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Behavior-Based Safety *Analysis* with Unsafe Action and Unsafe Condition *in Cadets at The General Workshop of Medan Aviation Polytechnic*

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ABSTRACT
This study aims to analyze the implementation of Behavior Safety (BBS) and identify factors related to Unsafe Actions and Unsafe Conditions in cadets at the General Workshop of Medan Aviation Polytechnic. The research method used was survey and observation, involving the active participation of cadets as respondents. Data were collected through questionnaires and direct observation of behaviors and conditions that could pose risks in the work environment. The results of the analysis showed that the implementation of BBS had a positive impact in increasing cadets' awareness and compliance with safety procedures. However, the findings also identified a high number of Unsafe Actions, such as inappropriate use of personal protective equipment or negligence in following safety procedures. In addition, Unsafe Conditions were also detected in several areas, such as unsuitability of work equipment and lack of preventive maintenance. This research provides in-depth insight into the factors causing Unsafe Actions and Unsafe Conditions so that concrete corrective measures can be taken to improve safety at the General Workshop of Medan Aviation Polytechnic. The implication of this research is expected to contribute to the development of a more effective security policy and improved work safety for cadets in carrying out activities in the workshop environment.

1. Introduction

One important factor that needs to be considered by the campus to ensure the welfare of cadets in the laboratory, especially the General Workshop, is occupational safety and health (K3) (Septianadi et al., 2021). The threat to the welfare of cadets will have an impact on occupational accidents and occupational diseases that not only harm cadets but also harm the campus both directly and indirectly. Referring to data from the Social Security Administration Agency (BPJS), in 2015 work accidents 110,285 cases, there was a spike in 2017 of 123,040 cases of work accidents, and in 2019 it reached 182,835 cases of work accidents (data.goodstats.id) during the pandemic, the number of

work accidents from 2020 to 2022 increased by around 200 thousand cases, of which 221,740 cases were work accidents, in 2021 there were 234,270 cases and in 2022 it reached 265,334 cases (gennaker, 2022). The increasing cases of work accidents show that the implementation of occupational safety and security in the workplace is still very small (Dwiyanti & Irlianti, 2014).

Occupational safety and health (K3) is an aspect of labor protection. One of the efforts to prevent accidents by implementing Behavior Based Safety (BBS). Behavior-Based Safety (BBS) is a proactive focus on Risk Behavior or dangerous behavior that has the opportunity to cause accidents. Many studies show that employee behavior patterns are exposed to dangerous conditions where the main aspects that affect human behavior are attitude, perception, and motivation (K3LH Guidelines, 2017). According to Rahman & Dwiyanti (2020), in construction workers, most construction workers have good knowledge 90%, and good awareness 90%, all workers have good motivation, and 100% of safety needs are met, 18 workers stated that there are Occupational Health Safety (K3) regulations that apply to the company with 90%, and workers stated that they had received rewards/praise and punishments of 95%. The results also show that most construction workers are already implementing safe behaviors in the workplace.

Deirdre Mckeon, 2007, in her research, found that organizations have a strong ability to influence their workforce behavior, management commitment, having a strong safety culture, and good oversight were identified as major influencing factors. Contrary to the previous, the Safety Representative role study found the least influential factor. Worker behavior is known to be the largest contributor to accident causes in participating organizations and is considered to have a large input record of construction sector accidents. Research by Irawati & Karyatibrata, (2019) with the implementation of the BBS program in transportation companies, the number of accidents, especially unsafe actions, has decreased. In contrast to the research of Ayuni et al., (2022) where at PT. X in the implementation of the Behavior Based Safety (BBS) program to reduce work accidents due to unsafe actions, effective even though the maturity level of the BBS application is still not at the criteria of high-performance levels on all criteria, and there is still no significant change in reducing the number of work accidents (Irkas et al., 2020); (Kairupan et al., 2019).

Education that encourages accident prevention efforts with the application of behavior-based safety can be obtained in college or school. UUPT No.12 of 2012 states that polytechnics are universities that provide vocational education with various clusters of technology and science (Tjendera, 2018). Awareness of cadets doing behavior-based safety must be equipped from the beginning so that in entering the world of work and even while working can adjust to the work environment. In learning and practice in the laboratory, cadets must carry out K3 procedures correctly so that when they become skilled workers they also carry out behavior-based safety. Medan Aviation Polytechnic cadets in the curriculum do not contain occupational safety and health (K3) subjects, subjects that contain safety are contained in learning safety management systems and Human Factors. Research by (Widhiarni & Lukmandono, 2017), K3 knowledge has a positive influence on K3 behavior (Hidayat & Wahyuni, 2016).

The implementation of learning during practice and simulation at the General Workshop (GWS) must meet occupational safety and health procedures, especially efforts to prevent work accidents. In general, there are 2 (two) causes of accidents, namely unsafe action (human factors) and unsafe conditions (environmental factors). According to research, 80-85% of accidents are caused by unsafe actions (Anizar, 2009); (Poetra, 2021). The implementation of learning in the General Workshop

(GWS) is inseparable from the use of tools and materials that contain high risks such as drills, pliers, saws, grinders, oil, and so on, which can cause work accidents such as scratches, cuts, trips, slips and so on as well as the arrangement of material equipment that is not neat (Irzal, 2016).

Heinrich's theory states that 88% of accidents are caused by unsafe actions, 10% are caused by unsafe conditions, and 2% are unavoidable. With this data, it can be seen that unsafe behavior or actions are actions that can endanger the workers themselves and others and can cause work accidents. The implementation of Based Behavior Safety (BBS) is very important at GWS to avoid unsafe behavior from these cadets so that work accidents at GWS do not occur. Xiongjum and Kaiqan, 2012, in Agustina et al., (2016) said BBS is the most suitable approach method for unsafe behavior with consideration to improve safety management and prevent accidents. A behavioral-based approach to industrial safety management has been advocated by many authors and has proven effective in improving safety performance in various industrial environments and on different continents (Jasiulewicz-Kaczmarek et al., 2015).

Unsafe action (additional to previous research) (conditions in the field) (BBS able to minimize accidents with management) that occur in the General Workshop such as chatting/joking with colleagues while working/operating machines, not having work procedures, and unsafe conditions including visual control is a form of application of 5R Steps 1 and 2, namely "Neat and Concise". This step is carried out by arranging/sorting equipment/goods based on the flow of work processes and also arranging/sorting equipment/goods based on the frequency of use and visual arrangement/control (management) of equipment/goods in the workplace with labels/signs with the purpose/purpose of goods or equipment more quickly and easily found to achieve order in the workplace. This is the background of the implementation of research analyzing behavior-based safety by looking at unsafe action and unsafe conditions in the general workshop at the Medan Aviation Polytechnic cadets".

2. Materials and Methods

This type of research is descriptive research through survey methods to describe the conditions of the General Workshop laboratory. Research samples are cadets doing practical work in the General Workshop laboratory by taking samples from the entire population. Data was collected using interviews with cadets and visits to the General Workshop laboratory to see the unsafe actions and unsafe conditions of cadets in the General Workshop laboratory (Sugiyono, 2013).

3. Results and Discussions

Characteristics of Respondents

Based on the results of the study, the characteristics of respondents are presented in the frequency distribution table and narrated according to the table below:

Table 1. Distribution of Characteristics of Medan Aviation Polytechnic Respondents

No	Characteristics of Respondents	Frequency	Percentage (%)
	Age		
1	< 20 years old	67	69,8
2	> 21 years old	29	30,2
	Gender		
1	Man	63	65,6
2	Woman	33	34,4
	Chorus		

No	Characteristics of Respondents	Frequency	Percentage (%)
1	THU	18	18,8
2	TLB	51	53,1
3	TPPU	27	28,1
	Force		
1	III	23	24,0
2	XX	27	28,1
3	XXI	46	47,0
	Sum	**96**	**100**

Source: Primary Research Data in 2023

Based on Table 1 The above shows that the frequency distribution of characteristics of respondents who have the age category of the majority of respondents has a < of 20 years as many as 67 people (69.8%) and minorities have an age of > 21 years as many as 29 years (30.2%). In gender characteristics, the majority of male respondents were 63 people (65.6%) and women as many as 33 people (34.4%). In the characteristics of hours, the majority of TNU respondents were 18 people (18.8%), TLB respondents were 51 people (53.1%) and TPPU respondents were 27 people (28.1%). In the characteristics of the third batch of respondents as many as 23 people (24.0%), respondents of batch XX as many as 27 people (28.1%), and respondents of batch XXI as many as 46 people (47.0%).

Univariate Analysis

Univariate analysis aims to explain or describe the characteristics of each variable studied. Data analysis is carried out to determine the frequency distribution and presentation of each variable to be studied.

Unsafe Action

The distribution of respondents according to Unsafe Action in this study can be seen in the following table:

Table 2 Distribution of Respondents According to Unsafe Action in the Gws Laboratory at the Medan Aviation Polytechnic Cadets

Unsafe Action	Frequency (n)	Percentage (%)
Tall	71	74,0
Low	25	26,0
Total	**96**	**100**

Sumber : Output SPSS Data Primer, 2023

Based on Table 2 above, shows that the frequency distribution of 96 respondents, stated the Unsafe Action variable in the High category as many as 71 respondents (74.0%), and in the Low category as many as 25 respondents (26.0%).

Unsafe Condition

The distribution of respondents according to Unsafe Conditions in this study can be seen in the following table:

Table 3. Distribution of Respondents According to Unsafe Conditions in GWS Laboratory at Medan Aviation Polytechnic Cadets

Unsafe Condition	Frequency (n)	Percentage (%)
Tall	76	79,2
Low	20	20,8
Total	**96**	**100**

Sumber : Output SPSS Data Primer, 2023

Based on Table 3 above, shows that the frequency distribution of 96 respondents, stated the Unsafe Condition variable in the High category as many as 76 people (79.2%), and the Low category as many as 20 people (20.8%).

Behavior Base Safety

The distribution of respondents according to Behavior Base Safety in this study can be seen in the following table:

Table 4. Distribution of Respondents According to Behavior Base Safety in Gws Laboratory at Medan Aviation Polytechnic Cadets

Behavior Base Safety	Frequency (n)	Percentage (%)
Ever	70	72,9
Never	26	27,1
Total	**96**	**100**

Source: Output SPSS Data Primer, 2023

Based on Table 4 above, shows that the frequency distribution of 96 respondents, stated the variable Behavior Base Safety category Penah as many as 70 respondents (72.9%), and the category never as many as 26 respondents (27.1%).

Bivariate Analysis

The Relationship of Unsafe Action Variables to Behavior Base Safety in the GWS Laboratory at Medan Aviation Polytechnic Cadets

The relationship of the Unsafe Action variable to Behavior Base Safety can be seen in the following table:

Table 5. Cross-Tabulation of Unsafe Action on Behavior Base Safety in Gws Laboratory at Medan Aviation Polytechnic Cadets

Unsafe Action	*Behavior Base Safety*						*P Value*
	Ever		Never		Sum		
	F	%	F	%	F	%	
Tall	46	47,9	25	26,0	71	74,0	0,006
Low	24	25,0	1	1,0	25	26,0	
Total	**70**	**72,9**	**26**	**27,1**	**96**	**100**	

Source: Primary Research Data in 2023

Based on table 5. above, shows that out of 96 respondents to the Unsafe Action variable with the "High" category, 71 respondents (74.0%) obtained Behavior Base Safety stating "Never" as many as 46 respondents (47.9%), and stating "Never" as many as 25 respondents (26.0%), while the Unsafe Action variable in the "Low" category as many as 25 respondents (26.0%) obtained by Behavior Base Safety stating "Never" as many as 24 respondents (25.0%) and stating "Never" as many as 1 respondents (1.0%)"

From the results of statistical tests using chi-square continuity correction, there is a significant relationship with a p-value of 0.006<0.05. This shows that there is a relationship between the Unsafe Action variable and the Behavior Base Safety variable in the Gws Laboratory at the Medan Aviation Polytechnic cadets

The Relationship of Unsafe Condition Variables to Behavior Base Safety in the GWS Laboratory at Medan Aviation Polytechnic Cadets

The relationship of the Unsafe Condition variable to Behavior Base Safety can be seen in the following table:

Table 6. Cross-tabulation of Unsafe Condition on Behavior Base Safety in Gws Laboratory at Medan Aviation Polytechnic Cadets

Unsafe Condition	*Behavior Base Safety*						*P Value*
	Ever		Never		Sum		
	F	%	F	%	F	%	
Tall	61	63,5	15	15,6	76	79,2	0,004
Low	9	9,4	11	11,5	20	20,8	
Total	**70**	**72,9**	**26**	**27,1**	**96**	**100**	

Source: Primary Research Data in 2023

Based on table 6 above, shows that out of 96 respondents in the Unsafe Condition variable with the "High" category, 76 respondents (79.2%) obtained Behavior Base Safety stating "Ever" as many as 61 respondents (63.5%), and stating "Never" as many as 15 respondents (15.6%), while the Unsafe Condition variable in the "Low" category as many as 20 respondents (20.8%) obtained Behavior Base Safety stated "Ever" as many as 9 respondents (9.4%) and who stated "No Ever" as many as 11respondents (11.5%)"

From the results of statistical tests using chi-square continuity correction, there is a significant relationship with a p-value of 0.004<0.05. This shows that there is a relationship between the Unsafe Condition variable and the Behavior Base Safety variable in the Gws Laboratory at the Medan Aviation Polytechnic Cadets.

Discussion

The Relationship of *Unsafe Action* Variables to *Behavior Base Safety* in the GWS Laboratory at Medan Aviation Polytechnic Cadets

From the results of statistical tests using *chi-square continuity correction,* there is a significant relationship with a *p-value* of 0.006<0.05. This shows that there is a relationship between *the Unsafe Action* variable and the *Behavior Base Safety variable* in the Gws Laboratory at the Medan Aviation Polytechnic Cadets (Ha accepted and H_0 rejected).

This research is in line with research conducted by Juniarsih, et al in 2023 entitled "Analysis of *Unsafe Action* and *Unsafe Condition* with Work Accidents on Bira-Pamatata Crossing Crews" The results showed that there was a significant relationship between *Unsafe action* and work accidents with value (p = 0.013 < 0.05).

This research is in line with research conducted by Felly Aprilia Kairupan, et al with the title "The Relationship Between *Unsafe* Action and *Unsafe Condition* with Work Accidents in Online Ojek and Base Ojek Drivers in Manado City" The results of the test show that the p-value obtained is 0.006 (α < 0.05), so it can be concluded that there is a significant relationship between unsafe action and work accidents in drivers Online motorcycle taxi and ojek base in Manado city.

An unsafe Act or unsafe action is a failure (*human failure*) in following the correct work requirements and procedures that cause injury (Priyohadi & Achmadiansyah, 2021); (ISMAWATI, 2021). According to Terok et al., (2020) says that 80% of work accidents are caused by unsafe action. Humans as a factor causing accidents are often called "human error". Based on the results of research, humans most often do things or have behaviors that bring accidents. Sometimes unwittingly humans act carelessly, and indifferently, and make mistakes, which are usually caused by there being no compatibility between humans and machines/environments, lack of knowledge or experience, physical and mental inadequacy, and lack of motivation and awareness.

The Relationship of *Unsafe Condition* Variables to *Behavior Base Safety* in the GWS Laboratory at Medan Aviation Polytechnic Cadets

From the results of statistical tests using *chi-square continuity correction,* there is a significant relationship with a *p-value* of 0.004<0.05. This shows that there is a relationship between the *Unsafe Condition* variable and the *Behavior Base Safety variable* in the Gws Laboratory at the Medan Aviation Polytechnic Cadets (Ha accepted and Ho rejected).

This research is in line with research conducted by Felly Aprilia Kairupan, et al with the title "The Relationship Between Unsafe Action and Unsafe Condition with Work Accidents in Online Ojek Riders and Base Ojek in Manado City" The results showed the relationship between Unsafe Condition and Work Accidents The test results showed that the value obtained was 0.022 (α < 0.05), so it can be concluded that there is a meaningful relationship between unsafe conditions (unsafe conditions/situations) found by respondents while working with work accidents.

The same is the case with Qisthiyah Qoimatul's research entitled The Relationship between Unsafe Action and Unsafe Conditions with Accidents in Loading and Unloading Workers at PT X Surabaya in 2017. From the results of statistical tests, it is known that there is a relationship between unsafe conditions and work accidents, p-value of 0.00 (p = 0.00< 0.05).

According to Ningsih, (2018), the percentage of causes of work accidents, namely 3% due to unavoidable causes (such as natural disasters), 24% due to the environment or equipment that does not meet the requirements, and 73% due to unsafe behavior. The work environment if it does not meet the requirements can affect occupational health which can result in work accidents. Work environment factors include noise, lighting, humidity, air temperature, employee needs, and

environmental cleanliness. *Unsafe Condition* or unsafe condition is the condition of an unfavorable working environment or hazardous working equipment condition (OSHA).

4. Conclusion

Based on the results of the research obtained in the study, it can be concluded that there is a relationship between the Unsafe Action variable and the Behavior Base Safety variable in the GWS Laboratory at the Medan Aviation Polytechnic Cadets with a value of sig-p = 0.006 (< 0.05). There is a relationship between the Unsafe Condition variable and the Behavior Base Safety variable in the Gws Laboratory at the Medan Aviation Polytechnic Cadets with a value of sig-p = 0.004 (< 0.05). In the curriculum, there is no learning about K3, and internal policies and SOPs for implementing practice in the laboratory are not yet available.

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