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# CHARACTER EDUCATION MODEL THROUGH FACE-TO-FACE TUTORIAL FOR MATHEMATICS COURSE AT UNIVERSITAS TERBUKA

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## ABSTRACT

*Character education needs to be integrated into every course in the Primary Teacher-Training Program at Universitas Terbuka. This paper describes the development of a character education model which met validity, effectiveness, and practicality criteria in the sense of motivating the students of Universitas Terbuka to develop positive characters in tutorial of mathematics course. The research subject were 48 students from the second semester of 2012 academic year. The model consisted of Tutorial Activity Plans, Tutorial Activity Units, Student Worksheets, and Evaluation Plan. The research instruments were students' activities observation sheet, tutor's activities observation sheet, character model assessment sheet, students' questionnaire, audio-visual recorder, and field notes. This research result showed that the model met the criteria of validity, effectiveness, and practicality. The model could also encourage the students to develop certain characters during the tutorial activities which were passion, habit of persistence, diligence, self-directed learning, confidence in unfamiliar situations, ability to collaborate in team work, active in tutorial, and ability to listen. In addition, the model could help the students actively construct in-depth understanding of mathematics concepts.*

**Keywords:** character education, collaborative learning, mathematics course, problem solving, tutorial

## INTRODUCTION

The Universitas Terbuka (UT) regional center in Yogyakarta is one of UT's branch offices located in Central Java. It is a part of UT's operational management obliged to contribute towards the achievement of Indonesia's national education goals. Learner support is provided to facilitate student learning activities in the forms of tutorials, counseling, study groups as well as administrative services. A variety of tutorial methods are available in UT, namely face-to-face, correspondence, broadcast, and online tutorials. Face-to-face tutorials are provided and facilitated by regional offices.

This paper highlights an example of the efforts taken by the Yogyakarta regional center in delivering the face-to-face tutorial in mathematics courses under the Primary Teacher-Training Program (PTTP). Mathematics tutors in this programme are expected to integrate character education in the planning and the execution of the course as per the aim of the university. Character education is a concept of developing moral consciousness in students (Lickona, 1999). It can be applied not only into social science courses such as in civic education, but also into exact or science courses, including mathematics courses. This concept can be integrated into day to day teaching and learning process. According to Greenberg (2003), education can help students to have knowledge, skill, care, responsibility and diligence.

## LITERATURE REVIEW

Education is expected to be able to motivate the students to reach higher dimension in learning such as thinking critically and creatively, and to have positive attitude (Marzano, Pickering, & McTighe, 1993). Thinking creatively in learning mathematics means thinking toward solving mathematics problems (Krulik, Rudnick, & Milou, 2003; Siswono, 2008). By exercising these two ways of thinking, the students can learn mathematics properly.

Mathematical problem is defined as a problem where the solution cannot directly be seen by the students (Polya, 1973; Posamentier & Krulik, 2009). Students need to integrate their understanding of that problem, their knowledge, and their experience in order to solve the problem (Mairing, Budayasa, & Juniati, 2011). The isomorphic problems are problems that have some structure but different in content (Sternberg and Sternberg, 2012). Students who have good ability in solving the problem have high order thinking and positive characters (Mairing, Budayasa, & Juniati, 2011; Marzano, Pickering and McTighe, 1993). Critical thinking and creative thinking is important (King, Goodson, Rohani, 2016; Krulik, Rudnick, and Milou, 2003). The characters are passion, habit of persistence, diligence, self-directed learning and confidence in unfamiliar situation (Mairing, Budayasa, & Juniati, 2012; Ministry of Education, 2006; National Council of Teachers of Mathematics, 2000).

Methods such as problem based learning and cooperative learning which stresses the use of problems in mathematics urge the students to work in heterogenic groups. Impact of these kind of learning is that the students are able to develop the attitude of respecting, listening, arguing, cooperating for similar purpose (Florida Department of Education, 2010; Ministry of Education, 2006). Some research showed that the characters effect students' achievement and students' ability to solve a problem (Pimta, Tayruakham, and Nuangchalerm, 2009).

The characters are important not only in learning mathematics but also in day-to-day life and in workplace. Success in day-to-day life and in workplace is affected by characters of passion and persistent ("Liputan6", 2017). Students develop the characters by practicing it in everyday situations including in the classroom. At mathematical class, they develop the characters by solving mathematical problems (National Council of Teachers of Mathematics, 2000). Students need to integrate their knowledge in each problem solving phases which are understand the problem, develop plans, carry out the plan, and look back (Polya, 1973). If students do not have the problem solving scheme, they will find difficulties in solving a problem (Mairing, 2014). They should read the problem more than one, represent the problem using graphs or pictures and try to solve it. Sometimes they should learn the concept and problem being solved from the text books and try solve the problem again. The process is made them acquired the persistent character (Mairing, Budayasa, & Juniati, 2011).

This research aimed to develop a character education model which met validity, effectiveness, and practicality criteria in the sense of motivating the UT's students to develop

positive characters in tutorial of mathematics course. The model stressed on learning problem solving collaboratively in team work. The characters were passion, habit of persistence, diligence, self-directed learning, confidence in unfamiliar situations, ability to collaborate in team work, ability to listen, and active in tutorial. The validity criteria was the model based on appropriate constructivism and mathematical theories. The effectiveness criteria was that the students show the characters in the tutorial activities. The practicality criteria was that the model can be implemented in eight tutorials meeting.

## RESEARCH METHOD

This study used both quantitative and qualitative approaches. They were used in order to develop a certain product such as a character education model through mathematics courses and tested the model to the selected students. The research subjects were the PTPP undergraduate students from Jetis learning center at the Yogyakarta Regional Centre from 2012/2013 academic year who took the Mathematics course (PDGK4108). There were 24 students in class A and 24 students in class B. The research was conducted from August to December 2012.

According to Plomp (1997) this study was educational design research. Plomp offered some phases in developing tutorial learning model. Those phases were early investigation, design, realization/construction, test, evaluation and revision, and implementation phases (Figure 1).

In early investigation phase, the researchers mapped the characters that were needed to be developed through questionnaires and interviews. Those characters are the ability of collaboration, the ability of asking or answering the questions, and sharing some ideas, the ability of listening to other students' thoughts, and the ability in self-learning. Since these characters are very important, students need to have high motivation to reach those abilities. Motivation itself is one of the factors in determining the student's learning success (Schlechty, 2001; Woolfolk & Margetts, 2007).

Developing of these attitudes should be started from the tutorial plan. The tutorial kit must be written in tutorial activity plan (TAP), tutorial activity unit (TAU), students' worksheets (SW), and evaluation plan (EP). TAP and TAU contain learning method that is used in tutorial activities. SW contains questions, assignments, and problems. All things in SW need to be done by collaboration with other students. EP contains items test and mathematical problems which can force the students to have an initiative to solve the problems. The implementation of tutorial kit can motivate the students to have the habit to think productively and to have positive character (Pimta, Tayruakham, & Nuangchalerm, 2009).

In the design phase, the researchers designed syntax tutorial, contents of the tutorial kit, classroom setting, learning media, reaction principle, role of tutor and students during tutorial activities, and some research instruments. The syntax should urge the students to develop the characters. The reaction principle was description for tutor how to provide intervention and to respond any behavior of students during the tutorials.

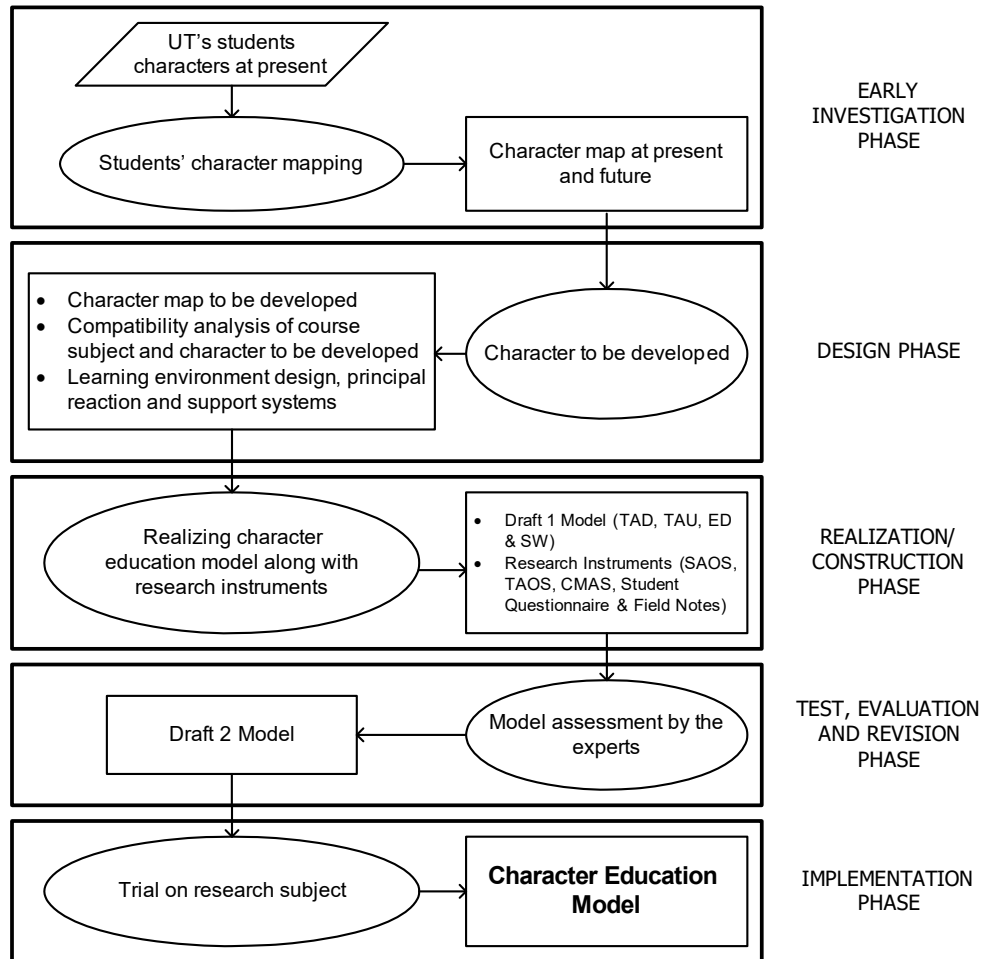


Figure 1: Character Education Model Development Procedure

In the realization/construction phase, the researchers developed a first prototype of the model and the research instruments. The first prototype contained TAP, TAU, SW and EP. The instruments were students' activities observation sheet (SAOS), tutor's activities observation sheet (TAOS), character model assessment sheet (CMAS), students' questionnaire, audio-visual recorder, and field notes.

In the test, evaluation and revision phase, three experts assessed the implementation of the Draft-1 Model. The experts were tutor, mathematical expert, and mathematical education expert. They also assessed the validity of the model and the criteria for measuring the effectiveness of the model. Based on the experts' suggestions, the researchers then revised the Draft-1 Model. The revised model is referred to as Draft-2 Model.

In the implementation phase, the researchers implement the Draft-2 model to the research subjects. The researchers evaluated the prototype based on the validity, effectiveness, and practicality criteria. The evaluation results were used to improve the Draft-2 model into its final form, the Character Education Model.

There were some instruments in collecting the data. They were:

- (1) The character model assessment sheet is used to determine whether the data meet all the validity criteria.
- (2) The tutor activities observation sheet is used to determine whether the data meet the practicality criteria.
- (3) The students' activities observation sheet, the field notes, the students' questionnaire, the students' worksheets, and the recorder are used to determine whether the data met the effectiveness criteria.

## RESULTS

### The Early Investigation Phase

Before developing the model of character education, current characters of the students were mapped by using information from the questionnaire. The results showed that 54% of the students could not collaborate in team work, 54% of them was not active in tutorial activities, 63% of them could not listen to other students' thoughts, and 65% of them did not have an ability of self-learning. Therefore, the researchers developed the education model that helped the students acquired the characters of ability to collaborate in team work, active in tutorial activities, ability to listen, and ability of self-learning. The blueprint of the education model planned in the design phase.

### Design Phase

Based on the result of the previous phase, the tutorial kit was developed to enhance students' skill in self-directed learning. The learning activity used collaborative learning method to allow the students to actively participate in-class activities and to give them a chance to explore their teamwork abilities. If these abilities are constantly exercised, then these will shape students' disposition in learning. The positive disposition that has been continuously developed will become the constructive character among the students. In general, the activities used in developing character in mathematics course tutorial were as follows:

- (1) The tutor motivated the students before they learn a certain new concept. This was done by linking the concept that needs to be learned with their daily activities or with things that have already been in students' memory. The tutor can ask the students about the previous concept related to the concept to be learned.
- (2) The tutor explained the goal of the tutorial and teamwork abilities to be exercised in the tutorial activities.
- (3) The student needed to find the concept in SW. One group consisted of 4 or 5 people. The tutor's role was to help the students to understand the concepts. In the beginning, the tutor's role seemed to be more dominant than the students' role. However, in the next tutorial, tutor's role was reduced.
- (4) In every worksheet, tutor gave exercises to the students to reinforce students' understanding. The exercises were done in a work group.
- (5) A representative from each group explained their answer in front of the class. The tutor facilitated a discussion in order to give the students conceptual knowledge.
- (6) Students made a conclusion guided by the tutor.
- (7) The tutor informed the plan for the next tutorial.

### Realization/ Construction Phase

In this phase, the plan designed in the previous phase was put into realization. It is called draft-1 model. The development of the draft-1 model in SW used discovery learning method with collaboration learning setting. Firstly, the tutor motivated the students to learn the materials by explaining their benefits and the goal of the tutorial. Secondly, the tutor encouraged the students to exercise their teamwork abilities. Thirdly, the students learned

from examples in SW and answered the questions. Those questions guided the students to make an abstraction to find certain concepts.

### Test, Evaluation, and Revision Phase

Before implementation, the draft-1 of model was assessed by three experts. They assessed the model using the assessment sheet. The sheet consisted of some indicators which were clarity of the tutorial objectives; appropriateness of the model with mathematical contents, tutorial characteristics, nature of UT's students, and constructivist theories; appropriateness of language; and sufficiency of the time. The result showed that the character education model fulfilled the criteria of valid, practical and could be used in mathematics course tutorial activities. There were some improvements suggested by the experts such as revising some sentences and clarifying some mathematical concepts for the model to be more appropriate with the expected characteristic and competency to be reached.

Based on these suggestions, draft-1 model was revised into a draft-2 character education model. This draft-2 model is used in tutorial activities.

### Implementation Phase

Draft-2 model was implemented during the mathematics course in class A and B at Jetis, Yogyakarta. Meanwhile, the tutorial was observed by two observers using an observation form. Observation results toward student activities showed that 96% of students from class A and 86% of students from class B did the activities during the tutorial. Some students did not actively participated because they were not familiar with the syntax of the character education model used in this tutorial. This means that the character education model fulfilled the effective criteria which was at least 60% of students actively participated in tutorial activities.

Activities done by the students showed that they obtained the self-directed learning character in which they were searching for information from SW or mathematics learning material. The students showed the confidence character in learning mathematics from the activity of asking or answering the question from tutor or peers and presenting their group discussion result in front of the class. Those activities could only be done by students who have self-esteem. This showed that character education model fulfilled the effective criteria. It was also supported by the field-note that students were enthusiastic in group and class discussion. During those activities, the students showed positive characters, which had already been planned for tutorial activities.

It was found that the observation result was in line with the observation results of the tutor, which was 100% of the tutor activities planned on SAT could be executed in tutorial activities for each session. This information showed that the model fulfilled practical criteria.

The implementation of a character education model on mathematics tutorial courses showed that students could find concepts independently. For example, in the concept of logics, students could find truth conjunction table, disjunction, implication, bi-implication table and the negation from the examples in SW as part of a character education model. An example of the truth table completed by students independently can be seen in Figure 2 where B = True and S = False.

$p$	$q$	$p \wedge q$
B	B	B
B	S	S
S	B	S
S	S	S

Figure 2: Truth Table completed by the students from examples in USW

When a student can discover the concept and relate it to other concepts, it will last longer in the students' mind (Skemp, 1982) and help the students to understand the concept much better (Sutawidjaja & Afgani, 2011). This is in line with the research result from Prastiti, Mairing and Juniati, (2011) where the discovery method with explorative discussion can encourage students to play an active role in getting deeper understanding regarding material provided in courses.

A student who understands the concept very well will have a greater ability to learn something new (Sutawidjaja & Afgani, 2011) as well as in solving a mathematics problem (Hudojo, 2005). This is reflected in the ability of the students to solve the truth table problems in SW (see Figure 3; Note: B = True; S = False).

1)  $(p \Rightarrow q) \vee (p \wedge q)$ .

$p$	$q$	$p \Rightarrow q$	$p \wedge q$	$(p \Rightarrow q) \vee (p \wedge q)$
B	B	B	B	B
B	S	S	S	S
S	B	B	S	B
S	S	B	S	B

2)  $\neg p \Rightarrow (p \Rightarrow \neg q)$

$p$	$q$	$\neg p$	$\neg q$	$p \Rightarrow \neg q$	$\neg p \Rightarrow (p \Rightarrow \neg q)$
B	B	S	S	S	B
B	S	S	B	B	B
S	B	B	S	B	B
S	S	B	B	B	B

Figure 3: Example of problem solving by students

Another example of a concept discovered by students in SW can be seen in Figure 4a and Figure 4b (Indonesian and English version).

Menurut teman-teman apa yang dimaksud dengan penyelesaian dan bukan penyelesaian suatu persamaan linear.

**Penyelesaian Suatu Persamaan Linear** adalah  
 Penyelesaian yang mengakibatkan suatu persamaan linear bernilai benar  
**Bukan Penyelesaian Suatu Persamaan Linear** adalah  
 Penyelesaian yang mengakibatkan suatu persamaan linear bernilai salah.

Figure 4a: Definition discovered by the students (in Indonesian)

The question is "What does it mean by a solution and a non-solution in a linear equation?"

These are students' response on the questions.

A solution has an impact that a linear equation has a value of true.

A non-solution has an impact that a linear equation has a value of false.

Figure 4b: Definition found by the students (in English)

When a student can discover the concepts and relate it to other concepts, it will last longer in the students' mind (Skemp, 1982). It also help the students to understand the concept much better (Sutawidjaja & Afgani, 2011). This is in line with some research that showed the discovery learning method with explorative discussion can encourage students to play an active role in getting in-depth understanding regarding material provided in courses (Mairing, Budayasa, and Juniati, 2011).

A student who had in-depth understanding of some concepts will have ability to learn new knowledge (Sutawidjaja & Afgani, 2011) as well as in solving mathematics problems (Hudojo, 2005). It showed in ability of the students to solve problem of truth table in SW (see Figure 3; Note: B = True; S = False). The students acquired the characters of passion, habit of persistence, and diligence by learning to solve mathematical problems in the SW (Florida Department of Education, 2010; National Council of Teachers of Mathematics, 2000). The characters of the effectiveness criteria were acquired by the students during the tutorial activities. Therefore, the model met the criteria.

Furthermore, the tutor also observed by one observer using the tutor's activities observation. The result showed all the tutor activities planned on TAU could be executed in tutorial activities for each session. This information showed that the model met the practicality criteria. Therefore, the Character Education Model met all the criteria.

Although, there were some problems in SW that the students had difficult to solve. The tutor help the students by asking metacognitive question at each problem solving stages. The stages were understand the problem, develop some plans, carry out the plans, and look back the solution (Polya, 1973; Posamenteir & Krulik, 2009). The difficulties since some sentences in the problems needed to revise in order to increase its clarity. Some sentences needed to add in SW to help the students discover the concepts. The researchers and the tutor made some revisions based on the implementation. The revised model is referred to its final form, the Character Education Model.

## DISCUSSION

This model could encourage students to develop positive characters in a mathematics course tutorial. The characters were passion, habit of persistence, diligence, self-directed learning, confidence in unfamiliar situations, ability to collaborate in team work, active in tutorial, and ability to listen. Therefore, the model used in tutorial influenced students' attitude towards mathematics (Akonsola & Olowojaiye, 2008).

When the students involve in doing reflective thought and share their ideas to others and draw the conclusion and also presenting the result in front of the class then the atmosphere of learning will be alive and will please the students. It also encourages students to become independent learners (Sutawidjaja & Afgani, 2011; Mairing, Budayasa, and Juniati, 2011).



There are two kind of characters in mathematics education which were mathematics education, and mathematics characters. The characters in mathematics education were thoroughness, diligence, hard worker, curiosity, persistence, and creativity (Kemendiknas, 2010). Values in mathematics education include accuracy, clarity of thought, ability to predict, consistency, creativity, effective organization, happiness, flexibility, openness of mind, determination and working systematically (Dede, 2006). There are characters in mathematics itself which were rationalism, objectives, control, progress and openness. Those characters will be useful in life, which means it is important for tutors to include the characters into tutorial courses. Some of the characters appeared in implementation of the character education model in the research.

Collaborative learning in this model could motivate students to exercise teamwork abilities (Jacobs, et al., 1996). This ability constitutes positive character and needs to be developed by students during the tutorial activities. Teamwork abilities that can be trained in this model are (a) responding thank you utterances (b) listening carefully (c) giving compliment-responding compliments (d) waiting/trying patiently (e) asking for help/giving help (f) prompting other students/participation/responding to participation impetus (g) asking questions/responding to questions (h) appropriate interruption/accepting interruption (i) inviting group to come back to assignment (Mairing, 2011).

## CONCLUSION

The Character Education Model consisted of Tutorial Activity Plans, Tutorial Activity Units, Student Worksheets, and Evaluation Plan. This research result showed that the developed model met the criteria of validity, effectiveness, and practicality. The model could also encourage the students to develop certain characters in the tutorial activities which were passion, habit of persistence, diligence, self-directed learning, confidence in unfamiliar situations, ability to collaborate in team work, active in tutorial, and ability to listen.

The characters could support the students to have good ability in solving mathematical problems, and to achieve highest dimensions of learning. The dimensions were habits of productive thinking, and positive attitudes. The productive thinking were critical thinking and creative thinking. Furthermore, the students could develop the attitudes by learning to solve mathematical problems in tutorial activities.

The model could encourage students to construct mathematical concepts meaningfully by themselves. The students with the meaningfully concepts had more capability to solve mathematical problems. The ability to solve problems could encourage the students to have critical thinking and creative thinking. In addition, mathematical concepts could be meaningful if they were implemented in solving mathematical problems.

Although the model was developed specifically for a mathematics course, it is proposed that this model can be used for other courses in other programs. It can also be expected that the same results will appear for other courses.

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