Influence of Laboratory Anxiety on Skill Acquisition and Confidence in Handling Electrical Equipment among Electrical Engineering Students

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ABSTRACT

This paper has discussed the role of laboratory anxiety in the learning of skills and confidence in operating electrical equipment among Electrical Engineering students. Due to the risky environment of electrical laboratories, it was discovered in the research that the fear of equipment, the fear of safety, the fear of error, and the pressure on the performance of students influence their technical performance and emotional preparedness. The study was carried out on a sample of 162 students who were taking major Electrical Engineering laboratory courses, using quantitative descriptive-correlational design. The structured survey was used as a source of data collection in measuring laboratory anxiety, perceived skill acquisition, and confidence levels. The relationships and predictive factors were also established using descriptive statistics, Pearson correlation, and multiple regression analyses. Findings showed that the students have a high rate of laboratory anxiety especially on issues of safety and fear of working with electrical equipment. The acquisition of skills was observed to be of moderate level with troubleshooting being the lowest. The levels of confidence were moderate too, and the lowest scores were considered to be on working on live circuits. Notable negative correlation was identified that there is a strong association between the high anxiety and the low skill acquisition ($r = -0.63$) and low confidence ($r = -0.71$). The regression analysis revealed that the fear of electrical equipment is the most powerful predictor to both outcomes. The results focus on the necessity of improvement in safety training, scaffold work, and facilitating laboratory conditions.

Keywords: laboratory anxiety, skill acquisition, confidence, electrical engineering students, safety concerns

INTRODUCTION

The anxiety related to performing hands-on experiments (with the exception of those that are perceived as dangerous) is characterized as laboratory anxiety (Bowen, 2019). This anxiety is magnified by the Electrical Engineering programs due to the riskiness of electrical equipment and exactness that should be used in laboratory sessions. According to students, they frequently have fear of breaking expensive equipment, creating crucial errors, getting electric shocks or not correctly constructing or troubleshooting circuits. Ekong (2021) highlights that the lack of familiarity with laboratory tools and confidence in their skills results in emotional distress and decreased involvement in the case of learners. The anxiety that comes about in technical learning environments is a big educational issue of concern. Excessive anxiety may disrupt the cognitive processing and decision-making, risk-taking behavior, and accurate measurement or troubleshooting of students.

These are the core competencies of an engineering student and the gaps in performance in these areas could be translated to poor acquisition of skills. Likewise, an essential factor of technical preparedness is confidence, which can be destroyed by the feelings of intimidation or even danger of students in a laboratory environment (Ferrell and Barbera, 2021). Lack of confidence makes students shy of practical activities, over-depend on the instructors or show hesitation in the usage of electrical equipment. Although laboratories are a central component of the EE curriculums, the literature on engineering laboratory anxiety is still underdeveloped, and the majority of studies concentrate on the general science laboratory anxiety. Specifically, scarce literature pertains to the special needs of Electrical Engineering students in their emotions and security matters. In addition, no studies have been conducted in the Philippines and found the relationship between anxiety in laboratories, skill

acquisition, and confidence in working with electrical equipment in Electrical Engineering laboratory backgrounds. This creates a critical gap in comprehension of the psychological background of influence on technical learning particularly in the context of laboratory performance directly related to professional preparation and licensure examinations.

Therefore, this research seeks to determine how much anxiety in the laboratory influences the acquisition of the skills by students and their confidence in dealing with electrical equipment. By pinpointing the dimensions of anxiety that can be considered important predictors of a performance outcome, the study aims to offer evidence-driven information on enhancing laboratory teaching, safety orientation, and student support in the Electrical Engineering programs.

Objectives of the Study

The study aims to investigate the influence of laboratory anxiety on Electrical Engineering students' skill acquisition and confidence in handling electrical equipment.

Specifically, it seeks to:

1. Determine the level of laboratory anxiety among Electrical Engineering students in terms of:

a. Fear of Electrical Equipment

b. Safety Concerns

c. Fear of Making Mistakes

d. Performance Pressure

2. Assess the level of students' skill acquisition in key laboratory tasks such as wiring, measurement, troubleshooting, equipment operation, and safety execution.

3. Determine the level of students' confidence in handling electrical equipment.

4. Examine the relationship between laboratory anxiety and skill acquisition.

5. Examine the relationship between laboratory anxiety and confidence in handling electrical equipment.

6. Identify which components of laboratory anxiety significantly predict skill acquisition and confidence.

Hypothesis

H_a: There is a significant negative relationship between laboratory anxiety and skill acquisition.

H_a: There is a significant negative relationship between laboratory anxiety and confidence in handling electrical equipment.

LITERATURE REVIEW

The obstacle of laboratory anxiety has long been acknowledged to an ineffective learning of science and engineering. According to Bowen (2019), laboratory anxiety entails the fear of errors, use of unknown equipment, or meeting with safety risks when performing laboratory duties. This emotional stress is more likely to be increased in engineering fields, where laboratory activities entail high stakes, technical processes. Multiple researches indicate that the performance of students is adversely influenced when they are exposed to laboratory conditions they find dangerous, difficult or challenging in terms of their technical ability (Galloway, 2020). Laboratory anxiety in the Electrical Engineering case is due to the dangers of working with electrical equipment, power supplies, rotating machines, transformers, motors, and energized circuits. Students are subject to

emotional distress due to the possibility of receiving an electric shock or having equipment malfunction. According to OSHA (2020), electrical laboratories are quite dangerous in case safety measures are not completely mastered, so the anxiety of safety can be understood as of special importance to the engineering students.

In engineering learning, skills acquired include procedural knowledge, equipment handling, troubleshooting as well as analysis of choices made. Kolb (2014) states that experiential learning is a key mechanism to technical mastery but in its turn, anxiety interferes with this process by disrupting attention, decreasing tolerance to trial-and-error processes, and limiting hands-on practice. Research indicates that more anxious students always perform poorly in laboratories, they do not do the following procedures, and they lack the ability to troubleshoot (Ekong, 2021).

Belief is a very important factor in laboratory learning. In their study, Ferrell and Barbera (2021) discovered that students who believe in their technical skills work more effectively and still stay involved in complicated laboratory activities. Low confidence on the other hand encourages avoidance behaviors, reliance on instructors, and reluctance in the actual hands-on operations. Confidence is even more central in hazardous laboratory environments such as electrical systems where the students have to go through the fear to handle potentially dangerous equipment.

Theoretical Framework

The research is rooted in two theoretical basis, the Experiential Learning Theory developed by Kolb and the Self-Efficacy Theory developed by Bandura, which offers a integrated psychological/pedagogical paradigm of laboratory anxiety.

According to Kolb (2014), learning is a four-stage process that takes place when a person has a concrete experience, reflects on it, abstractly conceptualizes it, and actively experiments with it. Laboratory anxiety disrupts this learning process by lowering the desire of students to participate in practical experimentation as well as a decrease in cognitive processes of students in technical work. As a result, anxiety can impair the fine-motor skills, troubleshooting competence and independent use of electrical equipments.

According to Bandura (1997), self-efficacy (or a belief that a person is able to do something) has a direct impact on the performance. In a laboratory, the confidence developed is predetermined by the mastery experience, safety perception, verbal encouragement and affective state, like fear or anxiety. The high laboratory anxiety students can develop low self-efficacy and become less willing to manipulate equipment, risky or complicated procedures. Combined, these theories have it that laboratory anxiety interferes with both the experiential and technical confidence building cycle and, as a result, the acquisition of skills and the performance in laboratories.

METHODS

Research Design

The research design used in the study is quantitative, descriptive-correlational design, which measures how the relationships between confidence and laboratory anxiety and skill acquisition exist. This design is suitable in finding patterns, associations as well as predictors without interfering with variables.

Research Locale

The population to be consists of the Electrical Engineering students of Camarines Sur Polytechnic Colleges who are taking laboratory disciplines like Electrical Circuits Laboratory and Electrical Machines Laboratory. The setting is suitable because it has a technical lab setting in which safety and competency are paramount.

Respondents of the Study

The respondents were comprised of 162 students of Electrical Engineering who are currently enrolled in at least one course in laboratory. The stratified sampling was applied to provide the representation by the year levels.

Criterion of inclusion: the students who were included in the study provided they have had at least one laboratory activity throughout the semester.

Instrumentation

In this study, a structured survey instrument was employed in acquiring the required information. The instrument consists of four major parts that aim at capturing the major variables of interest. The first is the Laboratory Anxiety Scale which assesses the degree of apprehension on the part of the students on four dimensions, namely: fear of electrical equipment, safety, fear of error, and performance pressure. The second part is the Skill Acquisition Questionnaire which determines the perceived competency of the students in the required laboratory skills, such as wiring, measurement, and operation of laboratory equipment, troubleshooting, and performance of safety procedures. The third part evaluates the confidence levels of the students in their ability to deal with electrical equipment, especially considering their self-confidence in performing different assignments in the laboratory. Lastly, the instrument also has a demographic section where the background data is collected in the form of year level, courses in labs completed, and exposure to laboratory. In order to check the reliability of the instrument, the pilot test was carried out, internal consistency was assessed according to the coefficient of Cronbach alpha, and a minimum acceptable coefficient is 0.70.

Data Gathering Procedure

The study was conducted in a systematic manner in order to guarantee the accuracy and integrity of the data collected. First, permission to carry out the research obtained within the department and the institution to give consent to the implementation of the research. Upon receiving the consent the informed consent was given to all the possible participants, which was include being aware of the objective of conducting the study, that they took part in the study as volunteers and what measures were taken to ensure the safety of their confidentiality. The survey tool was administered to the respondents during or after the laboratory sessions, subject to schedule and convenience of the subjects. All the responses were anonymous to protect the identity of the individuals participating in the study and to make the participants give sincere and correct responses. The responses were coded and arranged in a systematic order after data collection and subjected to statistical analysis that enables the researcher to answer all the research questions and objectives of the study in the correct way.

Data Analysis

The research utilized a sequence of statistical methods of quantitative approach that corresponds with research questions and the characteristics of variables to be studied. In order to identify the anxiety, skill and confidence levels of the participants, the data was modeled in terms of the mean and standard deviation that presented a good description of the central tendencies and variability of the responses. To analyze the association among the important variables, Pearson r correlation coefficient was used in order to determine the strength and direction of the associations. Moreover, multiple regression analysis was used to establish the variables that are significant in predicting the desired outcomes. In case of necessity, the intergroup differences were examined using a one-way Analysis of Variance (ANOVA) to determine whether the mean scores are substantially different depending on the chosen demographic or categorical variables.

Ethical Considerations

The research was conducted following ethical principles of research in order to protect the well-being of all participants. Before data collection, the respondents were informed on the purpose of the study, their rights as voluntary participants. There is no data about personal identifiers collected, and the anonymity and confidentiality were ensured during the research process. The information gathered shall be utilized only in academic purposes and were kept in a safe place where they cannot be accessed by anyone. The risk is very minimal and the respondents are allowed to walk out of the study at will without repercussions.

RESULTS AND DISCUSSION

The findings of the investigation about the effects of laboratory anxiety to skill learning and the level of confidence of using electrical equipment among 162 Electrical Engineering students are discussed in this chapter. The results are explained consecutively according to the research questions and the description follows the analysis rigor and style presented in the attached TSES model paper. Both sets of findings are thematically interpreted with the help of the literature and related with the implications of engineering education.

Level of Laboratory Anxiety

Table 1. Level of Laboratory Anxiety

Dimension	**Mean**	**Interpretation**
Fear of Electrical Equipment	3.82	High
Safety Concerns	3.94	High
Fear of Making Mistakes	3.67	Moderate to High
Performance Pressure	3.58	Moderate
Overall Anxiety	3.75	High

As it is shown in Table 1, Electrical Engineering students are characterized by high lab anxiety level (M = 3.75), and Safety Concerns (M = 3.94) and Fear of Electrical Equipment (M = 3.82) prove to be the primary causes of anxiety. These higher scores mean that the learners have the notion that electrical laboratory work is inherently dangerous, which is mainly caused by the dangers of electric shock, short circuiting, equipment failure, and the possibility of procedural errors. Such a propensity toward treating laboratory work as a hazardous activity is consistent with the results of Galloway (2020) that students who are subjected to exposure to the dangerous electrical context acquire an elevated fear reaction due to the perceived danger. These fears can help discourage the willingness of the learners to be immersed in equipment, restrict their exploration, and discourage the extent of practical learning experiences. The findings indicate that anxiety is not a one-time emotional reaction but an anticipated and ongoing component of EE laboratory engagement.

This particularity points out that the fear is strongly correlated with those tasks that imply direct manipulation of the equipment that is perceived to be of great risk. The subtle dispersion highlights an important pedagogical point: the process of technical training should be accompanied by emotional preparedness, not just some procedural training. Educators can provide a safer setting in laboratories, making students feel more secure, more competent, and more willing to participate in practical work by introducing systematic safety orientations, gradual exposure to equipment, and plans of building confidence. Prevention of anxiety turns out to be crucial not only in the emotional but also in enhancing technical competence and facilitating substantial learning in Electrical Engineering laboratories.

Level of Skill Acquisition

Table 2. Level of Skill Acquisition

Skill Component	**Mean**	**Interpretation**
Wiring and Assembly	3.12	Moderate
Measurement and Instrumentation	3.04	Moderate
Troubleshooting	2.96	Moderate

Equipment Operation	3.08	Moderate
Safety Procedure Execution	3.21	Moderate
Overall Skill Acquisition	3.08	Moderate

Table 2 indicates that the level of skills acquired by the students is moderate in all these competencies measured, with a mean score of between 2.96 and 3.21. Though students show moderate skills in more beginner-level wiring procedures, measurement, and implementation of safety guidelines, their lowest scores are in troubleshooting (M = 2.96) which is a problem that involves using higher-order thinking and making judgmental decisions. This indicates a learner is familiar with task-oriented learning and guided by tutor instructions but have trouble when being faced with technical problems that require diagnostic reasoning, error detection and independent problem-solving. In Electrical Engineering a laboratory Troubleshooting knowledge Procedural knowledge is only part of the requirements of troubleshooting, though; the ability to deduce how a system should behave, diagnose, and come up with solutions, which later develops over time and through continued exposure to hands-on work.

Such medium abilities also indicate that existing lab experiences might not offer adequate conditions of iterative practice, exploration, and reflection, which Kolb (2014) of the Experiential Learning Theory presupposes as crucial in learning as well as acquiring technical proficiency. EE labs may focus more on accomplishing prescribed experiments than on open-ended exploration, and so students are given little opportunity to troubleshoot their experiments, to experiment, or to learn to recover when they make an error- all of which are important to build engineering intuition. Through this, students can be able to do work and pass the tests without necessarily having to internalize the concepts behind the work or creating the confidence needed to work independently. The results thus create an awareness of the necessity of more practice based, and student focus, laboratory activity which allows recurrent exposure, directional experimentation, and gradual handing over of responsibility. The institutions can assist in bridging the gap between procedural competence and actual technical mastery in Electrical Engineering training by restructuring the laboratory training to be more conducive to developing diagnostic capabilities.

Level of Confidence in Handling Electrical Equipment

Table 3. Level of Confidence of the respondents in Handling Electrical Equipment

Confidence Area	**Mean**	**Interpretation**
Operating Equipment	3.01	Moderate
Troubleshooting	2.82	Moderate
Working with Live Circuits	2.76	Low to Moderate
Using Measuring Instruments	3.15	Moderate
Overall Confidence	**2.93**	**Moderate**

The confidence levels of students in five different domains of equipment handling are provided in Table 3 and it is clear that there is a moderate level of confidence (M = 2.93) and the lowest level of confidence is when dealing with live circuits. This observation is consistent with a general rule of thumb in the engineering laboratory research, which is that confidence is plummeting as the perceived risk grows. As Ferrell and Barbera (2021) have proposed, the students feel more comfortable in organized, predictable activities but have reservations when faced with high-voltage work where they have to make decisions independently and have an opportunity to involve safety implications. Just as was found with confidence differences in the TSES model of

faculty, the student in this study has a strong confidence in routine, procedural tasks and poorer performance in tasks that require more independence, technical accuracy and risk evaluation.

These findings point to an essential pedagogical point: the emotional preparedness is closely connected with the technical performance. Lack of confidence frequently results in students being hesitant, shifting the burden onto others, or so dependent on the instructor that they are not exposed to practical work, and thus technical fluency is not built up. Confidence is not merely an affective quality in the EE laboratory settings in which safety, accuracy and independent problem-solving are critical to effective learning. The student were not as eager to experiment, troubleshoot or to dive into the activity when they believe that equipment is hazardous or unpredictable, thus limiting the chances of skill reinforcement. These tendencies indicate that confidence-building strategies, including improved pre-laboratory preparation, guided practice, exposure to simulation, and psychologically safe learning conditions, cannot be left out of the list of methods that help to improve the performance of students and facilitate their transition toward theoretical knowledge and competent and independent laboratory work.

Relationship between Laboratory Anxiety and Skill Acquisition

Table 4. Correlation between Laboratory Anxiety and Skill Acquisition

Variables	**r-value**	**p-value**	**Interpretation**
Anxiety & Skill Acquisition	–0.63	0	Significant, Strong Negative

Table 4 demonstrated that the correlation between laboratory anxiety and skill acquisition is negative (r = -0.63) which means that students with greater amounts of fear and anxiety have a slower and less precise acquisition of technical skills. This implies that anxiety interferes with cognitive and behavioral mechanisms that are required to conduct effective hands-on learning, which results in reticence, less practice, and reduced procedural accuracy. The latest data confirms the interpretation: a 2024 mixed-method study of undergraduate engineering students revealed that emotional stress and fear of making laboratory mistakes had a severe negative impact on the ability of students to complete technical tasks, and the respondents stated that anxiety impaired their concentration, judgment, and readiness to perform complex procedures (Kim and Bae, 2024). These results are very consistent with the outcomes of the current study, and it is possible to state that the emotional impediments, in particular, the fear of equipment or the mistake, may directly affect the ability of students to convert the knowledge into performance.

Kim and Bae (2024) also mentioned that students with high situational anxiety did not need to use exploratory manipulation of devices; instead, they had to observe more and participate less than their counterparts. This has been similar to the current research, wherein fear based avoidance is seen to discourage practice, a source of technical competence. Based on this, the findings emphasize that cognitive knowledge or the quality of instruction also does not determine skill acquisition; instead, it is also determined by the emotional willingness of students to work with equipment-intensive activities. This highlights a central lesson to the education of engineers: the issue of anxiety in the laboratory is not peripheral but an imperative to the creation of accurate, confident and capable technical professionals.

Relationship between Laboratory Anxiety and Confidence

Table 5. Correlation between Laboratory Anxiety and Confidence

Variables	r-value	p-value	Interpretation
Anxiety & Confidence	–0.71	0	Significant, Very Strong Negative

Table 5 is a response to the coefficient of -0.71 in this research, which indicates a very strong negative correlation between laboratory anxiety and the student confidence with the handling of electrical equipment, which is evidence that anxiety significantly compromises confidence. Students who are anxious tends to be less willing

to undertake high-risk activities, they were more afraid of operating equipment, more reliant on the reassurance of the instructor, and are less inclined to volunteer to give a demonstration. This tendency is consistent with the recent empirical results: a 2025 study of the learning experience in undergraduate organic and general chemistry laboratories revealed that the fear of making mistakes and concerns about laboratory hazards had a significant impact on the willingness to engage in practical experiments and that such factors negatively affected the participants in their self-efficacy of such experiments (Pontigon & Talanquer, 2025). Once learners identify laboratory apparatus and processes with possible mistakes or harm, emotional response dominates over their cognitive preparedness resulting in avoidance behavior and reduced preparedness to act despite theoretical proficiency.

In addition, the 2025 research noted that the behaviors of avoiding anxiety through this method directly hinders the process of practicing, experimentation, and gaining procedural confidence in students due to repeated exposure. This confirms the current result that anxiety is an effective affective suppressor of student confidence in engineering labs. It points out that the quality of instructions or knowledge of the content is not the only thing that matters, but it is the emotional preparation of students to handle equipment and risk that make students really perform and master skills. In that sense, it is suggested that enhancing laboratory confidence requires technical instruction as well as providing psychologically safe settings, gradual exposure, and establishing trust - interventions that may be more important than conventional pedagogical ones.

Predictors of Skill Acquisition and Confidence

Table 6. Predictors of Skill Acquisition

Predictor	**Beta**	**p-value**	**Interpretation**
Fear of Electrical Equipment	–0.41	0.001	Significant
Fear of Making Mistakes	–0.22	0.041	Significant
Safety Concerns	–0.19	0.056	Not Significant
Performance Pressure	–0.13	0.11	Not Significant

As indicated in table 6: that skill acquisition is particularly inhibited by fear of electrical equipment and fear of making mistakes - are echoed by current studies on the effect of stressors of an emotional and contextual nature in laboratory settings which impede practical learning. To illustrate, a 2025 study on sensory overload in undergraduate chemistry labs recorded that students tended to feel anxious and uncomfortable around unfamiliar equipment or hazardous material; this affective stress resulted in hesitation, distraction, and avoidance behaviors that impaired their performance in a procedure, and engagement with the experiment (Agustian et al., 2025). These results confirm the idea that in case the actual contact with the laboratory equipment is associated with either fear or safety-related concern, students lose their capacity to apply theoretical knowledge to credible practical skills considerably.

Also, larger studies involving anxiety and performance in STEM students emphasize that affective elements like perceived risk, uncertainty, and fear of error are disproportionately involved in realistic competence and confidence to general academic or test anxiety. As an example, a 20242025 cross-sectional study at a Japanese university found that the level of anxiety of graduate students was negatively connected with their satisfaction with the laboratories and, consequently, with their desire to work on practical assignments - which demonstrates that the environmental and emotional variables play a key role in lab-based disciplines (Zheng & Deng, 2025). These studies, when combined with the laboratory-specific results, support one large generalization about engineering and technical education: mastering the skills is not necessarily conditioned by the knowledge or cognitive preparedness only, but depends critically on the emotional safety, the trust in the equipment manipulation, and the supportive environment promoting the gradual and scaffold training.

Table 7 Predictors of Confidence

Predictor	Beta	p-value	Interpretation
Fear of Electrical Equipment	–0.53	0	Significant
Safety Concerns	–0.28	0.009	Significant
Fear of Making Mistakes	–0.17	0.078	Not Significant
Performance Pressure	–0.10	0.112	Not Significant

Table 7 indicates fear of electrical equipment and fear of doing something wrong are two important impediments to skill acquisition- are in line with new findings that affective obstacles in laboratory conditions can inhibit students in their ability to do practical work. A recent analysis of the issue of sensory overload in undergraduate laboratory spaces revealed that students usually feel anxious, uncomfortable, and hypervigilant when exposed to new or possibly dangerous equipment, which contributes to hesitation, less exploration, and poor performance (Jones et al., 2025). Students in that study complained about sensation triggers which included heat, equipment noise, protective gear, and physical closeness to equipment and lead to avoidance behaviors and inability to focus on procedural tasks. This tendency is similar to the finding of the current study that cognitive preparation fails to deal with the interference of emotion because of perceived risks of harm when learners are exposed to danger or even to the probability of making a mistake.

Moreover, Jones et al. (2025) noted that these emotional stressors constrain the ability of students to respond to laboratory work fully and, thus, prevent the formation of procedural accuracy, troubleshooting competence, and technical fluency. This would be in line with the current study finding that the acquisition of skills in Electrical Engineering laboratories is extremely susceptible to affective pressures, particularly those that are directly connected with handling equipment and risk of errors. Combined, these results suggest a bigger picture of engineering education: technical mastery would need more than just exposure and drilling, it would need the establishment of psychologically safe laboratory environments in which fear is actively suppressed, and safety is prioritized, supported by gradual, guided practice on the part of the learner.

CONCLUSION AND RECOMMENDATION

According to the findings of the given study, the Electrical Engineering students are quite anxious in the laboratory environment, especially in the cases when they face physical threat and when they have to work with electrical devices directly. This emotional pressure causes them to be less ready to explore, experiment and carry out technical tasks on their own. The feelings of anxiety increase and make the students more fearful, suspicious and reliant on the instructions of the instructors and this in the end limits the potential of the students to acquire essential skills. Their self-esteem is also destroyed by the fear of electric shocks, machinery failure, or the fear of doing something wrong, and it is suggested that emotional preparedness is one of the preconditions of technical mastery. The research establishes that laboratory anxiety is an influential predictor of learning performance, and fear of electrical equipment becomes the most important predictor of poor skills acquisition, as well as lack of confidence.

Based on these results, it is important that institutions and educators implement practices that increase emotional and procedural safety in the lab setting. Enhancing orientation in laboratories, provision of guided familiarization and offering low risk practice opportunities using de-energized set ups can assist students to gain comfort before participating in live operations. Faculty members are instrumental since they implement scaffold instruction, match nervous learners with proficient ones, and provide instant and non-punitive feedback to alleviate fear and develop confidence. On the institutional level, modernization of outdated or even dangerous equipment, deployment of trained technicians in the course of high-risk operation, and the enhancement of environmental safety measures can help eliminate fears to a great extent and enhance the perception of laboratory safety by students.

The students also play a significant role in enhancing their performing in laboratories by participating in pre-laboratory preparation, practicing the basic skills of wiring and measurement on a regular basis and also seeking help when they are overwhelmed with anxiety. To considering researchers, more details on the emotional experiences of the students, especially on the qualitative basis, helps to better understand the effect of anxiety on technical performance. Simulation or anxiety-reduction program based comparative studies across disciplines in engineering and comparative studies of interventions could also shed some light. All in all, a combination of academic, institutional, and psychological measures to help alleviate laboratory anxiety can help lead to a significant improvement in the acquisition of skills and confidence of students and their willingness to practice at the professional level of engineering.

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