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Mathematics Teaching Using Generative Learning Model with Character Building Content Aided by Interactive Learning Media

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Abstract

This research is aimed at generating a Mathematics learning instrument using generative learning model with character building content aided by interactive learning media from the topic of Geometry for VIII graders, which is valid, effective for conceptual understanding, and descriptive in terms of learning instrument development characteristics. It is a developmental research using the 4-D model of Thiagarajan, which consists of defining, designing, developing, and disseminating. This research managed to finish three of those four stages. The learning instruments developed are the Syllabus, the Interactive Learning Media (Media Pembelajaran Interaktif/MPI), Plan for Teaching Execution (Rencana Pelaksanaan Pembelajaran/RPP), Students' Worksheet (Lembar Kerja Peserta Didik/LKPD), and Learning Potential Test (Tes Prestasi Belajar TPB) Data collection was carried out using testing, documentation, and observational methods.Results of data analysis show lead to the conclusion that validation for Syllabus, MPI, RPP, LKPD, and TPB indicate fulfillment of all validity criteria. Effective learning for concept understanding skills is marked with (1) classical learning completion, in which students taught using the generative learning model with character building content aided by interactive media learning are 80% successful, or equals to 75 minimum score, (2) students involvement in learning that positively affects their achievement, and (3) better achievement attained by students taught using the generative learning model with character building content aided by interactive media learning, compared to conventional learning model. The characteristics developed for Mathematics teaching using the generative learning model with character building content aided by interactive media learning are aimed at improving students' achievement in terms of concept understanding of Geometry, involving learning stages of generative learning model syntax, which consists of (1) introduction or exploration, (2) focusing, (3) challenge, and (4) application.

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INTRODUCTION

The beginning of the 21st century presents our national education system with a complex challenge of producing quality human resources (HR). Law No. 20 Year 2003 on The National Education System mentions in Article 3 that the national education is aimed at developing the potential of students to make them religious and faithful human beings to God The Almighty, having noble attitude, healthy, knowledgeable, skillful, creative, independent, and democratic, as well as responsible citizens. In line with that goal, the government has strove to increase and improve the quality of education in formal institutions.

Education quality improvement is performed by improving learning activities in classrooms. According to Pribadi (2009:154), there has been a shift in mathematics teaching, from behavioristic approach to constructive one. The theory of behavioristic approach takes behavior as measurable and observable, that it results from individual learning. Meanwhile, constructive approach emphasizes the need for mental process for a person to be actively involved in learning and constructing knowledge.

Hamalik (2008: 57) states that learning is a combination of elements of humans, materials, facilities, tools, and procedures that affect each other in achieving its goal. According to Santiana et al. (2014), there are some aspects worth noting in Mathematics teaching: 1) students should actively build their own knowledge, 2) learning is focused more on process and not result, 3) students focus on the learning process, and 4) teaching is making students learn.

The learning process often used as a communication means between the teacher and his/her students is lecturing. According to Djamarah and Zain (2006: 97) this lecturing method is referred to as the traditional or conventional method. This method requires a teacher's active role during the entire learning process, by giving oral explanation to students. The drawbacks that come with lecturing are that students are not actively involved in constructing their knowledge; it will be boring as time goes by, and it makes students become passive, as well as making it hard for the teacher to conclude whether the students understand and are interested. Therefore, there is a need for a more innovative learning method.

According to Wiguna (2014), innovative learning is a learning model designed by teachers to find the solution of a problem by focusing on the students in order to improve education quality. This is in line with that of Satyawati (2014) which mentions that Mathematics teaching using guided invention learning model based on Students' Worksheet (LKS) shows better results, compared to traditional teaching. Another research by Sariningsih (2014) reveals that achieving and improving mathematical understanding skills using contextual learning for students is better off than using conventional learning. A research by Muhamad (2013) states that mathematical representation skills and confidence of students exposed to discovery learning is better than those exposed to conventional learning. Meanwhile, a research by Lambertus (2016) suggests that mathematical understanding among students taught using open-ended approach is much better than those taught using conventional teaching. Those researchers suggest many teaching models available to solve problems faced by students.

Geometry is one mathematical topic that is both challenging and abstract. These facts are well summed up by Iswadji (1993: 1) who states that Geometry is one mathematical topic of high abstraction level. This is because the objects discussed are abstract in nature. It is also well-phrased by Moise in Herbst (2006: 317) who says that Geometry is not a line of problems along with their solutions; rather, it is an abstract concept with general solutions.

According to Kartono (2010: 25) the goal of Geometry learning is for students to gain confidence in their mathematical skills, to become good problem solvers, to be able to

communicate and think mathematically, to develop spatial intuition, to instill the knowledge that will support other materials, and to read and interpret mathematical arguments. According to Retnawati (2017: 33) students tend to have problems solving national exam problems in the topic of Geometry and Statistics, as well as narrative texts. This is due to lack of conceptual understanding of the elements of solid figures, and their related properties, and also the concept for their application in solving problems. Therefore, mathematical concept understanding is paramount in mathematical learning. Mathematical concepts are closely related to one another. Any given material is intertwined with previously given ones. For example, as they are learning polyhedron, students should remember the concepts of plane figures taught earlier.

According to Jihad (2008: 154) the causes of failure for students in understanding Mathematics are: (1) inability to understand the right concept, (2) failure to understand the meaning of symbols, (3) inability to understand the root of principles, (4) non fluency in using operators and procedures, (5) lack of comprehensive knowledge. Next, according to Soleh (1998: 20) a new concept is founded upon an older one. This means that the success of conceptual formation will affect the success of yet another conceptual formation.

One of the ways to deal with lack of Mathematics conceptual understanding is getting students to be active during learning. Active involvement in learning can be conditioned by using many instructions adjusted to the learning model used. This means that students do not only sit still, but instead, they are enthusiastic in collaborating with their peers in solving problems.

SMP Negeri 2 Magelang is a National Standard School in Magelang. On-site experience and interviews with Mathematics teachers lead to the conclusion that students there tend to be passive and only wait for and take in what the teacher says. In terms of Geometry, their achievement, behavior and involvement are categorically low. On the other hand, the teachers themselves have not involved students actively in their teaching. The teaching practice is still teacher-centered. The habit of being passive in learning makes students afraid and shy to ask their teacher about a topic they do not understand. This results in lack of achievement in the topic of Geometry as indicated by the many students failing to meet the minimum completion criteria. Low achievement in learning may also be caused by lack of conceptual understanding skills.

The teaching model used is still conventional. It is still teacher-centered and students only act as passive recipients. Teachers deliver the lesson directly by explaining new concepts to students long with associated sample problems, while the students only listen and take notes. The conventional learning model used results in below-expectation development in students' characters.

The characters of being responsible, cooperative, self-confident, hard-working and skillful in mathematical logic are still low. Responsibility in doing assignment is still limited to doing what they are asked to. They have not been able to develop their potential by responsibly responding to all activities provided. They have not been able to properly cooperate with their peers in solving problems. Problem solving is more often carried out individually. They also lack self-confidence. The teaching done so far has not catered for students' need to be courageous in stating opinions, asking questions, discussing topics, presenting discussion results, and the likes. Students also lack hard work. They tend to give up finishing difficult mathematical problems. The willingness to ask the teacher or find alternative solutions from all kinds of sources is also lacking. These result in lower mathematics logical skills.

Development in science and technology expects teachers to be technology savvy in using IT-based teaching methods. However, many teachers are not yet technology-savvy. They cannot properly used available IT yet. Lack of

variation in learning media makes teaching less interesting and hence, boring.

In order to deal with these issues, there needs to be more attention on teachers' creativity in using the proper teaching model and improvement in learning instruments that meet the need of the teaching model used. The learning instrument used should help ease students to better understand lessons, improve their active involvement, and motivate them to have positive attitude towards Math. According to Slameto (2003: 188) attitude is something learned, and it determines how individuals react to certain situations and decides what individuals seek in life.

A study by Mohamed (2011) finds that positive attitude of students affect learning outcome, and that gender does not influence attitude. Meanwhile, Colomeischi (2014) states that attitude towards Mathematics learning depends on emotional intelligence. The higher a person's emotional intelligence, the higher his/her learning motivation is, and he/she also tends to have positive orientation towards success in learning Mathematics. This is in line with a research by Karim (2016) which finds that students who have positive attitude towards learning Mathematics tend to have better learning outcome, whereas students with negative attitude towards life tend to have less satisfactory learning outcome. Also in agreement is a result by Rahmawan et al. (2015) which reveals that there is a relationship between cooperative learning and attitude in solving problems.

Cooperation with and help from others who understand certain topics better can help students develop positive attitude in gaining knowledge or information during learning. This means that students can use the knowledge they already have to construct new knowledge. In order to support that, there needs to be an effort to implement Mathematics teaching model that employs constructive approach. Piaget in Trianto (2010:28) states that in constructive theory, students must find and transform complex information, check new information using earlier formulas (rules) and revise them whenever necessary.

Another issue of concern is the negative tendency in teenagers' life nowadays. Students' brawl among high school or college students has spread to villages. Drugs use is also rife. Skipping school, fraud, theft, and sexual misconduct are among other delinquencies young people are often involved in an unhealthy community (Zuriah: 2007). The have be efforts to prevention and mitigation. One of the ways is by instilling moral values in early character building, starting from the family, the neighborhood, and school.

According to Khan (2010:1), character building teaches the habit and attitude that help individuals to live and work together in the family, community, and nation, and help them make informed decision. These facts are well summed up by Masrukan (2014: 76) by stating that nation character building can only be carried out with developing individual character of a person. In the meantime, individual character can only be grown in a suitable social and cultural environment. Masrukan further emphasizes that building the character and culture of a nation can only be carried out in a learning process that does not detach students from their social, cultural, communal, and national environment. Therefore, teachers as facilitators are expected to plan and perform teaching processes that cater for character building.

A research by Benninga (2003:19) mentions that schools implementing charactering building education tend to have better academic scores compared to the scores of previous years prior to the implementation of character building education. Another research by Rudyanto (2014) suggests that curiosity and communication skills positively affect creative thinking skills. Therefore, students of great character are religious and faithful, caring, independent, resilient, curious, skillful, and highly motivated to achieve the best. They are more capable of facing challenges in life to succeed in the future (Supriyadi, 2011). Character and moral values are not internalized

and projected to students' everyday life by themselves; instead, they must be organized, constructed, and transformed into the basic structure of individual understanding via participation (Winarni, 2011). This is in line with the result of a research by Siswanto et al. (2012) which states that the IDEAL Problem Solving model of Mathematics teaching using constructive approach that is oriented towards character building can improve active involvement and attitude that in turn positively affects problem solving skills.

Therefore, in order to improve learning outcome and build character, a model of learning that is proper and easy to implement is required. The model of character building that is integrated with teaching can be developed by choosing the model or strategy, model of assessment, learning media, and learning material (Sadia, 2013).

The model to be used in this research is generative learning. According to Wittrock in Lee (2008:112), generative learning is a model of learning in which students do not passively take in information, but they are actively involved in the learning instead. They build meaningful understanding of information found in the environment. Wittrock states that "when a student does not understand what the teacher is saying, he/she will surely understand what he/she says to him/herself." Wittrock (1992:531) adds that generative learning consists of four main processes; (a) attention, (b) motivation, (c) knowledge and assumption, and (d) generation.

According to Osborno and Wittrock in Wena (2008:183), generative learning is a model that emphasizes active integration of new knowledge using the very knowledge students already master. This new knowledge will be tested for its use in answering questions or responding to symptoms related. If the new knowledge is capable of solving the problems faced, then it is kept in the long term memory. This is in agreement with some researches suggesting that generative learning affects cognition (Rosdiyanto, 2017). That there is a difference in creative thinking and scientific process skills (Wijaya, 2014), and improved mathematical understanding skills (Martunis, 2014) among students of generative learning. This shows that generative learning does affect learning outcome, creative thinking skills and scientific process skills, as well as mathematical understanding skills in students.

Moreover, multimedia should be used to make Geometry more accessible/understandable. The use of information technology and multimedia is one effective and efficient way of conveying information (Yusuf, 2010). Susilana and Riyana (2007:7) describes that learning media is a niche of learning message, in terms of material to deliver in order to achieve learning outcome. According to Sanaky (2010:4), learning media are the education instruments that can be used to bridge learning process and highly effective and efficient learning outcome. Therefore, learning should involve communication or interaction among students, teachers, and learning materials. The use of interactive learning media will allow students to learn more. Students do no only pay attention to the media or object, but they are also required to interact with one another during learning.

A research by Macaulay (2003:185) shows that multimedia have the properties that help learners, especially in learning Mathematics, and that students using multimedia have higher scores compared to those not using them. According to Yuniati et al. (2011), learning materials presented using multimedia with interactive learning are easier to digest and are more interesting. Interactive media learning also improves learning attitude and outcome of students (Pramesti and Maryono: 2011). According to Hartanto (2013), the use of interactive learning multimedia increases students' willingness to learn and help them better understands Mathematics. Learning media based on flash macromedia is effective in teaching Mathematics (Safitri at al., 2013). Therefore, this research employs interactive learning media to help deliver teaching materials that will help students to better

understand what the teachers are trying to convey.

The goals of this research are (1) to describe valid development and generation of Mathematics teaching using generative learning model with character building content aided by interactive learning media for the topic of Geometry for VIII graders, (2) to find out the outcome of the generative learning model developed effectiveness, in terms of conceptual understanding skills, (3) to describe the characteristics of the generative learning model developed.

METHOD

This research is a developmental research that aims to develop a learning instrument and testing it in Mathematics teaching. The learning instruments developed are the Syllabus, the Interactive Learning Media (Media Pembelajaran Interaktif/MPI), Plan for Teaching Execution (Rencana Pelaksanaan Pembelajaran/RPP), Students' Worksheet (Lembar Kerja Peserta Didik/LKPD), and Learning Potential Test (Tes Prestasi Belajar TPB) Meanwhile, the research instruments are syllabus validation sheet, plan for teaching execution, interactive learning media, LKPD validation sheet, students' attitude observation sheet, students' active involvement observation sheet, and validation sheet for learning outcome test.

Development of Mathematics teaching instrument using generative learning model with character building content aided by interactive learning media is for polyhedron and cube intended for VIII graders of SMP Negeri 2 Magelang, in order to improve their mathematics conceptual understanding skills. The model developed is based on the Thiagarajan or the four-D model. According to Sinambela the 4-D model of Thiagarajan (2006: 61) consists of four stages of (1) definition, (2) design, (3) development, and (4) dissemination. However, this research only covers up to the third stage of development.

The definition stage is aimed at determining and setting the conditions required in learning by analyzing the purpose and material limitations. Activities involved in this stage include pre and post analyses, students analysis, task analysis, topic analysis, and learning outcome outlining.

The design stage aims to design a prototype of learning instrument. This stage takes place once a special learning goal is set. This means that an initial draft that suits the learning goal has to be obtained first. There are three steps involved in this stage: (1) test setting, (2) media selection, (3) format selection, and (4) initial design.

The development stage is aimed at producing a draft of learning instrument that has been revised based on inputs from experts and data of field studies. Activities involved in this stage include instrument validation with revisions and field tests using real students.

A valid learning instrument, according to Nieveen (1999:27) should be based on content validity and construct validity. Data obtained from expert validation are then analyzed by studying results of learning instrument evaluation. Results of evaluation from expert validation are used as inputs to improve the learning instrument developed with the following criteria: (1) $1.00 \leq Va < 1.70$ bad, (2) $1.70 \leq Va < 2.40$ not good enough, (3) $2.40 \leq Va < 3.10$ good enough, (4) $3.10 \leq Va < 4.00$ good. Further tests include validity, reliability, difficulty level, and differentiating factor against the TPB to be used in the research.

Effective learning, according to Pribadi (2009:201) involves activities and learning processes that help students to reach certain competence or learning outcome. Meanwhile, Sukestiyarno (2012:6) mentions that learning is said to be effective when : (1) it completes each variable, (2) the independent variable has positive effect on the dependent variable, (3) the dependent variable of the test group is better than the dependent variable o the control group.

In this research, learning is said to be effective when it improves students' conceptual understanding skills by meeting the following

indicators: (1) students reach minimum completion criteria of both individual and classical, with minimum individual completion criteria being 75%, and classical completion criteria being 80% (Winkel, 2007:466), (2) there is positive effect of attitude and active involvement against learning achievement, (3) better achievement shown by students exposed to generative learning model with character building content aided by interactive learning media, compared to those exposed to traditional learning model.

The population of this research was VIII graders of SMP Negeri 2 Magelang, comprising 6 classes of 148 students. Samples were taken using cluster random sampling technique with class VIII C chosen as the test trial group, class VIII E as the experiment group, and class VIII B as the control class. Data were collected by conducting tests to find out students' scores, and observations to figure out students' attitude and active involvement.

Prior to testing for teaching effectiveness, preliminary tests of normality and homogeneity tests were performed against post test scores. These two later procedures were also performed for all other data obtained in this research. Normality and homogeneity tests were performed using SPSS 16. The normality test employed One Sample Kolmogorov-Smirnov Test with a significance level of 5%. If sig > 0.05 then H_0 is accepted, and data are normally distributed. Meanwhile, the homogeneity employed the Independent Sample t Test. If sig > 5% then H_0 is accepted, and variants on both samples are homogeneous (Sukestiyarno 2010: 39).

The classical completion test was performed using the both parties proportion test. Results from this were then compared to z_{table} with % testing criteria. If z_{hitung} is in the acceptance region H_0, which is $-z_{\frac{1}{2}(1-\propto)} < z < z_{\frac{1}{2}(1-\propto)}$, then H_0 is accepted, meaning that classical completion reaches 80% (Sudjana 2002: 233).

Test for students' learning attitude (X_1) and active involvement (X_2), as independent variables of learning achievement (Y), which is a dependent variable, is tested using double regression. If $F_h > F_t$, then it is significant, or the model is linear (Sugiyono 2010:267). Once the model is tested and it is known to be linear, the effect of variable X on variable Y is determined. Analysis of the effect of attitude and active involvement against learning achievement was carried out with SPSS 16. Criteria H_0 is rejected if the sig of Anova output < 5%, which means H_1 is accepted, that attitude and active involvement affect learning achievement. The degree of the effect of attitude and active involvement against learning achievement is observable via the R square value of the model summary table (Sukestiyarno, 2010: 86).

Comparative and mean difference tests were used to compare learning achievement of students in the experiment class with that of the control class. Prior to mean difference test, two variants similarity tests were performed. This research employed the independent sample test to analyze data of comparative test. If the value of sig. > 5% then H_0 is accepted, which means that there is no difference in variants for both experiment and control class, or that both classes are homogeneous. Comparative test using one party t test (the right side) was then performed. The testing criterion is to accept H_0 if $t_{hitung} < t_{1-\frac{1}{2}\alpha}$, which means that mean score of the experiment class is not better than that of the control class, as $t_{1-\frac{1}{2}\alpha}$ taken from the t distribution list with dk = $(n_1 + n_2 - 2)$ and chance $1 - \frac{1}{2}\alpha$ (Sudjana, 2005: 239).

RESULT AND DISCUSSION

Results of analysis of Mathematics curriculum in SMP Negeri 2 Magelang show that the teaching method is still conventional. Teachers use lecturing method and students only take notes. When trying to do exercises, teachers do not really facilitate discussion, collaboration, and appreciation among students. This results in in low hard-work rate,

responsibility, and self-confidence among students.

Students are tend to be passive and only wait for knowledge transfer from the teacher, which means that students do not construct their own knowledge in learning. This is against the concept of generative learning introduced by Wittrock in Lee (2008:112), which states that generative learning is a model of learning in which students do not passively take in information, but they are actively involved in the learning instead. They build meaningful understanding of information found in the environment.

Results of analyses of students and the environment suggest that students are high in terms of academic abilities, but in terms of Mathematics, their outcome is still below expectation. Prior knowledge already possessed by students is not used to construct new knowledge from what they are learning that their active involvement is low. Piaget (1973) suggest that active involvement from students is very necessary in constructing new knowledge. This requires new strategies and methods that encourage students to be more involved. Meanwhile, according to Slameto (2003: 188) attitude is something learned, and it determines how individuals react to certain situations and decides what individuals seek in life.

Results of material analysis reveal that based on Education Unit Level Curriculum (Kurikulkum Tingkat Satuan Pendidikan/KTSP), the topic of polyhedron is taught for VIII graders in semester two. This geometrical topic covers identification of properties and elements of cubes and cuboids along with their measures, construction of nets and calculation of areas, as well as volumes.

Results of task analysis indicate that tasks performed well by students include identification of properties and elements of cubes and cuboids along with their measures, making nets of cubes and cuboids, determining the areas of cubes and cuboids, and calculating the volumes of cubes and cuboids. These results then serve as reference in setting the learning outcome. Results of analysis of definition stage are referred as daft I. Instruments in draft I are validated by a team of experts and are revised based on their input. The outcome from this is draft II. The followings are mean values of each learning instrument based on expert evaluation.

Table 1. Mean Values of Expert Validation Maximum Score is 4.00

Instrument		Mean value from experts				
		A	B	C	D	E
Mean	Syllabus	3.73	4.00	3.55	3.91	3.64
	RPP	3.82	3.82	3.76	3.82	3.59
	LKPD	3.71	4.00	3.57	4.00	3.71
	MPI	3.80	4.00	3.60	3.80	3.60
	TPB	3.50	4.00	3.80	3.90	3.70

It can be seen that the learning instrument developed here fulfills validation criteria.

Once it is stated as valid, instrument test was performed. Result of instrument test is followed by tests of validity, reliability, difficulty level, and differentiating aspect, in order to find out its feasibility for use. After trial using 20 problems prepared, 14 were taken as valid, while the other 6 were rendered invalid. Reliability score for test material is 0.7, which means that this is of high reliability criteria. Difficulty levels range from easy, medium, and difficult, with both significant and insignificant differentiating aspects. Hence, 13 problems were set as the TPB instrument.

Results of field observation for attitude and active involvement show a score of 63.86 of the m0 maximum score. Meanwhile, elements of responsibility, hard-work, collaboration, and logical thinking are also categorized as very high. Self-confident is categorized as high. Students' active involvement is categorized as high as proven with a score of 78.38 of 100. Characteristics of the Mathematics learning

instrument developed are generally designed to use learning generation model with character building content aided by interactive learning media that is aimed at improving learning achievement for the topic of geometry. The teaching stages implemented are: (1) introduction or exploration, (2) focusing, (3) challenges, and (4) application. The syllabus and RPP from development have characteristics of integrating indicators that must be obtained with those of conceptual understanding skills. The MPI developed contains Geometry materials equipped with sample problems and discussions, as well as interactively presented additional exercises. The LKPD developed is adjusted to the purpose of each meeting and is integrated with aspects of conceptual understanding skills. The TPB contains problems of Geometry with indicators in the problems adjusted to indicators of conceptual understanding skills.

Results of initial data analysis of odd semester test results among VIII graders of SMP N 2 Magelang show that samples were normally distributed, homogeneous, and have the same initial skills. The classical completion test was performed using the both parties proportion test. Results obtained $z_{hitung} = 1{,}08$ were compared to $z_{table} = 1.96$ with testing criteria of 5%. As z_{hitung} is located in H_0 acceptance area, that is $-z_{\frac{1}{2}(1-\propto)} < z < z_{\frac{1}{2}(1-\propto)}$, then H_0 is accepted, meaning that the percentage of students reaching the Minimum Completion Criteria (Kriteria Kelulusan Minimal/KKM) in the class using generative learning model with character building content aided by interactive learning media delivered in classical way is 80%. Therefore, students in the experiment class meet the completion criteria. This means that most of the students fulfill the criteria of conceptual understanding skills. This is in line with a research by Lusiana et al. (2009; 29) which shows that implementation of generative learning is effective in terms active involvement, learning completion, and attitude. Utami et al. (2015; 26) shows that generative learning instrument using **GI** is effective in instilling mathematical communication skills, learning independence, and involvement among students.

Some of the factors causing conceptual understanding skills of students to meet the minimum completion criteria are the stages involved in generative learning that boost improvement of conceptual understanding skills. Getting through stages of introduction or exploration, focusing, challenges, and application helps students to understand the concept they learned, in agreement with the learning goal.

Test for students' learning attitude (X_1) and active involvement (X_2), as independent variables of learning achievement (Y), which is a dependent variable, is tested using double regression. Results of SPSS 16 data processing show values of a = -8.396, $b_1 = 0.608$, and b2 = 0.659. Hence, the regression equation is $\hat{Y} = -8.396 + 0.608X_1 + 0.659X_2$. Results of Anova test output show values of F = 169.903 and sig = 0.000 or sig = 0%, which means that H_0 is rejected, which shows that is in a formula of linear regression. It is known from the Model Summary table that R square = 0.937 = 93.7%. These values indicate that attitude and active involvement affect learning achievement by| 93.7%, while the remaining 6.3% is influenced by other factors. These results are in agreement with those of Benninga (2003), which show that schools implementing character building education tend to have higher academic scores. A research by Ulusoy and Onen (2014) states that learning using generative model with context based learning improves attitude, motivation, and learning outcome of students.

Other than teaching using generative learning model, the character building content helps students to develop their attitude and active involvement in the learning process. The good characters of responsible, cooperative, hard-working, self-confident, and logical thinking boost attitude and active involvement among student, and in turn, improve learning outcome.

Comparative and mean difference tests were used to compare learning achievement of students in the experiment class with that of the control class. Prior to mean difference test, two variants similarity tests were performed. Results of data processing using Independent Sample Test show values of sig. = 0.872 = 87.2% > 5% that H_0 is accepted, that is, there is now differences in variants between the experiment and the control class., or that both are homogeneous. Comparative test using one party t test (the right side) was then performed, and results in$t_{hitung} = 3{,}23$. Using $\alpha = 5\ \%$ and dk = 26 + 24 – 2 = 48, we have $t_{1-\frac{1}{2}\alpha} = 2.943$. As $t_{hitung} > t_{1-\frac{1}{2}\alpha}$ then H_0 is rejected. Therefore, it can be concluded that mean value of learning achievement in the class taught using generative learning model with character building content aided by interactive learning media is better than that of the class taught using conventional learning.. It is in agreement with a research by Minarti (2012), which mentions that implementation of generative learning improves logical skills and mathematical connection. It is also effective for improvement of creative thinking (Sugilar, 2013), increasing cognition, (Rosdianto, 2017), increasing conceptual mastery skill (Maknun, 2015), and improving conceptual understanding (Irwandi and Rofiah, 2015 and Waluya, 2008).

These facts highlight the real success of Mathematics teaching using generative learning model with character building content aided by interactive learning media. This success is evident with trial test results of 83.69 in the experiment class, compared to the control class implementing conventional teaching, with a mean of 68.92. Mathematical teaching using generative learning with character building content aided by interactive learning media allow students to construct their own knowledge, analyze and explore more knowledge by relating it with what they have previously learned, and implementing what they have learned in everyday life.

Characteristics of the Mathematics learning instrument developed are generally designed to use learning generation model with character building content aided by interactive learning media that is aimed at improving learning achievement in terms of conceptual understanding skills for the topic of geometry. The teaching stages implemented that makes up the syntax of generative learning model are: (1) introduction or exploration, (2) focusing, (3) challenges, and (4) application.

The syllabus and RPP developed have characteristics of integrating indicators that must be obtained for the topic of Geometry, in terms of conceptual understanding skills. The interactive learning media contains materials on the concept of polyhedron for cubes and cuboids, along with problems, discussions, and additional exercises set in interactive format. Students learn and discuss MPI materials in discussion groups in order to independently construct their knowledge. Upon constructing their own knowledge, the information they have learned will be stored in the long term memory. The LKPD developed is adjusted to the purpose of each meeting and is integrated with aspects of conceptual understanding skills. The TPB contains problems of Geometry with indicators in the problems adjusted to indicators of conceptual understanding skills.

CONCLUSION

Results and discussion lead to the conclusion that the instrument of Mathematics teaching using generative learning model with character building content aided by interactive learning media for the topic of Geometry for VIII graders is valid. This result has undergone validation tests by experts in the field.

Mathematics teaching using generative learning model with character building content aided by interactive learning media for the topic of Geometry for VIII graders results in effective learning for the improvement of conceptual understanding, as proven with (1) fulfillment of minimum completion criteria for experiment class showing 80% of students scoring more than 75, which means a success in classical learning completion, (2) attitude and active

involvement positively affect learning achievement by 93.7%, (3) learning achievement of students in the experiment class taught using generative learning model with character building content aided by interactive learning media is at a mean score of 83.69, which is better than the control class using conventional model with a mean score of 68.92.

The learning instrument developed contain characteristics of Mathematical teaching using generative learning model with character building content aided by interactive learning media, including (1) the instruments developed are syllabus, RPP, LKPD, interactive learning media, and TPB. These instruments possesses characteristics that integrate indicators to achieve for the topic of Geometry and indicators of conceptual understanding skills, (2) the learning model developed uses generative learning model syntax that consists of introduction or exploration, focusing, challenge, and application, (3) the character building content developed covers responsibility, cooperation, hard-work, self-confident, and logical thinking, (4) the learning media used is interactive media materials for the topic of cubes and cuboids.

Results of this research also lead to some suggestions; (1) teachers should lead and facilitate students to help them improve conceptual understanding skills by encouraging them to construct their own knowledge using generative learning model, (2) topics other than Geometry can also use the instruments developed in this research, (3) teachers are responsible to provide support, motivation, and directive that will strengthen character building in order to instill noble personality, cultural awareness, good character, independence, and creativity.

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