The expansion of sociocultural theory-oriented mathematical learning model

by Gusti Ayu Dessy Sugiharni

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Abstract

The research aim was to obtain a Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight that is valid, practical, and effective in developing the good character of students in learning mathematics. This research was a research and development with reference to the development of Plomp. The data collection techniques used tests and questionnaires. The results showed that: (1) the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight is valid, practical, and effective to use to develop the good character of students; (2) there was an increase in the good character of students from the category 'sometimes shows good behavior according to the *Tri Hita Karana* aspect and often behaves not in accordance with the *Tri Hita Karana* aspect' to the category 'often and consistently shows good behavior according to the *Tri Hita Karana* aspect'; and (3) positive student responses to learning.

Keywords: Mathematical learning, sociocultural theory, *tri hita karana*, *pawongan*, *tri pramana*

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1. Introduction

There are two main goals of education, namely: first to help students master certain knowledge to be bright and smart, then second to help students to be kind and wise (Ardana et al., 2017; Ndiung et al., 2019). The second educational goal is very difficult to achieve so it is very natural to say that moral problems are serious problems that accompany the lives of students wherever and whenever (Berghaus, 2016; Chan, 2020). In connection with that, it is very natural that character education is placed as the basis for realising the vision of national development, namely realising a society with noble, moral, ethical, cultured and civilised morals based on the philosophy of *Pancasila* (Abdulkarim et al., 2020; Agussalim et al., 2021; Pardo, 2020). Character problems can arise as a result of the inability of students to achieve the first goal of educational goals(Suartama et al., 2020). As a result, students will make all efforts that tend to be negative to achieve good learning outcomes such as: cheating habits, looking for leaked answers from unclear sources, and plagiarism (Davis-Becker, 2013; Kim, 2020; Rhames, 2019). Behaviour that violates ethics, morals, and laws that are mild to severe is still often shown by students at both the primary and higher education levels (Ambang et al., 2019; McCormick et al., 2018; McGowan & Buttrick, 2017). If this condition is allowed to drag on, then character construction and development based on national culture will never happen. Even the character of students will worsen so that students will never be able to behave and act based on the values that have become their nation personality. In connection with the above problems, the Indonesian government launched *NAWACITA* where students as strategic and potential agents in building a nation with dignity and character (Pranoto & Hong, 2020; Sukmayadi & Yahya, 2020). Students as agents of development must be equipped with character values that are tough, critical, responsible, hardworking, honest, and other characters that provide them with the provisions and competencies to be able to compete both nationally and internationally (Bredemeier & Shields, 2019; Murray & Cousens, 2020). This is in line with the concept of general education in Indonesia related to UU No. 20 of 2003 concerning the national education system which highly emphasises the importance of inculcating divine and human values in an integrated manner (Raihani, 2018; Susilana & Asra, 2013).

In the application of mathematics learning, character education is often slightly neglected (Little, 2019). This is because the teachers are pursuing the cognitive domain of students to achieve the target score of learning (Kazu & Is, 2018). This target score is called the Minimum Completeness Criteria in the education of Indonesia (Sugiarto & Sumarsono, 2014). So that it causes a decrease in the moral quality of students when participating in mathematics learning (Martins & Justi, 2019). Based on this, it is necessary to instill noble values in students when learning mathematics, in addition to invest mathematical concepts. This is in line with the results of several previous studies, namely Mottet's (2015) research which showed that in learning mathematics apart from the cognitive domain, the affective domain also needs to be considered. Alade's (2018) research stated that character education must be inserted into various subjects, especially in the fields of mathematics, science and technology so that selfishness between individuals can be suppressed. Furthermore, the Can and Can's (2020) research showed the assessment of students' character could affect their ability to understand mathematical concepts. Sellbjer's (2018) research stated that students who have positive moral qualities have more math problem solving than students who have negative moral qualities. The

part of the noble values that need to be integrated into learning mathematics is *Tri Hita Karana*. *Tri Hita Karana* is a local wisdom in one of the regions in Indonesia, namely Bali. *Tri Hita Karana* is a Balinese local wisdom that is used to achieve a balance of life. *Tri Hita Karana* consists of the following elements: (1) Parahyangan (human relationship with God with the values: Religiosity, Fostering faith, Growing rastiti (piety) in the God, a clean attitude of spiritual physical life); (2) *Pawongan* (human to human relationship with the values: mutual cooperation, mutual service, effective communication, collaboration, responsibility, learning culture, democracy, discipline, and mutual respect); and (3) *Palemahan* (human relations with the environment with values: environmental care and preservation) (Divayana et al., 2018).

The inculcation of character values based on national culture through mathematics learning must certainly be done without neglecting the teaching principles and learning principles in mathematics; the characteristics of obtaining mathematical knowledge; and Vigotsky's sociocultural theory, namely students can study in Zone Proximal Development (ZPD) (Eun, 2019; Walle et al., 2013). In order to the benefits of learning in ZPD can be achieved maximally, the integration of the *Pawongan* section at *Tri Hita Karana* becomes an important role in learning mathematics. At the *Pawongan* section, there are several aspects related to *Tri Pramana*, namely *bayu* (ability to act), *sabda* (ability to communicate) and *idep* (ability to think) (Astuti & Kasiyan, 2018). The use of students' *idep* makes they are able to stimulate their thinking and be motivated to have various forms of learning experiences. Then by using the students' *sabda* makes they are able to carry out collaborations in social interactions so as to allow new learning experiences to occur. Furthermore, the use of *bayu* which is owned by students makes they are able to summarise all the creativity and thinking power gained from their learning experience to solve a math problem. In connection with the above, it was deemed necessary to conduct research related Development of the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight to Improve Students' Character in Mathematics Learning. This research can contribute to improvements from several previous studies, namely: Godfrey and Mtebe' (2018) research which discussed the negative nature of students in mathematic learning; Research by Henrich et al. (2016) discussed the intervention of students' negative attitudes in mathematics learning; and the research of Sulistyaningsih et al. (2019) where the focus on responsibility for individual assignments makes students lacking in collaborative learning experiences. The purpose of this research was to obtain a Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight that is valid, practical, and effective in developing the good character of students in learning mathematics.

2. Method

This type of research was development research, because this research focused on developing a model and learning device. The development of this research refers to the Plomp development model (Setyaningsih et al., 2019), whose development includes several phases such as:

(1) The initial investigation phase

This phase was focused on initial analysis/identification of problems and needs needed in ongoing learning. In addition, the characteristics of mathematics learning according to the

constructivist view, *Tri Hita Karana* theory, materials, and characteristics of students were also studied. The results of this study were used as the basis for designing a model which then underlies the design of research instruments.

(2) The design/design phase

The attention in this phase was focused on the process of formulating/compiling the design model, in the form of an outline of this learning model. In addition, an outline of the theoretical basis of this learning model was also prepared so that an outline of the model was obtained and an instrument design was also made for model development.

(3) Realization/construction phase

At this stage the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight and its supporting components began to be realised in accordance with the designs that had been designed at the design stage. At this stage, prototype 1 (early/basic draft) of the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight had been produced and its supporting components (validity and practicality test instruments) as a result of the realisation of the design phase.

(4) The test, evaluation & revision phase

The prototype obtained in the previous phase was ready to be tested and implemented in a wider scope, then evaluated and revised. The trial focuses on the validity, practicality, and effectiveness of the model.

(5) The implementation phase

This phase was concerned with implementing the model obtained based on the results of previous trials into a wider scope. This was done through implementation and dissemination aimed at evaluating the practicality and effectiveness of the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight product in a wider scope and gaining the trust of education experts and stakeholders.

The research subjects were elementary school grade 5 students in Singaraja who had registered with the *Buleleng* District Education and Culture Office. In order for this research to have continuity with the research that was carried out previously in 2020, subjects from *SD Negeri 1 Baktisraga Singaraja* were involved, namely 28 people from 5A class and 34 people from 5B class.

The data collection techniques used were: tests for data collection on student learning outcomes scores; a questionnaire to collect data about the character of students; questionnaire to obtain student activity data and student responses to the model; as well as a diary to record things that cannot be recorded through the data collection tools that had been prepared. The instruments of tests and questionnaires used in this study had been tested for validity and reliability using the *Pearson–product moment* correlation formula to determine validity, and the *Cronbach Alpha* formula to determine reliability.

The accuracy of the model was seen from: the activities of students following learning; the improvement/appearance of the students' good character (honesty, discipline, responsibility, tolerance, mutual cooperation, polite, self-confidence); student learning outcomes; and students' responses to the model. Data about the activities of students that were collected based on observations were analysed descriptively. The results of the analysis were then compared with the existing criteria. The classification of students' mathematics learning activity criteria can be seen in Table 1 (Ariawan et al., 2018; Divayana et al., 2021; Mahayukti et al., 2018; Sugiharni et al., 2018)

Table 1. Mathematics learning activities criteria

No	Score range	Criteria
1.	Score ≥ 85%	Very high
2.	70% ≤ Score < 85%	High
3.	55% ≤ Score < 70%	Enough
4.	40% ≤ Score < 55%	Low
5.	Score < 40%	Very low

After obtaining the category of student activity criteria in mathematics learning, it was then compared with the criteria for the effectiveness of the model. One aspect of the effectiveness of the model was the appearance/enhancement of the students' character which were collected from a questionnaire and analysed descriptively. Meanwhile, the data about students' responses that collected through questionnaires were analysed descriptively too, namely the percentage calculation of students who gave positive responses. Furthermore, the percentage of positive responses from students was compared with the existing criteria. The model was said to be effective, if it meets the following criteria: 1) The activities of students in learning participating were classified as high; 2) The appearance of students' good character was at least in the category of 'often and consistently showing good behavior according to the *Tri Hita Karana* aspect'; 3) At least 85% of students had a positive response.

2.1. Sociocultural Theory-oriented Mathematics Learning Model with Tri Hita Karana insight components

The Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight component to improve the character of students was conveyed by linking the components of the Joyce model (Cheek et al., 2019) with character values that can be built and developed through a Sociocultural theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight. The Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight syntax is as follows.

(1) Preliminary activities

   a. Greeting (insertion of *Pawongan* values in the *sabda* aspect).
   b. Organising the cleanliness of the environment before starting learning (insertion of *Pawongan* values in the *bayu* aspect and insertion of *Palemahan* values).
   c. Presence (insertion of the *Pawong* value in the *bayu* aspect).

    d.   Prayers together according to their respective beliefs (insertion of the *Pawongan* value in the *Idep* aspect and the insertion of the *Parahyangan* value).

    e.   Apperception

The learning process begins by the teacher by facilitating students to make a connection between the learning tasks that were being handled by students and their past experiences related to academics, personal, and culture. This means that the *idep* aspect in the *pawongan* value orientation was used for reasoning. The aim was to involve students in learning by arousing their curiosity, drawing their attention to the problems at hand, or the *sabda* aspect of the *pawongan* value orientation was used to ask some questions that make them think. In addition, this stage provided opportunities for teachers and students through evaluation activities to identify the initial concepts which they have were relating to the new concepts being studied (Kartal & Kici, 2020). It was by considering whether the initial concept is appropriate or incorrect (misconception). It was at this stage that the teacher identified the strengths and weaknesses of each individual or group because learning was carried out in ZPD. This was intended so that teachers make it easier to adjust the learning carried out with the learning experiences that each individual or group has against the knowledge learned (Diken, 2020). Thus, learning mathematics can be interesting and challenging for students.

It is known that the level of actual development is also called the independent level because students have been able to master skills and can do it independently. Conversely, if it is learned far above the level of potential development, the learning will be ineffective because the level of potential development refers to what students are unable to do independently (Winthrop & McGivney, 2017). However, by using the *bayu* aspect of the *pawongan* value orientation, they will be able to master skills under the guidance of adults or collaborate with more competent colleagues. In this first stage, character values based on national culture are possible to be realised were: curiosity, independence, hard work, and responsibility.

(2) Core activities

    a.   Formation of study groups (4–5 members) (insertion of *Pawongan* values on the *bayu* aspect).

    b.   Investigating and discussing mathematical problems related to daily life problems of students with insight into *Tri Hita Karana* values in cooperative groups (insertion of *Pawongan* values in the *bayu* aspect; insertion of *Palemahan* values; and insertion of *Parahyangan* values).

    c.   Utilisation of scaffolding as a way for teachers to help students who have problems (insertion of *Pawongan* values in the *idep* aspect).

    d.   Presentations then questions and answers between group members with tutoring from the teacher (insertion of *Pawongan* values on aspects of *bayu, sabda* and *idep*; insertion of *Palemahan* values).

In the second stage, learning was carried out by grouping students into cooperative groups of 4–5 members with various abilities and genders. At this stage, the teacher provided math problems that will be solved by students with a level of difficulty between the level of actual and the level of potential. In other words, students were learned in ZPD by using the *idep* aspect from the *Pawongan* value orientation. At this stage, the teacher facilitated students when they

were investigating a mathematical task that was being worked on. By using the *bayu* aspect from the *Pawongan* value orientation, so students worked on a task to understand certain concepts, then they acquired problem-solving skills and numeracy skills. When students investigated new material, the initial knowledge that was explored in stage 1 really helps the teacher adjust their learning to the learning experience of students. In order for this to run optimally, the teacher must give challenging assignments. It is the assignments that make sense, stimulate thinking, and can motivate students. In addition, teachers must design meaningful learning and be able to involve all students in social interactions in order to provide opportunities for students. It is to construct new knowledge, as well as provide feedback (evaluation) that helps and encourages further development of students' knowledge according to the speed of their abilities (Lewis, 2018). If the preconception was appropriate, then the teacher directs students and guides students to organise information that supports their ideas towards the conclusions that should be done. If there is a deadlock in students while carrying out an investigation, the teacher must facilitate them in the form of providing scaffolding assistance (Seo, 2019). Character values based on a national culture that can be accommodated in this case by paying attention to cooperative groups, ZPD, Scaffolding, and mathematical-problems with *Tri Hita Karana* value insights are: tolerance, honesty, hard work, discipline, creativity, independence, democratic, self-confidence, curiosity, mutual respect, communicative, caring for others, responsibility, like helping/mutual cooperation, enthusiasm, leadership, mutual trust and gratitude.

(3) Closing activities

a. The conclusion by students with teacher assistance (insertion of *Pawongan* values on the *sabda* aspect).
b. Giving assignments as a material to deepen the material being studied (insertion of the *Pawongan* value in the *idep* aspect).
c. Prayer together as a form of gratitude (insertion of *Parahyangan* values)

The activity in the third stage involved more than just reviewing what had been learned. During this stage, teachers engaged students in challenging discussions and can broaden their understanding of concepts and problem-solving skills (Johnson, 2017). This was done by using the *sabda* aspect of the *Pawongan* value orientation. At this stage, at least character values based on national culture can be accommodated, which include: communication and responsibility.

(4) Evaluation activities

The evaluation listed in the middle of each learning stage means that at each stage it is necessary to hold an evaluation as part of reflecting on each stage that is passed(Divayana et al., 2021; Alghamdi, 2017). At each stage from the beginning to the end, the teacher assesses the progress of students and asks students to evaluate themselves.

2.2. Social system

The Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight places students at the center of learning and highly upholds social life in intellectual terms. Thus,

the cultivation of good habits can be done through the application 46 the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight so that students are able to behave and act in accordance with the norms prevailing in society.

2.3. Reaction principles

The principle of reaction tells how the teacher acts on students and how students respond to the assignment that given by the teacher. In the preliminary stage, the teacher tries to dig up the students' initial knowledge and links the students' initial knowledge with the material/concept being studied. It was as previously mentioned, the teacher positions himself as a mediator and facilitator in learning, so that assistance in the form of scaffolding to students will be carried out if it is deemed necessary. The teacher provides reinforcement to students who have shown significant progress both in terms of knowledge, skills, and attitudes of students. Conversely, if students have not shown significant progress, the teacher provides reinforcement in the right direction. The reactions given by the teacher contribute positively to the knowledge construction process in student learning. The response given by the teacher really depends on the stimulus shown by the students. The principles of reaction of the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight are reflected in the following forms: honesty, sincerity, and other relevant *Tri Hita Karana* values.

2.4. Support system

The support system referred to in this case is what supporting conditions are needed so that the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight can still be implemented properly and effectively. In order for the model to run according to plan, it needs: teachers' understanding 84 the concept of the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight; teacher mastery in the values of *Tri Hita Karana* philosophy; teacher skills in implementing the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight; and contextual problems that contain *Tri Hita Karana* values.

2.5. Companion impact and instructional impact

There are two impacts that occur in the application of the learning model, namely the instructional impact and the accompanying impact. The instructional impact of applying the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight is that it makes it easier for students to master the concepts related to the material being studied according to the indicators that must be achieved. While the accompanying impact of this model is the formation of good character in students that reflects the values of the *Tri Hita Karana* philosophy. It is, there is harmony in the relationship with God (faith, caution, gratitude, discipline), with others (caring for others, tolerance, solidarity, courtesy, honesty), and with the environment (caring for the environment, respecting nature).

3. Results

Student activities in participating in learning by applying the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight can be reported that out of a total of 62 students, most of the students answered 'Yes' to every question asked related to student learning activities. By comparing the overall 'Yes' answers from students with the maximum total of 'Yes' answers, it was obtained that an average of 95.2% of students answered 'Yes' questions related to student activities. This showed that the activities of students in learning participating with the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight were in the very high category. The appearance of good characters in students during learning by applying the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight can be reported as shown in Tables 2 and 3.

Table 2. Development of the 5A grade students' good character

No.	Character	Meet-1	Meet-2	Meet-3	Meet-4	Meet-5	Meet-6
1	Honesty	2.3	2.7	3.0	3.0	3.0	3.0
2	Discipline	2.2	2.4	3.0	3.0	3.0	3.0
3	Responsible	2.4	2.4	2.6	2.6	2.7	2.6
4	Tolerance	2.2	2.5	2.5	2.5	2.6	2.6
5	Mutual cooperation	2.2	2.5	2.5	2.5	2.6	2.6
6	Polite	2.3	2.6	2.6	2.8	2.8	2.8
7	Confidence	2.2	2.2	2.3	2.3	2.4	2.6

Table 3. Development of the 5B grade students' good character

No.	Character	Meet-1	Meet-2	Meet-3	Meet-4	Meet-5	Meet-6
1	Honesty	2.3	2.6	2.9	3.0	3.2	3.3
2	Discipline	2.3	2.5	2.9	3.1	3.2	3.3
3	Responsible	2.6	2.8	3.0	3.1	3.2	3.2
4	Tolerance	2.3	2.4	2.6	2.9	3.2	3.3
5	Mutual cooperation	2.5	2.6	2.6	2.9	3.1	3.3
6	Polite	2.6	2.6	2.7	2.7	2.9	3.1
7	Confidence	2.5	2.5	2.6	2.6	2.9	3.1

Tables 2 and 3 show that all the good characters of students (honesty, discipline, responsibility, tolerance, mutual cooperation, courtesy and self-confidence) in the initial condition were in the category 'sometimes showing good behavior according to *Tri Hita Karana* aspects and often behaving not according to the *Tri Hita Karana* aspect'. However, in 5A class and 5B class, it can be seen that starting at meeting 1 there has been a slight improvement in the character of students. If we pay attention to the good character scores from meeting 1 to the next meeting, there tends to be a change for the better. So that the good character scores of students at the sixth meeting (last) were all close to score 3. It showed that the good character scores of students tend to be in the category of 'often and consistently showing good behavior according to the *Tri Hita Karana* aspect'. This showed that changes in the good character scores of students occur very significantly when compared with the good character scores in the initial conditions. This showed that the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight is very suitable to be used to improve the students' good character.

Furthermore, the students' learning outcomes on the implementation of the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight are given in Table 4.

Table 4. Student learning outcomes recapitulation

No	Learning outcomes	Class			
		5A		5B	
		Before	After	Before	After
1	Average	55.2	73.0	55.3	85
2	Absorption	55.2%	73.5%	55.3%	85%
3	Mastery learning	46.4%	96.4%	40.6%	100%
4	Curriculum target	100%	100%	100%	100%

Table 4 shows that there was a very significant change in student learning outcomes before and after the implementation of the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight. This can be seen that at the time before the application of the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight the average learning outcomes of students only reached the passing limit. But after the application of the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight, there was a significant increase so that it reached the good category. Meanwhile, students' learning completeness after applying the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight was very high. It was in 5A class at 96.4% and in 5B class at 100%. The results of a questionnaire about students' responses to the implementation of the learning process using the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight showed that of the 10 statements submitted there were several statements that were given negative responses by some students. Although it was like those, because students who gave positive responses were 91.9% which exceeded 85%, it can be concluded that the overall responses of students to the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight were positive. Because the activities of students were in the category of 'very high activeness', the appearance of students' good character was in the category of 'often and consistently showing good behavior according to the *Tri Hita Karana* aspect'. The learning outcomes of students were in a good category, and the students' responses to the implementation of the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight were in the 'positive' category, so it can be concluded that the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight is effective.

4. Discussions

The results showed that the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight met the criteria of validity, practicality, and effectiveness. The syntax for the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight consists of four phases, namely the Preliminary, Core, Closing (taking conclusions), and Evaluation phases, as can be seen fully in Figure 1.
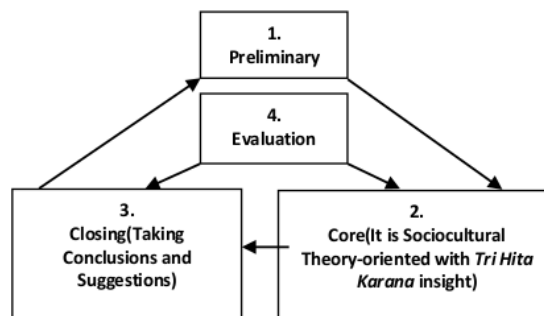
Figure 1. Syntax of Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight

The preliminary stage in the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight is carried out as the beginning to strengthen the students' good character through several activities such as: Say the opening greetings (insertion of *Pawongan* values on the *sabda* aspect); Arranging the cleanliness of the learning environment before starting learning (insertion of *Palemahan* values and insertion of *Pawongan* values on the *bayu* aspect); Obedience and discipline in presence (insertion of *Pawongan* values on the *bayu* aspect); Prayer together according to their respective beliefs (insertion of Parahyangan values); and apperception. Apperception activities are carried out with the aim of making it easier for students to understand the concepts they are going to learn. In other words, it is to make assimilation or accommodation easy for students through students' reflective thinking. This is done in accordance with the opinion of Fosnot which stated that through reflective thinking a person will get new information/ideas by connecting information that is already owned or modifying the ideas/information that is already owned (Haynor, 2018). Assimilation occurs when a new concept 'fit' with previous knowledge and new information expands existing networks. Accommodation occurs when a new concept does not 'fit' with the existing network (causing what Piaget called disequilibrium), so that the brain can change or replace existing schemes (Kural & Kocakulah, 2016). The task of the teacher in this case is to examine whether or not the students' ideas match the new information to be learned. This is where the preliminary-stage relationship with the evaluation in Figure 1. If the information that students have is appropriate, it means that learning can continue to the Core stage. Vice versa, if it is not appropriate, the teacher will guide students to adjust their knowledge with the new information to be learned.

At the Core stage, students are taught in cooperative groups consisting of 4–5 members with various genders and academic abilities. It is at this core activity that good character can be optimally enhanced. The good character 'honest' can be increased considering that some of the indicators are observed to change significantly, such as: students try to convey something in accordance with the actual situation; willing and brave to admit their mistakes, shortcomings or limitations; do not like to cheat or do not violate activities when they doing independent activities; not lying (students express their opinions as they are); and not manipulating facts/information (especially when asked to correct one's own work). This is due to the habituation in the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight in the form of problem discussion. So that students are trained to understand their responsibilities towards themselves and their responsibilities to the group. This habit is

carried out starting from the teacher who gives an example of honesty, such as recognising weaknesses when there is something that cannot be explained. This can happen because the teacher first embraces the values contained in *Tri Hita Karana* which are ready to be implemented in learning. It is done before learning with the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight is carried out. This is in accordance with the results of research conducted by Hermino and Arifin (2020), namely if a teacher wants to build an honest character in their students, then that honest character must be accustomed to appearing in the teacher. Furthermore, this is also in accordance with the research of Halonen et al. (2020)and Suastika et al. (2021)that each indicator of character education is indicated by strategies and learning methods that reflect the value of each character. The learning method in question can be in the form of assignments, learning practices, and habituation so that character education values can be implemented.

The improvement of the good character of 'discipline' occurs due to the appearance consistency of several indicators, such as: arrival on time and not skipping class; complete the task according to the set time; remind each other group/class members so that all group/class assignments are carried out properly; remind each other in order to maintain class order or so that the class does not make a fuss; orderly and comply with all rules and regulations that apply, especially when studying. The habituation carried out in this case is to be an example. It is coming on time; what the teacher says in accordance with the action; and convey the benefits of self-discipline both now and in any situation. This is in accordance with what Afshar and Hamzavi (2017) said, that is a person will have a balanced lifestyle if in his/her life he/she is always disciplined and on time in carrying out something. By discipline, a person will find it easier to understand something which he/she is learning, and life will be organised according to the disciplinary schedule that has been made. The increase in the 'responsibility' good character occurs because of the indicators appearance consistency such as: students' efforts to carry out tasks with good quality results, both individual and group assignments; doing assignments based on their own work; ready to accept the risk of the actions carried out; apologise to friends when they make mistakes; and are responsible for every learning action that is carried out.

The increase in the 'tolerance' good character occurs because of the indicators appearance consistency such as: care about the environment, especially seen when caring for group members who do not understand the concept; respect to the ability lack of friends/group members; respect to differences of opinion that occur; open trait; does not disturb friends who are working; does not impose an opinion; willing to cooperate with anyone; not prioritising personal interests; and the comfort of students in discussing in groups. The improvement in the good character of 'mutual cooperation' occurs due to the consistency of the indicators appearance such as: actively involved in completing group assignments; willing to carry out tasks according to mutual agreement; encourage other friends to work together to achieve common goals; and are willing to help other friends unconditionally or without much reason. This is able to arise as a result of habituation in the application of cooperative learning. This is in accordance with Leopold and Smith (2020) who said that the focus of values and skills that are targeted in collaborative learning strategies is the ability to work together. The increase in good character 'polite' occurs because of the indicators appearance consistency such as: teacher and students do not using profanity during the lesson; do not interrupt the speaker at the right time; express thanks after being assisted; and treat others as her/his self. The increase in good character 'self-

confidence' occurs because of the indicators appearance consistency such as: opine without showing any doubt; not easily discouraged; dare to ask, opine, or answer questions; and not awkward in acting. This confident character is accustomed to appearing in training students to communicate in the discussion of any problems that must be solved.

In this connection, Gray (2018) said that the focus of character strengthening in the discussion strategy is the ability to think critically, the ability to communicate, respect other people's opinions, be confident, and influence others through good argumentation procedures. Learning activities at the conclusion-taking stage are more than just asking for confirmation and conclusions from students. In this stage, the teacher engages students in activities and discussions that challenge and broaden their understanding of concepts and problem-solving skills. Learners apply what they have learned about math assignments and some of their experiences to develop, expand, connect, and deepen their understanding of concepts. Some of the obstacles found in this study were as follows: (1) there were some mathematical materials that were difficult to present in problems that contain character; (2) it was difficult for the teacher to make character-based math problems; (3) the occurrence of a prolonged debate in the study group, so that the temptation often occurs to the teacher to tell the answer directly; (4) teacher control of the study group had not been carried out properly so that the learning motivation of some people decreases as a result of the group's results which were not right or even wrong; and (5) there were some students who were less active in their study groups.

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5. Conclusion and recommendations

Based on the results of the research, discussion, and findings that had been stated previously, several things can be concluded as follows:

1) The resulting Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight has a syntax consisting of four phases, namely: Phase 1: Introduction, Phase 2: Core (Sociocultural Theory orientation and *Tri Hita Karana* insight); Phase 3: Drawing Conclusions; Phase 4: Evaluation.

2) The Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight met the validity criteria of a model, and also met the criteria for practicality and effectiveness.

3) The Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight was very effective in helping students understand the mathematical concepts which were being studied.

Things that will be done in the future to overcome the obstacles experienced in this study are as follows. Constraints (1) and (2) are overcome by ensuring that before applying the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight, a teacher needs to: (a) master the characteristics or components of the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight; (b) understand well the *Tri Hita Karana* values; (c) do the training to synchronise mathematical material with characters with insight into *Tri Hita Karana* values. Obstacle (3) is overcome by making a learning agenda or time limit for each activity, for example 35 minutes of group discussion, 25 minutes of class discussion, and 10 minutes of deepening and summarising the material. Constraint (4) is

overcome by ensuring that each group is well controlled and facilitated so that students can minimise errors in conclusions. Constraint (5) is overcome by maximising peer tutoring and definitively informing students that group achievement is highly dependent on the achievement of each group members.

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