

# An Analysis of Rectification and Safety Affecting Student Satisfaction: Take Jining University a Case Study

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## ABSTRACT

This study aimed to analyze the impact of safety and rectification factors on students' satisfaction with the university laboratory. The data were collected from 614 samples selected from relevant majors at Jining University through random sampling and questionnaires were sent to the correspondents online. A linear regression model was used for data analysis. The results indicated that both safety and rectification affected students' satisfaction with the university laboratory. The model was consistent with empirical data, and the statistical results were: CRONBACH'S  $\alpha = .881$  (X1)  $.953$  (X2)  $.900$  (Y), Mean (X1) = 4.245, SD = .568, Mean (X2) = 4.434, SD = 0.608, Adjusted R Square = .791, F = 1160.333,  $p = 0.000 < 0.05$ , at the level of .05 statistical significance.

**KEYWORDS:** Laboratory, Safety, Rectification, Jining University.

## Introduction

In recent years, with the reform of applied universities proposed by the country, applied technology undergraduate colleges refer to ordinary undergraduate colleges with applied technology as the educational orientation rather than academic orientation. It is opposite and different from academic undergraduate programs. Applied undergraduate education plays a positive role in adapting to the needs of China's economic and social development, cultivating high-level applied talents, and promoting the popularization of higher education in China. Some universities actively respond to the country's call to transform into applied universities. The experimental training room is an important teaching tool in applied universities, playing an increasingly important role in teaching.

In the actual use process, we found that the efficiency of laboratory use and the

enthusiasm of students are influenced by student satisfaction. If students have a high level of satisfaction with the laboratory, they are often proactive and proactive in using it. If students have a low level of satisfaction with the laboratory, they are often passive and passive in using it. Therefore, in response to the above issues, this article intends to adopt a quantitative research method to study and explore the impact of laboratory safety factors and rectification factors on student satisfaction.

It is hoped that this study can analyze and demonstrate the above problems and provide solutions. Although the laboratory is the standard teaching configuration and practical training place of colleges and universities, the school has many years of laboratory management experience, but with the progress of The times and economic development, the existing management mode

can no longer meet the learning and scientific research needs of college teachers and students. Through this study, the effective solution to improve the utilization rate of the laboratory is explored, and the rational use and availability of the laboratory are promoted. At the same time, it has played a role in promoting laboratory safety. It is hoped that this study can promote the development of laboratory fine management. Promote the transformation of university laboratories to the direction of refinement and standardization, and scientifically and effectively improve the level of scientific research and students' practical ability.

### **Research Objectives**

1. To study the influence of university laboratory rectification factor on students' satisfaction.

2. To study the influence of university laboratory safety factor on students' satisfaction.

3. To compare the influence factors of rectification and safety on students' satisfaction of university laboratory.

### **Literature Review and Concept**

Universities undertake both educational work and scientific research tasks. Laboratory is an important part of teaching activities and scientific research. To some extent, its management level reflects the comprehensive quality of the overall teaching level, scientific research level and management level of colleges and universities, which directly affects the quality level of experimental teaching and scientific research speed, and is an important guarantee for the smooth development of experimental teaching. (Liang, 2022) In June 2019, the Ministry of Education issued the Opinions on Strengthening Laboratory Safety Work in Universities, emphasizing the importance of laboratory safety management and pointing out that the construction of safe chemistry laboratories is imminent. (Qiao, 2022)

Laboratory safety is the promotion and improvement of teaching and research work

in higher education institutions. The basic guarantee for students' growth and success is related to the development of the school's career and the development of teachers and students. The safety of employees' lives and property requires the establishment of a concept of safe development. Carrying forward the idea of putting life first and safety first is a new era of higher education. The starting point and basic point of school laboratory safety work. (Guo, 2020)

The development of modern science and technology shows that most inventions that have a significant impact on economic construction come from laboratories, and the more modern science and technology rely on scientific experiments to develop (Zhang, 1984). Laboratory construction is the basic work of running a good university and training talents. Laboratory has its unique role in education, not only to teach people with knowledge and technology, to cultivate students' practical ability, analytical ability and problem-solving ability, but also to influence students' world view, way of thinking and style. Many classic teaching experiments are actually simplified simulations of some of the greatest discoveries in the history of science and technology. These findings objectively reflect the dialectical materialist way of thinking, the style of seeking truth from facts and the rigorous scientific habit. (Zhu, 1992).

A comprehensive inspection of the laboratory and the removal of unwanted things in the laboratory is the basis of the "5S" activity. Classify the "needed" and "unnecessary" items, investigate the frequency of use of the needed items, determine the daily amount and storage place, put the items with high use rate in the place where it is convenient to pick up, and put the items with low use frequency near the use place. (Yin, 2020)

Every tool, chemical reagent and experimental equipment should be in a reasonable position, so that students can use more convenient, tools are not easy to lose, but also more safe, and the rectification is not

only a simple placement, but also the use of modern information statistics, statistics and tracking of the use of experimental equipment and consumables. In this way, the missing supplies can be replenished in time, and the abnormal use of equipment can be warned.

Through fine management and reasonable grading system, the existing problems can be solved to a certain extent. Digitization and information technology are also important. The establishment of laboratory management information system centralized the management of laboratory teachers, students, laboratory technicians and laboratory instruments and equipment into the system platform. The purpose is to realize the modernization and systematization of laboratory management and operation, to provide efficient, multi-level and all-round services for experimental teaching, and to provide data support for the formulation of laboratory management decisions. (Liu, 2017)

The use of 5s tools for laboratory management can meet students' actual needs for laboratory use and strengthen management level. 5s does not need to invest too much management costs, and plays a great role in management quality and efficiency. (Xu, 2022)

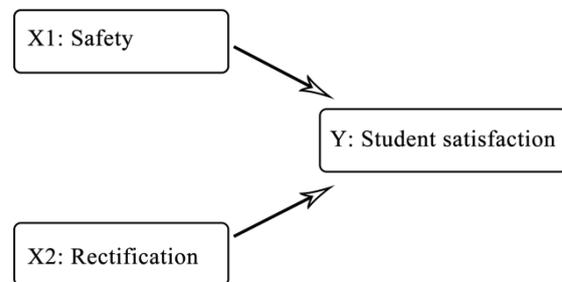
**SEITON** - The necessary items left behind are placed in a prescribed place and placed neatly and marked. Purpose: The workplace is clear, eliminates the time to find items, a neat work environment, eliminates excessive inventory.

**SECURITY** - Attaches importance to the safety education of members, and has the safety first concept at all times to prevent it from happening. Objective: To establish and maintain a safe production environment, all work should be established under the premise of safety. (baidu encyclopedia 2023-8-8. <https://baike.baidu.com/item/6S/779245>).

Laboratory consolidation and safety are also the basis for open laboratories. A good open laboratory can greatly improve the overall scientific research ability of the

school, stimulate students' interest in scientific research, and improve students' innovative ability.

### Conceptual Framework



*Figure-1. A conceptual framework for this research.*

### Research Methodology

Considering that this study takes Jining University as an example, it is convenient to organize and collect data, and has the conditions for quantitative research. Therefore, this study adopts quantitative method to conduct research, and the data comes from the online questionnaire survey of relevant students in Jining University.

### Population and Sample

The total number of students in Jining University's relevant courses is about 6,000. The sample design is 10% of the total number of students, and 600 samples are randomly selected from the students. Sampling method adopts simple random sampling method to conduct probability sampling of students. Considering the large population, sample collection is difficult, so a 5% error is allowed on the basis of 10% sample collection, that is, 570 samples. In the end, we collected and used 614 samples, and when considering that this study was based on a larger population, more samples are obviously more beneficial for subsequent studies.

### Instruments

Send questionnaires to students using online questionnaires.

Expert review: After questionnaire and interview design is completed, school experts, laboratory management leaders and specific managers are invited to review the questionnaire questions, and propose a revised questionnaire design plan from a professional perspective to improve the effectiveness and professionalism of the questionnaire to the greatest extent. At the same time, the responsible leaders and specific managers are asked to put forward suggestions from the practical management perspective to improve the multi-angle and comprehensive questionnaire design.

Focus group: After expert review, a focus group is convened to make final improvements to the questionnaire. Find out the loopholes in the questionnaire by brainstorming. All participants played different roles and made suggestions on the questionnaire.

Field pre- test/ Pilot: After questionnaire design is completed, a small number of samples are randomly selected from the original population for testing. After the test is completed, the samples that participated in the test are not included in the formally sampled population. Through the test, we can verify the validity of the questionnaire design in this study. The questionnaire design can then be finalized and used as a formal data collection tool to participate in follow-up studies.

The questionnaire is designed with 28 single-choice questions, among which questions 1-3 are basic information, questions 4-12 are independent variables, questions 13-22 are independent variables, and questions 23-28 are dependent variables.

The questionnaire used Likert five scale to scaling responses in survey research,

it typically has five scale point descriptors as: “strongly disagree”, “disagree”, “neutral”, “agree”, “Strongly agree”. The questionnaire codes the responses accordingly: Strongly disagree = 1, disagree = 2, neutral = 3, agree = 4, strongly agree = 5.

### **Data Analysis**

All statistical data were completed by spss statistical software for survey data input, sorting and statistical analysis. A quantitative method was used to analyze the questionnaire results of student samples. Using multiple regression analysis to analyze the data, you can calculate the influence of the derived variable on the dependent variable and use it as the data for research.

### **Results**

#### **The basic information of the sample**

This chapter presents the results of the data collected from the case study sample. The study collected valid online data from 614 students from Jining University in Shandong Province. These data are shown in the figure below.

#### **Reliability analysis**

For Cronbach's  $\alpha$  coefficient, if the Cronbach  $\alpha$  coefficient (or half coefficient) is above 0.9, the reliability of the test or scale is very good, between 0.8-0.9 indicating good reliability.

In this study, the Alpha value of Safety Factors was 0.881, indicating that the Safety Factors factor reliability in the questionnaire is good, and the Rectification factor and Satisfaction degree reliability above 0.9 indicate that the reliability is very reliable.

**Table 1. Reliability Statistics**

variable	number of items	Cronbach's Alpha
Safety Factors	9	0.881
Rectification factor	10	0.953
Satisfaction degree	6	0.900

**Mean and Standard Deviation**

Table 2 provides statistics on laboratory satisfaction. In the survey of laboratory satisfaction with safety and rectification factors, the mean and standard deviation were the highest (Mean = 4.43, SD = 1.073). According to the total data analysis of Safety Factors (Mean = 4.245, SD = 0.568), the influence of the total respondents was huge, indicating that the impact of the independent variable Safety Factors on satisfaction was very strong.

Table 3 provides statistics on laboratory satisfaction. In the survey of laboratory satisfaction with safety and rectification factors, the mean and standard deviation were the highest (Mean = 4.51, SD = 0.982). According to the total data analysis of Safety Factors (Mean = 4.434, SD = 0.608), the influence of the total respondents is huge, indicating that the impact of Safety Factors on satisfaction is very strong.

**Table 2. Report on Mean and SD of Safety Factors**

	Indicative Statements	Mean	Std. Deviation	Verbal Interpretation
1	Do you think the laboratory is a place with relatively high safety risks?	3.68	1.073	Highly importance
2	.Do you think the laboratory layout is reasonable and safety signs are clear?	4.4	0.677	Very Highly importance
3	Do you think the safety measures in the laboratory you use are sufficient?	4.43	0.652	Very Highly importance
4	Do you rarely worry about safety issues in the laboratory?	4.15	0.885	Very Highly importance
5	Have you received any laboratory safety training, and if so, do you feel that this safety training	4.31	0.748	Very Highly importance
6	You will review the standard operation before using the laboratory.	4.37	0.703	Very Highly importance
7	I think the safety of the lab can be guaranteed.	4.37	0.678	Very Highly importance
8	You feel that the safety of the laboratory has a certain impact on your study and experimental work.	4.09	0.946	Very Highly importance
9	You are satisfied with the safety of the laboratory.	4.41	0.669	Very Highly importance
	Total	4.245	0.568	

**Table 3. Report on Mean and SD of Rectification factor**

	Indicative Statements	Mean	Std. Deviation	Verbal Interpretation
1	You are satisfied with the cleanliness of the laboratory now.	4.39	0.693	Very Highly importance
2	You feel comfortable with the access and use of laboratory tools and experimental equipment.	4.36	0.728	Very Highly importance
3	Will you put the used equipment back in its original place?	4.51	0.614	Very Highly importance
4	The laboratory you are working in is often overhauled.	4.26	0.779	Very Highly importance
5	After the rectification, do you feel that the environment and equipment of the laboratory have been improved?	4.39	0.671	Very Highly importance
6	You believe that the current equipment management methods meet the needs of learning.	4.4	0.677	Very Highly importance
7	You have never experienced that the progress of learning was affected by the delay of equipment deployment.	4.05	0.982	Very Highly importance
8	I think the construction of the laboratory meets my study needs.	4.37	0.684	Very Highly importance
9	I think the laboratory environment can help me concentrate more.	4.38	0.672	Very Highly importance
10	I think the position of the experimental tools is reasonable and easy to access.	4.36	0.702	Very Highly importance
	Total	4.434	0.608	

**Result analysis**

As can be seen from Table 4, a linear regression analysis was performed with safety and rectification factors as the independent variables and satisfaction as the dependent variable. From Table 4.5, we can see that the r-square value of the model is 0.792, which means that the independent variable 1, independent variable 2 versus dependent variable change by 79%.

As can also be seen from the above table, when the F test is performed, the model

has passed the F test ( $F=1160.333$ ,  $p=0.000 < 0.05$ ), which means that the construction of the model will be meaningful.

Further analysis of the coefficient matrix found that these two independent variables had significant effects on satisfaction, with Rectification factor having the largest effect, followed by Safety Factors. The formula of the analysis is: Satisfaction degree =  $0.416 + 0.21$  (Safety Factors) +  $0.695$  (Rectification factor)

**Table 4. Regression analysis table**

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.890a	0.792	0.791	0.27223

**Table 5. ANOVA<sup>a</sup>**

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	171.986	2	85.993	1160.333	.000 <sup>b</sup>
	Residual	45.282	611	0.074		
	Total	217.268	613			

**Table 6. Coefficients**

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	0.416	0.084		4.949	.000
	Safety Factors	0.21	0.039	0.2	5.359	.000
	Rectification factor	0.695	0.037	0.71	19.018	.000

**Problem Solving Outcomes**

Whether it is safety or rectification, it affects students' satisfaction with the laboratory. Safety is the basic guarantee of laboratory operation, if there is a security problem, then the subsequent rectification and management will be meaningless. Rectification can make the operation of the laboratory more efficient and is an effective way to improve student satisfaction. This study will be used in university laboratory management, including construction to provide certain help, in order to improve students' satisfaction with the laboratory and laboratory management ability, and play a positive role in promoting the development of the school.

**Conclusion and Discussion**

Taking rectification and safety analysis as the theme, this paper mainly discusses the problems affecting the

satisfaction of university laboratories, analyzes the impact of safety factors and rectification factors on the utilization rate of laboratories, and finds that safety factors and rectification factors can affect students' satisfaction with laboratories. This topic is suitable for the practical needs of colleges and universities, and has theoretical and practical significance. The research design is reasonable, the research method is scientific, and the research results are reliable. This paper was completed successfully within the specified time and achieved the expected purpose.

Through data collection and result analysis, it can be found that students' satisfaction with laboratories in Jining College is affected by safety factors and rectification factors, which is consistent with the hypothesis of this study. Reliability results show that the reliability score is

above 0.9, indicating that the questionnaire has excellent credibility and accurate results, which can be used as data support for this study.

Safety factor Mean = 4.41, rectification factor Mean = 4.434, the results show that safety factor and rectification factor have a strong impact on students' satisfaction, and rectification factor has a greater impact. This conclusion can also be drawn from the last question of the questionnaire.

Rectification is not only an effective way for laboratory staff to improve the efficiency of laboratory users, but also a management method that is easy to implement, easy to quantify and easy to form a system. Through effective rectification, students' satisfaction with the laboratory can be improved, which has positive significance for university teaching and scientific research. It provides data and support for the construction and follow-up management of university laboratories, and plays a certain role in promoting the development of universities, which is also the significance of this study.

According to the regression analysis, rectification factors have a greater impact, while safety factors have a smaller impact, but this does not mean that safety factors are not important in laboratory management, but because the construction and management of laboratories in colleges and universities have always put safety in a very important position, safety factors are the first factor to be considered, and also an important link in laboratory management. Therefore, the laboratory brings a safe and reliable feeling to the people who use the laboratory, which is a natural trust of the users of the school, and is also the result of many years of efforts of the laboratory staff.

Compared with safety factors, rectification factors have a greater impact on laboratory satisfaction. According to the research of Maslow's demand theory, when people meet the safety needs, they will pursue higher needs. A convenient, clean and orderly environment has a positive effect on users, and will naturally improve users' satisfaction with the laboratory. "Rectification" can classify and place items, put them neatly, and make relevant marks, which can shorten the time of searching for items and improve the working environment (Cheng, 2022). Compared with the results of the research on the effect and satisfaction of 6S lean management applied to university medical laboratory management (Cheng, 2022), this result has a certain consistency. In addition, whether the laboratory is clean, whether the items are placed neatly, and whether the tools are convenient to take are intuitive and easy to be felt. Because of this, the results of this questionnaire are biased towards the rectification factor.

### **Deficiencies and outlook**

In this study, we collected sample data through questionnaire survey, and used qualitative analysis to summarize and analyze the data, and obtained experimental results that were highly consistent with the expected results. To some extent, it solves the problems related to laboratory satisfaction. There are also some limitations in this study, which did not cover all the students who used the laboratory during the sampling. The main reason for this is that some students did not use the laboratory too much and were too scattered. Therefore, the overall sampling selected students with high frequency of using the laboratory,

instead of expanding to all students. While this facilitates easy sampling and accuracy of results, non-lab students may also have a need to use the lab. Secondly, stratified sampling and probability sampling are used according to majors and grades when selecting samples. However, some students did not have the opportunity to use the laboratory for a long time due to the impact of enrollment time and the epidemic when filling out the questionnaire. They are not very clear about the requirements and questions about the use of the laboratory, so the results of these students may not be objective, and two problems may arise in the survey of our school. First, the degree of students' recognition of the school will affect the accuracy of the questionnaire survey; Second, students knew that the questionnaire was issued by the teachers of our school, and there might be favorable answers when filling in the questionnaire. In order to reduce the impact of these questions on the accuracy of the questionnaire results, many arguments and tests were conducted during the questionnaire design stage to minimize these impacts as much as possible. In the following research, we can further optimize the above problems. For example, we can

set up an overall sample for all students. When designing the questionnaire, we can add the option of long-term use of the laboratory. In this way, students with non-related majors and students with low usage time can add a scale coefficient of 0.3-0.5 to the results to ensure that the overall scope of the sample can cover the whole school, and also improve the validity of the results.

This study takes Jining University as an example. During the research process, many research problems are common in colleges and universities, and some problems are unique to Jining University. Therefore, the research results can only accurately reflect the actual situation of Jining College. In the future, it is suggested to expand the scope of sample selection, not limited to Jining University. The sample can be selected from students to schools as a whole. For example, the research results of Jining University can be used as a sample group to participate in the next research. In this way, we can find more common problems and research solutions in university laboratories, and we can also find more common problems between schools, so the research results will be more universal and applicable.

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