

Teacher-Student Interaction and Classroom Management as Predictors of Achievement among Secondary School Students in Cross River State

Henrietta Osayi Uchegbue^{1*}, and Mary Imo Inyang²

¹Department of Educational Foundations, University of Calabar, Cross River State, Nigeria.

²Institute of Education, University of Calabar, Cross River State, Nigeria.

*Corresponding author email: henriettauchegbue@gmail.com

ABSTRACT

This study considers the place of teacher-student interaction and classroom management as predictors of academic achievement among secondary school students in Cross River State, Nigeria. Utilizing a multi-stage sampling technique, the study selected a representative sample of 1,176 junior secondary school students from 45 schools offering Basic Technology across three educational zones: Calabar, Ikom, and Ogoja. The research aimed to determine which classroom variables, specifically teacher-student interaction and classroom management, effectively distinguish between high and low academic achievement groups. The study employed Fisher's linear stepwise discriminant analysis to analyze the data, revealing significant differences between classroom variables. Results indicated that teacher-student interaction (Wilk's Lambda = .993, $F = 7.779$, $p = .005$) and classroom management (Wilk's Lambda = .998, $F = 2.514$, $p = .113$) are crucial predictors of students' academic achievement levels. The classification function accurately predicted 80.1% of the original group memberships, demonstrating a high efficiency in distinguishing between students with high and low academic achievement. Moreover, the study found that classroom settings and thermal conditions also significantly influence students' academic achievement. However, factors such as student-student interaction and classroom lighting showed no significant predictive power. The results underscore the importance of effective teacher-student interactions and robust classroom management in fostering an environment conducive to academic achievement. The findings of this study have important implications for educational policy and practice, suggesting that enhancing teacher-student interactions and improving classroom management can significantly boost academic achievement among secondary school students. The findings will guide educators, school administrators, and policymakers in implementing strategies that enhance learning outcomes and equip students with essential skills for future success.

Keywords: Teacher-Student Interaction, Classroom Management, Academic achievement, Secondary Education, Predictors

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INTRODUCTION

Recent research from developed countries reveals that teacher-student interaction and classroom management are critical predictors of academic achievement in secondary education. Studies in the United States and Europe indicate that positive teacher-student interactions

contribute significantly to students' cognitive and emotional development, which in turn enhances their ability to acquire and apply new skills (Aldrup, Carstensen & Klusmann, 2022). Effective classroom management has also been linked to better academic achievement

immensely, as it creates a structured and supportive learning environment that allows students to focus on learning activities without frequent disruptions (McGarr, 2021). The integration of technology in classrooms in these countries has further enabled teachers to manage classrooms more efficiently and engage students in interactive learning processes, thereby fostering academic achievement.

Teacher-student interaction and classroom management is recognized as a major educational factor that impact in the development of any nation. The importance of technology in education is borne out of the need to improve the developmental stage of the economy and to advance the objectives of teaching and learning. For instance, technology experts in Nigeria have maintained that technology can be used for creation of wealth, poverty eradication, job creation, global competitiveness and improved learning (Gusen, Olarinoye & Garba, 2006).

Education is the totality of life experience that people acquire which enables them to cope with and derive satisfaction from living in the world. This is because it enables them to achieve social competence and optimum individual development. It is on this premise that it is believed that the quality of a nation's education is proportional to the level of its prosperity (Aduwa and Unwameiye, 2006).

The issue of quality in education goes beyond the curriculum or subject content but includes learning environment and school factors. It is the view of Obayan (2003) that classroom learning environment and school factors exerts some dominant influence on learner's achievement. To account for the school fees collected and to maintain appreciable number of students in their schools, the school proprietors strive to provide enabling environment for effective teaching and learning to thrive. A high-quality assurance in schools entails providing most of the factors that enhance effective teaching and learning which ultimately affect students' academic achievement. These factors as enumerated by Postlethwaite (2007) include but not limited to teacher-variables, environment/family-variables and school-variables. Of all these factors, the ones that are touted to exact most influence on the learning outcome are the "teacher-variables" as the teacher is the ultimate implementer of the curriculum.

Based on this it is possible that such teachers cannot interact positively with the students when it comes to Basic Technology among other variables which could affect students' learning outcome in Basic Technology. Obayan (2003) as cited in Agbejoye, Aleburu Obugbaiké and Ogunjimi (2015) views that classroom learning environment and school factors exerts some dominant influence on learner's achievement.

The researcher being worried about the relatively poor performance of students in basic technology decided to

consider other variables which could be responsible for such learning outcome. They include some classroom variables (class size, classroom settings, classroom management skills, classroom lighting, proper thermal condition, student-student interaction, teacher-student interaction (Uko, 2008).

Proper arrangement of furniture also plays a vital and crucial role in classroom functioning. Furniture is arranged with the intention that students may feel comfortable and they may be adjusted to the primary sources or different sources of information e.g., the teacher, instructional materials, while at the same time having accessibility to other sources or the activities e.g., work areas, computers without creating disturbance in the classroom (Nitsaisook and Anderson, 1989). Higgins, et al (2005) noted that desk arrangement could affect students' achievement and attention. Patton, et al (2001) found that majority (94%) of the K-3 teachers use a semicircle or cluster to arrange the desks in their classrooms. The teachers responded that arrangement of desks in groups has several advantages i.e., encouraging cooperative learning, building a sense of class community and making the best use of the space. Proper desk arrangement provides opportunities for learners to be enthusiastically engaged in learning process and creates the opportunity to work cooperatively with their colleagues. Therefore, it is imperative to make seating arrangement in such a way that it may ensure smooth functioning of instructional process. Numerous and complex variables affect the learning outcome hence the need to address them not only isolated element, but simultaneously. Which require multivariate statistical technique. Discriminant analysis is indeed the appropriate statistical technique to be used since dependent variables are categorical, and the independent variables are continuous.

Literature review

Teacher-student interaction has been identified as a crucial factor influencing students' academic performance and academic achievement. Positive interactions between teachers and students can enhance students' motivation, engagement, and overall learning experience (Leenknecht, Snijders, Wijnia, Rikers, & Loyens, 2023). Studies show that when teachers develop strong, supportive relationships with their students, it fosters a conducive learning environment that encourages active participation and persistence in learning activities (Sadoughi, & Hejazi, 2023). Moreover, students who perceive their teachers as caring and supportive are more likely to exhibit higher levels of academic achievement and develop essential skills necessary for their future careers (Nunes, Oliveira, Castelli, & Cruz-Jesus, 2023).

Classroom management is another critical aspect that significantly impacts students' ability to acquire skills.

Effective classroom management strategies help create a structured and orderly environment conducive to learning (Ahmed, 2024). Research indicates that classrooms characterized by clear expectations, consistent routines, and well-managed behaviors are more likely to facilitate academic achievement among students (Igwe, & Amirize, 2023). Teachers who employ proactive management techniques, such as establishing rules and procedures and reinforcing positive behavior, can minimize disruptions and maximize instructional time, thereby enhancing students' learning outcomes (Goodman, McBain, Ye, Sun, & Maitreesophon, 2023).

The interplay between teacher-student interaction and classroom management is pivotal in predicting academic achievement in secondary education. Studies suggest that when teachers combine positive interactions with effective management practices, students are more likely to engage in meaningful learning activities and develop essential skills (Osterman, 2023). For instance, teachers who create a supportive classroom climate and manage their classrooms effectively can address diverse student needs, promote cooperative learning, and encourage self-regulation, all of which are vital for skill development (Kong, S. C., & Lai, M. (2023). This integrated approach not only enhances students' academic performance but also prepares them for real-world challenges.

Empirical studies provide robust evidence supporting the significance of teacher-student interaction and classroom management in academic achievement. A study by Mallik, (2023), found that positive teacher-student relationships were associated with increased student engagement and academic success. Similarly, research by Archambault, Lampron-de Souza, Lamanque-Bélangier, Pascal, Pagani, & Dupéré, (2024). highlighted that effective classroom management is one of the strongest predictors of student learning outcomes. These findings underscore the importance of fostering positive interactions and implementing sound management practices to enhance students' academic achievement in secondary education. The findings from research on teacher-student interaction and classroom management have important implications for educational practice. Educators and policymakers should prioritize professional development programs that equip teachers with the skills needed to build positive relationships with students and manage their classrooms effectively (Gao, Bao, Du, & Yan, 2023). Additionally, schools should implement policies that support a collaborative and inclusive learning environment, where both teachers and students can thrive (Lakkala, Galkienė, Navaitienė, Cierpiałowska, Tomecek, & Uusiautti, 2021).

Purpose of the study

The purpose of this study was to identify using discriminant analysis, the relationship between classroom variables

and learning outcomes in basic technology among secondary school students.

Specifically, the study was aimed at determining:

- i) The extent to which the following classroom variables (class size, Classroom settings, classroom management skills, classroom lightings, proper thermal condition, student-student interaction, teacher-students' interaction) predict students' low and high verbal reasoning group to learning.
- ii) To determine, which classroom variables (class size, Classroom settings, classroom management skills, classroom lightings, proper thermal condition, student-student interaction, teacher-students' interaction) adequately help to distinguish between students' high and low skill acquisition groups to learning.

Research questions

In conducting the research, the following research questions were formulated to guide this study:

- i) To what extent do the following classroom variables (class size, Classroom setting, classroom management skills, classroom lightings, proper thermal condition, student-student interaction, teacher-students interaction clearly distinguish between students' low and high levels of verbal reasoning ability group to learning?
- ii) What is the relative contribution of the classroom variables (class size, Classroom settings, classroom management skills, classroom lightings, proper thermal condition, student-student interaction, teacher-students' interaction) to the prediction of students' low and high skill acquisition groups to learning?
- iii) To what extent is there any relationship between the classroom variables (class size, Classroom settings, classroom management skills, classroom lightings, proper thermal condition, student-student interaction, teacher-students' interaction) and students' positive and negative attitude groups to learning?

Statement of hypotheses

The following hypotheses were formulated to guide the researcher in the study:

- i) the classroom variables (class size, Classroom setting, classroom management skills, classroom lightings, proper thermal condition, student-student interaction, teacher-students interaction) do not significantly predict students' low and high verbal reasoning ability groups to learning.
- ii) the classroom variables (class size, Classroom setting, classroom management skills, classroom lights, proper thermal condition, student-student interaction,

teacher-students interaction) do not significantly predict students' low and high skill acquisition groups to learning.

iii the classroom variables (class size, Classroom setting, classroom management skills, classroom lightings, proper thermal condition, student-student interaction, teacher-students interaction) do not significantly predict students' positive and negative attitude groups to learning.

MATERIALS AND METHODS

The research design adopted in this study is the ex-post facto design. Cross River State, located in the south-south geo-political zone of Nigeria, is comprised of eighteen local government areas and lies within the tropical region characterized by both wet and dry seasons, with heavy rainfall due to its proximity to the Atlantic Ocean. Bordered by Benue State to the north, the Bight of Bonny and the Atlantic Ocean to the south, Cameroon to the east, and Abia, Akwa-Ibom, and Ebonyi states to the west, the state is rich in tourism attractions such as Agbokim waterfalls, Obudu Ranch Resort with the world's longest cable car, and the Tinapa business resort. The state is home to diverse ethnic groups including the Efiks, Yakurr, Bekwarras, and Ejahgams, with the major occupations being farming, fishing, and petty trading, although it is not heavily industrialized. Educational institutions include the University of Calabar and Cross River University of Technology.

The study focuses on the population of junior secondary school students in schools offering Basic Technology across the three educational zones—Calabar, Ikom, and Ogoja. Using a multi-stage sampling technique, the study selected 2% of the student population, resulting in a sample size of 1,176 students from sixteen out of eighteen local government areas, ensuring a representative and manageable sample for evaluating academic achievement in Basic Technology. Data collection was conducted using a single comprehensive instrument, constructed based on literature review and expert advice. This instrument included the Classroom Variable items (CVI) with six subscales to gather data on various classroom variables such as classroom setting, management skills, lighting, thermal conditions, and interactions among students and between teachers and students. Additionally, Skills Acquisition items (SAI) were used to assess the extent of Basic Technology skills acquired by the students.

Sampling technique

This study involves multi-stages of sampling techniques in order to achieve a representative sample. First, stratified sampling technique was used to stratify the study area – Cross River State into three (3) educational senatorial

zones – Calabar, Ikom and Ogoja. Second, random sampling technique was used to select sixteen (16) Local Government Areas out of eighteen (18) as shown in Table 2. Third, proportionate stratified sampling technique was used to select 2% of the population of students in the sixteen (16) Local Government Areas as shown in Table 1. The 2% was chosen in order to generalize the findings. Fourth, purposive sampling technique was also employed to select schools offering Basic Technology in each of the Local Government Area involved in this study. Then, simple random sampling technique was used to select number of students among the JSS 3 students. By this technique, the researcher randomly picked students based on the targeted percent of the sample.

Sample

The sample for the study was 1176 which is 2% of the junior secondary school students in each of the schools where they offer Basic technology at junior secondary school in Cross River State. The reason for this is that, the numbers of schools to be involved are many (45), if not streamlined; it will be too large to handle (Table 1). 1176 represent 2% of the population which is 58816.

RESULTS

The demographic indices of the respondents as presented in (Table 2) indicates that the sex of respondents has male as 503(46.2%) and female as 585(53.8%). The respondents' age had the following result: (10-12) years were 311 representing 28.6%, (13-16) years were 671 representing 61.7% and those above 16years were 106 representing 9.7%. The result on the class of respondents was 1088 (100%) representing the total respondents. Class size had the following result: (20-30) students were 85 representing 7.8%, (31-40) students were 52 representing 4.8%, (41-50) students were 430 representing 39.5% and class size of above 50 students were 521 representing 47.9%.

Data analysis was carried out on the basis of hypothesis-by-hypothesis.

Hypothesis one

The classroom variable (class size, classroom setting, classroom management skills, classroom lighting, proper thermal conditions, student-student interaction, teacher-student interaction) do not significantly predict students' verbal reasoning. The dependent variable is Students' low and high verbal reasoning, while the independent variable is classroom variables (consisting of Class size, classroom setting, classroom management skills, classroom lightings, proper thermal condition, student-student interaction, teacher-student interaction). This hypothesis

Table 1: Distribution of sample by Education Zone

Zone	LGA	No. of JSS Students	School Offering Basic Technology	Sample 2%
Calabar	Akamkpa	2649	8	53
	Akpabuyo	1218	2	24
	Biase	2288	2	46
	Calabar Mun.	9761	7	195
	Calabar South	5807	6	116
	Odukpani	2222	1	45
Ikom	Abi	1833	2	37
	Boki	3999	2	80
	Ikom	5750	1	115
	Obubra	3615	1	72
	Yakurr	3846	3	77
Ogoja	Bekwarra	2360	2	47
	Obaniku	1820	3	36
	Obudu	3806	2	76
	Ogoja	3415	1	68
	Yala	4427	2	89
Total		58816	45	1176

Table 2: Demographic indices of respondents.

Variables	Responses	Percentage
GENDER		
Male	503	46.2
Female	585	53.2
Total	1088	100.0
AGE		
10-12	311	28.6
13-16	671	61.7
Above 16	106	9.7
Total	1088	100.0
CLASS SIZE		
20-30	85	7.8
31-40	52	4.8
41-50	430	39.5
Above 50	521	47.9
Total	1088	100.0

Source: Field survey, 2015

Table 3: Descriptive statistics of variables.

Variables	N	Mean	Standard Deviation
Classroom setting	1088	12.05	2.791
Student-student interaction	1088	12.47	2.943
Teacher-student interaction	1088	12.20	2.838
Classroom lightings	1088	13.06	2.968
Classroom management	1088	12.76	2.779
Thermal condition	1088	12.07	3.141
Attitude to learning	1088	11.85	2.766
Skill acquisition	1088	15.90	4.065
Verbal score	1088	13.43	6.050
=Academic achievement score	1088	11.67	4.457

was analyzed using discriminant technique. The results are presented in (Tables 3, 4). Fisher's linear stepwise discriminant analysis was used. This enabled the variables entered at each step to be minimized by Wilk's Lambda. From Table 4 the means and standard deviations of classroom variables are: Classroom setting ($\bar{x} = 12.05, SD = 2.791$), Student-student interaction ($\bar{x} = 12.47, SD = 2.943$), Teacher-student interaction ($\bar{x} = 12.20, SD = 2.838$), Classroom lightings ($\bar{x} = 13.06, SD =$

2.968), Classroom management ($\bar{x} = 12.76, SD = 2.779$) and Thermal condition ($\bar{x} = 12.07, SD = 3.141$).

The mean difference between the classroom's variables suggest that these may be good discriminators as the separations are high. The result in Table 8 revealed that Classroom Setting (Wilk's Lambda = .994, $F = 6.592, df_1 = 1, df_2 = 1086$ and sig. = .010); Student-student Interaction (Wilk's Lambda = .997, $F = 2.979, df_1 = 1, df_2 = 1086$ and sig. = .084); Teacher Student Interaction

Table 4: Group statistics for academic achievement group.

	Low		High		Total	
	Mean	Std.	Mean	Std.	Mean	Std.
Classroom setting	12.01	2.804	12.24	2.737	12.05	2.291
Student-student interaction	12.36	2.970	12.91	2.797	12.47	2.943
Teacher student interaction	12.06	2.821	12.74	2.846	12.20	2.838
Classroom lightings	13.03	3.027	12.74	2.846	13.06	2.968
Classroom management	12.65	2.797	13.22	2.666	12.76	2.779
Thermal condition	11.99	3.149	12.41	3.092	12.07	3.141

(Wilk's Lambda = .993, $F = 7.779$, $df_1 = 1$, $df_2 = 1086$ and $sig. = .005$); Classroom Lightings (Wilk's Lambda = .999, $F = .732$, $df_1 = 1$, $df_2 = 1086$ and $sig. = .393$); Classroom Management (Wilk's Lambda = .998, $F = 2,514$, $df_1 = 1$, $df_2 = 1086$ and $sig. = .113$) and Thermal Condition (Wilk's Lambda = .984, $F = 18.101$, $df_1 = 1$, $df_2 = 1086$ and $sig. = .000$). This result on the test of equality of group means shows strong statistical evidence of significant differences between means of classroom setting, teacher student interaction and thermal condition ($P < 0.05$), while student-student interaction, classroom lighting and classroom management were not statistically significant ($P > 0.05$).

The study tested the hypothesis that classroom variable (class size, classroom setting, classroom management skills, classroom lighting, proper thermal conditions, student-student interaction, teacher-student interaction) do not significantly predict students' academic achievement. The dependent variable is Students' low and high academic achievement, while the independent variable is Class size, classroom setting, classroom management skills, classroom lighting, proper thermal condition, student-student interaction. Discriminant analysis was used, revealing significant mean difference in classroom setting, student-student interaction, teacher student interaction, classroom lightings, classroom management and thermal condition. The discriminant function analysis reveals an Eigen value of 0.14 accounting for 100% of the variance in the classroom variables with a Canonical Discriminant Function coefficients of classroom variables Classroom setting (-.169), Student-student interaction (-.343), Teacher-student interaction (.622), Classroom lightings (-.332), Classroom management (.458) and Thermal condition (.131).

The analysis showed that that 80.1% of the original grouped cases were correctly classified. It also shows that low academic achievement 871 (100.0%) and high academic achievement 217 (100.0%) of the students were correctly classified, indicating high efficiency in predicting students' academic achievement. The centroids (group means) for group 1, the low academic achievement group (-.059) are quite far apart, when compared to that of group 2, the high academic achievement group (.236), with a mean discrepancy of .295. While the log determinants were quite similar, Box's M indicated that the assumption

of equality of covariance matrix was violated. However, given the large sample size, this problem was not considered serious. The study concluded that the discriminant function significantly predicts students learning outcomes, demonstrating the predictive power of classroom variables on academic achievement.

Hypothesis two

The classroom variable (class size, classroom setting, classroom management skills, classroom lighting, proper thermal conditions, student-student interaction, teacher-student interaction) do not significantly predict students' skill acquisition. The dependent variable is Students' low and high skill acquisition, while the independent variable is Class size, classroom setting, classroom management skills, classroom lighting, proper thermal condition, student-student interaction. This hypothesis was analyzed using discriminant technique. The results are presented in (Table 5).

Hypothesis three

The classroom variable (class size, classroom setting, classroom management skills, classroom lighting, proper thermal conditions, student-student interaction, teacher-student interaction) do not significantly predict students' attitude to learning. The dependent variable is Students' positive and negative attitude group to learning, while the independent variable is Classroom variable (consisting of Class size, classroom setting, classroom management skills, classroom lightings, proper thermal condition, student-student interaction, teacher-student interaction). This hypothesis was analyzed using discriminant technique. The results are presented in (Table 6).

DISCUSSION

The data for this study were collected from both primary and secondary sources. The data were obtained from State Ministry of Education and some selected secondary schools in Cross River State. The data under consideration are classroom variables (class size, classroom setting, classroom management skills,

Table 5: Group statistics for skill acquisition group.

	Low		High		Total	
	Mean	Std.	Mean	Std.	Mean	Std.
Classroom setting	12.01	2.804	12.24	2.737	12.05	2.291
Student-student interaction	12.36	2.970	12.91	2.797	12.47	2.943
Teacher student interaction	12.06	2.821	12.74	2.846	12.20	2.838
Classroom lightings	13.03	3.027	12.74	2.846	13.06	2.968
Classroom management	12.65	2.797	13.22	2.666	12.76	2.779
Thermal condition	11.99	3.149	12.41	3.092	12.07	3.141

Table 6: Group statistics for attitude to learning;

	Low		High		Total	
	Mean	Std.	Mean	Std.	Mean	Std.
Classroom setting	11.59	2.770	12.68	2.698	12.05	2.791
Student-student interaction	12.11	2.928	12.95	2.897	12.47	2.943
Teacher student interaction	11.62	2.773	12.98	2.738	12.20	2.838
Classroom lightings	12.11	3.066	13.53	2.612	13.06	2.968
Classroom management	12.33	2.820	13.36	2.612	12.76	2.779
Thermal condition	11.48	3.109	12.87	3.009	12.07	3.141

classroom lightings, proper thermal condition, student-student interaction, and teacher-student interaction), students' high and low achievement groups in learning.

Table 4 gives the result of the variables: the mean score of classroom setting was 12.05 with a standard deviation of 2.791, student-student interaction had a mean score of 12.47 and standard deviation of 2.943, teacher-student interaction had a mean score of 12.20 and standard deviation of 2.838, classroom lightings had a mean score of 13.06 and standard deviation of 2.968, classroom management had a mean score of 12.76 and standard deviation of 2.779, thermal condition had a mean score of 12.07 and standard deviation 3.141, attitude to learning had a mean score of 11.85 and standard deviation of 2.766, academic achievement had a mean score of 15.90 and standard deviation of 4.065, verbal score had a mean score of 13.43 and standard deviation of 6.050 and academic achievement score had a mean score of 11.67 and standard deviation of 4.457.

The demographic indices of the respondents as presented in table 8 indicates that the sex of respondents has male as 503(46.2%) and female as 585(53.8%). The respondents' age had the following result: (10-12) years were 311 representing 28.6%, (13-16) years were 671 representing 61.7% and those above 16years were 106 representing 9.7%. The result on the class of respondents was 1088 (100%) representing the total respondents. Class size had the following result: (20-30) students were 85 representing 7.8%, (31-40) students were 52 representing 4.8%, (41-50) students were 430 representing 39.5% and class size of above 50 students were 521 representing 47.9%.

RECOMMENDATIONS

Based on the findings of the study, the following

recommendations are made:

1. The government and other stake holders should provide a conducive and ideal classroom environment for students, particularly in Basic Technology class in order to achieve desirable learning outcomes.
2. Curriculum builders should deliberately include evaluation techniques for accessing desirable learning outcomes in graduating students (JSS3&SS3).
3. Government should invest more on educational system, especially on provision of classroom infrastructures to boost students' interest in order to promote an ideal classroom for better learning outcomes.
4. The curriculum planners should review the current curriculum that merged four subjects together thereby reducing the teacher's time for interacting with students which has invariably affected learning outcomes.
5. Parents should be properly sensitized on the essence of stimulating their children/wards academically to enhance learning outcomes.
6. Government /administrators should maintain a maximum class enrolment for effective participation and organization of class activities.
7. Students should be convinced to imbibe a good study habit and attitude to promote learning outcome.

Suggestions for further research

1. Further researchers can consider other environmental variables such as home environment variables in predicting learning outcomes.
2. Studies of this type should be repeated considering other learning outcomes retention, etc.
3. The same work can be carried out considering a larger sample size.
4. Other variables like instructional materials and the

workshop tools / appliances should be used to predict learning outcomes in Basic Technology.

5. More studies should be carried out in order to establish the general conclusion regarding the predictive power and relative variance of discriminant analysis Discriminant analysis in predicting categorized variables.

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