

## **AN ANALYTICAL STUDY ON THE REASONS FOR THE LOW LEVEL OF STUDENT PERFORMANCE IN THE DEPARTMENT OF MATHEMATICS**

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### **ABSTRACT**

*The importance of this study comes from the fact that it identifies the points of imbalance in teaching and learning mathematics by knowing the reasons for the low educational level of student performance in mathematics subjects that have been taught at the university. In addition, advocating for better education of mathematics through the development of proposed and practical solutions to factors that contribute to low student performance in Mathematics significantly.*

*The results of the research indicate that there is a strong correlation between the success rate of students in each of the mathematics subjects they study with the ability of the lecturer of his didactical competencies that he practiced in the study hall. The lower rate of students success in a particular subject shows that there is a decrease in the teaching level of the lecturer of his ability of educational competencies practiced in the study hall and vice versa. The educational preparation of the teaching staff, their capability to follow good teaching methods in the lecture and their capability to make the students like the lecturer, then they like the subject, then increasing their performance. These are all factors that will reduce the failure rates of students in mathematics subjects.*

**KEYWORDS:** *Educational Evaluation of teachers, Evaluation of Exam Questions, Completely Randomized Design*

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### **Article History**

**Received: 10 Jun 2019 | Revised: 18 Jun 2019 | Accepted: 03 Jul 2019**

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### **INTRODUCTION**

The problem that facing the departments of mathematics is the low educational level of students performance in most mathematics subjects. So by inspecting the results of the students performance in department of mathematics for the first semester in the Faculty of Computer Science and mathematics at Kufa University for the academic year 2018-2019, and for the various study subjects and for most of the academic stages. (Second, third, fourth) This serious problem has become clear.

This research has come to attempt to identify the real reasons for the low level of student performance in most of the basic subjects in which they have been examined (mathematics only) through building objective tools to evaluate students' examination questions. In addition to evaluating the performance of the lecturer in the lecture and finding out methods used in teaching methods and all related to the educational competencies within the lecture that would affect the understanding of students and thus affect the low level of their performance. Thus, through these objective tools, the real reasons for the low level of student performance in Mathematics can be judged.

The current research aims to find out the main reasons for the low level of students performance in the study subjects of the department of mathematics (compulsory and voluntary). The importance of research is as follows:

- Identifying the locations of imbalances in the teaching and learning of mathematics by finding out the reasons for the low level of student performance.
- Advocating for better education through the development of proposed and practical solutions to the factors that significantly contribute to the very low level of student performance in mathematics.

## MATERIALS AND METHODS

### Exam Questions Evaluation Form

The form below that belongs to the Department of Education in Al-Qassim/Ministry of Education/Kingdom of Saudi Arabia was adopted, where the form is based on a precise mechanism to evaluate the examination questions for students of the mathematics department and for the three stages (second, third and fourth).

**Table 1: Study and Analysis of Exam Questions**

Order	Items	Degree	Degree Of Entitlement
1	The official framework of the Mathematics department (Ministry, University, College, Department, semester, article name, stage, student's name, time, exam date)	10	
2	Final output of questions	• Suitable for the time allocated for the study material	5
		• Variant between intellectual and direct questions	5
		• Clearly formulated for students	5
		• Cover all key points of the curriculum.	5
		• Contain the terminology of the curriculum.	5
		• Grades have been distributed on the questions form.	5
		• Write a phrase indicating the end of the questions content or write the words (wish you success), after the last question.	5
3	Multiple choice questions	• The phrases are understood for the students.	5
		• the phrase Includes one goal	5
		• All phrases are not true or false together.	5
		• Phrases are equal in words number if possible.	5
4	Printing in clear font.	5	
5	Paying attention to point headings (numbering).	5	
6	Free of linguistic and typographical errors.	5	
7	Variety of individual differences among the students (the ease and difficulty of the questions).	5	
8	Their suitability must be according to the level of the student so that they range from easy to hard.	5	
9	Not to be shortened in an unacceptable brief.	5	
10	Not to contain conjecture, prediction and speculation in their way of understanding.	5	
<b>Total</b>		<b>100</b>	

### Corrective and Educational Evaluation Application Form of the Lecturer in the Study Hall

This application form was prepared by the two researchers after reviewing the literature on the lecturer's educational competencies in the study hall, where a precise mechanism was adopted to evaluate the educational

competencies of the lecturer. The teaching staff was visited in their study halls, each lecturer separately to determine his ability of those educational competencies.

Regarding the method of evaluation for each lecturer, it was inside the study hall where each researcher registered his or her own assessment grade according to the form set out below, and in order to obtain a degree of reasonableness and truthfulness, the average was taken for them to obtain the final degree of evaluation for each one of the teaching staff.

**Table 2: The Lecturer's Educational Evaluation Form**

Order	Lecturer's Behavior in the Study Hall	Degree
1	He engages the students when explaining the scientific material.	---
2	He gives enough examples on the subject.	---
3	He presents a comprehensive summary of the subject at the end of the lecture.	---
4	He uses positive oral boosters to promote correct answers.	---
5	He enriches the scientific material during the explanation.	---
6	He paves the way for the lecture with an appropriate introduction in not less than 5 minutes.	---
7	He uses another method of display other than whiteboard to explain the subject.	---
8	He asks students questions about the subject.	---
9	He gives homework to the students.	---
10	He writes on the whiteboard in an orderly and clear manner.	---
<b>Total</b>		

**Success Percentage Form for Each Study Stage**

**Table 3: Success Percentage for Each Stage**

Study Subjects	Total Number of Students	No. of Successful Students	No. of Failed Students	Success Percentage
X1	---	---	---	---
	---	---	---	---
Xn	---	---	---	---

This form has been adopted as a final summary of each of the three stages under study (second, third and fourth), giving us a clear view of the success percentages for each study stage.

**The Completely Randomized Design CRD**

The completely randomized design CDR refers to the random assignment of experimental units to a set of treatments. It is essential to have more than one experimental unit per treatment to estimate the magnitude of experimental error and to make probability statements concerning treatment effects.

**Table 4: Analysis of Variance (ANOVA) Table for CRD with Unequal Replication**

S.O.V.	DF	SS	MS	F
Treatment	t-1	$\frac{\sum Y_i^2}{r} - CF$	$\frac{SST}{t - 1}$	$\frac{MST}{MSE}$
Error	t(r-1)	SST-sst	$\frac{SSE}{t(r - 1)}$	
Total	tr-1	$\sum Y_i^2 - CF$		

Where, S.O.V.: Source of variation, DF: Degree of freedom SS: Sum of squares, MS: Mean square. Depend on Tables 5, we get Table 12

**Table 5: Success Rates for the Three Stages of the Study**

Stage 2	Stage 3	Stage 4
41	73	33
35	32	83
50	71	36
19	88	72
26	76	50
11	37	100
		97
		88
$\sum$ 182 n=6 $\bar{y}=30.333$	$\sum$ 377 n=6 $\bar{y}=62.833$	$\sum$ 559 n=8 $\bar{y}=69.875$

$$H_0: \mu_1 = \mu_2 = \mu_3$$

$H_1$ : At least two different averages

$$\bar{y}_{..} = 55.9, SST = 14461.857, SSt = 5772.831,$$

$SSE = 8689.026$ , then the ANOVA Table for the completely randomized design was introduced in section 3.

## RESULTS AND DISCUSSIONS

The tables listed below indicate the success rates in mathematics subjects for each study stage under consideration:

**Table 6: Success Percentages for the Second Stages**

Subject	Lecturer Name	Total Number of Students	No. of Successful Students	No. of Failed Students	Success Percentage
Normal differential equations	$X_1$	85	35	50	41 %
Advanced Calculus	$X_2$	82	41	41	50 %
Probability	$X_3$	74	14	60	19 %
Group algebra	$X_4$	95	25	70	26 %

It is clear from the above table that the success percentages are very low in all subjects; they did not reach the best 50% and in one subject out of a total of four subjects.

**Table 7: Success Percentages for the Third Stage**

Subject	Lecturer Name	Total Number of Students	No. of Successful Students	No. of Failed Students	Success Percentage
Mathematical analysis	$X_5$	37	27	10	73 %
modeling	$X_6$	41	13	28	32 %
Mathematical statistics	$X_7$	48	34	14	71 %
Linear algebra	$X_8$	41	36	5	88 %
Operations researches	$X_9$	45	34	11	76 %
Theoretical application of Groups	$X_{10}$	38	14	24	37 %

The table above indicates that success percentages range from very low to good.

**Table 8: Success Percentages for the Fourth Stage**

Subject	Lecturer Name	Total Number of Students	No. of Successful Students	No. of Failed Students	Success Percentage
Rings algebra	X <sub>11</sub>	3	1	2	33 %
Reliability	X <sub>12</sub>	6	5	1	83 %
Mathematical modeling	X <sub>13</sub>	12	3	9	36 %
Coding	X <sub>14</sub>	29	21	8	72 %
Functional analysis	X <sub>15</sub>	30	15	15	50 %
Fuzzy algebra	X <sub>17</sub>	34	30	4	4 %

The table above indicates that the success percentages range from very low to low to medium to good. The table below indicates the evaluation degree of questions for each lecturer according to the evaluation form of exam question.

**Table 9: Questions Evaluation for Each Lecturer**

Lecturer Name	Evaluation Degree of His/Her Questions	Lecturer Name	Evaluation Degree of His/Her Questions
X <sub>1</sub>	89 %	X <sub>10</sub>	86 %
X <sub>2</sub>	76 %	X <sub>11</sub>	88 %
X <sub>3</sub>	70 %	X <sub>12</sub>	89 %
X <sub>4</sub>	84 %	X <sub>13</sub>	94 %
X <sub>5</sub>	84 %	X <sub>14</sub>	94 %
X <sub>6</sub>	88 %	X <sub>15</sub>	85 %
X <sub>7</sub>	90 %	X <sub>16</sub>	60 %
X <sub>8</sub>	91 %	X <sub>17</sub>	94 %
X <sub>9</sub>	90 %		

The above table indicates that the evaluation percentage for all subjects vary from medium to good.

The table below refers to the evaluation of each lecture of the teaching staff based on the evaluation form for evaluating his Educational and teaching competencies in the lecture hall according to the evaluation form prepared for this purpose.

**Table 10: Evaluation of Educational and Teaching Competencies for Each Lecturer**

Lecturer Name	Degree of Educational Evaluation	Lecturer Name	Degree of Educational Evaluation
X <sub>1</sub>	63	X <sub>10</sub>	60
X <sub>2</sub>	34	X <sub>11</sub>	60
X <sub>3</sub>	47	X <sub>12</sub>	70
X <sub>4</sub>	78	X <sub>13</sub>	66
X <sub>5</sub>	50	X <sub>14</sub>	50
X <sub>6</sub>	50	X <sub>15</sub>	50
X <sub>7</sub>	60	X <sub>16</sub>	58
X <sub>8</sub>	60	X <sub>17</sub>	77
X <sub>9</sub>	70		

It is clear from the above table that the evaluation percentages of the teaching staff for their educational competencies in the study hall in all subjects range from weak to moderate and good. In addition, most educational competencies percentages are weak.

The table below refers to the overall vision of the research where this table includes the success percentages in each subject and the evaluation degree of questions for each lecturer and the degree of educational evaluation for each lecturer.

**Table 11: The Overall Vision of Success Percentages Compared with the Evaluation Degree of Lecturer's Questions and the Degree of His / Her Educational Evaluation**

Subject	Lecturer Name	Stage	Success Percentage	Degree of Question Evaluation	Degree of Educational Evaluation
Normal differential equations	X <sub>1</sub>	2	41 %	89 %	63 %
Advanced Calculus	X <sub>2</sub>	2	50 %	76 %	34 %
Probability	X <sub>3</sub>	2	19 %	70 %	47 %
Group algebra	X <sub>4</sub>	2	26 %	84 %	78 %
Mathematical analysis	X <sub>5</sub>	3	73 %	84 %	50 %
Modeling	X <sub>6</sub>	3	32 %	88 %	66 %
Mathematical statistics	X <sub>7</sub>	3	71 %	90 %	50 %
Linear algebra	X <sub>8</sub>	3	88 %	91 %	60 %
Operations researches	X <sub>9</sub>	3	76 %	90 %	54 %
Theoretical application of Groups	X <sub>10</sub>	3	37 %	86 %	60 %
Rings algebra	X <sub>11</sub>	4	33 %	88 %	60 %
Reliability	X <sub>12</sub>	4	83 %	89 %	70 %
Mathematical modeling	X <sub>13</sub>	4	36 %	94 %	50%
Coding	X <sub>14</sub>	4	72 %	94 %	60%
Functional analysis	X <sub>15</sub>	4	50 %	85 %	55%
Topology	X <sub>16</sub>	4	50%	60 %	70%
Fuzzy algebra	X <sub>17</sub>	4	88 %	94 %	55%

The above table shows the overall vision of the study and its results in terms of the success percentage of each study subject and the corresponding percentage of the question's evaluation of that subject and the corresponding degree of lecturer's educational competencies in that subject.

**Table 12: ANOVA for the Completely Randomized Design**

S.O.V.	DF	SS	MS	F
SS <sub>t</sub>	2	5772.831		
SSE	17	8689.026	2886.415	5.647
SST	19	14461.857	511.119	

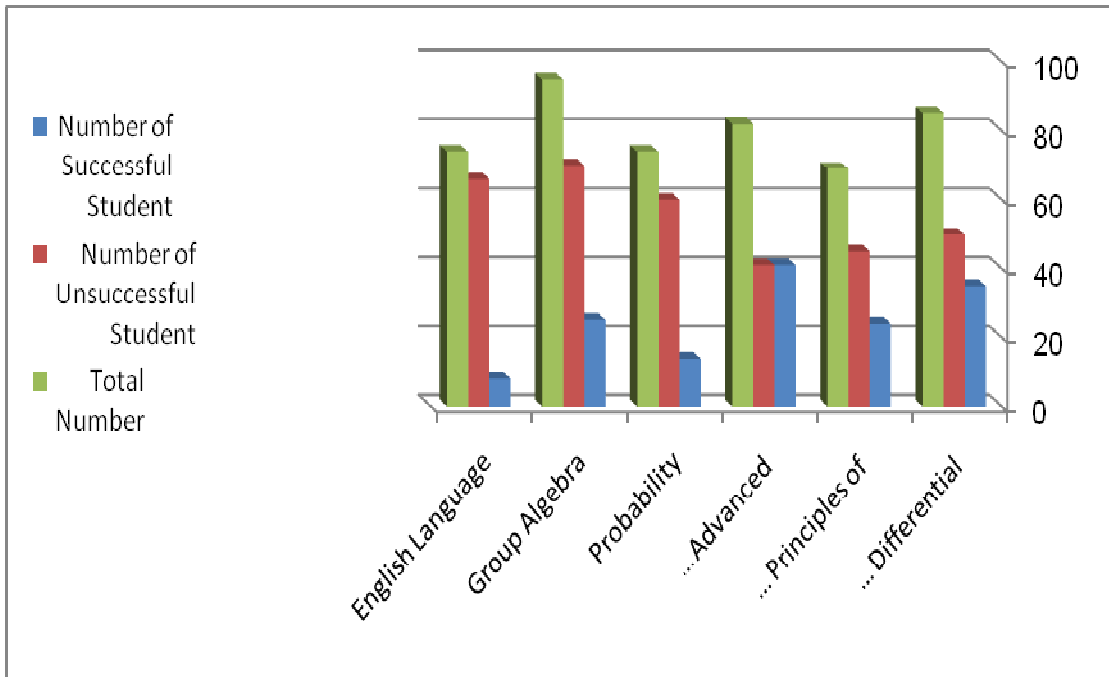


Figure 1: Distribution of Success Rates on Subjects for the Second Stage

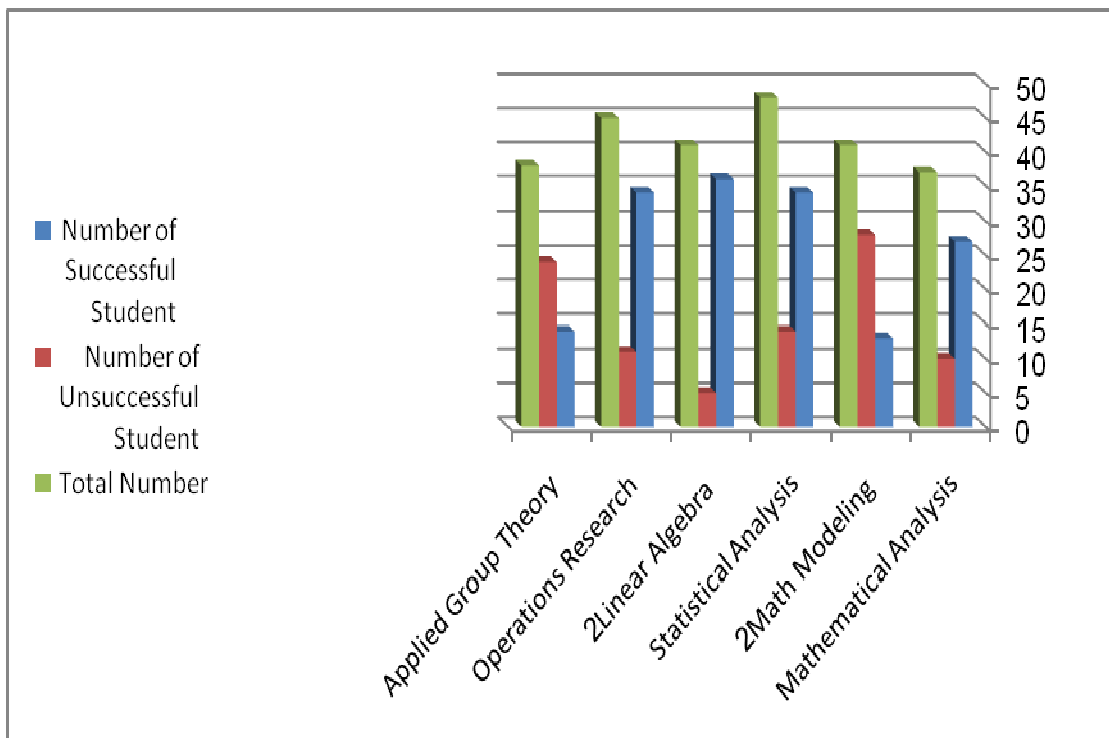
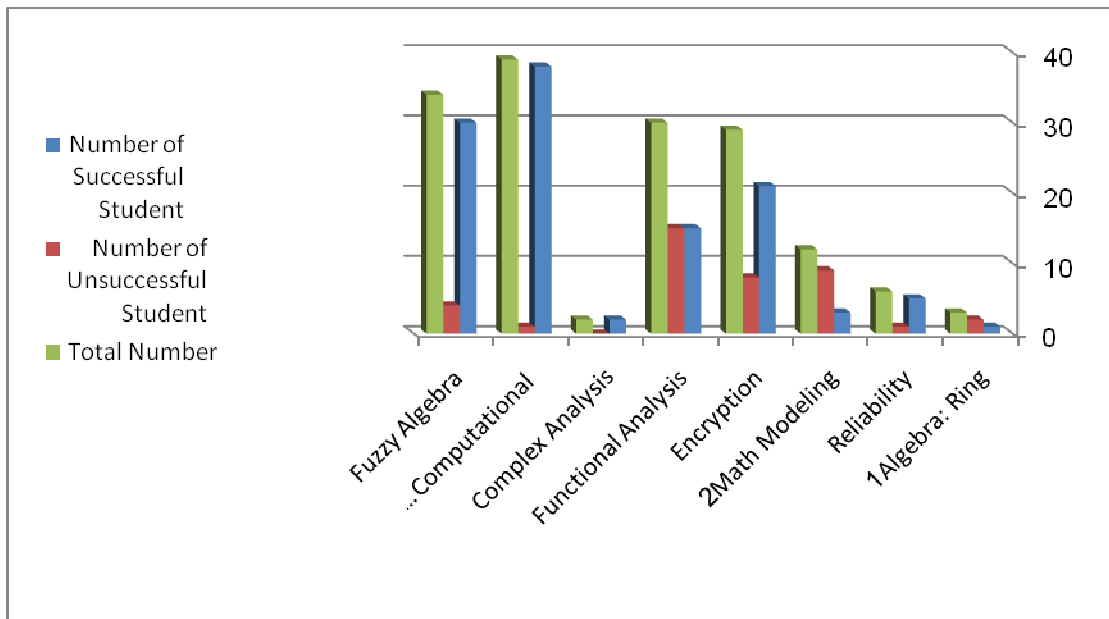


Figure 2: Distribution of Success Rates on Subjects for the Third Stage



**Figure 3: Distribution of Success Rates on Subjects for the Fourth Stage**

## CONCLUSIONS

- Generally there is no imbalance in the questions set for students in various study subjects where all question evaluation percentage for all study subjects indicated that they were acceptable where they ranged from (69%-94%), which means that there is no moral effect on the exam questions on the percentages of students' low-level in subjects of mathematics.
- In general, there is an imbalance in the capability of the lecturer to be able to have educational competencies in the lecture, where the percentages had calculated in this field indicated that 65% of lecturers have been able to the educational competencies within the lecture were very low, which is 50% and below, and that few of them have been able to have educational competencies and they represent 35% of the lecturers.
- The reason for the low level of student performance in mathematics can be attributed to this imbalance, in the sense that the lecturer who is proficient in his educational competencies within the lecture will have a high percentage of students success in his subject and vice versa too, meaning that the lecturer who is not qualified in his educational competencies within the lecture will have low success percentage in his subject.
- It has been noted that the level of students performance in all subjects of the second stage was low, this low level decreases as we step into the study stage where it becomes lower in the third stage and much lower in the fourth stage. That is normal, whenever the student progresses in the study stages, his experience, and scientific competence increases as a result of the knowledge accumulation over time.



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