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E-mail addresses: herpratiwi.1964@fkip.unila.ac.id (Herpratiwi) chandrafkipunila@gmail.com (Chandra Ertikanto) riswandi.1976@fkip.unila.ac.id (Riswandi) bambang_setiyadi76@yahoo.co.id (Ag. Bambang Setiyadi) sugiyanto.1957@eng.unila.ac.id (Sugiyanto) * Corresponding author Building Students' Character in Elementary School through the Scientific Method: A Case Study of the Lampung Province 1*, Ag.

Bambang Setiyadi 1 1, Chandra Ertikanto 1 and Sugiyanto2 1Faculty of Teacher Training and Education, Universitas Lampung, Jalan Prof. S. Brojonegoro No. 1, Bandar Lampung 35145, Indonesia 2Faculty of Engineering, Universitas Lampung, Jalan Prof. S. Brojonegoro No. 1, Bandar Lampung 35145, Indonesia ABSTRACT The scientific method is a popular mechanism through which science teachers can impact students' cognitive domains and academic nature. The purpose of this study is to analyze educational character in the affective domain.

To do so, we engaged in research using quasi- experimental methods. A random sample of 40 students was chosen. Data were collected using a questionnaire on students' character consisting of three aspects: reasoning, feeling, and The have normal with significant of and are with significant of > data analyzed a paired sample T-test.

The character value of social studies learners, after being taught using the scientific method, was higher than ever with a significance of $0.000 < 0.05$. The character of students in the affective domain was influenced by the feelings aspect resulting from the scientific method. Thus, using the scientific method in educational interventions improved the character of fifth-grade elementary school students.

Keywords: Affective domain, elementary school, character education, scientific method

INTRODUCTION In recent years, the issue of character development has become a prevalent one faced by all institutions (Schreuder, 2011) such that schools and colleges have sought to develop curricula to enhance students' character. Formal educational institutions are one category of organizations that 1548 have pursued this goal (Anwar, 2016), as schools have the role, resources, and cultural capital of the powerful to shape students' experiences (Chang & Chou, 2015; Lareau, 1987; Lickona, 1996).

Activities in the classroom affect and change students (Tinto, 1987); thus, it is necessary to integrate the values of society into their formal education (Owour, 2008). It is difficult, however, for schools to create programs that lead to character education and to measure the success of these programs (Schaps et al., 2001). Learning in schools should not only be oriented to domain-oriented (cognitive) academic activities, but also to the affective domain of social, emotional, and ethical competence.

This be by method, scientific has used only by teachers in the field of natural the understanding of the theories of the constructivist Piaget (1968), as well as Ausubel (1968)'s theory of meaningful learning. Bruner (Carin & Sund, 1975) posited that people only learn and develop the mind through discoveries that will strengthen memory retention.

Vygotsky (1990), a social constructivist, believed that cognitive learners will be developed at the moment when the teacher provides scaffolding through interaction with peers. Scientific are in and group so that students can build knowledge and develop their character. Value education scaffolds social and emotional learning, develops peer group friendships, and promotes a sense of "togetherness" as the basis for the classroom community (Oers & Hannikainen, 2001). According to Woolfolk (2004), cognitive activity, and social transmission.

With the cognitive and character learners will develop in tandem. Through the method, where students work together to conduct research, as well as through discussion, the teacher can create a moral community. Such a community is characterized as one where students respect and care for one another such that mutual respect exists within the group, and where a democratic environment exists in the classroom such that students are involved in decision making.

Teachers train the students on a moral discipline, using the creation and application of the rules as an opportunity to promote moral reasoning, self-control, and respect for others, as well as to teach values through the curriculum 2010). Character education involves values education or religious education, which must teach the scientific method

(Kirschenbaum, 2000).

Character education has the educational value of helping students to develop dispositions to act in ways that definitely. The role of schools that stand out with regard to the formation of character can be characterized as follows: "to build on and supplement the values children have already begun to develop by offering further exposure to a range of values that are current in society (such as 1549 equal opportunities and respect for diversity); and to help children to reflect on, make sense of and apply their own developing values' (Halstead & Taylor, 2000, p. 169).

Halstead and Taylor (2000) found that character values were taught and presented in learning Citizenship, Personal, Social, and Health Education (PSHE), and Math, Science and Geography, Design and Technology, as well as Physical Education and Sport. According to Lickona (1991), and Ryan and Bohlin (1999), character education includes moral reasoning (or the ability to know when something is good), moral feelings, love, kindness, as well as moral behavior (or doing something good).

Gleeson and Flaherty (2016) stated that the role of the teacher consists of being a moral educator, role model, and holistic educator. The responsibility of schools is, thus, to provide a moral education on behalf of the state. Lickona (1991) showed that character education was developed to train students to be able to decide what is right or wrong, and to act in accordance with their beliefs.

Character is a collection of qualities, or a mark that distinguishes itself from others (Homjak, 2007). The character of an individual determines whether they understand love and kindness, and whether they do well (Ryan & Bohlin, 1999). Character education is not only limited to courage, integrity, decency, kindness, perseverance, responsibility, tolerance, discipline, respect, and responsibility, but also denotes how a person responds to desires, fears, challenges, opportunities, failure, and success (Cheung & Lee, 2010).

Character education helps students to understand right from wrong and to know how to control themselves and consistently do what is right (Josephson, 2002). According to Lickona (1991), character education addresses three aspects: knowledge (cognitive), feelings, and action. This examined scientific and character education and focused on three aspects, namely reasoning, feeling, and behaviors.

For these reasons, it is necessary to study scientific method in the character of elementary school students of Social Science in the Lampung province of Indonesia. Elementary schools are the most basic institutions for shaping the character of future

citizens. LITERATURE REVIEW Learning in schools should be oriented to academic activities that tend to not only cognitive domains, but also the affective domain.

These activities should target social competence, emotions, and ethics, because doing so will contribute to students' quality of life (Cheung & Lee, 2010; Cohen, 2006). This can be done by means of the scientific method, the method generally been used only by science teachers. Learning the method students conducting observations, proposing a hypothesis, and testing that hypothesis by means of experimentation (Raven et al., 2008).

The method to set 1550 of assumptions, attitudes, and procedures used to investigate, pose questions, and draw conclusions (Hockenbury & Hockenbury, 2000; Mc Murry & Fay, 2008). The scientific method is a method of collecting data that relies on the assumption that knowledge is built from observation and that knowledge is a truth (Ferrante, 2008).

Students using the method will make observations, ask questions, formulate hypotheses, search for the evidence to test hypotheses, and develop theories (Keyes, 2010; Wicander & Monroe, The method critical thinking that begins with observation activities, proposing hypotheses, and experimenting. Character education includes three aspects of knowledge (cognitive), feeling, and action.

This is in accordance with Park's opinion (2017), that cognitive ability positively supports tripartite character, that is, interpersonal, intrapersonal, and intellectual personality. Zarinpoush's (2000); Blanchette (2010), and Smith (2017) research shows that reasoning and mood affect a person's moral behavior and enrich the understanding of moral education. Students with good behavior exhibit more moral and emotional sensitivity than children who engage in bad behavior.

Furthermore, the empathy component is stronger in encouraging prosocial behavior and inhibiting antisocial measures than the cognitive component (Lonigro, 2014). and affects reasoning, which in turn affects the empathy of teachers, and teachers to package the values of character education so as to accelerate the change of students' knowledge of the value (Barger, 2013; Beachum, 2013; Senland, 2013; Walker 2015). Moral learning will shape the character of the child.

The level of reasoning in feelings, goals, and actions. Teachers should remember this wisely, because knowledge of morals will affect the moral response that is awakened to the child. Moral learning should be interesting, so it will affect the habits and willingness to behave well (Nucci, 2014).

Kohlberg's theory of moral development explores the role of cognition and emotion, although the focus is cognition. Contemporary post-formal theory leads to the conclusion that skills resulting from cognitive affective integration facilitate and moral behavior. The development model of the four moral components for development describes these skills in particular.

Components, moral motivation, moral sensitivity, moral reasoning and moral character, operate as a multidimensional process that facilitates moral development and then encourages moral behavior (Morton, 2006). METHODS The research used was quasi-experimental in nature to evaluate the causal relationship between the scientific method with the character of elementary school students in 1551 Lampung Province and assess what factors are dominant in the characters formation.

This method reveals the causal relationship that is not determinative but is only a probability of increasing the probability of effect (Cook & Campbell, 1979; Shadish, 1995; Shadish et al., 2002). This research methodology is used to answer the research question whether there with the character of elementary school students in Lampung Province? And what factors are dominant in the formation of these characters? The sample was determined by random sampling, which involved sampling the population with a random member of the population regardless of strata. Samples were obtained directly from the sampling unit; thus, each unit had the same opportunity to be sampled (Roscoe, 1975).

The number of samples was determined by Stephen Isaac and William B. Michael (Isaac, 1981) with an error rate of 5%. The sample size was 40 students (22 girls and 18 boys) in fifth-grade elementary school with an average age of 12 years. The research was conducted during a single week.

Table 1 Aspects of the character questionnaire and the number of statement items

Aspect of Measurement	Number of Items
Reasoning	9 items
Feeling	6 items
Behavior	15 items
Total	30 items

Data on the character of the students were collected by means of questionnaires consisting of three aspects (Lickona, 1991) in which the statements were developed by the author: reasoning (9 statements, numbered as items 1 through 9), feelings (6 statements, numbered as items 10 to 15), and behavior (15 statements, numbered as items 16 to 30), as shown in Table 1.

Table 2 shows the value of the reliability of the questionnaires according to the aspect of students' character, in which reasoning was obtained with a Cronbach's Alpha value of 0.89, feelings with a Cronbach's Alpha value of 0.81, and behavior with a Cronbach's

Alpha value of 0.93. Based on the reliability testing, all aspects have a Cronbach's Alpha value of 0.967, so that all items contained in the questionnaire were reliable and consistent throughout the test because the reliability was strong (Bonett & Wright, 2015; Maier et al., 2016; Sebastian, 2004). Table 2 Reliability of the character aspects Aspect of Measurement Cronbach's Alpha Value Reasoning 0.89 Feelings 0.81 Behavior 0.93 Total 0.967 Table 3 shows that all of the data were tested using a one-sample Kolmogorov- Smirnov score (Yu et al., 2006), which had a normal distribution.

The Kolmogorov- Smirnov score for the reasoning aspect was 0.231 a value 0.200; feelings aspect was 0.238 with a significant value of 0.200; and the behavioral aspect was 0.308 with a significant value of 0.077. This indicated that the samples were normally distributed. Table 3 Results of the data normality test Aspect of Measurement Kolmogorov- Smirnov Score Significant Value Reasoning 0.231 0.200 Feelings 0.238 0.200 Behavior 0.308 0.077 Table 4 Steps of the data analysis Steps Purpose Analysis 1 Reliability assessment Cronbach's alpha test 2 Relationships among variables Correlation analysis 3 Differential tests before and after treatment Paired sample t-test Based on the homogeneity test using one-way ANOVA (Ary et al., 2010), the indicated that the sample was homogeneous.

The data were analyzed using a paired sample T-test as the design (Ary et al., 2010). A step-by-step analysis of the data is shown in Table 4. RESULTS Mean and Standard Deviation The average and standard deviation of the three aspects of character were compared. Table 5 shows that the highest average was the reasoning aspect (2.556 ± 0.527), followed by feelings with an average of 2.17 ± 0.408 , and behavior with an average of 2.00 ± 0.378 . Of the three categories, the lowest was the behavioral aspect and the highest was the reasoning aspect.

Table 5 Mean and standard deviation (SD) Character Mean SD Reasoning 2.556 0.527 Feelings 2.17 0.408 Behavior 2.00 0.378 Inter-Correlation among the Aspects of Character Three aspects of the character of students were analyzed by the correlation analysis. Table 6 shows how the character aspect was correlated with all other aspects.

The results presented in Table 6 show that the reasoning aspect was significantly correlated with the behavioral aspect. Its correlation coefficient was 0.683 (r value was 0.043 (p 0.005). feelings aspect was significantly correlated with the behavioral aspect with $r = 0.977$ and $p = 0.001$ (p 0.005). The of in this study were reasoning, feelings, and behavior.

Correlation analysis between these two aspects cannot describe the correlation that is closest among the three, and thus further correlation analysis is required. 1553

Regression Analysis of Variables A regression analysis was performed to determine whether character can be predicted by reasoning and feelings, as well as to identify whether character is better predicted by either the reasoning or feelings variable.

Regression was performed to determine the extent of the contribution of reasoning or feelings to character. Variables reasoning and feelings were used as independent variables for character. Tables 7 and 8 show that reasoning was a significant contributor to behavior to a significant degree, with values of 0.001 for less than 0.05.

Given this significance, reasoning can be to behavior. A contribution was made to behavior by the reasoning variable with a value of 0.786 or 78.6%, of which 21.4% of the behavior was influenced by other factors. The contribution made by the feelings variable towards behavior was 0.972, or 97.2%, of which 2.8% of the behavior was influenced by other factors. Knowing that the constant value of the reasoning aspect value was 0.879, we could thus obtain the regression equation of $y = x$. That is, when students obtained a score of 21.4

in reasoning, it could be predicted that the behavior score was $y - 5.308 (0.879 \ 22) - 5.308 \ 19.338 = 14.03$. While the constant of the feelings aspect was 118.180, the value of the feelings aspect was -0.540, giving us the following regression equation: $y = 118.180 + x$. That is, when the feelings of students obtained a score of 97.2, it could be predicted that the behavior score was $y (-52.488) = 65.692$.

Table 6 Inter-correlation among the aspects of character Reasoning Feeling Behavior R Sig R Sig R Sig Reasoning 0.720 0.107 0.683 0.043 Feeling 0.720 0.107 0.977 0.001 Behavior 0.683 0.043 0.977 0.001 Table 7 The constant of the reasoning and feelings aspects Model Unstandardized coefficient Standardized coefficient T Sig. B Std. error Beta 1 (Constant) Reasoning -5.308 0.879 15.249 0.173 0.887 -0.348 5.078 0.738 0.001 1 (Constant) Feeling 118.180 -0.540 3.840 0.046 -0.986 30.775 -11.784 0.000 0.000 1554 The data in Table 9 describe how the variables contribute to the reasoning and feelings of character.

The results of the analysis showed that these two variables wignifi of character. The most obvious contributions of variants were from feelings ($\beta = 0.986$, $p < 0.01$), followed by ($\beta 0.887$, $p 0.01$). can be said that the feelings aspect contributed as a potential variable to the formation of character. Table 8 The contribution of reasoning and feelings to behavior Model R R2 Adjusted R2 Std. error of the estimate 1 Reasoning 0.887 0.786 0.756 2.531 1 Feeling 0.986 0.972 0.965 0.529 Table 9 Regression analysis of the reasoning and feelings variables Variable B Std. error B Beta (β) Reasoning 0.879 0.172 0.887 Feeling -0 .540 0.046 -0 .986 As discussed earlier, feelings and reasoning

were significantly correlated with character ($r = 0.977$, $p < 0.01$ and $r = 0.683$, p independent variables acted as a predictor of character, a multiple regression analysis with a stepwise approach was performed.

As shown in Table 8, with two independent variables included in the equation, only the feelings variable was statistically significant in predicting character. Analysis showed that the feelings aspect was predicted as the best to ($\beta 0.972$, $p < 0.01$). It found the aspect accounted for 98% of the feelings aspect of reasoning. In particular, the variable aspect of feelings contributed 98% of character, and reasoning was not a significantly predictive aspect of character.

The use of the feelings aspect was a very strong predictor of character. Reasoning can be understood as being directly related to character and not as a factor that has a direct effect on character. Aspects of the feelings of students predict their character and in turn, the feelings aspect of students is predicted to help build character.

Differences Pre- and Post-Test of the Character Values of Students Table 10 shows the results of the descriptive statistical analysis. The table shows that the average pretest value was 47.62 ± 0.886 with a standard error of 0.886 and an average posttest value of 66.70 ± 0.868 with a standard error of 0.868. Table 11 shows the results of the correlation analysis between the pre- and posttest. The coefficient was 0.349 with a significance value of 0.027. This suggests that both sets of data were not correlated. Table 10 Paired samples statistics Mean N SD Std.

Error Mean Pair 1 Pretest Posttest 47.62 66.70 40 40 5.601 5.492 0.886 0.868 Table 11 Paired samples correlation N Correlation Sig. Pair 1 Pretest and Posttest 40 0.349 0.027 Table 12 shows the results of the average difference between the pre- and posttest values. The results show that the T value -19.058 a value (two-tailed) of 0.000.

This explains why there was a difference between the pre- and posttest values, and therefore the value of T was found to be negative, indicating that the posttest value was better than the pretest value. Thus, there were differences in the character education of students before and social sciences who learned according to the methods better education than before.

Table 12 Paired samples test Paired Differences T df Sig. (two- tailed) 95% Confidence Interval of the Difference Mean STD Std. Error Mean Lower Upper Pair 1 Pretest and Posttest -9.075 6.330 1.001 -21.099 -17.051 -19.058 39 0.000 DISCUSSION Based on the analysis, it appears that the value of the character of students in social with the scientific method than before the use of the scientific method.

Thus, the scientific method proved capable of forming students' character in social science material tends to exist on a cognitive 1556 process dimension involving memory and understanding, and exists in the factual and conceptual knowledge dimension (Anderson & Krathwohl, 2001). The scientific method can improve character because learners are accustomed to observing and searching for a problem or symptom, and teaching is not enough, on its own, for explaining the material (Bernard, 1995).

With the scientific method, students experience the process of diffusion and socialization, and will have a broader perspective of the area of science being taught to them. The application of in groups and classical so that the process of socialization between students that can form the character and strengthen the knowledge. Viewing **is the process of** overcoming conceptual misperception. Observation is the basis of scientific thinking, because learning is not "literal" or "mechanical."

The results of student learning do not come from a textbook, but from the opinions of experts and other authorities. With the complexity be analyzed according to each variable. If students will **be taught to think critically** and powerful of fields that they are studying (Keyes, 2010).

The for students to apply and develop an understanding of scientific ways of thinking and develop their character accordingly. Classes are formed in groups of four to six students to solve problems starting from observation, data collection, experimenting, and experimental presentation. There are three aspects involved in the formation of character: reasoning, feelings, and behavior (Lickona, 1991).

Table 4 shows that the feelings aspect is more dominant in forming behavior than the reasoning aspect that follows. The data also show that the relationship to feelings is higher than that to reasoning. The relationship between feelings and reasoning will affect students' character. The data also show that students' character is related to feelings and reasoning.

Apparently, agreeing and disagreeing with students with regard do things to make others happy, given that behavior depends on the situation, will make students interested in behaving better. This study indicated that students' character is formed by the feelings that teachers instill in them using the scientific method. Through the scientific method, students will be conditioned to handle the feelings that are often **referred to as emotional** intelligence.

The **steps of the scientific method** are to train and organize emotions, because emotions

reactions are rather than reactions to character or great feelings toward someone or something (Robbins & Judge, 2013). An intelligence and emotional maturity will determine how well a person can use their skills and determine their attitude and behavior (Cooper & Ayman, 1998; Goleman, 1995).

The **ability to perceive, understand,** and apply emotional sensitivity selectively as an energy source needs to be learned by students using the right method, which is powered by Mahasmeh 1557 (2016)'s research. Thus, students will learn to recognize and appreciate their sense of self, to respond appropriately, and to implement this sense of self effectively in everyday life.

Emotional intelligence refers to the range of skills, capabilities, and non-cognitive competencies that predispose a person to successfully meet the demands and environmental pressures of life (Robbins & Judge, 2013). Students who have a positive mood will be used to interacting socially, and will contribute to the good mood of others around them (Isen, 2003); thus, behavior will always be in character.

Dimensional feeling has a role in the formation of character, so that all contents should **be able to be** interpreted in accordance with that feeling, because the purpose of education is reasoning and character development (Barak & Shakhman, 2008). To achieve these objectives, the students must be taught and empowered naturally. This is according to the research of Nunez (2015).

The findings of this study support Lawson (2009)'s finding that acquiring knowledge and skills with the scientific approach will accelerate the acquisition of yield, quality, and retention. Students who participate actively in class and learn will understand the process of education, because students engage in dialogue **with one another and** play a role in their own education (Sanderse, 2013), and because learning is not only an individual endeavor (Chen, 2013). Modern society requires an efficient learning method.

The **scientific method will help** learners to reason, solve problems, and conduct research based on empirical data rather than from the results of scientific findings (Hodson, 1986). Learning the scientific method would encourage conflict resolution, thus helping students to learn how to solve problems and encourage moral reasoning, self-control, and respect for others. The integration of **character education is an important part** of the success of academic activities.

Character education will be effective if implemented with full commitment and scientific basis. **Character education cannot be** built in a purely academic way and does not occur instantly, but through habituation and conditioning it could be implemented

continuously Saripudin, 2015; Woolfolk, 2004).

Habituation can be achieved by following the work of a scientist and using individuals, which will estimate students to respect one another, as well as be patient and honest in describing the results obtained. A method of character education using approaches and methods of indoctrination that are not reflectively and empirically integrated with the system and culture of the school is unlikely to succeed (Al Hamdani, 2016).

Likewise, character education for children of primary school age is not possible because primary-school children are sensitive to the cultivation of character education at that age (Peterson, 2015). 1558 CONCLUSION The scientific method as a method of intervention to improve the character education of elementary school students is more directed to the affective domain in method, however, is not only used by natural science teachers that prefer the cognitive domain.

Students' character is built from the aspects of feelings, behavior, and reasoning. Therefore, it is necessary to design and reformulate the syntax of the scientific method as an important variable in character education. Further research is also needed, especially to create a questionnaire to measure students' character that is more standardized and includes more comprehensive measures of character.

The discussion of the issues examined in this study is not yet complete because the relationships between the character-forming aspects can be measured separately as possible independent variables. The causal relationship of two variables requires further research in order to identify which of the variables change as a result of the relationship.

The empirical data of this study could not establish whether students' character generated by the scientific method changed over time. This study also did not prove how the three aspects of character formation significantly relate to character. The relationship between these three aspects as described this has identified to explain how the aspects of character can produce a significant change in character.

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