	Optimization techniques				
5	Complex analysis				
6	Transportation algorithms				
7	Simple approaches				
8	Markov chain				
9	Linear programming technique (graphical approach)				
10	Simulation techniques				
11	Accounting arithmetic				
12	Bearing				
13	Estimation				
14	Geometry (Plane and Cyclic)				



**Cluster: B**

S/N	Basic mathematics skills required for competency in accounting education and practice	SA	A	D	SD
1	Ability to apply probability theorems and matrices in problem-solving in accounting.				
2	Ability to apply correlation and regression analysis to determine relationships between variables.				
3	Ability to apply La Grange models, maximization, and minimization in solving problems.				
4	Ability to apply addition, subtraction, multiplication, and division skills in accounting computations.				
5	Ability to utilize transportation algorithms to resolve transportation issues in accounting.				
6	Ability to apply simplex approaches and graphical methods in solving accounting problems involving transformation.				
7	Ability to utilize simulation techniques for solving problems in accounting and practice.				
8	Ability to apply calculus in accounting problem-solving.				
9	Ability to estimate cost behavior patterns in accounting.				

**Cluster: C**

S/N	Basic managerial education skills required for competency in accounting education and practice	SA	A	D	SD
1	The management courses offered in accounting at the university are not required for the labor market needs in accounting practice.				
2	The knowledge of management strategy courses taught in schools helps make accounting learners into good managerial accountants.				
3	The knowledge of managerial skills does not matter for an accountant's management of funds.				
4	Management skills help accountants determine where bottlenecks occur and calculate the impact of these constraints on revenue, profit, and cash flow.				
5	Managerial skills enable accountants to analyze financial trends, evaluate performance, and develop cost-effective strategies.				
6	Management skills develop in accountants' ability to analyze complex financial data, identify trends, and make informed decisions that can shape the future of a company (analytical thinking skills).				
7	Management skills help accountants cooperate with their colleagues and know how to effectively deal with their subordinates, which allows for an easy flow of activities within the organization (Administrative skills).				
8	Management skills can prevent accountants from formulating comprehensive plans and budgets.				
9	The knowledge of managerial skills helps accountants provide financial information Data and resources to the internal management of the organization.				

**Cluster: D**

S/N	How mathematics skills contribute to effective performance of practicing accountants based on gender	SA	A	D	SD
1	Ability to apply probability theorems and matrices in problem-solving in accounting.				
2	Ability to apply correlation and regression analysis to determine relationships between variables.				
3	Ability to apply La Grange models, maximization, and minimization in solving problems.				
4	Ability to apply addition, subtraction, multiplication, and division skills in accounting computations.				
5	Ability to utilize transportation algorithms to resolve transportation issues in accounting.				
6	Ability to apply simplex approaches and graphical methods in solving accounting problems involving transformation.				
7	Ability to utilize simulation techniques for solving problems in accounting and practice.				
8	Ability to apply calculus in accounting problem-solving.				
9	Ability to estimate cost behavior patterns in accounting.				

**Cluster: E**

How far managerial skills contribute to effective performance of practicing accountants based on gender	SA	A	D	SD
The management courses offered in accounting at the university are not required for the labor market needs in accounting practice.				
The knowledge of management strategies taught in schools helps accounting learners become effective managerial accountants.				
The knowledge of managerial skills does not matter for an accountant's management of funds.				
Management skills help accountants identify where problems occur and calculate the impact of these constraints on revenue, profit, and cash flow.				
Managerial skills enable accountants to analyze financial trends, evaluate performance, and develop cost-effective strategies.				
Management skills develop in accountants' ability to analyze complex financial data, identify trends, and make informed decisions that can shape the future of a company (analytical thinking skills).				
Management skills help accountants relate to their fellow co-workers and know how to deal effectively with their subordinates, which allows for an easy flow of activities in the organization (Administrative skills).				
Management skills can prevent accountants from formulating comprehensive plans and budgets.				
The knowledge of managerial skills helps accountants provide financial information and resources to the internal management of the organization.				

**Cluster: F**

S/N	How far mathematics skills contribute to effective performance of practicing accountants based on school type	SA	A	D	SD
1	Ability to apply probability theorems and matrices in problem-solving in accounting.				
2	Ability to apply correlation and regression analysis to determine relationships between variables.				
3	Ability to apply La Grange models, maximization and minimization in solving problems				
4	Ability to apply addition, subtraction, multiplication, and division skills in accounting computations.				
5	Ability to use transportation algorithms to solve transportation problems in accounting				

6	Ability to apply simplex approaches and graphical method in solving accounting problems involving transformation			
7	Ability to use simulation techniques in solving problems in accounting and practice			
8	Ability to apply calculus in accounting problem solving			
9	Ability to estimate cost behavior patterns in accounting.			

**Cluster: G**

S/N	How far managerial skills contribute to effective performance of practicing accountants based on the school type	SA	A	D	SD
1	The management courses offered in accounting at the university are not required for the labor market needs in accounting practice.				
2	The knowledge of management strategies courses taught in schools helps to make accounting learners good managerial accountants				
3	The knowledge of managerial skills does not matter for an accountant's management of funds.				
4	Management skills help accountants to find out where problems occur and determine the impact of such problems on revenue, profit, and cash flow.				
5	Managerial skills enable accountants to analyze financial trends, evaluate performance, and develop cost-effective strategies.				
6	Management skills develop in accountants' ability to analyze complex financial data, identify trends, and make informed decisions that can shape the future of a company (analytical thinking skills).				
7	Management skills help accountant to relate with their fellow co-workers and know how to deal well with their subordinates, which allows for the easy flow of activities in the organization (Administrative skills)				
8	Management skills can make accountants not to formulate comprehensive plans and budgets				
9	The knowledge of managerial skills helps accountants provide financial information Data and resources to the internal management of the organization.				

**Source:** Curled from course learning objectives of accounting departments of UNN and GOU.