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Identifying the level of Motivation, Personality Traits and Environment that Influences Students' Creativity in the Creation of Functional Project for the Subject of Design and Technology

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Abstract: Project implementation is the making of a functional product consisting of mock-ups, partial functional models, and prototype functional products. Therefore, the making of this functional product requires the creativity of the students to produce more innovative ideas in accordance with the product to be presented. Hence, in the production of this functional product each individual creativity has different potential. Therefore, this study was conducted to identify the level of motivation, personality and environment that influence students' creativity in the production of functional products for the subject of Design and Technology (RBT). The study design was quantitative by using the questionnaire method. The research instrument consists of 4 sections and each section consists of several different items namely demographics (4 items), motivation (8 question items), personality (44 question items) and environment (8 question items). A total of 175 form 3 students of SMK Desa Kencana, Lahad Datu was selected as the study sample. Study data was analyzed using descriptive and correlation analysis to find out the relationship between creativity and personality traits. The findings of the study found that the independent variables of motivation level (M = 4.2843, SD = .58299) and environment (M = 4.3293, SD = .75517) can affect students' creativity. Meanwhile, for personality, the mean and deviation values are based on five personality traits, namely openness to experience (M = 3.6469, SD = .41864), conscientiousness (M = 3.6724, SD = .58604), extraversion (M = 3.4921, SD = .57566), agreeableness (M = 3.7073, SD = .42491), and neuroticism (M = 2.7700, SD = .6286). Besides, the results of the analysis of the correlation of creativity with personality significance traits found that there is a positive and negative relationship with levels of 0.01 and 0.05. Personality traits, openness to experience (r = .945, P = .000), conscientiousness (r = .372, P = .000), extraversion (r = .512, P = .000), agreeableness (r = .435, P = .000), had a positive relationship whereas neuroticism trait (r =-. 184, P = .0.15) had a negative relationship. In sum, an individual's creativity in the creation of a functional product can be influenced by their level of motivation, environment, and personality. With the help of the findings, it is hoped that subsequent researchers will be able to determine how much motivation, personality, and environment influence students' creative thinking.

Keywords: Creativity, motivation, personality big five, environment

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1. Introduction

Design and Technology (RBT) is a subject that emphasizes the design process, application of knowledge, and process skills using design project-based curriculum forms (Azmi et al., 2017)**.** Given that it is the first stage in developing a creative mind necessary to produce competitive human capital, creative thinking is a crucial factor that must be implemented in 21st-century learning. RBT courses demand that students create product designs and integrate technology into their study ideas. Student-centered learning and project-based learning are innovations that have been incorporated into the educational system. This approach to teaching and learning motivates students to participate actively in the processes of collaboration and communication. To make the project successful, they are simply required to apply creative thinking skills to the problem. According to the paper by Hazni et al., (2019)**,** creativity is a significant and important domain in RBT subjects. In the creation of a functional product some students must choose at least two applications of technology that have been studied, however, some students are less interested in the subject that required a creative skill. The element of product development that requires students to come up with ideas, identify issues, and resolve internal issues is either effective or effective, depending on the title (Hazni et al., 2019). The purpose of this research is to identify the level of motivation, personal traits, and environmental factors that affect students' creativity in the creation of functional products for the subject of Design and Technology (RBT) at SMK Desa Kencana,Lahad Datu.

1.1 Creativity

According to Siswono (2008) in Panjaitan and Surya, (2017), creativity is essentially the ability to think clearly, stimulate the imagination, come up with any new ideas that might be possible, and unveil astonishing and surprising ideas. Applying creative thinking abilities link indirectly associated with a result, some fundamental elements serve as the foundation for creative thinking. This type of creative thinking emphasizes a variety of abilities, including foreseeing, coming to conclusions, coming up with ideas, synthesizing, developing first ideas, linking, and hypothesizing (Seiva, 2015).

1.2 Motivation

One of the factors that encourages someone to carry out an activity is motivation. According to a study by Situmorang, (2016) on creativity potential and motivation, creative students typically have a strong desire to act logically, learn new things, and actualize the expected. This is strongly tied to the internal drive to get the best results possible, which is driven by motivation. Motivation is a process that describes a person's strength, direction, and even tenacity in working toward a goal. This motivation is closely related to motive since the motive is an internal stimulus or impulse from within one's personality until he can do something. Moreover, motivation is believed that mental stimulation encourages more actions, motivation also includes expectations, goals, and incentives (Arianti, 2019). There are 2 types of motivation, first, is intrinsic motivations which are active motives that does not require external stimuli because an individual already have the urge to do something. Meanwhile, extrinsic motivation is a factor that is driven by incentives or valued things to accomplish such as rewards, honor, promotion, or relatedness (Norfarahi et al., 2020). Clearly, rewards can be used as an incentive to change behavior.

1.3 Personality

Personality comes from the Latin word persona which means the mask which this mask is used by Greek actors to act on stage (Yunus et al., 2018)**.** Every human being is born with a distinctive and unique character a person individual to another individual either in terms of behavior or personality. Other than that, Yunus et al. (2018) said personality can also be defined by how people interact with one another or how people perform in certain roles in society. Based on the study from Bujang & Yusof, (2015), it can be concluded that each person's personality will indeed be unique despite being in the same environment and having similar traits. Each person's personality will last for a while and can be identified more clearly based on the circumstances. This study focuses on five personality traits that are used to determine creativity also known as The Big Five established in 1992 by Goldberg in Ishak et al., (2018) which is *Openness to experience*, where a person with the highest objectives who enjoys being socially involved, sociable, and energetic. Furthermore, the personality is more open to innovative approaches and any kind of change. *Conscientious* individuals in this category tend to be more organized, responsible, and meticulous when executing tasks plus they also tend to stick to schedules. A person who has extraversion is someone with whom it is simple to communicate when these feelings are present. In addition, *Extraversion's* personality is passionate, action-oriented, frequently accepts opportunities to achieve self-satisfaction, enjoys talking, takes a strong stand, and is more noticeable in groups. *Agreeableness* is a person who

appreciates collaboration and a peaceful environment. People in this category are also courteous, amicable, giving, helpful, and tolerant. They are also hopeful about others, and people with these qualities are well appreciated by the general population. Lastly for personality traits *Neuroticism* people with such negative emotional inclinations frequently experience worry, anger, or stress. Due to their inconsistent moods, it is challenging for them to think clearly, which makes it challenging to make wise judgments and manage stress.

1.4 Environment

The setting in which learning occurs, or the "learning environment," can have an impact on the social, psychological, or educational context because it can foster intellectual engagement, teamwork, friendships, and support, which can help students become more creative learners (Marinah Awang et al., 2018). When viewed from a broad viewpoint, the term "environmental factors" encompasses a wide range of variables, including the physical environment, the social environment, and psychological traits that influence how one interacts with one's own environment. This implies that people and the environment both have an impact on creativity because every person is influenced by culture and society in some way. Meanwhile, there is an interacting relationship between a person's personality and the environment that is based on that person's personality, which helps to distinguish that person from other people. Creativity is primarily influenced by genetic factors, but it cannot be achieved or successfully developed without the support of social, educational, and psychological environments.

2. Conceptual Framework

This conceptual framework (Fig. 1) is designed to identify the level of motivation, personality traits and environment that influence students in the development of functional products for design and technology subjects. The independent variable is the indicator that consists of motivation, traits personality and the environment while the dependent variable is the creativity of students. The conceptual framework of this study is based on the Theory of Sternberg's creativity and combined with the component Theory creative Amabile, 1989 in Rasul et al., (2013).

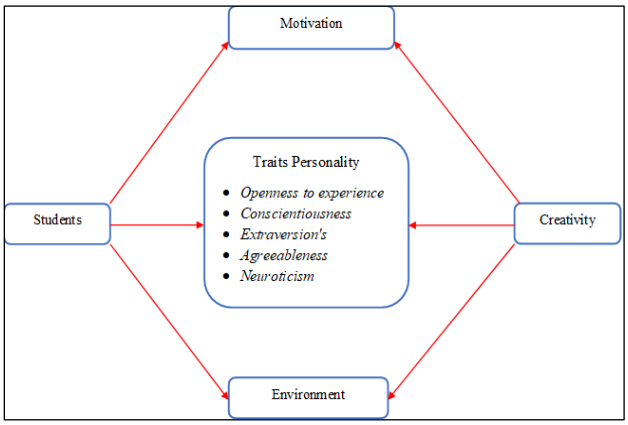

Fig. 1: Conceptual Framework of the Study

3. Methods

The study design used is quantitative. The targeted study population was form 3 students taking Design and Technology (RBT) subject consisting of 318 pupils and this number was rounded to 320 to refer to the sample size of Krejcie and Morgan (1970). Therefore, the sample size was 175 students. The research instrument used was a questionnaire form disclosed online because according to Nooraini & Siti Soleha (2017), simple questionnaire instrument to get cooperation from respondents as well as the advantages of using this questionnaire is a quick way to obtain feedback from respondents, saving time and expense as well as, respondents are more willing to provide feedback on the aspects studied. The questionnaire also has an organized choice of answers and will be distributed to respondents to obtain data to answer the objectives of the study. This questionnaire contains 4 parts, which is part A for demographic respondent, part B for the level of motivation, part C for the level of personality traits using The Big Five Inventory (BFI) consists of 44 items, and part D the level of environment. In addition, this questionnaire uses a Likert scale starting from scale 1 to 5. Likert scale seeks information to understand the subject's attitude by combining individual responses to a series of designed opinion questions to relate the relevant aspects.

The findings of this study are presented in the form of frequency analysis showing the frequency (mean), percentage (%), and correlation as well as descriptive analysis consisting of mean values and standard deviations. Table 1 below shows the mean score range according to the Nor (2015).

Table 1: Mean score level determination

Mean Score	Interpretation level
3.01 – 5.00	High
3.00	Moderate
0.00 – 2.99	Low

(Source: Useng Awae, 1995 in Nor Hidayah binti Mohamed, 2004) in (Nor, 2015)

Analysis correlation coefficient (R) indicates how much relationship occurs between the variable independent (x) motivation, traits personality and the environment simultaneously with the dependent variable (Y) creativity of students. Table 2 shows the correlation interpretation.

Table 2: Correlation Interpretation

Range Correlation	Correlation relationship
.00 - .19	Very Low
.20 - .39	Low
.40 - .59	Medium
.60 - .79	Strong
.80 – 1.0	Very Strong

Source: (Nurwahyuni et al., 2020)

4. Results

4.1 Demographic characteristics

Demographic analysis showed that the class consists of 10 form 3 classes which taking the subject of Design and Technology. The religious flow class (KAA) is by 9.1% with a frequency of 16, Sincere Class 16% with a frequency of 28, class Ikhwan 8.6% with frequency 15, Ilham class 7.4% with frequency 13, class Scientific 8.6% with frequency 15, class Innovation 13.7% with frequency 24, class Integrity 9.7% with frequency 17, Iltizam class 8.6% with frequency 15, Faith class 10.9% with a frequency of 19, and the Special Plan class 7.4% with a frequency of 13. Based on the age of respondents, for the age of students in form 3 consists of 14 and 15 year that is students who are 15 years old is 98.9% with 173 people and students 14 years old is 1.1% of 2 people. The study respondents involved a total of 175 form 3 students who took the subject of Design and Technology. The results of the data analysis show male student respondent data is 46.3% consisting of 81 people, while female student respondents were 53.7% consisting of 94 people. Overall, there are more female respondents than male respondents.

4.2 Motivation

Based on the results of data analysis for the level of motivation that influences students' creativity in the production of functional products for the subject of Design and Technology is at a good level and very good. Almost the entire distribution of respondents' answers in the questionnaire that was conducted showed a high mean score in the range of 3.61 to 4.52 and this can be referenced based on the mean interpretation score stated in Table 1. The results of the study (Table 3) on the level of motivation that influences students' creativity in the production of functional products showed item no.1 "Every time I created a functional product or a functional project, I feel happy" recorded mean and standard deviation (M = 4.34, SD = .786). Meanwhile, for item no.2, “When there is an RBT project I will complete it immediately” recorded (M = 4.07, SD = .881) and for item no.3 “Rewards offered if completing the project has motivated me to do my best” recorded mean and standard deviation with (M = 4.49, SD = .823). Item no.4 “I will be more creative when there is motivation” to record a high mean value and standard deviation that is (M = 4.52, SD = .779), while for item no.5 “Creating a functional product is good to increase my creativity” recorded mean and deviation values with (M

= 4.43, SD = .799). Next, for item no.6 “Facilities provided to produce functional products make me more enthusiastic” the mean value and standard advantage is (M = 4.46, SD = .709). However, item no.7 “I had to provide functional products because of that is my job as a student” recorded a low mean value and standard deviation of (M = 3.61, SD = 1.203). Finally, for the last item which is no.8 “I will put full effort when to create a functional product” that records the mean value and standard waste (M = 4.36, SD = .774). Overall, the findings of the analysis for the level of motivation were at a very good level with mean values and standard deviations (M = 4.2843, SD = .58299).

Table 3: Descriptive analysis the level of motivation that influences students ’creativity in the production of functional products for (Design and Technology) RBT subjects.

No	Item	Mean	Standard Deviation
1	Every time I created a functional product or a functional project, I feel happy	4.34	.786
2	When there is an RBT project I will complete it immediately	4.07	.881
3	Rewards offered if completing the project has motivated me to do my best	4.49	.823
4	I will be more creative when there is motivation	4.52	.779
5	Creating a functional product is good to increase my creativity	4.43	.799
6	Facilities provided to produce functional products make me more enthusiastic	4.46	.709
7	I had to provide functional products because of that my job as a student	3.61	1.203
8	I will put full effort when to create a functional product	4.36	.774
	Total	4.2843	.58299

4.3 Big Five Personality Trait

Table 4 is a descriptive analysis of 5 personality traits in which each personality trait shows different mean values and standard deviations. Personality *Openness to experience* recorded a mean score and standard deviation with (M = 3.6469, SD = .41864) therefore the level of personality interpretation is high. Thus, individuals who belong to this personality trait are individuals who are open to new ideas and motivated to explore the environment. Personality *Conscientiousness* recorded the mean score and standard deviation that is (M = 3.6724, SD = .58604) therefore the level of interpretation based on the mean range is at a high level but individuals who belong to this personality trait are thorough and structured individuals. Next the mean score and standard deviation for *Extraversion* personality (M = 3.4921, SD = .57566) is also at a high level followed by which individuals in this personality trait have an excited attitude and like activities involving groups. Next, the mean score and standard deviation for *Agreeableness* personality trait is (M = 3.7073, SD = .42491) with high level and this shows they have positive thinking towards activities that involve creativity. The last personality is *Neuroticism*, where this personality is at a low level (M = 2.7700, SD = .62826) but if an individual has a high *Neuroticism* personality trait, they will always think negatively and could not adjust their thinking effectively.

Table 4: Descriptive analysis of Big Five Personality

Trait Personality	Mean	Standard Deviation
Openness to experience	3.6469	.41864
Conscientiousness	3.6724	.58604
Extraversion	3.4921	.57566
Agreeableness	3.7073	.42491

Neuroticism	2.7700	.62826

4.4 Environment

Results of descriptive analysis for the level of the environment that influences students 'creativity in the production of functional products for RBT subjects, Table 5 shows almost the entire distribution of respondents' answers in this section shows a high mean score in the range of 3.99 to 4.46. Item no.1 “A complete environment provide functional products makes me more creative” showed mean score and standard deviations with (M = 4.43, SD = .874). Meanwhile, item no.2 “My creativity is influenced by the current environment” the mean score and standard deviation are (M = 4.38, SD = .869). Item no.3 “Activities that involve project make me more active to be involved” recorded mean and standard deviation (M = 4.29, SD = 8.96). Next, item no.4 “The environment that applies innovation in learning gives me more preparedness to produce projects and I can apply creativity” mean score and standard deviation are (M = 4.33, SD = .880). While for item no.5 "I like to get involved when there is a competition that involves product development, especially on RBT subjects" showed a low mean value of (M = 3.99, SD = 1.069). As for item no.6 " I suggest that the school increase the activities involving RBT subjects in the future because it can influence my creative thinking " the mean score and standard deviation are (M = 4.29, SD = .952). Finally, item no.7 “Encouragement from teachers and parents is very helpful in completing project” and item no.8 “People around me are very helpful in developing my creative ideas” recorded the same mean score and standard deviation of (M = 4.46, SD = .856). In conclusion, the results of the analysis for the environmental level are very good with mean values and standard deviations (M = 4.3293, SD = .75517).

Table 5: Descriptive analysis the level of environment influencing students ’creativity in the creating of functional project for Design and Technology (RBT) subjects.

No	Item	Mean	Standard Deviation
1	A complete environment provide functional products makes me more creative	4.43	.874
2	My creativity is influenced by the current environment	4.38	.869
3	Activities that involve project make me more active to be involved	4.29	.896
4	The environment that applies innovation in learning gives me more preparedness to produce projects and I can apply creativity	4.33	.880
5	I like to get involved when there is a competition that involves product development, especially on RBT subjects	3.99	1.069
6	I suggest that the school increase the activities involving RBT subjects in the future because it can influence my creative thinking	4.29	.952
7	Encouragement from teachers and parents is very helpful in completing the project	4.46	.856
8	People around me are very helpful in developing my creative ideas	4.46	.856
	Total	4.3293	.75517

4.5 Correlation analysis for creativity with Big Five Personality, motivation and environment that influencing student creativity in the creating of functional project for (Design and Technology) RBT subject.

The results of the analysis (Table 6) found that there was also a negative relationship between creativity and 5 personality traits with significant levels of 0.00 (99%) and 0.05 (95%). Personality Openness to experience showed a positive and significant relationship with creativity at the 0.01 level (r = .945, P = .000). Next for personality Conscientiousness also showed a positive relationship to creativity a significant negative 0.01 (r = .372, P = .000) however, the strength of the relationship was moderate. Moreover, creativity had a positive relationship and was in the moderate category with Extraversion personality and significant at the 0.01 level (r = .512, P = .000). Personality Agreeableness also showed a positive relationship with significant negative creativity of 0.01 (r = .435, P = .000) and the correlation relationship was at a moderate level. While for personality traits Neuroticism showed a negative relationship with creativity and exceeded

the significance level of 0.05 (r =-. 184, P = .0.15) therefore personality Neuroticism showed a very low relationship with creativity. Other than that, there is a significant relationship between creativity and motivation where the value of the correlation score is (r=.663, P=.000) and there is a strong relationship between motivation that affects students' creativity in making the project work. The environment also shows a significant presence between creativity and the score of the correlation is (r=.677, P=.000) thus showing a strong relationship between these two variables.

Table 6: Relationship creativity with personality traits, motivation, and environment

Relationship creativity with personality traits			
Personality Traits	*Pearson Correlation*	*Significant (2-Tailed)*	Correlation Relationship
Openness to experience	.945**	.000	Very Strong
Conscientiousness	.372**	.000	Low
Extraversion	.512**	.000	Medium
Agreeableness	.435**	.000	Medium
Neuroticism	-.184*	.0.15	Very Low
Relationship creativity with motivation and environment			
Item	*Pearson Correlation*	*Significant (2-Tailed)*	Correlation Relationship
Motivation	.663**	.000	Strong
Environment	.677**	.000	Strong

5.0 Discussion

Both learning and doing things effectively depend on motivation. According to the findings, form 3 students' motivation is at a high level with a mean score of M = 4.2843, SD =.58299 because motivated students are more likely to learn to inspire themselves to achieve goals and are less likely to become quickly discouraged (Ermistri, 2017). Therefore, if a student lacks motivation, they will just finish the task to satisfy the project production assessment requirements without using any creative thinking skills. This is because, motivation involves desires, objectives, and rewards, it is also viewed as a form of mental stimulation that influences behavior (Arianti, 2019). Correlation analysis shows a strong relationship between these two variables. The correlation analysis also showed a significant value with a correlation score (r = .663, P = .000), this indicates that motivation plays an important role in encouraging students to apply creativity. According Oleynick et al., (2017) to explore an idea and be inspired to turn it into a creative output, it must have the motivation to do so.

The level of environment that influences students' creativity in the production of functional products is at a high level with a mean score value (M = 4.3293, SD = .75517). Therefore, the study found that the level of environment plays an important role in influencing the creativity of form 3 students in Sekolah Menengah Kebangsaan Desa Kencana. Thus, support from the environment, such as equipment provision, the implementation of initiatives involving product development, and the encouragement of creative job seekers, can indirectly aid the development of creativity towards greater quality. A study by Alfuhaigi (2015) on the relationship between the school environment and the development of creativity found that the individual environment plays a role in stimulating the development of creativity, especially if the environment is active. In addition, the involvement in applying creativity is also more active. The environment also showed a significant relationship with students 'creativity with a correlation score (r = .663, P = .000). The findings of this correlation analysis indicate the existence of a strong level of relationship to creativity. Hence this positive relationship emerges because the formation of an individual's character and the context of their surroundings are strongly related. Furthermore, in the study of Pujiriyanto et al., (2017), researchers discovered that project-based learning is highly effective at influencing the creative environment.

Based on the findings of the study, the five personality traits show different levels of creativity. Agreeableness personality traits have the highest level as a trait that influences students' creativity in the production of functional products with mean score value and standard deviation (M = 3.7073, SD = .42491) this shows students value cooperation and harmonious atmosphere as well as individuals belonging to this were considerate and tolerant. In addition, they also have the nature of trust and personality that is favored by society (Yunus et al., 2018). Next, the personality trait Conscientiousness has the second highest level with a mean score value (M = 3.6724, SD = .58604) in influencing students' creativity towards the production of functional projects. Students who belong to this trait have a high disciplinary nature, have direction and purpose. Afrina Rohani (2017) also stated that individuals who belong to this personality are organized, disciplined, and have a strong nature of responsibility because the implementation of this project is a task that must be performed by students. Next, personality Openness to experience is at the third highest level in influencing students' creativity in the production of functional products with a mean score value (M = 3.6469, SD = .41864). This

personality is an important trait in influencing a person's creativity because individuals who belong to this personality have broad -minded, imaginative, and flexible thinking (Ishak et al., 2018). Meanwhile, Extraversion personality which has a value (M = 3.4921, SD = .57566) with a high level but this personality trait has less influence on students' creativity in the production of functional products based on the results of the study. Lastly, personality traits Neuroticism has the lowest mean score value among the five personality traits stated and is at a low level. The results of the study found that this personality trait is at a low level therefore it is a good thing because individuals with high levels of personality Neuroticism have less stable emotions and often think negatively about tasks that can cause them stress.

The results of the analysis of studies that have been conducted show that there is a significant relationship between creativity and personality. Personality Openness to experience has the highest correlation score value among the five personalities that is (r = .945, P = .000) with the value of the correlation score this personality has a very strong relationship with creativity. This is in line with the study conducted by Kaspi (2019)**,** in which he found that personality Openness to experience is dominant personality dementia tied to creativity. In addition, Extraversion Personality also has a significant relationship to creativity but is at a moderate level of relationship with the correlation score value (r = .512, P = .000). According to Abdullah et al. (2016) individuals with personality Openness to experience and High Extraversion have high creativity compared to others but individuals with high levels of Agreeableness, Conscientiousness and Neuroticism are less creative. Besides that, Conscientiousness personality has a significant relationship with the correlation score value (r = .372, P = .000) but the relationship between these two variables is weak, this may be because Conscientiousness personality tends towards a more organized and structured in implementing assignments then students prefer to follow the set evaluation criteria rather than thinking outside the box of thinking related to creativity because this personality has a very strong sense of duty while performing assignments (Afrina Rohani, 2017)**.** Agreeableness personality trait also had a significant relationship with the correlation score value (r = .435, P = .000) but the relationship between these two variables was at a moderate level of relationship. However, the relationship between creativity and personality conducted by Abdullah et al. (2016)found that this personality has no relationship with creativity, so it can be concluded that it is appropriate that the relationship between students' creativity in the production of functional products is at a moderate level. Analysis of the study found that there is a negative relationship between personality traits Neuroticism with creativity with a correlation score value (r =-. 184, P = .0.15) and the relationship of creativity is at a very weak level. Based on a study conducted by Amin et al. (2020) the findings of this study are in line with the existing literature that individuals with high levels of personality Neuroticism have low tolerance in a given task. Thus, the higher one's creativity the lower the personality traits of Neuroticism.

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