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Students' Slogging Through Physics: Anxiety and Self- Confidence

[(1)] Tala Sasa, [(2)] Tasnim Alayid, [(3)] Eman Almuhur, [(4)] Husam Miqdad

Department of Basic Science and Humanities,
Applied Science Private University, Amman, Jordan.

ABSTRACT

Purpose of the study: Predominantly, physics students feel of fear and anxiety rather than practical contacting with the creative delight of physics. To make physics classes more exciting and motivating, this research is introduced on the desire of physics instructors. This research explores how various strategies of learning interact with students' motivations, help them to get rid of their fears of physics and developing a reliable instrument for understanding perceiving physics as a difficult course.

Methodology: Basically, empirical data collected from the responses of 291 students of Applied Science Private University who study physics 101, 102 and physics labs used to in this research paper. The data collection instrument comprises a questionnaire.

Applications: Findings of our research paper provide insights and guidance for physics instructors, policymakers and leaders in defining needs of the students.

Originality: This research paper presents and discusses essential methods and procedures to fulfill requirements of students to understand well and enjoy physics.

Findings: We are trying to raise students' self-confidence and minimize their anxiety toward physics courses. Students who understand those advices well and follow them up noticed that their academic performance improved.

Challenges are summarized in the methods we are fundamentally conducting to convince students that their anxiety will gradually disappear and self-confidence will fortify.

Keywords: Physics, Teaching Strategies, Self-Confidence, Anxiety, ASU.

1. INTRODUCTION

This research includes two extremes concerning how the students experience physics: fear and anxiety versus integrity and self-Self-Confidence. We focus on the theoretical perspective about motivation and identity that aids in examining advantages of the learning environments that specify experience of students in physics classes. Such perspective focuses on the importance of the passion and the power physics instructors have in striking students' enthusiasm by constructing a suitable learning environment. The main challenge faced by physics instructors is characterizing best learning environments that interact with the students' minds and hearts. Various attempts of instructors to teach physics extensively and efficiently in order to make the context of physics courses impacts their learning and their life style [1]. Determining the core reason causing bad feeling toward physics by asking the majority of students having distresses in memorizing and understanding basics of courses beside solving problems [2]. Primarily, it is important to overcome problems either faced by students or instructors, hence identifying perceptions about the courses easiest our task. Physics is conceptually difficult to be recognized even though it is interesting [3], it is stated that competency in mathematics basics is a fundamental for realizing concepts of physics, we assert that each of instructors and students may have several views about understanding and learning of physics, instructors should understand students' views about courses of physics, the experienced instructors have to know procedures that enable students to be successful and creative. In addition, instructors should be conscious of how their views differ from students' ones. This enable them to recognize what difficulties students have in physics [15].

2. PROBLEM OF RESEARCH AND PARTICIPANTS

A survey is conducted on the undergraduate students of Applied Science Private University; it is titled "Self- Confidence and Anxiety of Physics" includes 291 students from four faculties: pharmacy, arts and science, information technology and engineering. It is designed to find how far students have self-confidence and anxiety of physics.

3. PROCEDURE

During the courses of Physics 101, 102 and physics labs of 2020-2021 academic year, our students were asked to fill out an E-questionnaire which wrote by using the Google Form, and the link was shared through Microsoft Teams' platform.

4. STATISTICAL ANALYSIS

According to demographic characteristics, results were compared using an independent sample t-test and one-way analysis of variance (ANOVA) were calculated. The Pearson correlation coefficient was also calculated between the questionnaire axes. In addition, we calculated the Cronbach's Alpha of our study which is 0.875, data analysis was carried out using SPSS version 22. The statistical significance level is set at $p<0.05$ (two-sided). The level of statistical significance in evaluating correlation coefficient is set at $p<0.01$ (two-sided).

Table 1 Displays demographic characteristics of the study sample

Variable	Category	No.	%
Gender	Male	128	44.00
	Female	163	56.00
Faculty	Engineering	87	29.90
	Pharmacy	158	54.30
	IT	35	12.00
	Arts and science	11	3.80
Cumulative average	60-67.9	9	3.10
	68-75.9	22	7.60
	76-83.9	98	33.70
	≥ 84	162	55.70

A total of 291 students were recruited to the study, 56% of the sample representing females and 44% are males. About 54.30% of them are from faculty of pharmacy, 12% are from faculty of information technology, 29.9% from faculty of engineering and technology and 3.8% are from faculty of arts and science. A percent of 55.70% of the total sample are students with cumulative average greater than or equal to 84.

Now, **table 2** displays each of mean, standard deviation and attitude for items of self-confidence.

Item No.	Item	Mean	SD	Attitude
5	I do my best to be successful in problem solving	4.16	0.83	agree
6	I try too hard when I cannot solve the problem	4.12	0.82	agree
7	I am sure that I can solve a problem	4.04	0.84	agree
8	I am self-confident in problem solving	3.99	0.87	agree
1	I like to solve to a problem	3.99	0.90	agree
2	I enjoy solving a problem	3.95	0.89	agree
9	I lose track of time while solving a problem	3.71	1.00	agree
14	I am afraid of making numerical mistakes	3.70	1.16	agree
3	I like to solve a numeric problem	3.69	1.03	agree
13	I am upset when I find incorrect answer of a problem	3.66	1.05	agree
10	I demoralize if I cannot solve a problem	3.66	1.05	agree
4	I like to solve problem from different sources	3.62	0.96	agree
11	I am stressed while solving a problem	3.30	1.08	Neutral
12	I lose self-Self-Confidence if I cannot solve a problem	2.85	1.26	Neutral
self- confidence **Cronbach's Alpha = 0.825**		3.74	0.54	agree

From table 2, item 5 " I do my best to be successful in problem solving" has the highest mean of 4.16(SD= 0.83) with attitude of 'agree'. In the second rank is item 6 “I try too

hard when I cannot solve the problem" with mean 4.12(SD=0.82) with attitude of 'agree'. The minimum mean is for item 12 " I lose self- confidence if I cannot solve a problem" with mean 2.85(SD=1.26) with attitude of 'neutral'. In general, Self-confidence is of 'agree' attitude with mean 3.74(SD=0.54).

Cronbach's Alpha of self-confidence is high and its value reflects the reliability of the measure we use in our research paper. We note that the students of physics subjects who responded to the questionnaire questions do their best to succeed in solving problems and always strive to reach the solution of problems and have a sufficient amount of self-confidence in solving problems, but stress may occur when the inability to solve the problem may amount to a loss of self- confidence. Students who are finding it is so hard to grasp the physics concepts have a plethora of reasons, struggling in solving problems leads to a negative feeling. Students have to make courses enjoyable and useful with tons of real applications. Napoleon Bonaparte was a most strict student by struggling over books in many subjects, he mastered the usage of the mathematical functions that were necessary for the design of field the artillery pieces.

Also **table (3)** displays each of mean, standard deviation and attitude for items of anxiety

Item No.	Item	Mean	SD	Attitude
1	It frightens me when I don't understand the physics terms.	3.53	1.05	agree
11	I feel overwhelmed by the number of definitions/terminology you have to learn to understand physics	3.30	1.19	neutral
2	In physics class, I can get so nervous if I forget the technical terms I know.	3.17	1.03	neutral
10	I get nervous when I don't understand every physics term the physics instructor says.	3.16	1.08	neutral
5	I can feel my heart pounding when the instructor is going to call me to answer a question in the physics class.	3.00	1.25	neutral
6	The more I study for a physics test, the more confused I get.	2.99	1.21	neutral
4	Even if I am well prepared for physics class, I feel anxious about the physics terminology.	2.93	1.12	neutral

7	I always feel that the other students speak the technical language of physics better than I do	2.90	1.15	neutral
3	3. It embarrasses me to volunteer answers in my physics class.	2.73	1.21	neutral
9	I get nervous and confused when I am speaking the technical language of physics in class.	2.66	1.08	neutral
8	I feel more tense and nervous in my physics class than in my other classes due to the vocabulary of physics.	2.50	1.09	Disagree
Anxiety **Cronbach's Alpha 0.887**		2.99	0.77	neutral

From table 3, item 1 " It frightens me when I don't understand the physics terms" have the highest mean value of 3.53 (SD=1.05) with 'agree' attitude. In the second rank is item 11 " I feel overwhelmed by the number of definitions/terminology you have to learn to understand physics" with mean 3.30 (SD=1.19) with 'neutral' attitude. Item 8 " I feel more tense and nervous in my physics class than in my other classes due to the vocabulary of physics " has the lowest mean with 2.50 (SD=1.09) with 'disagree' attitude. In general, anxiety is of 'neutral' attitude with mean 2.99 (SD=0.77).

Cronbach's Alpha of anxiety is high and its value reflects the reliability of the measure we use in our research paper. We note that students are afraid of not understanding physics terms, but this does not lead to a feeling of tension and nervousness in the physics class more than in other classes.

Table 4 shows the Pearson's correlation coefficients between the two criteria (variables): Self-Confidence and Anxiety as follows:

	Self-Confidence	**Anxiety**
Self-Confidence	1	0.33^{**}
Anxiety	0.33**	1

The table displays that the criteria (Anxiety and Self-Confidence) are positively correlated where r= 0.33, p=0.000 < 0.01, but their correlation is weak.

Research hypothesis:

Some questions authors are embarked with and correlated hypothesis related to self-confidence and anxiety of physics by assuming these hypothesis:

H_1: there are differences in the levels of the study criteria (variables) that can be attributed to gender.

H_0: there are no differences in the levels of the study criteria (variables) that can be attributed to gender.

Now, **table 5** shows the mean and standard deviation of the criteria of both males and females.

Gender		N	Mean	Standard Deviation	Standard Error Mean
Self-Confidence	Male	128	3.76	0.55	0.05
	Female	163	3.73	0.53	0.04
Anxiety	Male	128	3.04	0.76	0.07
	Female	163	2.94	0.78	0.06

Table 6 indicates independent samples T tests

Variable	**t**	**Degrees of Freedom**	**Sig. (2-tailed)**	**Mean Difference**	**Standard Error Difference**	**95% Self-Confidence Interval of the Difference**	
						Lower	Upper
Self-Confidence	0.554	289	0.58	0.035	0.064	-0.089	0.16
Anxiety	1.0989	289	0.277	0.099	0.091	-0.08	0.279

Since p=0.58 and 0.277 which are greater than 0.05 we accept H_0, so there are no significant differences attributed to the gender are between self-confidence and anxiety. A much debated topic, scientists said that it is interesting that while males and females use two different activity centers, they perform equally well on measures of cognitive abilities [6].

The next table is table 7 which implies the both of mean and standard deviation within criteria (variables) concerning faculty, where the variance is analyzed to highlight the impact of the students' specializations.

Variable	Category	Mean	SD	N
Self-Confidence	Engineering	3.79	0.563	87
	Pharmacy	3.70	0.538	158
	IT	3.78	0.475	35
	Arts and science	3.87	0.499	11
Anxiety	Engineering	2.98	0.647	87
	Pharmacy	2.90	0.766	158
	IT	3.22	0.949	35
	Arts and science	3.52	0.879	11

Our hypothesis:

H_1: there are differences in the levels of the study criteria (variables) that can be attributed to faculty.

H_0: there are no differences in the levels of the study criteria (variables) that can be attributed to faculty.

Analysis of variance (ANOVA) will be used to test our hypothesis in **table 8**

Variable	Sum of Squares	Degrees of Freedom	Mean Square	F	Sig.
Self-Confidence	0.636	3	0.212	0.733	0.533
Anxiety	6.225	3	2.075	3.574	0.014

From table 8, we find that p=0.533 for self-confidence which is greater than 0.05, then we accept H_0 and there are no significant differences attributed to the faculty. But there is significant effect of faculty on anxiety (F=3.574) with a p-value=0.014 < α = 0.05 so we accept H_1. By (Least Significant Deference (LSD)) test, Post-hoc comparisons implies that the means of each of students of pharmacy and engineering which are 2.90 and 2.98 respectively significantly is less than the mean of students of information technology and arts and science which are 3.22 and 3.52 respectively.

For our study, the variance analysis gives the impact of the cumulative grade point average (GPA) on the study criteria (variables). Results are indicated in **table 9.**

Variable	Category	Mean	Standard Deviation	N
Self-Confidence	60 - 67.9	3.97	0.506	9
	68 - 75.9	3.75	0.481	22
	76 - 83.9	3.81	0.497	98
	≥ 84	3.69	0.565	162
Anxiety	60 - 67.9	3.45	0.83	9
	68 - 75.9	3.23	0.768	22
	76 - 83.9	3.25	0.748	98
	≥ 84	2.77	0.719	162

Our hypothesis:

H_1: there are differences in the levels of the study criteria (variables) that can be attributed to cumulative average (GPA).

H_0: there are no differences in the levels of the study criteria (variables) that can be attributed to cumulative average (GPA).

Analysis of variance (ANOVA) will be used to test our hypothesis in **table 10**

Variable	Sum of Squares	Degrees of Freedom	Mean Square	F	Sig.
Self-Confidence	1.326	3	0.44	1.54	0.204
Anxiety	17.206	3	5.74	10.58	0.000

From table 10, we find that p=0.204 for self-confidence which is greater than 0.05, then we accept H_0 and there are no significant differences attributed to the to cumulative average (GPA). But the cumulative average has a significant effect on anxiety (F=10.575) and p-value=0.000 < α=0.05 so we accept H_1. Post-hoc comparisons using (Least Significant Deference (LSD)) test indicates that the mean of the students whose

cumulative average is greater than or equal to (84) is 2.77 remarkably is less than the mean of students whose cumulative average 60-67.9 which is 3.45.

7. DISCUSSION

It is crucial to assure that thorough understanding mathematical concepts and taking mathematics notes may help in solving physical problems. The modeling in physics essentially is mathematical applications, in order to get a well comprehension of the theoretical part of mathematics and calculations, a student to digest all basics of mathematics [17].

Conceptual understanding is a necessity, trying to reason ways through ideas given. Understand means of expressions and units attached to them. It is extremely useful to know terms well by solving problems, coming up with workable function including the given terms [7]. Learning physics is a pivotal element in problem's solving [16]. The quantitative parts of the problem solving like mathematical procedures are what we emphasize on rather than qualitative analysis for concepts and principles. Nowadays, lots of programs help in understanding basics of mathematics and physics, their teaching is supported by modern technologies highly [8,25].

Namely, most of the students think the content of the course is difficult because of the concepts. A talented instructor directs students to hidden pits in knowledge by a good learning, they help students to certain ideas of the course. To mitigate fear from physics, a good instructor must give students good methods for handling the course. Studies of the influence of integrating knowledge in problems solving on students' understanding of concepts are important, our target is to developed students' knowledge and help them to overcome misconceptions and incorrect ideas in physics. We can see a decline in students' academic performance because of their high levels of anxiety. Students have to focus the problem, this guides them to state an approach in terms of principles and concepts, emphasize the justification for the appropriateness of manners the problem solving methods work [9]. Our current study investigated dual goals: Pedagogical approaches that help students in simplifying physics and that promote students' self-confidence versus anxiety. If the students identify the methods that enable them to control their levels of anxiety, they can take over bad performance [18]. Relaxation exercises are used alongside the students' visualizing themselves in classes, this process evokes feelings of the real scene.

Namely, support must be provided to students who suffer of intense panic and anxiety about being unable to do the well in physics. Frame working solving physics' problems has to be adapted to the existing course materials. Questions of the curriculum are usually tackled by the instructor; hence students must try them often beside solving a lots of problems. Solving past tests of physics carefully because they have the best insight into real challenges might be faced by students, this strategy helps in overcoming physics anxiety. Physics ideas have to be linked since there might be ideas that are misremembered or not easily stocked in minds. Doing a physics map containing simple algorithms, rules and ideas to make a chain of steps "brain dump" in solving a

problem simplify dealing with physics difficulties [19]. Studding large bothers students and exhausts them, so studying every day enables them to avoid theses bad feelings toward the courses. Make awareness programs to urge students to live healthy by sleeping well which has a positive impact on the memory [10]. Monitoring students' stress levels to try to calm them, this encourages them to mediate. Most students prejudice that physics courses are difficult and they have this feeling since their environment encourages this. This is one of our findings, the contents of the physics course are not prepared with the students' lives [20].

Speculating that students' anxiety indicate a failure, consequently anxiety-evoking is diminished by implantation of favorable self-defining memories. Feeling anxiety has an adverse effect, this might prevent healthy development of students' brains and bodies and harms their future [11].

Too much stress taken before entrance exams, experiencing "mind block" are caused by anxiety. Practicing hard deriving the formulas completes understanding prospects. Physics anxiety, worry and emotionality are reasons of a lack of self-confidence [12] and discourage students; it might force them neglecting preparations for their exams [13]. Panic attacks students before exams are usually worse than doing bad in the actual exam. If students have elder brothers and sisters who have done well in exams, then students will feel that they have to match up to levels of their relatives [21].

Finding methods that allay anxiety and fear of physics is a necessity in our world which actually relies on progress in many of fields and scientific thoughts. Expanding technologies academically or globally, an elevation of the world's needs for scientists to continue current standards of living. Numbers of scientists have not raised, the essential causes may be fear of physics and scientific subjects [22]. Many tips that easiest physics study and reduce anxiety, a student cannot be idealistic, everybody tries to be better. Writing notes are useful to digest all ideas, dividing subjects a student study to headings and subheadings might works, in addition using highlighting pens. Concentration to be in its high levels especially after sleeping adequately is good to understand well. Practice hones a student's skills and treat physics. Solving problems from past test papers and explaining tricky solutions to partners or even student himself helps in checking whether ideas are absorbed [23]. For some individuals, being good at physics is a natural case, for the rest, getting good scores in physics requires a great amount of hard work. By learning foundational skills and practicing, mostly students can master their physics materials. A short burst of doing revision regularly are extremely better than staring at the same page for hours. In addition, asking for help reduces stress and save time and efforts. In most cases, all students have to be in a coolness mode and take a good and healthy breakfast. Talking to partners may disturb or distract the student's mind, consequently finding a corner may make a student more concentrated. A deep breathing helps student to calm down. Doing exercises, walking in a fresh air and swimming may help in keeping a healthy mind and getting rid of bad feelings like anxiety [24].

8. CONCLUSION

According to our current surveys, a large proportion of students were anxious about their capabilities of getting high scores because of the panic when thinking about physics. Conversely, most of them do not have barriers with their instructors in asking questions either during lectures or online, beside they feel good when dealing with the whole academic team, but anxiety comes from not good preparations to exams and performing worse. Actually, classroom anxiety seems to be moderate.

9. RECOMMENDATION

We recommend that teachers have their own teaching methods - formal and informal - depending on the situations, examples should be condensed to visualize and understand physical concepts and laws, and impractical methods in teaching physics should be avoided because it is a practical subject and learning should be embraced as fun as possible.

We advise teachers to always strive to provide a weekly summary that contains the tasks that are supposed to be completed and delivered during the week as well as the lectures and topics that will be studied during them, and to provide immediate motivational feedback on the student's performance, which leads to increasing the student's confidence in himself, provides reassurance and creates a positive relationship between the student and the teacher.

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AUTHORS CONTRIBUTION

Design of the work: All authors.

Data collection: First, second and fourth Authors.

Data analysis: First Author.

Data interpretation: First and second Authors.

Drafting the article: Third Author.

Critical revision of the article: All Authors.

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