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DESIGN RESEARCH FOR EXPLORING COGNITIVE PROCESS AND SOFT SKILL ATTRIBUTES BASED ON PERSONALITY TYPE CLASSIFICATION

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Abstract

Preparing students to be a fulfilled human being in this time becomes shared responsibility of family, school, and society. STMIK Surabaya as a Higher Education is not fulfilling enough by only preparing the students' ability in hard skills aspect. It is required to prepare fulfilling the demand of personal attitude and interpersonal skills which are able to develop and to maximize performance or soft skills. By looking at hard skills point of view, Operational Research is a lecture whose objective to model optimization problem and to solve the model using mathematical formulation. Because of its abstract characteristic, this lecture is thought to be difficult by the students. By looking at soft skill side, STMIK Surabaya has instilled six values that have to be owned by the students. In the learning process of this Operational Research lecture, it is thought that the process does not play part in improving the six values that has been the focus of the students' soft skills development. As an effort to answer these two challenges, an approach using personality types. This approach is chosen because by using the understanding of these four personality types, each student is approached more personally. By using explorative, qualitative and design approach, profile of cognitive process and soft skill attributes are generated from the Operational Research students based on classification of four different personality types. The following developments can be conducted by making learning model which fits into the profile of cognitive process and soft skill attributes from each personality types.

Keywords: *cognitive process profile, personality type, design research*

INTRODUCTION

One topic in mathematics, which can support the idea of achieving the objective for the students to have abilities to think critically, logically, systematically, and creatively, is problem solving. (Simon, 2000) presents an idea that; through problem solving, learners can try to build a concept in a better and perfect way, because learners are demanded to become more active in utilizing the obtained concepts in new situations they encounter. As one of Operational Research lecture's objectives is to model optimization problems and to solve the models using mathematical formula, problem solving becomes an important topic involved in the lecture.

By realizing the importance of ability to solve problems, teachers or instructors need to think seriously about a technique so their learners can acquire this ability well for not only solving problems but also problems in the learners' daily lives. One way, which is believed to be able to improve the learners' abilities, is to give an exact teaching method in order to obtain the best result. Mathematical teaching method is a way or technique for teaching mathematics, constructed systematically and logically,

considering its mathematical and psychological aspects (Hudoyo, 1988). If we take a look at the psychological aspect of teaching method, it is closely related to the answer of the questions: “to whom” mathematics is being taught. The methods, which are unsuitable for the learners, cannot be digested so that they cause frustration in learning mathematics, especially in solving mathematical problems. Compatibility with a method will certainly be different for every learner. One of the efforts, that can provide best learning experiences psychologically, is by observing every learner’s condition in his/her daily basis. Observation results of the learners’ condition will result a conclusion, explaining that every learner always have differences. The easiest way to notice the existing differences is by looking at the real behaviors.

Some psychology experts argue that differences between human beings can happen because of different personalities. Originating from the fact that, human personalities are diverse and various and they can be as many as the number of humans, a group of experts tries to classify these human beings into some certain types. They decided to do so because this is the most effective way to know other people.

In 1984, (Keirsey, 1984) in his book *Please Understand Me I and II*, David Keirsey, a psychology professor of California State University, classified personalities into four types: *Rational, Idealist, Artisan, and Guardian*. The classification done by Keirsey is based on the reason that real differences can be observed by looking at someone’s behavior. The behavior of someone is a visible reflection of what he/she thinks and feels. In other words, if someone wants to know what another person thinks, it can be known from his/her behavior.

By being aware of the learners’ different conditions, teachers or instructors can provide best teaching method for their learners. Teaching methods will be presented based on the learners’ thinking patterns. These thinking processes will be investigated based on personality types which have been classified by David Keirsey. By using the teaching methods fitted into the learners’ thinking processes, it is expected that teaching and learning process can touch the learners more personally, since the learners should have the rights to be cared of by every teacher/instructor individually, not only in classical way in which many persons are joined in one group.

In this research, in order to observe the students’ cognitive processes in solving mathematical problems thoroughly, the research will be directed to use Polya step. This has to be done because by using Polya step, the cognitive processes of the students can be observed thoroughly, since the first step to the step of problem’s solutions development done by the students. Observation is also conducted on how the learners re-check their answers. Subjects that will join this research are the students of Operational Research class.

Besides covering hard skills aspect like it has been explained previously, by using the similar steps, the profile of soft skill attributes belongs to every student registered in Operational Research class will be able to be investigated based on the students’ personality types.

Soft skill attributes, that will be the reference, are taken by harmonizing character education program which has been conducted by STMIK Surabaya for the last seven years in an activity, called Campus Life Orientation (Orientasi Kehidupan Kampus/OKK) for the students who have recently started studying at university (freshmen). The OKK activity focuses on character

development training which is done through a program divided into games and practical activity. The first activity of the program is character development using outbound training. The outbound training is expected to instill holistic intelligence values and standard method character learning, focusing on spirit of *The Winner* whose six characteristics: *Closed to God, the Learner, Never Give Up, Never Complain, Motivator, and Be Happy*. The second activity is practice of social sensitivity. The objective of this activity is to help the learners gaining personal experiences of feeling empathy by interacting with community members who have not been lucky economically.

Regarding the background which has been previously described, the existing problem formulation is how the students' cognitive process profiles in solving mathematical problems based on classification of personality types can be described and what soft skill attributes belong to each personality type.

Based on the existing problem formulation, an important objective to be accomplished is obtaining students' cognitive process profiles in solving mathematical problems based on classification of personality types and determining soft skill attributes owned by the students of each personality type.

RESEARCH METHODS

Type of Research

In order to obtain cognitive process profiles and soft skills attributes on a particular personality type, qualitative and explorative research is used. The qualitative type is chosen because the definition of students' cognitive process profile and soft skill attributes with nature setting is based on the main research instrument which is the researchers themselves. The research is also explorative because it is expected to be analyzed cognitive process profiles and soft skill attributes of the students. The procedure of the research consists of these stages: selecting research subjects, defining supporting research instruments, constructing data collection procedure, and analyzing data. This research tries to describe phenomenon in *natural setting*. The phenomenon is a situation in which the students with certain personality type demonstrate their cognitive process profiles and soft skill attributes, residing inside themselves, while they are given problem solving questions. The students' situation will be reviewed based on determination of personality values which have been decided to be observed.

Data Collection Method

Data collection is conducted by giving problems to research subjects who have been grouped based on certain personality type. The subjects are allowed to decide how they want to solve the problems, either by discussing with other students who do not take part as research subjects, or by solving the problems independently/individually. While solving the problems, research subjects must be kept away from high-pressure atmosphere, so that the expected natural (common) situation can be obtained. Researchers record the research subjects' verbal expression in video format and take note of the subjects' behaviors (expressions) happening in observation, including unique things they do while solving the mathematical problems. From the video recording, it is expected that the soft skill attributes existing inside the students can be seen. If there is not enough data, the researchers have to clarify by repeating the interview.

Data Collection Instrument

For gaining targeted values of character education that need to be developed in each personality type, the main research instrument is the researchers themselves. Besides acting as research organizers, researchers also take on the role as main instrument in collecting data which cannot be substituted by other instruments. There is also assignment sheet [instrument](#) for solving mathematical problems. This instrument will be handed out to every subject.

Data Analysis Method

In order to obtain cognitive process profile and soft skills attributes, data analysis process is executed by following a set of stages: (1) Transcribe collected verbal data (2) Analyze all available data from various resource, including: (video) recording, subjects' performance results, interview, and written observation in the form of on-site notes (3) Reduce data by making abstraction (4) Construct in units which are then categorized by making coding system (5) Analyze targeted values of character education (6) Analyze interesting things (7) Draw conclusion.

RESULTS AND DISCUSSION

Students Cognitive Process Profile Based on Personality Types Classification.

The research result demonstrates that every personality type has different cognitive process profile in solving problems.

In understanding problems, men who belong to the *Rational* type do it by following the sequence of problems statements, by taking in the summary of each sentence, then symbolize these summaries. While planning problem solving, these *Rational* type men do not stick to certain formula, but they analyze the sufficiency of the information in problem statement based on units in this information. As soon as they reach the problem solving stage, they perform based on the plans they made and check again the solutions by changing the sequence of constructing solution. Meanwhile, to understand the problems, the women who belong to *Rational* type take in relations between the information in problem statements, then underline these information. In planning to solve the problems, the *Rational* type women base themselves on the problems they have faced and experienced in daily basis.

While understanding the problems, *Idealist* type men do it by following the sequence of the problem statements, by absorbing each sentence's essence and moving their pens. When it comes to planning the problem solving, these men use the formula they have got, but they analyze the sufficiency information in the problem statements based on the use of these information. Once the male *Idealists* are solving the problems, they stick to the plans they made, and check their solutions by examining again the calculations they have done. On the other hand, in understanding the problems, the female *Idealists* do visualization by underlining the sentences which are considered to be important.

To understand the problems, *Artisan* men do it by following sequence of the problem statements, by taking in each sentence's essence and by moving their bodies frequently. In planning to solve the problems, these men do not use the formula they have got, but they analyze the sufficiency of the information in problem statement based on the use of this information. Once it reaches the problem solving stage, they

do not follow the plans they made, but instead they use another technique. Finally, they check their solutions by examining the calculations they have done. Meanwhile, *Artisan* women understand the problems by making short note of each sentence's essence and solve the problems by following the plans they made before.

In understanding problems, the male *Guardians* do it by following sequence of the problem statements, by taking in the meaning of the sentences and marking the important parts. While planning to solve the problems, these men do not use the formula they have got but they analyze the sufficiency of the information in problem statement based on the use of this information. Once it comes to problem solving, they stick to the plan they made and check again the solutions by examining again the calculations they have done. On the other hand, to understand the problems, female *Guardian* take note of each sentences' summary. When it reaches to problem solving stage, they do not follow the plans they made, instead by using another way.

Profile of Students' Soft Skill attributes Based on Classification of Personality Types.

The research output demonstrates that each personality type has different profile of soft skill attributes. Table 1 provides observation and analysis result of soft skills attributes profile based on Rational personality type.

Observation Result	Analysis Result
Directly solving the problems without starting by praying.	Do not start with praying.
Immediately try to solve the problems seriously, without wasting time.	Serious. Focus on objectives. Work independently; do not care about others.
Re-write information which is thought to be important for solving the problem, and using the help from variables.	Thoroughly organize important things. Have highly abstraction.
Have procedure for solving problems which is not following certain acquired topic. Once finished solving the problem, re-check the solutions by changing the solving process sequence.	Have massive creativities. Perform with highly seriousness. Expect perfection of answers. Do not become hopeless easily.

Table 1. Soft skill attributes profile of Rational type

Table 2 presents observation and analysis result of soft skills attributes profile based on Idealist personality type.

Observation Result	Analysis Result
Directly solving the problems without starting by praying.	Do not start with praying.
Try to solve the problems as well as possible.	Like perfection.
Read the problem statements by not following the statements' sequence, but starting from the question sentences.	Want to know the main task at first.

Re-write information which is thought to be important for solving the problem, and without the help from variables.	Thoroughly organize important things.
Do not put priority on the problem solving plan.	Prefer to immediately finish solving the problems so that the problems can be stated as done.
Once finished solving problems, the persons of this type try to check their answers with other friends' answers. When different answers exist, they still trust the truth of their answers and do not try to repeat the calculations.	Expect perfection of answers. Less able to take in others' opinions.

Table 2. Soft skill attributes profile of Idealist type

Table 3 shows observation and analysis result of soft skills attributes profile based on Guardian personality type.

Observation Result	Analysis Result
Directly solving the problems without starting by praying.	Do not start with praying.
Immediately try to join a group and try actively to unite with their team members.	Smart in socializing. Highly social characteristics.
Read the problem statements sequentially, but do not read them intact, some of the sentences are passed.	Less thorough.
Look for the sentences' summary for understanding the problems.	Have good analysis.
Do not make notes of important information gained from understanding the problems, but only say it to their team members.	Less prefer detailed and organized things.
After finishing solving the problems, only re-check the calculations which have been done with their team members.	Do not put priority on the perfection of answers; have felt satisfied with the existing results.
After the problems said to be done, the persons of this type immediately use their time for chatting with their team members and their participations can make the team enthusiastic.	Highly social characteristics and highly adaptability.

Table 3. Soft skill attributes profile of Guardian type

Table 4 points on observation and analysis result of soft skills attributes profile based on Artisan personality type.

Observation Result	Analysis Result
Directly solving the problems without starting by praying.	Do not start with praying.
Immediately try to make group, delegate the assignments and lead discussion in group.	Have leadership spirit. Can manage friends who are in the same age. Can motivate friends.
Read problem statement sequentially and intact.	Think systematically in

Do not make note of important information gained from observation of problem statements.	regular/organized way.
Have mature problem solving plan.	Prefer detailed and organized things.
After finishing solving the problems, re-check the answers only on the calculations part which have been done.	Like perfection. Expect perfection of answers. Do not become hopeless easily.

Table 4. Soft skill attributes profile of Artisan type

CONCLUSION

Based on the obtained research result, some conclusions can be explained. First, in solving mathematical problems, every learner seems to have different cognitive process even though in the end they get the same final solution for the same problem. Second, a teacher or instructor needs to be aware of the cognitive process differences on each learner. Third, one technique for clustering is by grouping the learners based on their personality types so that in performing learning process the learners feel respected as an individual and not as a more general group in which many personality types joining. Finally, in developing soft skill attributes, teachers or instructors have to pay attention to personality types so they can develop more precisely.

RECOMMENDATION

Since the writing in this paper is still an early research output, there are many things that can be recommended for improving this research as follow.

Research subjects can be developed to be more than one subject for each personality type. And, it would be better if the subjects can be differentiated based on gender.

Once the profile of cognitive process and soft skill attributes are obtained for each personality type, this research can be continued with development of learning model based on profile of cognitive process and soft skill attributes.

Research can be continued to the level of other lectures in one program.

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