

Principal Components Factoring Technique for Exploring University Students' Inclination Towards Examination Malpractices: A Case of a Public University in Ghana

F. B. K. Twenefour* , C. K. Amissah , E. M. Baah , J. A. Addor , and M. Techie Quaicoe 

Department of Mathematics, Statistics and Actuarial Science, Faculty of Applied Sciences, Takoradi Technical University, Ghana

*Corresponding author: frank.twenefuor@ttu.edu.gh

Received: 18th October 2024/ Revised: 31st December 2024/ Published: 17th March 2025

©IAppstat-SL2025

ABSTRACT

Exams are frequently viewed as the most practical, economical, trustworthy, and consistent way to gauge students' levels of intelligence. However, the increase in malpractices has prompted serious worries. Examinee fraud incidents have significantly increased in our culture, especially in academic institutions. This study aims to investigate the elements that affect college students' propensity to cheat on exams. The study, which encompassed 600 respondents, discovered that five factors using principal component factoring, which together explained 63.3% of the variability among the original variables, influence students' propensity for examination malpractices. These results illuminate the intricate processes affecting such student behaviour. In conclusion, the factors that have been linked to students' propensity for exam fraud in Ghana's tertiary institutions were identified as pressure for academic success, enhanced societal value of exceptional academic achievement, Insufficient study planning, incorrect programme orientation prior to program selection and nepotism or academic dishonesty. Effective exam preparation should be promoted among students as a solution to this problem. Furthermore, applying severe penalties to violators might serve as a warning to others, thus reducing the frequency of malpractice. Students should also get instruction on the value of moral principles, independence, and the ability to make well-informed programme selection decisions. Adopting these methods can reduce or even eliminate examination misconduct, promoting academic honesty and integrity.

Keywords: Education, Examination malpractices, Principal Component Factoring, Public University, Students.

1 Introduction

Education is a fundamental pillar of personal and societal development, serving as a powerful tool for shaping minds, fostering social cohesion, and driving economic growth. It provides individuals with knowledge, skills, values, and perspectives necessary to navigate and contribute to a rapidly changing world. Beyond personal advancement, education is integral to building resilient communities and empowering citizens to address global challenges. By fostering critical thinking, creativity, and ethical decision-making, education not only prepares individuals for the workforce but also cultivates responsible and informed members of society, underscoring its vital role in national and global progress.

1.1 The Role of Education in National Development

Education plays a pivotal role in the progress of every nation. It is regarded as a tool for liberating minds, fostering social cohesion, and driving economic growth. Within the academic framework, education serves as the primary means of developing knowledge, skills, attitudes, and values. To adapt to the rapidly evolving world, it is essential for nations to ensure high-quality education for their citizens, as the well-being and future prospects of individuals are heavily influenced by the standard of education they receive (Stewart, 2012; Mireku et al., 2024).

1.2 The Importance of Ethical Standards in Education

The success of educational institutions largely depends on their ability to uphold ethical principles across all aspects of their activities. Consistently tracking and maintaining these standards can enhance institutional reputation and garner widespread public trust, ultimately supporting long-term educational excellence (Udim et al., 2018). A critical element in achieving such high standards of education is academic performance. Students' academic scores, often measured through cumulative grade point averages (CGPAs) and examinations, are key indicators of their academic achievements.

1.3 Examination

According to the Oxford Advanced Learner's Dictionary (2000), examination is defined as a spoken or hands-on assessment conducted in an educational setting, especially one that is significant for earning a qualification. Wikipedia explains that a test or examination serves as a means to evaluate an individual's knowledge, abilities, physical fitness, or other aspects such as personal

beliefs. Tests can be conducted through various methods, including oral presentations, written formats, computer-based platforms, or in controlled settings where participants must physically demonstrate specific skills. An examination is a systematic method of evaluation that involves presenting participants with a series of tasks or questions aimed at assessing the knowledge and competencies they have developed (Oduwaiye, 2014). Examinations are often seen as the most practical, affordable, and reliable method for assessing students' intelligence and academic performance. However, the emphasis on academic credentials as prerequisites for employment and further education has intensified the focus on examinations (Mireku et al., 2024). This high-stakes environment has led to the proliferation of examination malpractice.

1.4 Examination Malpractice

According to Examination malpractice is defined as any deliberate violation of the examination rules, intended to give a candidate an unfair advantage. Commonly referred to as cheating, it involves students engaging in unlawful actions during exams to achieve higher grades through dishonest methods. Such malpractice includes any irregular or improper conduct that deviates from the official guidelines for administering exams. This problem has had a considerable impact on most students, as many have become reliant on dishonest practices instead of focused study, believing they can continue to use shortcuts to perform well in exams. Examination malpractice has become a significant issue within the Ghanaian education system, causing concern not only for exam bodies but the broader education sector, the government, and society at large (Akaranga and Ongong, 2013; Chala and Agago, 2022; Onuka and Amoo, 2004).

1.5 The Prevalence and Nature of Examination Malpractice

Examination malpractice has been a persistent issue within the education system. It has recently escalated into a widespread problem, affecting all levels of education, from elementary to higher education (Bitrus, 2013; Dada, 2014). Common forms of malpractice include students copying from peers, smuggling materials into examination rooms, or purchasing leaked examination questions. Disturbingly, some negligent parents even facilitate malpractice by acquiring exam questions for their children to secure higher grades (Akaranga and Ongong, 2013; Okey and Ewa, 2019; Tiong and Lee, 2021).

In higher education, unethical practices often involve bribing lecturers or teaching assistants for favorable treatment. Such behaviors stem from societal pressures, unrealistic expectations from families, and the perceived value of academic credentials. Students may cheat to meet societal standards of intelligence or to enhance their employability in a competitive job market (Altbach and Knight, 2007). Employers frequently prioritize academic qualifications in hiring decisions, leading to the exclusion of candidates who may possess

the skills required for the job but lack the desired academic class (Akaranga and Ongong, 2013; Okey and Ewa, 2019; Tiong and Lee, 2021).

1.6 The Consequence of Examination Malpractice

The repercussions of examination malpractice are severe, impacting both individuals and society. Students caught cheating face expulsion, jeopardizing their futures. On a broader scale, widespread malpractice undermines the quality of education and produces graduates who lack the competencies required for the workforce. This results in reduced productivity for employers and the economy as a whole (Bitrus, 2013; Okey and Ewa, 2019). Furthermore, the societal implications are alarming, especially when graduates who have cheated their way through education occupy influential positions in the economy or government. Such individuals often become liabilities, contributing little to societal advancement. Examination misconduct, regardless of the educational stage, remains a recurring issue, and its prevalence in tertiary institutions is particularly concerning (Zhong and Ren, 2009).

1.7 Research Focus and Objectives

This study seeks to understand the underlying causes of students' propensity for examination malpractice, develop a predictive model, and propose measures to mitigate or prevent such behaviour. Addressing the root causes of this issue is critical for preserving the integrity of education and ensuring that graduates are well-equipped to contribute meaningfully to society.

2 Methodology

This paper presents research findings obtained from a cross-sectional survey conducted among students at a public university in Ghana. The survey covered students from levels 100 to 400 and was carried out during May in 2023, coinciding with their end-of-semester exams. We interviewed the first 150 students who completed their exams at each level, resulting in a total sample size of 600 to analyze the collected data, we employed the statistical technique known as principal component factoring analysis, utilizing both SPSS and R, a statistical programming environment. The survey included twenty-three questions, each designed to assess responses on a 5-point scale, ranging from 1 for "strongly disagree" to 5 for "strongly agree." It's worth noting that our sample size of 600 exceeds the minimum requirement for principal component factoring analysis, as recommended by Hair et al. (2014) who suggest that the sample size should be at least five times the number of variables under consideration in a study. While the foregoing sample size requirement has been met as pointed out above, it would have been preferable to sample from other similar institutions to enhance the generalizability of the results (make it applicable to such analogous institutions).

2.1 Model of Data

The data model is expressed using matrix notation as follows:

$$(\mathbf{X} - \mu)_{p \times 1} = \mathbf{L}_{p \times m} \mathbf{F}_{m \times 1} + \boldsymbol{\varepsilon}_{p \times 1}, \quad m \ll p$$

where $\mathbf{L}_{p \times m}$ is a $p \times m$ matrix consisting of the coefficients l_{ij} , $i = 1, 2, \dots, p$;

$$l_{ij}, i = 1, 2, \dots, p; j = 1, 2, \dots, m$$

$\mathbf{X}' = (X_1, X_2, \dots, X_p)$ represents the vector of observable (indicator) variables. $\mu = E[\mathbf{X}] = (\mu_1, \mu_2, \dots, \mu_p)'$ denotes the average of $\mathbf{X}$.

$\mathbf{F}' = (F_1, F_2, \dots, F_m)$ is the vector of latent factors. $\boldsymbol{\varepsilon}' = [\varepsilon_1, \varepsilon_2, \dots, \varepsilon_p]$ represents the vector of potential error terms associated with each X_i for $i = 1, 2, \dots, p$, respectively, and the mean corrected vector $(\mathbf{X} - \mu)_{p \times 1}$ is the response variable (Baah et al., 2015; Twenefour et al., 2015).

The following conditions must be satisfied if $\mathbf{F}' = (F_1, F_2, \dots, F_m)$ are to remain uncorrelated (orthogonal):

$$E[\mathbf{F}] = \mathbf{O}_{(m \times 1)}, \quad E[\boldsymbol{\varepsilon}] = \mathbf{O}_{(p \times 1)}, \quad \text{Cov}(\mathbf{F}) = \mathbf{I}_{(m \times m)}$$

$$\text{Cov}(\varepsilon_i, \varepsilon_j) = 0, \quad \text{Cov}(F_i, \varepsilon_j) = 0$$

where $\mathbf{O}$ represents a matrix of zeros.

The conditions above ensure that:

- The factors are independent,
- The specific error terms are independent, and
- The specific error terms and latent factors are independent.

The latent factors account for the observed correlations among the indicator variables $X_1, X_2, \dots, X_p$, as indicated above. For a factor solution with $F_1, F_2, \dots, F_m$ uncorrelated, the simple correlations (structure loadings) between the factors F_j , $j = 1, 2, \dots, m$, and the indicator variables X_i , $i = 1, 2, \dots, p$, are the same as the coefficients (pattern loadings) l_{ij} .

The value of l_{ij}^2 is then the variance that F_j has in common with X_i , so:

$$l_{i1}^2 + l_{i2}^2 + \dots + l_{im}^2$$

represents total variance (communality) shared between X_i and all m factors (Everitt et al., 2001; Johnson et al., 2002; Sharma, 1995; Twenefour et al., 2015).

2.2 Principal Component Factoring

Principal Component Factoring (PCF) is a technique used in factor analysis. In this method, Principal Component Analysis (PCA) (Everitt and Dunn, 2001; Johnson and Wichern, 2007; Hair et al., 2014) is applied to examine the correlations between indicator variables, helping to identify the latent dimensions that drive these correlations. As many uncorrelated linear combinations (Principal Components, PCs) are created as there are indicator variables. The PCs are arranged in such a way that the first PC captures the maximum variance in the data, while each subsequent PC captures the largest remaining variance, with the last PC accounting for the least variance. The more variance explained by the first few PCs, the more effective the data reduction process becomes, as the original set of variables can be replaced by the first few PCs, making them the new variables. This approach helps to simplify the interpretation of correlations among manifest variables, while retaining as much of the original data's information as possible (Everitt et al., 2001; Johnson et al., 2002; Sharma, 1995; Twenefour et al., 2015).

To ensure that the principal components $C_1, C_2, \dots, C_p$ specified below are uncorrelated with constrained variance, the coefficients (weights) w_{ij} , $i = 1, \dots, p$, $j = 1, \dots, p$, are found

$$C_1 = w_{11}X_1 + w_{12}X_2 + \dots + w_{1p}X_p \quad (1)$$

$$C_2 = w_{21}X_1 + w_{22}X_2 + \dots + w_{2p}X_p \quad (2)$$

$$\vdots$$

$$C_p = w_{p1}X_1 + w_{p2}X_2 + \dots + w_{pp}X_p \quad (3)$$

Conditional on Equations 1 and 2 respectively (Everitt et al., 2001; Johnson et al., 2002; Sharma, 1995).

$$w'_i \cdot w_j = 0 \quad \text{for all } i \neq j \quad (1)$$

and

$$w'_i \cdot w_i = 1 \quad (2)$$

where $\mathbf{w}'_i = (w_{i1}, w_{i2}, \dots, w_{ip})$.

The principal components can be formed by

$$Z_i = \frac{X_i - \mu_i}{\sigma_{ii}},$$

for $i = 1, \dots, p$, where the mean and the standard deviation of the observed variable are X_i , μ_i and σ_{ii} , respectively (Sharma, 1995; Hair et al., 2014; Twenefour et al., 2015).

The vector of standardized variables can be expressed in matrix notation as

$$Z = \left(V^{\frac{1}{2}}\right)^{-1} (X - \mu)$$

where

$$\mu' = (\mu_1, \mu_2, \dots, \mu_p)$$

and

$$V^{\frac{1}{2}} = \begin{bmatrix} \sigma_{11} & 0 & \dots & 0 \\ 0 & \sigma_{22} & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & \dots & 0 & \sigma_{pp} \end{bmatrix}$$

with

$$E[Z_i] = 0, \quad \text{Var}[Z_i] = 1, \quad i = 1, \dots, p$$

and

$$\rho = \text{Cov}(Z) = \left(V^{\frac{1}{2}}\right)^{-1} \Sigma \left(V^{\frac{1}{2}}\right)^{-1}$$

where

$$\rho = \begin{bmatrix} \sigma_{11}^2 & \sigma_{11}\sigma_{12} & \dots & \sigma_{11}\sigma_{1p} \\ \sigma_{11}\sigma_{12} & \sigma_{12}^2 & \dots & \sigma_{12}\sigma_{2p} \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{1p}\sigma_{11} & \dots & \sigma_{2p}\sigma_{pp} \end{bmatrix}$$

and

$$\Sigma = \begin{bmatrix} \sigma_{11}^2 & \sigma_{12}^2 & \dots & \sigma_{1p}^2 \\ \sigma_{21}^2 & \sigma_{22}^2 & \dots & \sigma_{2p}^2 \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{p1}^2 & \sigma_{p2}^2 & \dots & \sigma_{pp}^2 \end{bmatrix}$$

The covariance ρ_{ij} between variables X_i and X_j is given by

$$\rho_{ij} = \frac{1}{n} \sum_{k=1}^n (x_{ki} - \mu_i)(x_{kj} - \mu_j), \quad i \neq j$$

where each of the terms is computed with n observations.

If (λ_i, e_i) , $i = 1, 2, \dots, p$ are the eigenvalue-eigenvector pairs of ρ such that

$$\lambda_1 \geq \lambda_2 \geq \dots \geq \lambda_p \geq 0, \quad e'_i \cdot e_j = 0 \quad \text{and} \quad e'_i \cdot e_i = 1,$$

then the principal components are given by

$$C = A'Z$$

where $C' = [C_1, C_2, \dots, C_p]$ are the p principal components and

$$A = [e_1, e_2, \dots, e_p].$$

The variance of each principal component is

$$\text{Var}(C_i) = e_i' \rho e_i = \lambda_i,$$

and

$$\sum_{i=1}^p \text{Var}(C_i) = \sum_{i=1}^p \text{Var}(Z_i) = p.$$

In Principal Component Factoring, the initial communality of each indicator variable is set to one (Hair et al., 2014). The entity $\frac{\lambda_j}{p}$ is the proportion of the variance in the data due to C_j , and the correlation between C_i and Z_j is given by

$$\text{Corr}(C_i, Z_j) = e_{ij} \cdot \frac{\lambda_j}{\frac{1}{2}},$$

which is the loading of the standardized variable Z_j on any C_i (i.e., the correlations between a given PC C_i and a given Z_j).

Given the effect of the other variables $Z_k, j \neq k$, the loading of each Z_j on each C_i expresses the extent to which each C_i is impacted by Z_j (Everitt et al., 2001; Johnson et al., 2002; Sharma, 1995; Twenefour et al., 2015).

3 Results

The distribution of the sample was biased towards the male demographic (refer to Table 1), comprising 64% of the participants, while the remaining 36% were female.

The age range of respondents was diverse, spanning from under 20 to 35 years and older. The largest portion of participants belonged to the 20–24 age category, encompassing 60% of the entire respondent pool. Subsequently, the under 20 age brackets followed (constituting 21% of the total), next was the 25-29 age group which constitute 14% while the smallest group was the 35 years and above category (making up 1%). The educational level of the respondents was generally targeted on levels 100 to 400 encompassing 25% respectively (see Table 1).

Table 2 presents the descriptive analysis of all variables categorized under the section titled "Comprehension of Examination Malpractices." The mean values for all variables were notably elevated. Notably, the act of introducing unauthorized materials into the examination hall exhibited the highest mean and the lowest standard deviation ($\mu = 4.75, \sigma = 0.527$). Conversely, the cat-

Table 1: Personal Profile of Respondents

Variable	N	Count	%
	600		
Gender			
Male		384	64
Female		216	36
Age			
< 20		128	21
20-24		362	60
25-29		82	14
30-34		22	4
35+		6	1
Level of respondents			
Level 100		150	25
Level 200		150	25
Level 300		150	25
Level 400		150	25

Table 2: Comprehension of Examination Malpractice

Variable (X_i)	Mean (μ)	Std. Dev. (σ)	Rank (R_{X_i})
Cheating in the examination hall	4.41	0.580	2
Bringing foreign materials into the examination hall	4.75	0.527	1
Talking in the examination hall	4.08	0.570	3
Looking onto/copying a colleague's work	3.89	0.632	4
Others	3.71	0.651	5

egory labeled "others" displayed a mean ($\mu = 3.71$) with a standard deviation ($\sigma = 0.651$). The outcomes depicted in Table 2 affirm that students possess an understanding of the concept of examination malpractice.

3.1 Descriptive Statistics of the Variables

The average and deviation from the norm were displayed for all 21 variables to identify which among them holds a more significant impact on the subject in question. The ranking order of mean responses and their corresponding standard deviations is as shown in Table 3.

The variables that hold the greatest sway over the inclinations of Ghanaian tertiary students to engage in examination malpractices are presented. The variable "I have to get a good academic certificate to be able to further my education" holds the most influence, with a mean response value of 4.58 and a standard deviation of 1.104. Following closely are "I have to get a good class" (mean: 4.32, deviation: 1.281), "I have to keep my position and in class" (mean: 3.74, deviation: 1.354), "I want to get a good job after school" (mean: 3.63, deviation: 1.419), and "I want to be among the best in my field" (mean: 3.59, deviation: 1.386).

An interesting relationship could be observed between the mean values and their respective standard deviations (see Table 3). The variables which hold the most sway have higher mean values and smaller standard deviation values. In other words, the more pronounced this observed inverse relationship between the mean and the standard deviation is, the more influence the variable wields. However, it's important to note that utilizing mean and standard deviation alone has a limitation: it allows for the ranking of the latent variables, but does not facilitate the discovery of the underlying latent influences informing the propensity of tertiary students to partake in examination misconduct.

Factor analysis (a data reduction technique) using principal component factoring was used to extract the latent factors influencing students' propensity to engage in examination misconduct.

The adequacy of the sample size and the appropriateness of the correlation matrix for factor analysis were evaluated using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity, respectively. Both the Bartlett's test p-value of 0.000 and the KMO value of 0.85 (which significantly exceeds the minimum threshold of 0.50

Table 5 delineates the initial and ultimate extraction of the variables. In principal component factoring (PCF), every variable is initially assigned a variance of one (1) in total communality. The concluding communalities (extraction) of each variable illustrate the extent to which the selected factor solution can account for the variance in the variable. Among the initial twenty-one variables, only eighteen remained in the final factor solution. The remaining three variables possessed communalities below 0.50, leading to their exclu-

Table 3: Descriptive Statistics of the Variables

Variable	μ	σ	R_{X_i}
V1 I do not think I can ever fail no matter what	3.20	1.504	10
V2 I do not want my friends to laugh at me	3.12	1.484	12
V3 I want to be recognized by my colleagues	3.10	1.481	13
V4 I want to be among the best in my field	3.59	1.386	5
V5 I have to keep my position and grade in class	3.74	1.354	3
V6 I have to get a good class	4.32	1.121	2
V7 The course lecturer is not fair when marking	2.69	1.358	19
V8 The teaching assistants favour their friends	2.78	1.363	17
V9 Some colleagues bribe lecturers and teaching assistants to pass or get higher grades	3.29	1.422	9
V10 I did not understand the course well	2.77	1.197	18
V11 I could not learn enough before examination	3.03	1.308	15
V12 The course is too difficult	3.07	1.291	14
V13 I want to get a good job after school	3.63	1.419	4
V14 The company I want to work for has a minimum grade I must meet.	3.19	1.376	11
V15 I have to get a good academic certificate to be able to further my education	4.58	1.104	1
V16 At workplaces, colleagues respect those with good academic certificates	3.36	1.328	8
V17 The programme I wanted to study is not what I am studying	2.46	1.420	20
V18 My siblings are looking up to me	3.44	1.345	7
V19 My family will be proud of me	3.45	1.362	6
V20 I do not have interest in learning anymore	2.13	1.292	21
V21 I did my best in the previous examination but was given poor grades	2.98	1.363	16

Table 4: Bartlett's Test of Sphericity and KMO

Test	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.853
Bartlett's Test of Sphericity	
Approx. Chi-Square	1795.953
Degrees of Freedom (df)	153
Significance (Sig.)	0.000
Reliability Statistics	
Cronbach's Alpha (Standardized Items)	0.845
Number of Items (Variables)	18

sion from the analysis. The three variables which were excluded are V1: "I do not think I can ever fail no matter what", V7: "the course lecturer is not fair when marking" and V21: "I did my best in the previous examination but was given poor grades". It appears V1, V7 and V21 do not logically align with the other variables thought to measure the latent constructs informing examination malpractices; for V1, why would you want to cheat if you believe you will not fail?; for V7 and V21, on what basis is the assertion that the course lecturer is not fair when marking and is it not possible that one's best could still be below the pass mark, respectively. Indeed the correlation of V1, V7 and V21 with the other variables were low, with respective maximum values of 0.297, 0.395, 0.271. All final communalities, as displayed in Table 6, were at least 0.50.

Therefore, each variable in the final factor solution accounted for at least 50% of the initial communality. As a result, the factor solution is deemed sufficient. Given that every variable shares at least half of its variance with the latent factors extracted in factor analysis, the factor solution is considered satisfactory.

3.2 Number of Extracted Factors

The decision regarding the number of factors to retain for interpretation was based on three fundamental criteria: the eigenvalue-greater-than-one rule, plotting eigenvalues against factor numbers (scree plot), and the percentage of variance accounted for by the final factor solution. Following the eigenvalue-greater-than-one rule, five factors were deemed appropriate for interpretation as their eigenvalues are greater than one.

The first five components explain 63.3% of the variability in the data, which exceeds the recommended 60% threshold as stated by Hair et al. (2014), while the first six components account for approximately 68% of the data's variance. However, the sixth component possesses an eigenvalue of 0.834, which falls short of 1. Considering the outcomes of all three criteria, it's advisable to retain the first five factors for interpretation. The components retained for interpretation after taking the initial factor solution through the Varimax rotation method (Table 7 refers). The varimax rotation ensures that each variable loads highly on only one factor and ensures the independence of the factors. Table 7 presents the extracted factors along with the loadings of individual variables impacting the factors. The impact of a variable on a factor is represented by its loading on that factor. For a sample size of 200, a loading of 0.40 is regarded as significant and for a sample size of 350 a loading of 0.30 is deemed significant, as indicated by

In order to ensure that only variables with practical significance are incorporated into the ultimate factor solution, a higher threshold of 0.50 was adopted. To facilitate a more straightforward interpretation of the conclusive factor solution, loadings below 0.50 were removed, with the retained loadings arranged in a descending order of magnitude. Components 1, 2, 3, 4, and 5 (as illus-

Table 5: Communalities

Variables	Initial	Extraction
V2 I do not want my friends to laugh at me	1.000	0.608
V3 I want to be recognized by my colleagues	1.000	0.671
V4 I want to be among the best in my field	1.000	0.620
V5 I have to keep my position in class	1.000	0.691
V6 I have to get a good class	1.000	0.730
V8 The teaching assistants favour their friends	1.000	0.626
V9 Some colleagues bribe lecturers and teaching assistants to pass or get higher grades	1.000	0.679
V10 I did not understand the course well	1.000	0.624
V11 I could not learn enough before examination	1.000	0.627
V12 The course is too difficult	1.000	0.587
V13 I want to get a good job after school	1.000	0.655
V14 The company I want to work for has a minimum grade I must meet	1.000	0.646
V15 I have to get a good academic certificate to be able to further my education	1.000	0.695
V16 At workplaces, colleagues respect those with good academic certificates	1.000	0.565
V17 The programme I wanted to study is not what I am studying	1.000	0.584
V18 My siblings are looking up to me	1.000	0.588
V19 My family is proud of me	1.000	0.566
V20 I do not have interest in learning anymore	1.000	0.632

Extraction Method: Principal Component Analysis

Table 6: Proportion of Total Variance Explained by Factors

Component	Initial Eigenvalues	% of Variance	Cumulative %
1	5.648	31.378	31.378
2	1.888	10.488	41.867
3	1.399	7.775	49.641
4	1.253	6.960	56.601
5	1.206	6.700	63.301
6	0.834	4.634	67.935
7	0.783	4.351	72.286
8	0.760	4.222	76.508
9	0.632	3.513	80.021
10	0.575	3.194	83.214
11	0.515	2.858	86.073
12	0.500	2.779	88.851
13	0.443	2.460	91.311
14	0.395	2.193	93.505
15	0.366	2.035	95.540
16	0.327	1.818	97.359
17	0.279	1.547	98.906
18	0.197	1.094	100.000

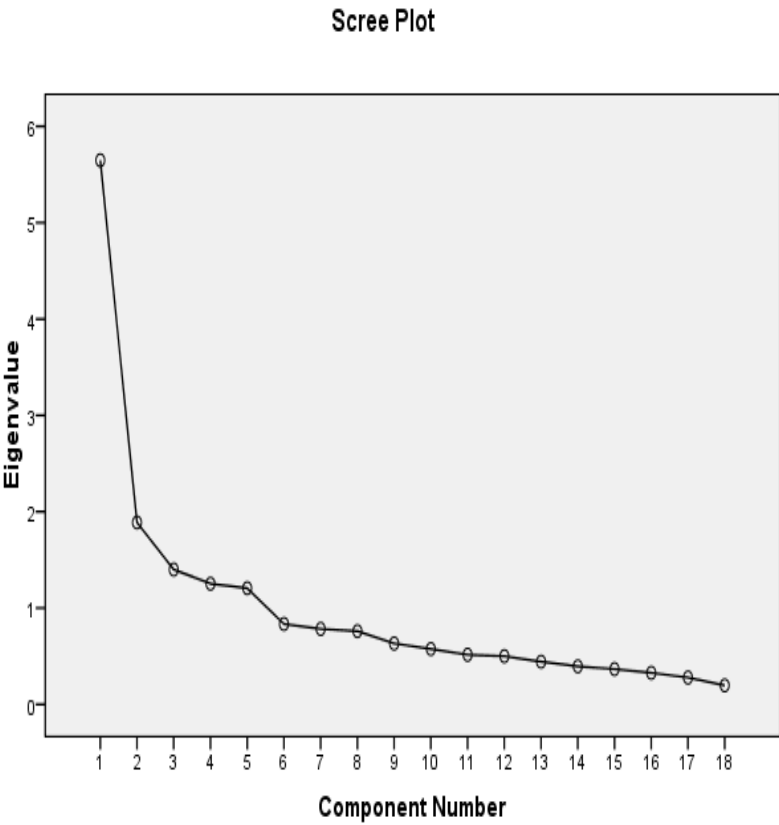


Fig. 1: Scree Plot of Extracted Factors

Table 7: Matrix of Rotated Components

Variables	1	2	3	4	5
V15 I have to get a good academic certificate to be able to further my education	0.779				
V14 The company I want to work for has a minimum grade I must meet	0.757				
V13 I want to get a good job after school	0.745				
V18 My siblings are looking up to me	0.717				
V19 My family is proud of me	0.693				
V16 At workplaces, colleagues respect those with good academic certificates	0.669				
V6 I have to get a good class	0.667				
V5 I have to keep my position and grade in class	0.656				
V3 I want to be recognized by my colleagues		0.776			
V2 I do not want my friends to laugh at me		0.732			
V4 I want to be among the best in my field		0.588			
V10 I did not understand the course well			0.784		
V11 I could not learn enough before examination			0.744		
V12 The course is too difficult			0.702		
V20 I do not have interest in learning anymore				0.782	
V17 The programme I wanted to study is not what I am studying				0.709	
V9 Some colleagues bribe lecturers and teaching assistants to pass or get higher grades					0.799
V8 The teaching assistants favour their friends					0.750

trated in Table 7) are considered to constitute the fundamental factors that impact a student’s inclination to engage in examination cheating. The variables’ loadings (as depicted in Figure 2) were used for the naming of factors; consequently, the greater the absolute value of a variable’s loading on a factor, the more influential its contribution in the naming of the factor. The ensuing are the designated names for the factors:

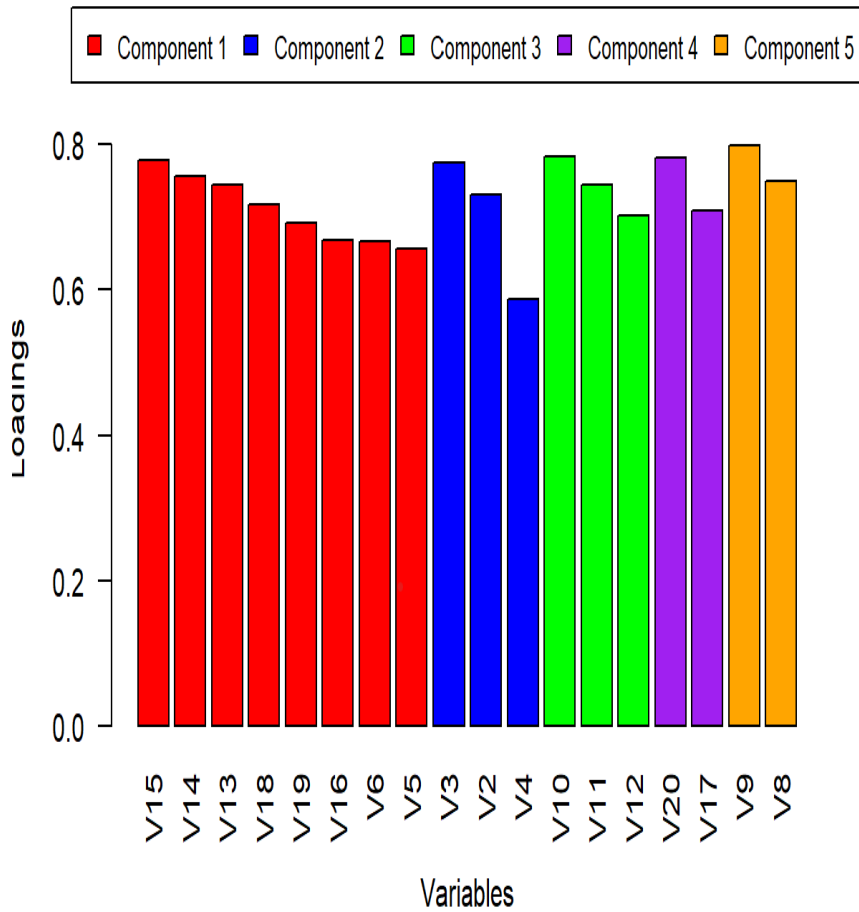


Fig. 2: Bar chart showing the magnitude of the Principal Components Factor Loadings.

Factor 1: Pressure for Academic Success

Factor 2: Overly hyped societal value of high academic achievement

Factor 3: Insufficient study planning

Factor 4: Inappropriate orientation prior to programme selection

Factor 5: Favouritism

The variables loading on Factor 1 in order of decreasing importance are V15: I have to get a good academic certificate to be able to further my education, V14: The company I want to work for has a minimum grade I must meet, V13: I want to get a good job after school, V18: My siblings are looking up to me, V19: My family is proud of me, V16: At workplaces, colleagues respect those with good academic certificates, V6: I have to get a good class, and V5: I have to keep my position and grade in class. The forgoing variables relate to circumstances that demand that a student do well in examinations; thus students may feel pressured by these circumstances and may be tempted to cheat in examinations, just so they may be successful academically. Hence Factor 1 was named “Pressure for Academic Success”. For Factor 2, the related variable are V3: I want to be recognized by my colleagues, V2: I do not want my friends to laugh at me, and V4: I want to be among the best in my field. These variables relate to the value society place on academic achievement, and so this factor was designated “Overly hyped societal value of high academic achievement. Factor 3 was named “Insufficient study planning” as the variables V10: I did not understand the course well, V11: I could not learn enough before examination, and V12: The course is too difficult, reflect student inability to respond to the demands of academic endeavour by doing proper evaluation and preparation in the academic programme of pursuit. Factor 4 is expressed by the indicator variables V20: I do not have interest in learning anymore, and V17: The programme I wanted to study is not what I am studying. These variables related to inappropriate choice of programme of study, hence Factor 4 was named “Incorrect programme orientation prior to program selection”. The variables V9: Some colleagues bribe lecturers and teaching assistants to pass or get higher grades, and V8: The teaching assistants favour their friends, which load on Factor 5 pertain to unjustified preferential treatment of some students. Factor 5 was therefore designated as “Favouritism”.

4 Discussion

This study aims to investigate the elements that affect college students’ propensity to cheat on exams. The study, which encompassed 600 respondents, discovered that five factors using principal component factoring, which together Explained 63.3% of the variability among the original variables, influence students’ propensity for examination malpractices. These results illuminate the intricate processes affecting such student behaviour. In conclusion, the factors that have been linked to students’ propensity for exam fraud in Ghana’s ter-

tiary institutions were identified as: pressure for academic success, enhanced societal value of exceptional academic achievement, Insufficient study planning, incorrect programme orientation prior to program selection and nepotism or academic dishonesty.

4.1 Pressure for Academic Success

The desire to excel, fulfil personal objectives, and ensure future possibilities motivates many people to pursue academic excellence. However, this pursuit's pressure can have a variety of negative repercussions on students' well-being. This article explores how academic pressure affects students' mental health and overall development, with emphasis on the necessity of finding a balance between success and wellbeing. Academic pressure, which results from societal demands, high expectations for academics, and aspirations from parents, has become a typical part of students' lives. This pressure can serve as a driving force, encouraging students to pursue greatness and forge solid work habits. However, when it gets excessive, this pressure can have a negative impact on students' mental health (Slimmen et al., 2022). This paper is also in consonance with Rhees (2024) who posited the common effects of high academic pressure to include chronic stress, anxiety, and burnout. Due to their obsession with perfection and fear of failing, students may suffer increased anxiety and hence resort to examination malpractice. Pressure for academic success has two opposing effects: it can either encourage students to achieve excellence or compromise their general wellbeing. In order to nurture an environment that fosters academic accomplishment and mental wellness, it is essential to acknowledge the psychological toll that excessive pressure takes. Students can excel intellectually and keep their emotional and mental balance by adopting a balanced attitude to achievement and applying supportive techniques within educational institutions.

4.2 Overly Hyped Societal Value of High Academic Achievement

The findings of this study indicate that a key factor contributing to examination malpractice among tertiary students in Ghana is increased societal values of outstanding academic accomplishment. It's a complicated phenomenon, but society places a high value on great intellectual success. Outstanding scholastic achievement is highly regarded and frequently used as a key indicator of someone's value and likelihood of success in many civilizations. Although this emphasis on academic achievement might motivate students to do their best work, it can sometimes unintentionally have negative effects, such as a rise in exam fraud. This article examines the complex relationship between the rise of examination malpractice and the increased societal value of outstanding academic accomplishment, illuminating the underlying processes and offering some viable remedies. This finding supports Yamamoto and Holloway (2010) and Boonk et al. (2018) who specifically stated in their research works that societal expectations, economic pressures, and the notion that academic

achievement predicts future success. Academically gifted people are frequently praised, given scholarships, and given more options for higher study and employment. To satisfy these high expectations, some students may feel under extreme pressure which may cause them to seek immoral shortcuts like cheating on exams, also, According to Sakhiyeva et al. (2014), the most common reason for examination fraud is society's preference for paper qualifications. This shows that the majority of students attend classes more to receive certificates that they may use to find employment than to actually learn skills. As a result, there is underperformance on the job market. The results of this study are consistent with Jega (2006), Baijnath and Singh (2019) and Ukporkor (2005) assertions that examination fraud is caused by sociocultural variables such the stigma attached to obtaining a certificate or piece of paper.

4.3 Insufficient study planning

This study explores the connection between insufficient study planning and students' inclination to use unethical examination techniques, outlining the vestigial structure and viable treatments. This result is in agreement with Mancini and Mancini (2003), Klassen et al. (2008) and Ahern and Manathunga (2004) who asserted that procrastination, overcommitment, and poor time management are just a few of the causes of ineffective study preparation. Students may feel overwhelmed by the urge to live up to the high expectations placed on them by society, which may encourage them to take shortcuts like cheating on exams. Some people could be motivated to act unethically to make up for their lack of preparation when study contents are inadequately covered due to poor planning. They further discovered a substantial correlation between students' examination malpractice behaviours and attitudes and study habits. Lack of appropriate study techniques causes strain, which lowers students' effectiveness and success in exams.

4.4 Inappropriate orientation prior to programme selection

The findings of this study consider incorrect programme orientation prior to program selection as a contributing factor leading examination malpractice. Students most often through the advice of parents frequently have to complete the critical work of programme orientation before choosing an academic programme, which entails comprehending the curriculum, prerequisites, and expectations of their chosen field of study. Programme orientation that is insufficient or inaccurate may unintentionally aid in cheating in exams (Sakhiyeva et al., 2014). This succinct article explores how incorrect programme orientation might serve as a trigger for students to use unethical examination practices, illuminating the underlying dynamics and offering some viable remedies. This study is in consonance with Dweck (2006) who contend that programme orientation is essential for assisting students in making wise academic decisions. Students may find it difficult to match their study efforts with the desired results if they don't comprehend the structure of their programme.

Particularly in programmes with demanding academic requirements, this imbalance can cause emotions of inadequacy and desperation. In order to make up for their lack of preparation, students may be persuaded to commit examination malpractice. The link between improper programme orientation and exam misconduct emphasizes how crucial precise and thorough programme advice is. Students who are knowledgeable about their academic path are less likely to engage in immoral actions that result from desperation. Institutions and learners can work together to lessen the occurrence of malpractice and advance a more moral educational experience by building a learning environment that prioritizes understanding and growth (Hallak et al., 2007).

4.5 Favouritism

Within educational institutions, nepotism and academic corruption can foster an environment that is favourable to exam fraud. This last factor examines the relationship between favoritism, academic dishonesty, and the chance that students may engage in unethical examination practices, illuminating the mechanisms at work and offering potential lines of defense. This findings in support of Srivastava et al (2015) and Altbach and Knight (2007) who were of the view that favouritism for family members or close friends is a common indicator of nepotism, which can compromise the credibility of a university. The values of justice and equal opportunity are undermined when jobs and opportunities are unfairly given out based on connections rather than talent (Brown et al., 2019). This develops an entitlement mentality. Some students may come to assume that dishonest practices are the norm due to this climate of academic corruption, which can have a negative impact on how they see the educational system. Students may see malpractice as a way to level the playing field if they feel that the educational system lacks fairness or transparency as a result of academic corruption or nepotism. When students observe instances of favouritism, this justification may be strengthened because it undermines their faith in the institution's dedication to objectivity.

5 Conclusion and Recommendation

This paper used principal components factoring to discover the factors impacting university students' involvement in examination misconduct in Ghanaian public universities. The study found five factors that influence students' propensity for academic dishonesty; namely, pressure for academic success, overly hyped societal value of high academic achievement, insufficient study planning, inappropriate orientation prior to program selection and favouritism. In general, the study has a crucial policy implication for preserving academic integrity. University administrators, policymakers, and educators could be guided by the identified factors to fashion strategies, interventions and preventive measures to reduce examination dishonesty.

The following multifaceted strategy could be used to combat examination dishonesty: improving academic counselling to enable students appropriately handle pressure for academic success; engaging stakeholders including employers, students, parents and alumni in conversation about the crucial role of ethics, creativity and skills over mere grades; giving study skills training by introducing mandatory courses or workshops on time management, effective study habits and goal setting, and pairing student with mentors who can guide them in creating personalized study plans and to identify student struggling with study planning and provide support; giving comprehensive career guidance before admissions to help student make informed programme choices, organizing orientation programmes to provide detailed insight into the content, expectations and career prospect of each programme, allowing students to switch programmes within a reasonable time frame if they realize they made an incorrect programme choice; promoting ethical values, strengthening ethical policies, enforcing strict codes of conduct with zero tolerance for favouritism, ensuring transparent mechanism for reporting and addressing academic misconduct, integrating ethics and integrity education into the curriculum

5.1 Limitations

It is important to recognize that this study has several limitations. The study focused on only one public university in Ghana, thus its findings is not likely to be representative of all enrolled students at the tertiary level. A larger study that includes all public and private universities in Ghana might offer deeper insights and enhance the generalizability of study results.

Acknowledgement

The authors would like to extend their gratitude to Jonathan sackey for his invaluable assistance in preparing the manuscript in LaTeX overleaf format.

References

- Ahern, K. and Manathunga, C. (2004). Clutch-starting stalled research students. *Innovative Higher Education*, 28:237–254.
- Akaranga, S. I. and Ongong, J. J. (2013). *The phenomenon of examination malpractice an example of Nairobi and Kenyatta universities*. PhD thesis, University of Nairobi.
- Altbach, P. G. and Knight, J. (2007). The internationalization of higher education: Motivations and realities. *Journal of studies in international education*, 11(3-4):290–305.
- Baah, E. M., Johnson, J. K., and Twenefour, F. B. (2015). A statistical model of organizational performance using factor analysis—a case of a bank

- in ghana. *International Journal of Mathematics and Statistics Studies*, 3(1):38–46.
- Bajjnath, N. and Singh, D. (2019). Examination cheating: Risks to the quality and integrity of higher education. *South African Journal of Science*, 115(11-12):1–6.
- Bitrus, A. (2013). Examination misconducts: A threat to sustainable national development. *International Journal of Development and Sustainability*, 2(2):1324–1332.
- Boonk, L., Gijssels, H. J., Ritzen, H., and Brand-Gruwel, S. (2018). A review of the relationship between parental involvement indicators and academic achievement. *Educational research review*, 24:10–30.
- Chala, L. and Agago, M. (2022). Exploring national examination malpractice mechanisms and countermeasures: An ethiopian perspective. *International Journal of Instruction*, 15(3):413–428.
- Dada, O. M. O. (2014). A sociological investigation of the causes, effects and solutions to the problem of examination malpractice: the opinions of the crawford university students in nigeria. *International Journal of Advanced Research in Management and Social Sciences*, 3(5):19–34.
- Dweck, C. S. (2006). *Mindset: The new psychology of success*. Random house.
- Everitt, B., Dunn, G., et al. (2001). *Applied multivariate data analysis*, volume 2. Wiley Online Library.
- Hair, J. F., Black, W. C., Babin, B. J., and Anderson, R. E. (2014). Multivariate data analysis (pearson new internat. ed). *Harlow: Pearson*.
- Hallak, J., Poisson, M., et al. (2007). *Corrupt schools, corrupt universities: What can be done?* International Institute for Education Planning Paris.
- Jega, A. (2006). Examination malpractice: Concept, causes, consequences and remedies. *Education for Today*, 6(2):59–72.
- Johnson, R. A., Wichern, D. W., et al. (2002). Applied multivariate statistical analysis.
- Klassen, R. M., Krawchuk, L. L., and Rajani, S. (2008). Academic procrastination of undergraduates: Low self-efficacy to self-regulate predicts higher levels of procrastination. *Contemporary educational psychology*, 33(4):915–931.
- Mancini, M. and Mancini, M. (2003). *Time management*, volume 1. McGraw-Hill New York.

- Mireku, D. O., Bervell, B., and Dzamesi, P. D. (2024). Examination malpractice behaviours in higher education (emalbihe) in sub-saharan africa: A systematic review. *International Journal of Educational Development*, 108:103064.
- Oduwaiye, R. (2014). Student's perception of factors and solution to examination malpractices in nigerian universities: A case study of the university of ilorin. *Ilorin Journal of Education*, 24(7):23.
- Okey, A. and Ewa, A. (2019). Examination malpractice and corruption among students at cross river state university of technology, calabar, nigeria. *International Journal of Quantitative and Qualitative Research Method*, 7(2):27–38.
- Onuka, A. and Amoo, S. (2004). Examination malpractice and act 33 of 1999.
- Rhees, N. T. (2024). The effect of applied mental health courses on college student anxiety and perfectionism.
- Sakhiyeva, F., Berdibayeva, S., Shomanbayeva, A., and Kalkhojayeva, A. (2014). Ethnic identity as an ethnic identity aggregate value orientations. *Procedia-Social and Behavioral Sciences*, 114:415–419.
- Sharma, S. (1995). *Applied multivariate techniques*. John Wiley & Sons, Inc.
- Slimmen, S., Timmermans, O., Mikolajczak-Degrauwe, K., and Oenema, A. (2022). How stress-related factors affect mental wellbeing of university students a cross-sectional study to explore the associations between stressors, perceived stress, and mental wellbeing. *PLoS One*, 17(11):e0275925.
- Stewart, V. (2012). *A world-class education: Learning from international models of excellence and innovation*. ASCD.
- Tiong, L. C. O. and Lee, H. J. (2021). E-cheating prevention measures: detection of cheating at online examinations using deep learning approach—a case study. *arXiv preprint arXiv:2101.09841*.
- Twenefour, F., Nortey, E., and Baah, E. (2015). Principal component analysis of students academic performance. *International Journal of Business and Social Research*, 5(02).
- Udim, D. K., Abubakar, U., and Essien, J. O. (2018). An indepth evaluation on the issue of examination malpractice in nigeria. *Research in Pedagogy*, 8(2):204–213.
- Ukpor, C. O. (2005). Instigators of examination cheating tendency among senior school students in akpabuyo local government area. Unpublished M. Ed. Thesis, Department of Educational Foundations, Guidance and Counselling, University of Calabar.

Yamamoto, Y. and Holloway, S. D. (2010). Parental expectations and children's academic performance in sociocultural context. *Educational Psychology Review*, 22:189–214.

Zhong, L.-f. and Ren, H.-l. (2009). The relationship between academic stress and psychological distress: The moderating effects of psychological capital. In *2009 International Conference on Management Science and Engineering*, pages 1087–1091. IEEE.