

**BUKTI PERJALANAN ARTIKEL
MULAI SUBMIT SAMPAI TERBIT**

Pada Cypriot Journal of Educational Sciences (Terindex Scopus Q3)

Nama Jurnal : Cypriot Journal of Educational Sciences

Judul Artikel : The expansion of sociocultural theory-oriented mathematical learning model

Penulis : I Made Ardana, I Putu Wisna Ariawan, Gusti Ayu Dessy Sugiharni

Rincian Perjalanan Artikel:

Submit : 2 Juli 2021

Hasil Review : 15 Agustus 2021

Upload Revisi : 9 Oktober 2021

Accepted : 2 Desember 2021

Publish : 31 Desember 2021

ARTIKEL YANG DISUBMIT (2 Juli 2021)



**The Expansion of Sociocultural Theory-oriented
Mathematical Learning Model with THK insight: Pawongan
integrated in Tri Pramana**

Journal:	<i>Cypriot Journal of Educational Sciences (CJES)</i>
Manuscript ID	Draft
Manuscript Type:	Original Article
Keywords:	Mathematical Learning, Sociocultural Theory, THK

SCHOLARONE™
Manuscripts

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

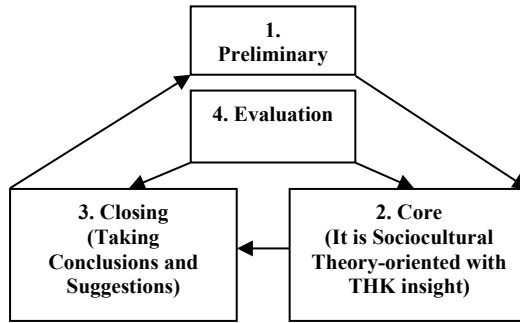


Figure 1. Syntax of PMbSbTHK Model

For Review Only

The Expansion of Sociocultural Theory-oriented Mathematical Learning Model with THK insight: *Pawongan* integrated in *Tri Pramana*

Abstract

The research aim was to obtain a Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight (PMbSbTHK Model) that is valid, practical, and effective in developing good character of students on learning mathematics. This research was a research and development (R&D) with reference to the development of Plomp. The results showed that: (1) the PMbSbTHK model 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 THK aspect and often behaves not in accordance with the THK aspect" to the category "often and consistently shows good behavior according to the THK aspect; and (3) positive student responses to learning.

Keywords: Mathematical Learning, Sociocultural Theory, THK, Pawongan, Tri Pramana.

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 realizing the vision of national development. It namely realizing a society with noble, moral, ethical, cultured and civilized 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. 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, plagiarism, etc. (Davis-Becker, 2013; Kim, 2020; Rhames, 2019). Behavior 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, Marleen; Buttrick, Hilary; McGowan, 2018; McGowan, Richard J.; 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

1
2
3 35 building a nation with dignity and character (Sugiyo Pranoto & Hong, 2020; Sukmayadi & Yahya, 2020). Students
4 36 as agents of development must be equipped with character values that are tough, critical, responsible, hardworking,
5 37 honest, and other characters that provide them with the provisions and competencies to be able to compete both
6 38 nationally and internationally (Bredemeier & Shields, 2019; Murray & Cousens, 2020). This is in line with the
7 39 concept of general education in Indonesia related to UU No. 20 of 2003 concerning the national education system
8 40 which highly emphasizes the importance of inculcating divine and human values in an integrated manner (Raihani,
9 41 2018; Susilana & Asra, 2013).

13 42 In the application of mathematics learning, character education is often slightly neglected (Little, 2019). This is
14 43 because the teachers are pursuing the cognitive domain of students to achieve the target score of learning (Kazu & Is,
15 44 2018). This target score is called the Minimum Completeness Criteria in education of Indonesia (Sugiarto &
16 45 Sumarsono, 2014). So that it causes a decrease in the moral quality of students when participating in mathematics
17 46 learning (Martins & Justi, 2019). Based on this, it is necessary to instill noble values in students when learning
18 47 mathematics, in addition to invest mathematical concepts. This is in line with the results of several previous studies,
19 48 namely Motet's research which showed that in learning mathematics apart from the cognitive domain, the affective
20 49 domain also needs to be considered (Mottet, 2015). Alade's research stated that character education must be inserted
21 50 into various subjects, especially in the fields of mathematics, science and technology so that selfishness between
22 51 individuals can be suppressed (Aladé, 2018). Furthermore, the Can and Can research where the assessment of student
23 52 character could affect their ability to understand mathematical concepts (Can & Can, 2020). And Sellbjer's research
24 53 stated that students who have positive moral qualities have more math problem solving than students who have
25 54 negative moral qualities (Sellbjer, 2018). The part of the noble values that need to be integrated in learning
26 55 mathematics is *Tri Hita Karana (THK)*. *THK* is a local wisdom in one of the regions in Indonesia, namely Bali. *THK*
27 56 is a Balinese local wisdom that is used to achieve a balance of life. *THK* consists of the following elements: (1)
28 57 *Parahyangan* (human relationship with God with the values: Religiosity, Fostering faith, Growing *rastiti* (piety) in
29 58 the God, a clean attitude of spiritual physical life); (2) *Pawongan* (human to human relationship with the values:
30 59 mutual cooperation, mutual service, effective communication, collaboration, responsibility, learning culture,
31 60 democracy, discipline, and mutual respect); and (3) *Palemahan* (human relations with the environment with values:
32 61 environmental care and preservation) (Divayana et al., 2018).

33 62 The inculcation of character values based on national culture through mathematics learning must certainly be
34 63 done without neglecting the teaching principles and learning principles in mathematics; the characteristics of
35 64 obtaining mathematical knowledge; and Vigotsky's sociocultural theory, namely students can study in Zone Proximal
36 65 Development (ZPD) (Eun, 2019; Walle et al., 2013). In order to the benefits of learning in ZPD can be achieved
37 66 maximally, the integration of the *Pawongan* section at *THK* becomes an important role in learning mathematics. At
38 67 the *Pawongan* section, there are several aspects related to *Tri Pramana*, namely *bayu* (ability to act), *sabda* (ability
39 68 to communicate) and *idep* (ability to think) (Astuti & Kasiyan, 2018). The use of students' *idep* makes they are able
40 69 to stimulate their thinking and be motivated to have various forms of learning experiences. Then by using the
41 70 students' *sabda* makes they are able to carry out collaborations in social interactions so as to allow new learning
42 71 experiences to occur. Furthermore, the use of *bayu* which is owned by students makes they are able to summarize 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 PMbSbTHK Model to Improve Students' Character in Mathematics Learning. This research can contribute to improvements from several previous studies, namely: Godfrey and Mtebe research which discussed the negative nature of students in mathematic learning (Godfrey & Mtebe, 2018); Research by Heinrich et al. discussed the intervention of students' negative attitudes in mathematics learning (Henrich et al., 2016); and the research of Sulistyaningsih et al. where the focus on responsibility for individual assignments makes students lacking in collaborative learning experiences (Sulistyaningsih et al., 2019).

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; (2) the design/design phase; (3) realization/construction phase; (4) the test, evaluation & revision phase; and (5) the implementation phase. The research subjects were elementary school (SD) 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 Elementary School (SD) Negeri 1 BaktisragaSingaraja 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 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 analyzed 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 (Divayana et al., 2021).

Table 1. Mathematics learning activities criteria

No.	Score Range	Note
1.	Score \geq 85%	Very High
2.	70% \leq Score < 85%	High
3.	55% \leq Score < 70%	Enough
4.	40% \leq 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

1
2
3 103 appearance/enhancement of the students' character which were collected from a questionnaire and analyzed
4 104 descriptively. Meanwhile, the data about students' responses that collected through questionnaires were analyzed
5 105 descriptively too, namely the percentage calculation of students who gave positive responses. Furthermore, the
6 106 percentage of positive responses from students was compared with the existing criteria. The model was said to be
7 107 effective, if it meets the following criteria: 1) The activities of students in learning participating were classified as
8 108 high; 2) The appearance of students' good character was at least in the category of "often and consistently showing
9 109 good behavior according to the *THK* aspect"; 3) At least 85% of students had a positive response.

14 110 2.1. *PMbSbTHK Model Components*

16 111 The *PMbSbTHK* Model component to improve the character of students was conveyed by linking the
17 112 components of the Joyce model (Cheek et al., 2019) with character values that can be built and developed through a
18 113 Sociocultural theory-oriented Mathematics Learning Model with *THK* insight. The *PMbSbTHK* model syntax is as
19 114 follows.

22 115 1) Preliminary Activities

- 23 116 a. Greeting (insertion of *Pawongan* values in the *sabda* aspect).
- 24 117 b. Organizing the cleanliness of the environment before starting learning (insertion of *Pawongan* values in the
25 118 *bayu* aspect and insertion of *Palemahan* values).
- 26 119 c. Presence (insertion of the *Pawong* value in the *bayu* aspect).
- 27 120 d. Prayers together according to their respective beliefs (insertion of the *Pawongan* value in the *Idep* aspect
28 121 and the insertion of the *Parahyangan* value).
- 29 122 e. Apperception

33 123 The learning process begins by the teacher by facilitating students to make a connection between the learning
34 124 tasks that were being handled by students and their past experiences related to academics, personal, and culture. This
35 125 means that the *idep* aspect in the *pawongan* value orientation was used for reasoning. The aim was to involve
36 126 students in learning by arousing their curiosity, drawing their attention to the problems at hand, or the *sabda* aspect
37 127 of the *pawongan* value orientation was used to ask some questions that make them think. In addition, this stage
38 128 provided opportunities for teachers and students through evaluation activities to identify the initial concepts which
39 129 they have were relating to the new concepts being studied (Kartal & Kici, 2020). It was by considering whether the
40 130 initial concept is appropriate or incorrect (misconception). It was at this stage that the teacher identified the strengths
41 131 and weaknesses of each individual or group because learning was carried out in ZPD. This was intended so that
42 132 teachers make it easier to adjust the learning carried out with the learning experiences that each individual or group
43 133 has against the knowledge learned (Diken, 2020). Thus learning mathematics can be interesting and challenging for
44 134 students.

50 135 It is known that the level of actual development is also called the independent level, because students have been
51 136 able to master skills and can do it independently. Conversely, if it is learned far above the level of potential
52 137 development, the learning will be ineffective because the level of potential development refers to what students are
53 138 unable to do independently (Winthrop & McGivney, 2017). However, by using the *bayu* aspect of the *pawongan*

1
2
3 139 value orientation, they will be able to master skills under the guidance of adults or collaborate with more competent
4 140 colleagues. In this first stage, character values based on national culture are possible to be realized were: curiosity,
5 141 independence, hard work, and responsibility.

7 142 2) Core Activities

- 9 143 a. Formation of study groups (4–5 members) (insertion of *Pawongan* values on the *bayu* aspect).
- 11 144 b. Investigating and discussing mathematical problems related to daily life problems of students with insight
12 145 into THK values in cooperative groups (insertion of *Pawongan* values in the *bayu* aspect; insertion of
13 146 *Palemah* values; and insertion of *Parahyangan* values).
- 15 147 c. Utilization of scaffolding as a way for teachers to help students who have problems (insertion of *Pawongan*
16 148 values in the *idep* aspect).
- 18 149 d. Presentations then questions and answers between group members with tutoring from the teacher (insertion
19 150 of *Pawongan* values on aspects of *bayu*, *sabda* and *idep*; insertion of *Palemahan* values).

20 151 In the second stage, learning was carried out by grouping students into cooperative groups of 4-5 members with
21 152 various abilities and genders. At this stage the teacher provided math problems that will be solved by students with a
22 153 level of difficulty between the level of actual and the level of potential. In other words, students were learned in ZPD
23 154 by using the *idep* aspect from the *Pawongan* value orientation. At this stage the teacher facilitated students when
24 155 they were investigating a mathematical task that was being worked on. By using the *bayu* aspect from the *Pawongan*
25 156 value orientation, so students worked on a task to understand certain concepts, then they acquired problem-solving
26 157 skills and numeracy skills. When students investigated new material, the initial knowledge that was explored in stage
27 158 1 really helps the teacher adjust their learning to the learning experience of students. In order for this to run
28 159 optimally, the teacher must give challenging assignments. It is the assignments which make sense, stimulate
29 160 thinking, and can motivate students. In addition, teachers must design meaningful learning and be able to involve all
30 161 students in social interactions in order to provide opportunities for students. It is to construct new knowledge, as well
31 162 as provide feedback (evaluation) that helps and encourages further development of students' knowledge according to
32 163 the speed of their abilities (Rees Lewis, 2018). If the preconception was appropriate, then the teacher directs students
33 164 and guides students to organize information that supports their ideas towards the conclusions that should be done. If
34 165 there is a deadlock in students while carrying out an investigation, the teacher must facilitate them in the form of
35 166 providing scaffolding assistance (Seo, 2019). Character values based on national culture that can be accommodated
36 167 in this case by paying attention to cooperative groups, ZPD, Scaffolding, and mathematical-problems with *THK*
37 168 values insight are: tolerance, honesty, hard work, discipline, creative, independence, democratic, self-confidence,
38 169 curiosity, mutual respect, communicative, caring for others, responsibility, like helping/mutual cooperation,
39 170 enthusiasm, leadership, mutual trust, and gratitude.

49 171 3) Closing activities

- 50 172 a. The conclusion by students with teacher assistance (insertion of *Pawongan* values on the *sabda* aspect).
- 52 173 b. Giving assignments as a material to deepen the material being studied (insertion of the *Pawongan* value in
53 174 the *idep* aspect).
- 55 175 c. Prayer together as a form of gratitude (insertion of *Parahyangan* values)

1
2
3 176 The activity in the third stage involved more than just reviewing what had been learned. During this stage,
4 177 teachers engaged students in challenging discussions and can broaden their understanding of concepts and problem
5 178 solving skills (Johnson, 2017). This was done by using the *sabda* aspect of the *Pawongan* value orientation. At this
6 179 stage, at least character values based on national culture can be accommodated, which include: communication and
7 180 responsibility.

10 181 4) Evaluation Activities

11 182 The evaluation listed in the middle of each learning stage means that at each stage it is necessary to hold an
12 183 evaluation as part of reflecting on each stage that is passed (Alghamdi, 2017). At each stage from the beginning to
13 184 the end, the teacher assesses the progress of students and asks students to evaluate themselves.

16 185 2.2. Social System

17 186 The PMbSbTHK model places students at the center of learning and highly upholds social life in intellectual
18 187 terms. Thus the cultivation of good habits can be done through the application of the PMbSbTHK model so that
19 188 students are able to behave and act in accordance with the norms prevailing in society.

23 189 2.3. Reaction Principles

24 190 The principle of reaction tells how the teacher acts on students and how students respond to the assignment that
25 191 given by the teacher. In the preliminary stage, the teacher tries to dig up the students' initial knowledge and links the
26 192 students' initial knowledge with the material/concept being studied (Branoff et al., 2018). It was as previously
27 193 mentioned, the teacher positions himself as a mediator and facilitator in learning, so that assistance in the form of
28 194 scaffolding to students will be carried out if it is deemed necessary. The teacher provides reinforcement to students
29 195 who have shown significant progress both in terms of knowledge, skills, and attitudes of students. Conversely, if
30 196 students have not shown significant progress, the teacher provides reinforcement in the right direction. The reactions
31 197 given by the teacher contribute positively to the knowledge construction process in student learning. The response
32 198 given by the teacher really depends on the stimulus shown by the students. The principles of reaction of the
33 199 PMbSbTHK Model are reflected in the following forms: honesty, sincerity, and other relevant *THK* values.

40 200 2.4. Support System

41 201 The support system referred to in this case is what supporting conditions are needed so that the PMbSbTHK
42 202 Model can still be implemented properly and effectively. In order for the model to run according to plan, it needs:
43 203 teachers' understanding of the concept of the PMbSbTHK Model; teacher mastery in the values of *THK* philosophy;
44 204 teacher skills in implementing the PMbSbTHK Model; and contextual problems that contain *THK* values.

49 205 2.5. Companion Impact and Instructional Impact

50 206 According to Breslyn et al, there are two impacts that occur in the application of the learning model, namely the
51 207 instructional impact and the accompanying impact (Breslyn et al., 2016). The instructional impact of applying the
52 208 PMbSbTHK Model 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 *THK* 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 and discussions

Student activities in participating in learning by applying the PMbSbTHK Model 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 PMbSbTHK Model were in the very high category. The appearance of good characters in students during learning by applying the PMbSbTHK Model can be reported as shown in Table 2 and Table 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

Table 2 and Table 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 *THK* aspects and often behaving not according to the *THK* 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, it tends to be a change for the better. So that the good character scores of students at the 6th meeting (last) were all close to score 3.

232 It showed that the good character scores of students tend to be in the category of "often and consistently showing
 233 good behavior according to the *THK* aspect". This showed that changes in the good character scores of students
 234 occur very significantly when compared with the good character scores in the initial conditions. This showed that the
 235 PMbSbTHK Model is very suitable to be used to improve the students' good character. Furthermore, the students'
 236 learning outcomes on the implementation of the PMbSbTHK Model is shown in Table 4.

237

238

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%

239

Table 4 shows that there was a very significant change in student learning outcomes before and after the implementation of the PMbSbTHK model. This can be seen that at the time before the application of the PMbSbTHK model the average learning outcomes of students only reached the passing limit. But after the application of the PMbSbTHK model there was a significant increase so that it reached the good category. Meanwhile, students' learning completeness after applying the PMbSbTHK model 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 PMbSbTHK Model 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 PMbSbTHK Model 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 *THK* aspect". The learning outcomes of students were in the good category, and the students' responses to the implementation of the PMbSbTHK Model were in the "positive" category, so it can be concluded that the PMbSbTHK Model is effective.

The results showed that the PMbSbTHK model met the criteria of validity, practicality, and effectiveness. The syntax for the PMbSbTHK Model consists of 4 phases, namely the Preliminary, Core, Closing (taking conclusions), and Evaluation phases, as can be seen fully in Figure 1.

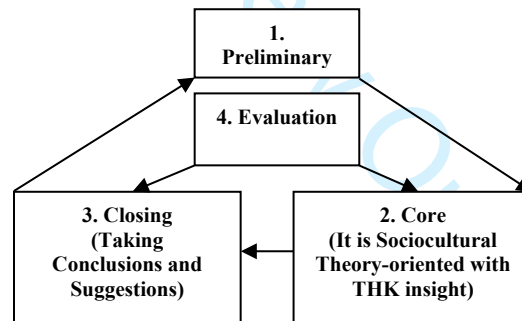


Figure 1. Syntax of PMbSbTHK Model

The preliminary stage in the PMbSbTHK model 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

1
2
3 275 information that is already owned or modifying the ideas/information that is already owned (Haynor, 2018).
4 276 Assimilation occurs when a new concept "fit" with previous knowledge and new information expands existing
5 277 networks. Accommodation occurs when a new concept does not "fit" with the existing network (causing what Piaget
6 278 called disequilibrium), so that the brain can change or replace existing schemes (Kural & Kocakulah, 2016). The task
7 279 of the teacher in this case is to examine whether or not the students' ideas match the new information to be learned.
8 280 This is where the preliminary-stage relationship with the evaluation in Figure 1. If the information that students have
9 281 is appropriate, it means that learning can continue to the Core stage. Vice versa, if it is not appropriate, the teacher
10 282 will guide students to adjust their knowledge with the new information to be learned.

11
12
13
14
15 283 At the Core stage, students are taught in cooperative groups consisting of 4-5 members with various genders and
16 284 academic abilities. It is at this core activity that good character can be optimally enhanced. The good character
17 285 "honest" can be increased considering that some of the indicators are observed to change significantly, such as:
18 286 students try to convey something in accordance with the actual situation; willing and brave to admit their mistakes,
19 287 shortcomings or limitations; do not like to cheat or do not violate activities when they doing independent activities;
20 288 not lying (students express their opinions as they are); and not manipulating facts/information (especially when asked
21 289 to correct one's own work). This is due to the habituation in the PMbSbTHK model in the form of problem
22 290 discussion. So that students are trained to understand their responsibilities towards themselves and their
23 291 responsibilities to the group. This habit is carried out starting from the teacher who gives an example of honesty,
24 292 such as recognize weaknesses when there is something that cannot be explained. This can happen because the
25 293 teacher first embraces the values contained in *THK* which are ready to be implemented in learning. It is done before
26 294 learning with the PMbSbTHK model is carried out. This is in accordance with the results of research conducted by
27 295 Hermino and Arifin, namely if a teacher wants to build an honest character in their students, then that honest
28 296 character must be accustomed to appearing in the teacher (Hermino & Arifin, 2020). Furthermore, this is also in
29 297 accordance with research of Halonen et al. that each indicator of character education is indicated by strategies and
30 298 learning methods that reflect the value of each character. The learning in question can be in the form of
31 299 assignments, learning practices, and habituation so that character education values can be implemented (Halonen et
32 300 al., 2020).

33
34
35
36
37
38
39
40
41 301 The improvement of the good character of "discipline" occurs due to the appearance consistency of several
42 302 indicators, such as: arrival on time and not skipping class; complete the task according to the set time; remind each
43 303 other group/class members so that all group/class assignments are carried out properly; remind each other in order to
44 304 maintain class order or so that the class does not make a fuss; orderly and comply with all rules and regulations that
45 305 apply, especially when studying. The habituation carried out in this case is to be an example. It is coming on time;
46 306 what the teacher says in accordance with the action; and convey the benefits of self-discipline both now and in any
47 307 situation. This is in accordance with what Afshar and Hamzavi said, that is a person will have a balanced lifestyle if
48 308 in his/her life he/she is always disciplined and on time in carrying out something (Afshar & Hamzavi, 2017). By
49 309 discipline a person will find it easier to understand something which he/she is learning, and life will be organized
50 310 according to the disciplinary schedule that has been made. The increase in the "responsibility" good character occurs
51 311 because of the indicators appearance consistency such as: students' efforts to carry out tasks with good quality

1
2
3 312 results, both individual and group assignments; doing assignments based on their own work; ready to accept the risk
4 313 of the actions carried out; apologize to friends when they make mistakes; and are responsible for every learning
5 314 action that is carried out.

6
7
8 315 The increase in the "tolerance" good character occurs because of the indicators appearance consistency such as:
9 316 care about the environment, especially seen when caring for group members who do not understand the concept;
10 317 respect to the ability lack of friends/group members; respect to differences of opinion that occur; open trait; does not
11 318 disturb friends who are working; does not impose an opinion; willing to cooperate with anyone; not prioritizing
12 319 personal interests; and the comfort of students in discussing in groups. The improvement in the good character of "
13 320 mutual cooperation" occurs due to the consistency of the indicators appearance such as: actively involved in
14 321 completing group assignments; willing to carry out tasks according to mutual agreement; encourage other friends to
15 322 work together to achieve common goals; and are willing to help other friends unconditionally or without much
16 323 reason. This is able to arise as a result of habituation in the application of cooperative learning. This is in accordance
17 324 with Leopold and Smith who said that the focus of values and skills that are targeted in collaborative learning
18 325 strategies is the ability to work together (Leopold & Smith, 2020). The increase in good character "polite" occurs
19 326 because of the indicators appearance consistency such as: teacher and students do not using profanity during the
20 327 lesson; do not interrupt the speaker at the right time; express thanks after being assisted; and treat others as her/his
21 328 self. The increase in good character "self-confidence" occurs because of the indicators appearance consistency such
22 329 as: opine without showing any doubt; not easily discouraged; dare to ask, opine, or answer questions; and not
23 330 awkward in acting. This confident character is accustomed to appearing in training students to communicate in the
24 331 discussion of any problems that must be solved.

25
26
27
28
29
30
31
32
33 332 In this connection, Gray said that the focus of character strengthening in the discussion strategy is the ability to
34 333 think critically, the ability to communicate, respect other people's opinions, be confident, and influence others
35 334 through good argumentation procedures (Gray, 2018). Learning activities at the conclusion-taking stage are more
36 335 than just asking for confirmation and conclusions from students. In this stage, the teacher engages students in
37 336 activities and discussions that challenge and broaden their understanding of concepts and problem solving skills.
38 337 Learners apply what they have learned about math assignments and some of their experiences to develop, expand,
39 338 connect, and deepen their understanding of concepts. Some of the obstacles found in this study were as follows: (1)
40 339 there were some mathematical materials which were difficult to present in problems that contain character; (2) it was
41 340 difficult for the teacher to make character-based math problems; (3) the occurrence of a prolonged debate in the
42 341 study group, so that the temptation often occurs to the teacher to tell the answer directly; (4) teacher control of the
43 342 study group had not been carried out properly so that the learning motivation of some people decreases as a result of
44 343 the group's results which were not right or even wrong; and (5) there were some students who were less active in
45 344 their study groups.

46
47
48
49
50
51
52 345

53 54 346 **4. Conclusion and recommendations**

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

- 349 1) The resulting PMbSbTHK model has a syntax consisting of 4 phases, namely: Phase 1: Introduction, Phase 2:
350 Core (Sociocultural Theory orientation and *THK* insight); Phase 3: Drawing Conclusions; Phase 4: Evaluation.
- 351 2) The PMbSbTHK model met the validity criteria of a model, and also met the criteria for practicality and
352 effectiveness.
- 353 3) The PMbSbTHK model was very effective in helping students understand the mathematical concepts which
354 were being studied.

355 Things that will be done in the future to overcome the obstacles experienced in this study are as follows.
356 Constraints (1) and (2) are overcome by ensuring that before applying the PMbSbTHK model, a teacher needs to: (a)
357 master the characteristics or components of the PMbSbTHK model; (b) understand well the *THK* values; (c) do the
358 training to synchronize mathematical material with characters with insight into *THK* values. Obstacle (3) is
359 overcome by making a learning agenda or time limit for each activity, for example 35 minutes of group discussion,
360 25 minutes of class discussion, and 10 minutes of deepening and summarizing the material. Constraint (4) is
361 overcome by ensuring that each group is well controlled and facilitated so that students can minimize errors in
362 conclusions. Constraint (5) is overcome by maximizing peer tutoring and definitively informing students that group
363 achievement is highly dependent on the achievement of each group members.

365 References

- 366 Abdulkarim, A., Komalasari, K., Saripudin, D., Ratmaningsih, N., & Anggraini, D. N. (2020). Development of a Unity in Diversity-Based
367 Pancasila Education Text Book for Indonesian Universities. *International Journal of Instruction*, 13(1), 371–386.
- 368 Afshar, H. S., & Hamzavi, R. (2017). An Investigation into the Characteristics of Iranian EFL Teachers of Senior Secondary Schools and
369 Language Institutes. *Iranian Journal of Language Teaching Research*, 5(1), 21–36.
- 370 Agussalim, Widjaja, S. U. M., Haryono, A., & Wahyono, H. (2021). Pancasila Economic Character Literacy Program for High School Students.
371 *International Journal of Instruction*, 14(1), 235–252.
- 372 Aladé, F. (2018). *Character Portrayals in STEM-Focused Educational Television Shows and Their Impact on Children's Attitudes towards*
373 *STEM*. Northwestern University.
- 374 Alghamdi, M. S. (2017). The Reality and Difficulties of Employing ICT in Teaching from the Perspective of Math Teachers of Middle Stage in
375 Riyadh. *International Education Studies*, 10(12), 109–129.
- 376 Ambang, O. A., Alloggio, S., & Tandlich, R. (2019). Moral Reciprocity, Ethics of Appropriation of Indigenous Medicinal Plant Knowledge and
377 Associated Biopiracy. *Acta Educationis Generalis*, 9(2), 24–65.
- 378 Ardana, I. M., Ariawan, I. P. W., & Divayana, D. G. H. (2017). Measuring the effectiveness of BLCS model (Bruner, Local Culture, Scaffolding)
379 in mathematics teaching by using expert system-based CSE-UCLA. *International Journal of Education and Management Engineering*, 4,
380 1–12.
- 381 Astuti, N. L. P. W., & Kasiyan. (2018). The Values of Taksu in Pendet Dance at Saraswati Balinese Dance Studio Yogyakarta. *Advances in Social*
382 *Science, Education and Humanities Research*, 327, 274–279.
- 383 Berghaus, P. T. (2016). The Problems of Authority and the Want of Apprenticeship in Soldiers' Character Development. *Journal of Moral*
384 *Education*, 45(3), 324–337.
- 385 Bredemeier, B. L., & Shields, D. L. (2019). Social Justice, Character Education, and Sport: A Position Statement. *Quest*, 71(2), 202–214.

- 1
2
3 386 Can, D., & Can, V. (2020). Fairness in Resource Distribution: Relationship between Children's Moral Reasoning and Logical Reasoning. *Acta*
4 387 *Educationis Generalis*, 10(3), 66–86.
- 5 388 Chan, C. W. (2020). Moral Education in Hong Kong Kindergartens: An Analysis of the Preschool Curriculum Guides. *Global Studies of*
6 389 *Childhood*, 10(2), 156–169.
- 7 390 Cheek, A. E., Idol, W. A., Jones, J. L., & Holden, K. B. (2019). Infusing Technology throughout Teacher Preparation Programs to Support
8 391 Preservice Teacher Development. *Journal of Special Education Apprenticeship*, 8(2), 1–14.
- 9 392 Davis-Becker, S. (2013). Construct Maps: Do They Make the Unclear Clear? *Measurement: Interdisciplinary Research and Perspectives*, 11(4),
10 393 174–176.
- 11 394 Diken, E. H. (2020). The Opinions of Science Teachers on the Weaknesses and Strengths of LGS and TEOG Systems (The Case of Kars
12 395 Province). *Journal of Curriculum and Teaching*, 9(2), 20–32.
- 13 396 Divayana, D. G. H., Ariawan, I. P. W., Adiarta, A., Parmithi, D. P., Mahendra, I. W. E., & Parmithi, N. N. (2018). Development of ANEKA-Based
14 397 Countenance Model Integrated with Tri Hita Karana-SAW in Evaluating Student's Charater and Quality of Computer Learning in Bali.
15 398 *Journal of Engineering and Applied Sciences*, 13(15), 6303–6315.
- 16 399 Divayana, D. G. H., Suyasa, P. W. A., & Widiartini, N. K. (2021). An innovative model as evaluation model for information technology-based
17 400 learning at ICT vocational schools. *Heliyon*, 7(2), 1–13.
- 18 401 Eun, B. (2019). The Zone of Proximal Development as an Overarching Concept: A Framework for Synthesizing Vygotsky's Theories.
19 402 *Educational Philosophy and Theory*, 51(1), 18–30.
- 20 403 Godfrey, Z., & Mtebe, J. (2018). Redesigning Local Games to Stimulate Pupils' Interest in Learning Numeracy in Tanzania. *International Journal*
21 404 *of Education and Development Using Information and Communication Technology*, 14(3), 17–37.
- 22 405 Gray, K. M. (2018). *Characterizing Environmental Health Literacy Related to Fish Consumption Advisories: Knowledge and Beliefs of Informal*
23 406 *Educators in a Southeastern State*. North Carolina State University.
- 24 407 Halonen, J. S., Nolan, S. A., Frantz, S., Hoss, R. A., McCarthy, M. A., Pusateri, T., & Wickes, K. (2020). The Challenge of Assessing Character:
25 408 Measuring APA Goal 3 Student Learning Outcomes. *Teaching of Psychology*, 47(4), 285–295.
- 26 409 Haynor, M. I. (2018). *Applying a Constructivist Approach to the Assessment of Compositions in a Secondary Technology-Based Music*
27 410 *Classroom*. Boston University.
- 28 411 Henrich, A., Slougher, J. M., Anderson, J., & Bahauud, E. (2016). Addressing Negative Math Attitudes with Service-Learning. *PRIMUS*, 26(8),
29 412 788–802.
- 30 413 Hermino, A., & Arifin, I. (2020). Contextual Character Education for Students in the Senior High School. *European Journal of Educational*
31 414 *Research*, 9(3), 1009–1023.
- 32 415 Johnson, N. C. (2017). *Expanding Competence: Supporting Students to Engage with Each Other's Mathematical Ideas*. University of California,
33 416 Los Angeles.
- 34 417 Kartal, G., & Kici, D. (2020). Reflection through Drama and Concept Maps for Preservice Teacher Education in Information Communication
35 418 Technologies. *Education and Information Technologies*, 25(6), 4861–4881.
- 36 419 Kazu, I. Y., & Is, A. (2018). An Investigation about Actualization Levels of Learning Outcomes in Early Childhood Curriculum. *Journal of*
37 420 *Education and Training Studies*, 6(3), 66–77.
- 38 421 Kim, Y. (2020). Partial Identification of Answer Reviewing Effects in Multiple-Choice Exams. *Journal of Educational Measurement*, 57(4), 511–
39 422 526.
- 40 423 Kural, M., & Kocakulah, M. S. (2016). Teaching for Hot Conceptual Change: Towards a New Model, beyond the Cold and Warm Ones.
41 424 *European Journal of Education Studies*, 2(8), 1–40.
- 42 425 Leopold, H., & Smith, A. (2020). Implementing Reflective Group Work Activities in a Large Chemistry Lab to Support Collaborative Learning.
43 426 *Education Sciences*, 10(7), 1–19.
- 44 427 Little, J. (2019). Connecting Mathematics with Science to Enhance Student Achievement -- A Position Paper. *Mathematics Education Research*
45 428 *Group of Australasia*, 452–459.
- 46 429 Martins, M., & Justi, R. (2019). An Instrument for Analysing Students' Argumentative Reasoning When Participating in Debates. *International*
47 430 *Journal of Science Education*, 41(6), 713–738.
- 48 431 McCormick, Marleen; Buttrick, Hilary; McGowan, R. (2018). Ethics of Entrepreneurship: Should We Be Teaching Students the Inevitable Moral
49 432 Dilemmas That Challenge All Entrepreneurs? *Journal of Learning in Higher Education*, 14(1), 29–36.

- 1
2
3 433 McGowan, Richard J.; Buttrick, H. G. (2017). Teaching Environmental Ethics: Moral Considerations and Legislative Action. *Journal of Learning*
4 434 *in Higher Education*, 13(1), 49–54.
- 5 435 Mottet, T. P. (2015). FORUM: Affective Learning. Affective Learning from a Cognitive Neuroscientific Perspective. *Communication Education*,
6 436 64(4), 508–510.
- 7 437 Murray, J., & Cousens, D. (2020). Primary School Children’s Beliefs Associating Extra-Curricular Provision with Non-Cognitive Skills and
8 438 Academic Achievement. *Education 3-13*, 48(1), 37–53.
- 9 439 Ndiung, S., Dantes, N., Ardana, I., & Marhaeni, A. (2019). Treffinger Creative Learning Model with RME Principles on Creative Thinking Skill
10 440 by Considering Numerical Ability. *International Journal of Instruction*, 12(3), 731–744.
- 11 441 Pardo, N. (2020). Character Development Assessment in Imagine Schools. *Journal of Character Education*, 16(2), 69–72.
- 12 442 Raihani, R. (2018). Education for Multicultural Citizens in Indonesia: Policies and Practices. *Compare: A Journal of Comparative and*
13 443 *International Education*, 48(6), 992–1009.
- 14 444 Rees Lewis, D. G. (2018). *Beyond Problems on a Platter: Creating Tools for Teaching Planning in Real World Design*. Northwestern University.
- 15 445 Rhames, M. A. (2019). The “F-Word” of Social and Emotional Learning: Faith. *American Enterprise Institute*, 1–8.
- 16 446 Sellbjer, S. (2018). “Have You Read My Comments? It Is Not Noticeable. Change!” An Analysis of Feedback Given to Students Who Have
17 447 Failed Examinations. *Assessment & Evaluation in Higher Education*, 43(2), 163–174.
- 18 448 Seo, B.-I. (2019). An Investigation of How 7th Grade and 8th Grade Students Manipulate Mathematical Writing Elements. *Perspectives in*
19 449 *Education*, 37(2), 141–159.
- 20 450 Setyaningsih, N., Rejeki, S., & Ishartono, N. (2019). Developing Realistic and Child-Friendly Learning Model for Teaching Mathematics. *Journal*
21 451 *of Research and Advances in Mathematics Education*, 4(2), 79–88.
- 22 452 Sugiarto, D., & Sumarsono, P. (2014). The Implementation of Think-Pair-Share Model to Improve Students’ Ability in Reading Narrative Texts.
23 453 *International Journal of English and Education*, 3(3), 206–215.
- 24 454 Sugiyo Pranoto, Y. K., & Hong, J. (2020). The Aspirations of Young Indonesian Children. *Global Studies of Childhood*, 10(2), 202–209.
- 25 455 Sukmayadi, V., & Yahya, A. H. (2020). Indonesian Education Landscape and the 21st Century Challenges. *Journal of Social Studies Education*
26 456 *Research*, 11(4), 219–234.
- 27 457 Sulistyaningsih, D., Purnomo, & Aziz, A. (2019). Development of Learning Design for Mathematics Manipulatives Learning Based on E-
28 458 Learning and Character Building. *International Electronic Journal of Mathematics Education*, 14(3), 197–205.
- 29 459 Susilana, R., & Asra. (2013). Development of Quality Assurance System in Culture and Nation Character Education in Primary Education in
30 460 Indonesia. *Malaysian Online Journal of Educational Sciences*, 1(2), 17–24.
- 31 461 Walle, J. A. Van De, Karp, K. S., & Bay-Williams, J. M. (2013). *Elementary and Middle School Mathematics, Teaching Developmentally*.
32 462 Pearson Education, Inc.
- 33 463 Winthrop, R., & McGivney, E. (2017). *Can We Leapfrog? The Potential of Education Innovations to Rapidly Accelerate Progress. Skills for a*
34 464 *Changing World*. Center for Universal Education at The Brookings Institution.
- 35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

**REVISI ARTIKEL YANG DIUPLOAD
(9 Oktober 2021)**



**The Expansion of Sociocultural Theory-oriented
Mathematical Learning Model**

Journal:	<i>Cypriot Journal of Educational Sciences (CJES)</i>
Manuscript ID	CJES-2021-0329.R2
Manuscript Type:	Original Article
Keywords:	Mathematical Learning, Sociocultural Theory, Tri Hita Karana

SCHOLARONE™
Manuscripts

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

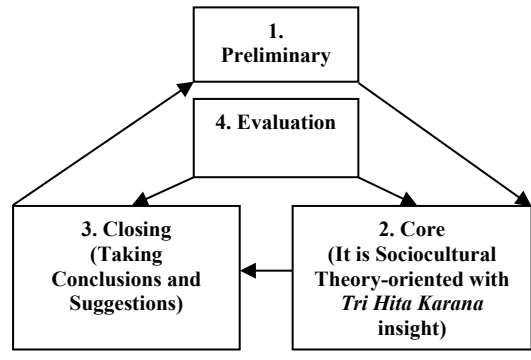


Figure 1. Syntax of Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight

For Review Only

The Expansion of Sociocultural Theory-oriented Mathematical Learning Model

I Made Ardana*, Department of Mathematics Education, Universitas Pendidikan Ganesha, Jalan Udayana No.11, Singaraja 81119, Indonesia. <https://orcid.org/0000-0002-0629-8704>

I Putu Wisna Ariawan^b, Department of Mathematics Education, Universitas Pendidikan Ganesha, Jalan Udayana No.11, Singaraja 81119, Indonesia. <https://orcid.org/0000-0002-2996-6648>

Gusti Ayu Dessy Sugiharni^c, Department of Information System, Institut Teknologi dan Bisnis STIKOM Bali, Jl. Raya Puputan No.86, Denpasar 80234, Indonesia. <https://orcid.org/0000-0003-2578-0456>

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 good character of students on 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.

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 realizing the vision of national development. It namely realizing a society with noble, moral, ethical, cultured and civilized 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. 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, plagiarism, etc. (Davis-Becker, 2013; Kim, 2020; Rhames, 2019). Behavior 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

Commented [A1]: Answer for question :
1) The title is too long, please shorten it. It can be as follows.
"The Expansion of Sociocultural Theory-oriented Mathematical Learning Model".

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

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 emphasizes 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 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 Motet's research which showed that in learning mathematics apart from the cognitive domain, the affective domain also needs to be considered (Mottet, 2015). Aladé's 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 (Aladé, 2018). Furthermore, the Can & Can's research showed the assessment of students' character could affect their ability to understand mathematical concepts (Can & Can, 2020). Sellbjer's research stated that students who have positive moral qualities have more math problem solving than students who have negative moral qualities (Sellbjer, 2018). The part of the noble values that need to be integrated in 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

74 experiences. Then by using the students' *sabda* makes they are able to carry out collaborations in social interactions
75 so as to allow new learning experiences to occur. Furthermore, the use of *bayu* which is owned by students makes
76 they are able to summarize all the creativity and thinking power gained from their learning experience to solve a
77 math problem. In connection with the above, it was deemed necessary to conduct research related Development of
78 the Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight to Improve Students'
79 Character in Mathematics Learning. This research can contribute to improvements from several previous studies,
80 namely: Godfrey and Mtebe' research which discussed the negative nature of students in mathematic learning
81 (Godfrey & Mtebe, 2018); Research by Heinrich et al. discussed the intervention of students' negative attitudes in
82 mathematics learning (Henrich et al., 2016); and the research of Sulistyarningsih et al. where the focus on
83 responsibility for individual assignments makes students lacking in collaborative learning experiences
84 (Sulistyarningsih et al., 2019). The purpose of this research was to obtain a Sociocultural Theory-oriented
85 Mathematics Learning Model with *Tri Hita Karana* insight that is valid, practical, and effective in developing good
86 character of students on learning mathematics.

87

88 2. Method

89 This type of research was development research, because this research focused on developing a model and
90 learning device. The development of this research refers to the *Plomp* development model (Setyaningsih et al.,
91 2019), whose development includes several phases such as:

92 (1) The Initial Investigation Phase

93 This phase was focused on initial analysis/identification of problems and needs needed in ongoing learning. In
94 addition, the characteristics of mathematics learning according to the constructivist view, *Tri Hita Karana*
95 theory, materials, and characteristics of students were also studied. The results of this study were used as the
96 basis for designing a model which then underlies the design of research instruments.

97 (2) The Design/Design Phase

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

102 (3) Realization/Construction Phase

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

108 (4) The Test, Evaluation & Revision Phase

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

111 (5) The Implementation Phase

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

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

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

126 The accuracy of the model was seen from: the activities of students following learning; the
127 improvement/appearance of the students' good character (honesty, discipline, responsibility, tolerance, mutual
128 cooperation, polite, self-confidence); student learning outcomes; and students' responses to the model. Data about
129 the activities of students that were collected based on observations were analyzed descriptively. The results of the
130 analysis were then compared with the existing criteria. The classification of students' mathematics learning activity
131 criteria can be seen in Table 1 (Ariawan et al., 2018; Divayana et al., 2021; Mahayukti et al., 2018; Sugiharni et al.,
132 2018)

133 Table 1. Mathematics learning activities criteria

No.	Score Range	Criteria
1.	Score $\geq 85\%$	Very High
2.	$70\% \leq \text{Score} < 85\%$	High
3.	$55\% \leq \text{Score} < 70\%$	Enough
4.	$40\% \leq \text{Score} < 55\%$	Low
5.	Score $< 40\%$	Very Low

134
135 After obtaining the category of student activity criteria in mathematics learning, it was then compared with the
136 criteria for the effectiveness of the model. One aspect of the effectiveness of the model was the
137 appearance/enhancement of the students' character which were collected from a questionnaire and analyzed

Commented [A2]: Answer for question:
The method part of the research should be written in detail.
The method of research; research model, participants, data
collection tools, data collection process, and data analysis
should be written in detail under subheadings

1
2
3
4
5
6
7
8
9
10 138 descriptively. Meanwhile, the data about students' responses that collected through questionnaires were analyzed
11 139 descriptively too, namely the percentage calculation of students who gave positive responses. Furthermore, the
12 140 percentage of positive responses from students was compared with the existing criteria. The model was said to be
13 141 effective, if it meets the following criteria: 1) The activities of students in learning participating were classified as
14 142 high; 2) The appearance of students' good character was at least in the category of "often and consistently showing
15 143 good behavior according to the *Tri Hita Karana* aspect"; 3) At least 85% of students had a positive response.

17 144 2.1. *Sociocultural Theory-oriented Mathematics Learning Model with Tri Hita Karana insight* Components

18 145 The *Sociocultural Theory-oriented Mathematics Learning Model with Tri Hita Karana insight* component to
19 146 improve the character of students was conveyed by linking the components of the *Joyce* model (Cheek et al., 2019)
20 147 with character values that can be built and developed through a Sociocultural theory-oriented Mathematics Learning
21 148 Model with *Tri Hita Karana* insight. The *Sociocultural Theory-oriented Mathematics Learning Model with Tri Hita*
22 149 *Karana insight* syntax is as follows.

24 150 1) Preliminary Activities

- 25 151 a. Greeting (insertion of *Pawongan* values in the *sabda* aspect).
- 26 152 b. Organizing the cleanliness of the environment before starting learning (insertion of *Pawongan* values in the
27 153 *bayu* aspect and insertion of *Palemahan* values).
- 28 154 c. Presence (insertion of the *Pawong* value in the *bayu* aspect).
- 29 155 d. Prayers together according to their respective beliefs (insertion of the *Pawongan* value in the *Idep* aspect
30 156 and the insertion of the *Parahyangan* value).
- 31 157 e. Apperception

32 158 The learning process begins by the teacher by facilitating students to make a connection between the learning
33 159 tasks that were being handled by students and their past experiences related to academics, personal, and culture. This
34 160 means that the *idep* aspect in the *pawongan* value orientation was used for reasoning. The aim was to involve
35 161 students in learning by arousing their curiosity, drawing their attention to the problems at hand, or the *sabda* aspect
36 162 of the *pawongan* value orientation was used to ask some questions that make them think. In addition, this stage
37 163 provided opportunities for teachers and students through evaluation activities to identify the initial concepts which
38 164 they have were relating to the new concepts being studied (Kartal & Kici, 2020). It was by considering whether the
39 165 initial concept is appropriate or incorrect (misconception). It was at this stage that the teacher identified the strengths
40 166 and weaknesses of each individual or group because learning was carried out in ZPD. This was intended so that
41 167 teachers make it easier to adjust the learning carried out with the learning experiences that each individual or group
42 168 has against the knowledge learned (Diken, 2020). Thus learning mathematics can be interesting and challenging for
43 169 students.

44 170 It is known that the level of actual development is also called the independent level, because students have been
45 171 able to master skills and can do it independently. Conversely, if it is learned far above the level of potential
46 172 development, the learning will be ineffective because the level of potential development refers to what students are
47 173 unable to do independently (Winthrop & McGivney, 2017). However, by using the *bayu* aspect of the

174 *pawongan* value orientation, they will be able to master skills under the guidance of adults or collaborate with more
175 competent colleagues. In this first stage, character values based on national culture are possible to be realized were:
176 curiosity, independence, hard work, and responsibility.

177 2) Core Activities

- 178 a. Formation of study groups (4–5 members) (insertion of *Pawongan* values on the *bayu* aspect).
- 179 b. Investigating and discussing mathematical problems related to daily life problems of students with insight
180 into *Tri Hita Karana* values in cooperative groups (insertion of *Pawongan* values in the *bayu* aspect;
181 insertion of *Palemah* values; and insertion of *Parahyangan* values).
- 182 c. Utilization of scaffolding as a way for teachers to help students who have problems (insertion of *Pawongan*
183 values in the *idep* aspect).
- 184 d. Presentations then questions and answers between group members with tutoring from the teacher (insertion
185 of *Pawongan* values on aspects of *bayu*, *sabda* and *idep*; insertion of *Palemahan* values).

186 In the second stage, learning was carried out by grouping students into cooperative groups of 4-5 members with
187 various abilities and genders. At this stage the teacher provided math problems that will be solved by students with a
188 level of difficulty between the level of actual and the level of potential. In other words, students were learned in ZPD
189 by using the *idep* aspect from the *Pawongan* value orientation. At this stage the teacher facilitated students when
190 they were investigating a mathematical task that was being worked on. By using the *bayu* aspect from the *Pawongan*
191 value orientation, so students worked on a task to understand certain concepts, then they acquired problem-solving
192 skills and numeracy skills. When students investigated new material, the initial knowledge that was explored in stage
193 1 really helps the teacher adjust their learning to the learning experience of students. In order for this to run
194 optimally, the teacher must give challenging assignments. It is the assignments which make sense, stimulate
195 thinking, and can motivate students. In addition, teachers must design meaningful learning and be able to involve all
196 students in social interactions in order to provide opportunities for students. It is to construct new knowledge, as well
197 as provide feedback (evaluation) that helps and encourages further development of students' knowledge according to
198 the speed of their abilities (Lewis, 2018). If the preconception was appropriate, then the teacher directs students and
199 guides students to organize information that supports their ideas towards the conclusions that should be done. If there
200 is a deadlock in students while carrying out an investigation, the teacher must facilitate them in the form of providing
201 scaffolding assistance (Seo, 2019). Character values based on national culture that can be accommodated in this case
202 by paying attention to cooperative groups, ZPD, Scaffolding, and mathematical-problems with *Tri Hita Karana*
203 values insight are: tolerance, honesty, hard work, discipline, creative, independence, democratic, self-confidence,
204 curiosity, mutual respect, communicative, caring for others, responsibility, like helping/mutual cooperation,
205 enthusiasm, leadership, mutual trust, and gratitude.

206 3) Closing activities

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

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

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

216 4) Evaluation Activities

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

222 2.2. Social System

223 The **Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight** places students at
224 the center of learning and highly upholds social life in intellectual terms. Thus the cultivation of good habits can be
225 done through the application of the **Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita***
226 ***Karana* insight** so that students are able to behave and act in accordance with the norms prevailing in society.

227 2.3. Reaction Principles

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

239 2.4. Support System

240 The support system referred to in this case is what supporting conditions are needed so that the **Sociocultural**
241 **Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight** can still be implemented properly and
242 effectively. In order for the model to run according to plan, it needs: teachers' understanding of the concept of the
243 **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 Table 2 and Table 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

Table 2 and Table 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, it tends to be a change for the better. So that the good character scores of students at the 6th 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** is shown 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 the 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 4 phases, namely the Preliminary, Core, Closing (taking conclusions), and Evaluation phases, as can be seen fully in Figure 1.

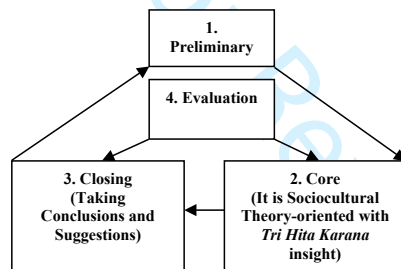


Figure 1. Syntax of **Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight**

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.

333 Vice versa, if it is not appropriate, the teacher will guide students to adjust their knowledge with the new information
334 to be learned.

335 At the Core stage, students are taught in cooperative groups consisting of 4-5 members with various genders and
336 academic abilities. It is at this core activity that good character can be optimally enhanced. The good character
337 “honest” can be increased considering that some of the indicators are observed to change significantly, such as:
338 students try to convey something in accordance with the actual situation; willing and brave to admit their mistakes,
339 shortcomings or limitations; do not like to cheat or do not violate activities when they doing independent activities;
340 not lying (students express their opinions as they are); and not manipulating facts/information (especially when asked
341 to correct one’s own work). This is due to the habituation in the **Sociocultural Theory-oriented Mathematics**
342 **Learning Model with Tri Hita Karana insight** in the form of problem discussion. So that students are trained to
343 understand their responsibilities towards themselves and their responsibilities to the group. This habit is carried out
344 starting from the teacher who gives an example of honesty, such as recognize weaknesses when there is something
345 that cannot be explained. This can happen because the teacher first embraces the values contained in *Tri Hita Karana*
346 which are ready to be implemented in learning. It is done before learning with the **Sociocultural Theory-oriented**
347 **Mathematics Learning Model with Tri Hita Karana insight** is carried out. This is in accordance with the results of
348 research conducted by Hermino & Arifin, namely if a teacher wants to build an honest character in their students,
349 then that honest character must be accustomed to appearing in the teacher (Hermino & Arifin, 2020). Furthermore,
350 this is also in accordance with research of Halonen et al. that each indicator of character education is indicated by
351 strategies and learning methods that reflect the value of each character. The learning method in question can be in the
352 form of assignments, learning practices, and habituation so that character education values can be implemented
353 (Halonen et al., 2020).

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

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

368 The increase in the “tolerance” good character occurs because of the indicators appearance consistency such as:
369 care about the environment, especially seen when caring for group members who do not understand the concept;
370 respect to the ability lack of friends/group members; respect to differences of opinion that occur; open trait; does not
371 disturb friends who are working; does not impose an opinion; willing to cooperate with anyone; not prioritizing
372 personal interests; and the comfort of students in discussing in groups. The improvement in the good character of
373 “mutual cooperation” occurs due to the consistency of the indicators appearance such as: actively involved in
374 completing group assignments; willing to carry out tasks according to mutual agreement; encourage other friends to
375 work together to achieve common goals; and are willing to help other friends unconditionally or without much
376 reason. This is able to arise as a result of habituation in the application of cooperative learning. This is in accordance
377 with Leopold and Smith who said that the focus of values and skills that are targeted in collaborative learning
378 strategies is the ability to work together (Leopold & Smith, 2020). The increase in good character “polite” occurs
379 because of the indicators appearance consistency such as: teacher and students do not using profanity during the
380 lesson; do not interrupt the speaker at the right time; express thanks after being assisted; and treat others as her/his
381 self. The increase in good character “self-confidence” occurs because of the indicators appearance consistency such
382 as: opine without showing any doubt; not easily discouraged; dare to ask, opine, or answer questions; and not
383 awkward in acting. This confident character is accustomed to appearing in training students to communicate in the
384 discussion of any problems that must be solved.

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

398

399 **5. Conclusion and recommendations**

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

- 1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
- 402 1) The resulting **Sociocultural Theory-oriented Mathematics Learning Model with Tri Hita Karana insight** has a
403 syntax consisting of 4 phases, namely: Phase 1: Introduction, Phase 2: Core (Sociocultural Theory orientation
404 and *Tri Hita Karana* insight); Phase 3: Drawing Conclusions; Phase 4: Evaluation.
 - 405 2) The **Sociocultural Theory-oriented Mathematics Learning Model with Tri Hita Karana insight** met the validity
406 criteria of a model, and also met the criteria for practicality and effectiveness.
 - 407 3) The **Sociocultural Theory-oriented Mathematics Learning Model with Tri Hita Karana insight** was very
408 effective in helping students understand the mathematical concepts which were being studied.

18 Things that will be done in the future to overcome the obstacles experienced in this study are as follows.
19 Constraints (1) and (2) are overcome by ensuring that before applying the **Sociocultural Theory-oriented**
20 **Mathematics Learning Model with Tri Hita Karana insight**, a teacher needs to: (a) master the characteristics or
21 components of the **Sociocultural Theory-oriented Mathematics Learning Model with Tri Hita Karana insight**; (b)
22 understand well the *Tri Hita Karana* values; (c) do the training to synchronize mathematical material with characters
23 with insight into *Tri Hita Karana* values. Obstacle (3) is overcome by making a learning agenda or time limit for
24 each activity, for example 35 minutes of group discussion, 25 minutes of class discussion, and 10 minutes of
25 deepening and summarizing the material. Constraint (4) is overcome by ensuring that each group is well controlled
26 and facilitated so that students can minimize errors in conclusions. Constraint (5) is overcome by maximizing peer
27 tutoring and definitively informing students that group achievement is highly dependent on the achievement of each
28 group members.
29
30

31 421 **References**

- 32
33
34 422 **Abdulkarim, A., Komalasari, K., Saripudin, D., Ratmaningsih, N., & Anggraini, D. N. (2020). Development of a Unity in Diversity-Based**
423 **Pancasila Education Text Book for Indonesian Universities. *International Journal of Instruction*, 13(1), 371–386.**
424 **<https://doi.org/https://doi.org/10.29333/iji.2020.131256>**
- 35
36 425 **Atshar, H. S., & Hamzavi, R. (2017). An Investigation into the Characteristics of Iranian EFL Teachers of Senior Secondary Schools and**
426 **Language Institutes. *Iranian Journal of Language Teaching Research*, 5(1), 21–36.**
- 37
38 427 **Agussalim, Widjaja, S. U. M., Haryono, A., & Wahyono, H. (2021). Pancasila Economic Character Literacy Program for High School Students**
428 ***International Journal of Instruction*, 14(1), 235–252. <https://doi.org/https://doi.org/10.29333/iji.2021.141144>**
- 39
40 429 **Aladé, F. (2018). *Character Portrayals in STEM-Focused Educational Television Shows and Their Impact on Children's Attitudes towards***
430 ***STEM*. Northwestern University.**
- 41
42 431 **Alghamdi, M. S. (2017). The Reality and Difficulties of Employing ICT in Teaching from the Perspective of Math Teachers of Middle Stage in**
432 **Riyadh. *International Education Studies*, 10(12), 109–129. <https://doi.org/https://doi.org/10.5539/ies.v10n12p109>**
- 43
44 433 **Ambang, O. A., Alloggio, S., & Tandlich, R. (2019). Moral Reciprocity, Ethics of Appropriation of Indigenous Medicinal Plant Knowledge and**
434 **Associated Biopiracy. *Acta Educationis Generalis*, 9(2), 24–65. <https://doi.org/http://dx.doi.org/10.2478/atd-2019-0007>**
- 45
46 435 **Ardana, I. M., Ariawan, I. P. W., & Divayana, D. G. H. (2017). Measuring the Effectiveness of BLCS Model (Bruner, Local Culture, Scaffolding)**
436 **in Mathematics Teaching by using Expert System-Based CSE-UCLA. *International Journal of Education and Management Engineering*,**
437 **7(4), 1–12. <https://doi.org/10.5815/ijeme.2017.04.01>**
- 47
48 438 **Ariawan, I. P. W., Simatupang, W., Ishak, A. M., Agung, A. A. G., Suratmin, Adiarta, A., & Divayana, D. G. H. (2018). Development of ANEKA**
439 **Evaluation Model Based on Topsis in Searching the Dominant Aspects of Computer Learning Quality Determinants. *Journal of***
440 ***Theoretical and Applied Information Technology*, 96(19), 6580–6596. <http://www.jatit.org/volumes/Vol96No19/25Vol96No19.pdf>**

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

- 441 Astuti, N. L. P. W., & Kasiyan. (2018). The Values of Taksu in Pendet Dance at Saraswati Balinese Dance Studio Yogyakarta. *Advances in Social*
442 *Science, Education and Humanities Research*, 327, 274–279.
- 443 Berghaus, P. T. (2016). The Problems of Authority and the Want of Apprenticeship in Soldiers' Character Development. *Journal of Moral*
444 *Education*, 45(3), 324–337. <https://doi.org/http://dx.doi.org/10.1080/03057240.2016.1204272>
- 445 Bredemeier, B. L., & Shields, D. L. (2019). Social Justice, Character Education, and Sport: A Position Statement. *Quest*, 71(2), 202–214.
446 <https://doi.org/http://dx.doi.org/10.1080/00336297.2019.1608270>
- 447 Can, D., & Can, V. (2020). Fairness in Resource Distribution: Relationship between Children's Moral Reasoning and Logical Reasoning. *Acta*
448 *Educationalis Generalis*, 10(3), 66–86.
- 449 Chan, C. W. (2020). Moral Education in Hong Kong Kindergartens: An Analysis of the Preschool Curriculum Guides. *Global Studies of*
450 *Childhood*, 10(2), 156–169. <https://doi.org/http://dx.doi.org/10.1177/2043610619885385>
- 451 Cheek, A. E., Idol, W. A., Jones, J. L., & Holden, K. B. (2019). Infusing Technology throughout Teacher Preparation Programs to Support
452 Preservice Teacher Development. *Journal of Special Education Apprenticeship*, 8(2), 1–14.
- 453 Davis-Becker, S. (2013). Construct Maps: Do They Make the Unclear Clear? *Measurement: Interdisciplinary Research and Perspectives*, 11(4),
454 174–176. <https://doi.org/http://dx.doi.org/10.1080/15366367.2013.857980>
- 455 Diken, E. H. (2020). The Opinions of Science Teachers on the Weaknesses and Strengths of LGS and TEOG Systems (The Case of Kars
456 Province). *Journal of Curriculum and Teaching*, 9(2), 20–32. <https://doi.org/https://doi.org/10.5430/jct.v9n2p20>
- 457 Divayana, D. G. H., Ariawan, I. P. W., Adiarta, A., Parmiti, D. P., Mahendra, I. W. E., & Parmithi, N. N. (2018). Development of ANEKA-based
458 Countenance Model Integrated with Tri Hita Karana-SAW in Evaluating Student's Character and Quality of Computer Learning in Bali.
459 *Journal of Engineering and Applied Sciences*, 13(15), 6303–6315.
- 460 Divayana, D. G. H., Suyasa, P. W. A., & Widiartini, N. K. (2021). An Innovative Model as Evaluation Model for Information Technology-Based
461 Learning at ICT Vocational Schools. *Heliyon*, 7(2). <https://doi.org/10.1016/j.heliyon.2021.e06347>
- 462 Eun, B. (2019). The Zone of Proximal Development as an Overarching Concept: A Framework for Synthesizing Vygotsky's Theories.
463 *Educational Philosophy and Theory*, 51(1), 18–30.
- 464 Godfrey, Z., & Mtebe, J. (2018). Redesigning Local Games to Stimulate Pupils' Interest in Learning Numeracy in Tanzania. *International Journal*
465 *of Education and Development Using Information and Communication Technology*, 14(3), 17–37.
- 466 Gray, K. M. (2018). *Characterizing Environmental Health Literacy Related to Fish Consumption Advisories: Knowledge and Beliefs of Informal*
467 *Educators in a Southeastern State*. North Carolina State University.
- 468 Halonen, J. S., Nolan, S. A., Frantz, S., Hoss, R. A., McCarthy, M. A., Pusateri, T., & Wickes, K. (2020). The Challenge of Assessing Character:
469 Measuring APA Goal 3 Student Learning Outcomes. *Teaching of Psychology*, 47(4), 285–295.
470 <https://doi.org/http://dx.doi.org/10.1177/0098628320945119>
- 471 Haynor, M. I. (2018). *Applying a Constructivist Approach to the Assessment of Compositions in a Secondary Technology-Based Music*
472 *Classroom*. Boston University.
- 473 Henrich, A., Sloughter, J. M., Anderson, J., & Bahuau, E. (2016). Addressing Negative Math Attitudes with Service-Learning. *PRIMUS*, 26(8),
474 788–802. <https://doi.org/http://dx.doi.org/10.1080/10511970.2016.1174967>
- 475 Hermino, A., & Arifin, I. (2020). Contextual Character Education for Students in the Senior High School. *European Journal of Educational*
476 *Research*, 9(3), 1009–1023. <https://doi.org/https://doi.org/10.12973/eu-er.9.3.1009>
- 477 Johnson, N. C. (2017). *Expanding Competence: Supporting Students to Engage with Each Other's Mathematical Ideas*. University of California,
478 Los Angeles.
- 479 Kartal, G., & Kici, D. (2020). Reflection through Drama and Concept Maps for Preservice Teacher Education in Information Communication
480 Technologies. *Education and Information Technologies*, 25(6), 4861–4881. <https://doi.org/http://dx.doi.org/10.1007/s10639-020-10194-4>
- 481 Kazu, I. Y., & Is, A. (2018). An Investigation about Actualization Levels of Learning Outcomes in Early Childhood Curriculum. *Journal of*
482 *Education and Training Studies*, 6(3), 66–77. <https://doi.org/https://doi.org/10.11114/jets.v6i3.2928>
- 483 Kim, Y. (2020). Partial Identification of Answer Reviewing Effects in Multiple-Choice Exams. *Journal of Educational Measurement*, 57(4), 511–
484 526. <https://doi.org/http://dx.doi.org/10.1111/jedm.12259>
- 485 Kural, M., & Kocakulah, M. S. (2016). Teaching for Hot Conceptual Change: Towards a New Model, beyond the Cold and Warm Ones.
486 *European Journal of Education Studies*, 2(8), 1–40.
- 487 Leopold, H., & Smith, A. (2020). Implementing Reflective Group Work Activities in a Large Chemistry Lab to Support Collaborative Learning.

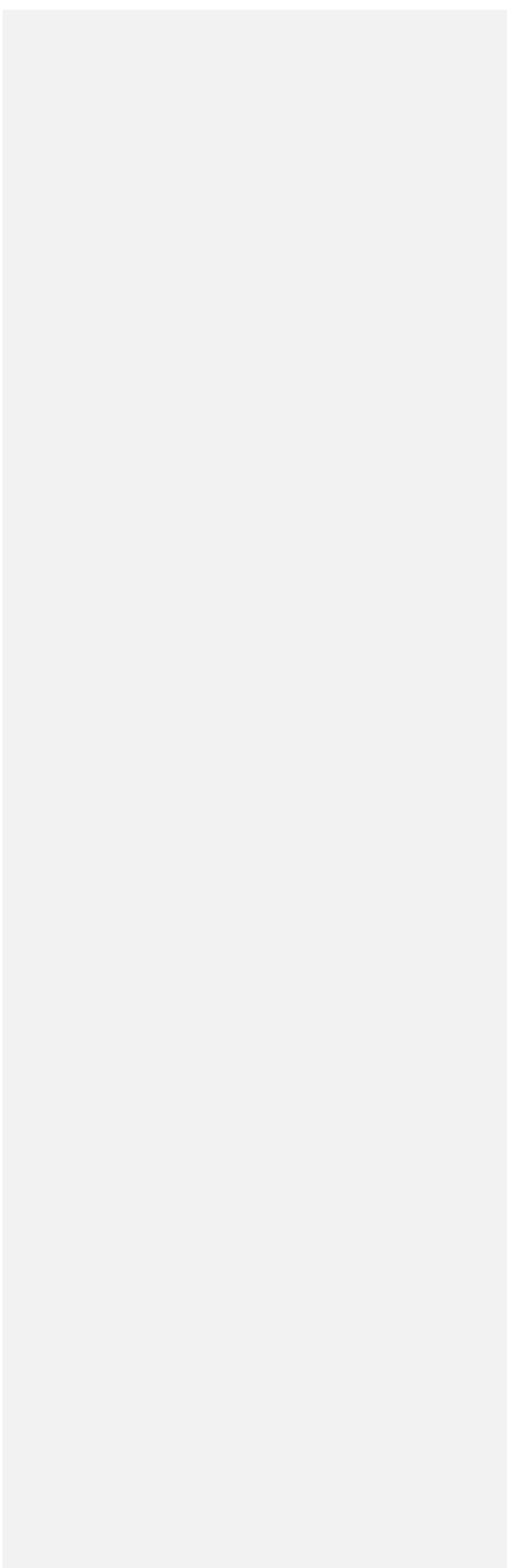
- 488 [Education Sciences, 10\(7\), 1–19](#).
- 489 Lewis, D. G. R. (2018). *Beyond Problems on a Platter: Creating Tools for Teaching Planning in Real World Design*. Northwestern University.
- 490 Little, J. (2019). Connecting Mathematics with Science to Enhance Student Achievement – A Position Paper. *Mathematics Education Research*
- 491 *Group of Australasia, 452–459*.
- 492 Mahayukti, M.A., Dantes, N., Candiasa, I.M., Marhaeni, A.A.I.N., Gita, I.N., Divayana, D. G. H. (2018). Computer-based Portfolio Assessment to
- 493 Enhance Students' Self-Regulated Learning. *Journal of Theoretical and Applied Information Technology, 96(8), 2351–2360*.
- 494 Martins, M., & Justi, R. (2019). An Instrument for Analysing Students' Argumentative Reasoning When Participating in Debates. *International*
- 495 *Journal of Science Education, 41(6), 713–738*. <https://doi.org/http://dx.doi.org/10.1080/09500693.2019.1579005>
- 496 McCormick, M., Buttrick, H., & McGowan, R. (2018). Ethics of Entrepreneurship: Should We Be Teaching Students the Inevitable Moral
- 497 Dilemmas That Challenge All Entrepreneurs? *Journal of Learning in Higher Education, 14(1), 29–36*.
- 498 McGowan, R.J., & Buttrick, H. G. (2017). Teaching Environmental Ethics: Moral Considerations and Legislative Action. *Journal of Learning in*
- 499 *Higher Education, 13(1), 49–54*.
- 500 Mottet, T. P. (2015). FORUM: Affective Learning. Affective Learning from a Cognitive Neuroscientific Perspective. *Communication Education,*
- 501 *64(4), 508–510*. <https://doi.org/http://dx.doi.org/10.1080/03634523.2015.1064144>
- 502 Murray, J., & Cousens, D. (2020). Primary School Children's Beliefs Associating Extra-Curricular Provision with Non-Cognitive Skills and
- 503 Academic Achievement. *Education 3-13, 48(1), 37–53*. <https://doi.org/http://dx.doi.org/10.1080/03004279.2019.1572769>
- 504 Ndiung, S., Dantes, N., Ardana, I., & Marhaeni, A.A.I.N. (2019). Treffinger Creative Learning Model with RME Principles on Creative Thinking
- 505 Skill by Considering Numerical Ability. *International Journal of Instruction, 12(3), 731–744*.
- 506 <https://doi.org/https://doi.org/10.29333/iji.2019.12344>
- 507 Pardo, N. (2020). Character Development Assessment in Imagine Schools. *Journal of Character Education, 16(2), 69–72*.
- 508 Pranoto, S.Y. K., & Hong, J. (2020). The Aspirations of Young Indonesian Children. *Global Studies of Childhood, 10(2), 202–209*.
- 509 <https://doi.org/http://dx.doi.org/10.1177/2043610619869704>
- 510 Raihani, R. (2018). Education for Multicultural Citizens in Indonesia: Policies and Practices. *Compare: A Journal of Comparative and*
- 511 *International Education, 48(6), 992–1009*. <https://doi.org/http://dx.doi.org/10.1080/03057925.2017.1399250>
- 512 Rhames, M. A. (2019). The "F-Word" of Social and Emotional Learning: Faith. *American Enterprise Institute, 1–8*.
- 513 Sellbjer, S. (2018). "Have You Read My Comments? It Is Not Noticeable. Change!" An Analysis of Feedback Given to Students Who Have
- 514 Failed Examinations. *Assessment & Evaluation in Higher Education, 43(2), 163–174*.
- 515 <https://doi.org/http://dx.doi.org/10.1080/02602938.2017.1310801>
- 516 Seo, B. I. (2019). An Investigation of How 7th Grade and 8th Grade Students Manipulate Mathematical Writing Elements. *Perspectives in*
- 517 *Education, 37(2), 141–159*.
- 518 Setyaningsih, N., Rejeki, S., & Ishartono, N. (2019). Developing Realistic and Child-Friendly Learning Model for Teaching Mathematics. *Journal*
- 519 *of Research and Advances in Mathematics Education, 4(2), 79–88*.
- 520 Sugiarto, D., & Sumarsono, P. (2014). The Implementation of Think-Pair-Share Model to Improve Students' Ability in Reading Narrative Texts.
- 521 *International Journal of English and Education, 3(3), 206–215*.
- 522 Sugiharni, G. A. D., Setiasih, N. W., Mahendra, I. W. E., Ardana, I. M., & Divayana, D. G. H. (2018). Development of Alkin Model Instruments
- 523 as Evaluation Tools of Blended Learning Implementation in Discrete Mathematics Course on STIKOM Bali. *Journal of Theoretical and*
- 524 *Applied Information Technology, 96(17)*. <http://www.jatit.org/volumes/Vol96No17/15Vol96No17.pdf>
- 525 Sukmayadi, V., & Yahya, A. H. (2020). Indonesian Education Landscape and the 21st Century Challenges. *Journal of Social Studies Education*
- 526 *Research, 11(4), 219–234*.
- 527 Sulistyarningsih, D., Purnomo, & Aziz, A. (2019). Development of Learning Design for Mathematics Manipulatives Learning Based on E-
- 528 Learning and Character Building. *International Electronic Journal of Mathematics Education, 14(3), 197–205*.
- 529 <https://doi.org/https://doi.org/10.29333/iejme/3996>
- 530 Susilana, R., & Asra. (2013). Development of Quality Assurance System in Culture and Nation Character Education in Primary Education in
- 531 Indonesia. *Malaysian Online Journal of Educational Sciences, 1(2), 17–24*. <https://doi.org/https://files.eric.ed.gov/fulltext/EJ1086212.pdf>
- 532 Walle, J. A., Van De, T. D., Karp, K. S., & Bay-Williams, J. M. (2013). *Elementary and Middle School Mathematics, Teaching Developmentally*.
- 533 Pearson Education, Inc.
- 534 Winthrop, R., & McGivney, E. (2017). *Can We Leapfrog? The Potential of Education Innovations to Rapidly Accelerate Progress. Skills for a*

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

535
536

Changing World. Center for Universal Education at The Brookings Institution.

For Review Only



**ARTIKEL YANG DIACCEPTED /
CAMERA READY
(2 Desember 2021)**

Advancement of Science and Societies Life

Proofreading Editing

proofreading-editing.eu



CERTIFICATE OF ENGLISH EDITING

This document certifies that the paper listed below has been edited to ensure that the language is clear and free of errors. The logical presentation of ideas and the structure of the paper were also checked during the editing process. The intent of the author's message was not altered in any way during the editing process. The quality of the edit has been guaranteed, with the assumption that our suggested changes have been accepted and have not been further altered without the knowledge of our editors.

TITLE OF THE PAPER

“The expansion of Sociocultural Theory-oriented Mathematical Learning Model”

AUTHOR/S

I Made Ardana

A handwritten signature in blue ink, appearing to read 'Pembe Mehmet'.

Pembe Mehmet

November 20, 2021

No: 345

Contact

The Academic Event Group (TAEG)

Registration No: SLBT 375, Postal Address: P.O. 22912,1525 Nicosia, Cyprus.

Dispute: Subject to Nicosia (Cyprus) Jurisdiction only, in case of any dispute

www.proofreading-editing.eu E-mail: taeg.proofreading@gmail.com WhatsApp: +905428566055

The expansion of Sociocultural Theory-oriented Mathematical Learning Model

I Made Ardana^{a*}, Department of Mathematics Education, Universitas Pendidikan Ganesha, Jalan Udayana No.11, Singaraja 81119, Indonesia, <https://orcid.org/0000-0002-0629-8704>

I Putu Wisna Ariawan^b, Department of Mathematics Education, Universitas Pendidikan Ganesha, Jalan Udayana No.11, Singaraja 81119, Indonesia, <https://orcid.org/0000-0002-2996-6648>

Gusti Ayu Dessy Sugiharni^c, Department of Information System, Institut Teknologi dan Bisnis STIKOM Bali, Jl. Raya Puputan No.86, Denpasar 80234, Indonesia, <https://orcid.org/0000-0003-2578-0456>

Suggested Citation:

Ardana, I. M., Ariawan, I. P. W., Sugiharni, G. A. D. (2021). The expansion of Sociocultural Theory-oriented Mathematical Learning Model. *Cypriot Journal of Educational Science*. 0(0), 00-00.

Received from; revised from; accepted from.

Selection and peer review under responsibility of Prof. Dr. Huseyin Uzunboylu, Near East University, Cyprus.

©2021 United World Center of Research Innovation and Publication. All rights reserved.

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*

*ADDRESS FOR CORRESPONDENCE: I Made Ardana, Universitas Pendidikan Ganesha, Udayana Street No.11 Singaraja–Bali, 81116, Indonesia
E-mail address: ardanaimade@undiksha.ac.id/Telp.: +62 857-9234-5155

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 \geq 85%	Very high
2.	$70\% \leq$ Score $<$ 85%	High
3.	$55\% \leq$ Score $<$ 70%	Enough
4.	$40\% \leq$ 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 of 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 of 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.

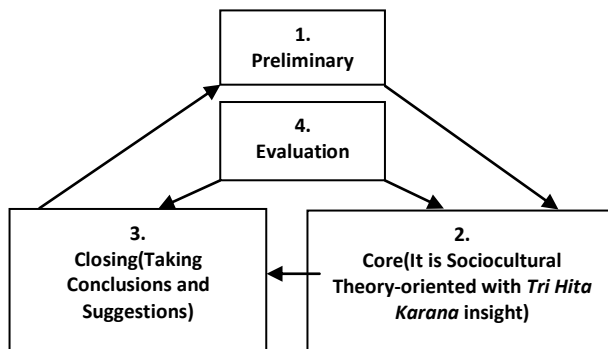


Figure 1. Syntax of Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight

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.

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.

References

- Abdulkarim, A., Komalasari, K., Saripudin, D., Ratmaningsih, N., & Anggraini, D. N. (2020). Development of a Unity in Diversity-Based Pancasila Education Text Book for Indonesian Universities. *International Journal of Instruction*, 13(1), 371–386. <https://doi.org/10.29333/iji.2020.13125a>
- Afshar, H. S., & Hamzavi, R. (2017). An Investigation into the Characteristics of Iranian EFL Teachers of Senior Secondary Schools and Language Institutes. *Iranian Journal of Language Teaching Research*, 5(1), 21–36.
- Agussalim, A., Widjaja, S. U. M., Haryono, A., & Wahyono, H. (2021). Pancasila Economic Character Literacy Program for High School Students. *International Journal of Instruction*, 14(1), 235–252. <https://doi.org/10.29333/iji.2021.14114a>
- Alade, F. (2018). *Character Portrayals in STEM-Focused Educational Television Shows and Their Impact on Children's Attitudes towards STEM*. Northwestern University.
- Alghamdi, M. S. (2017). The Reality and Difficulties of Employing ICT in Teaching from the Perspective of Math Teachers of Middle Stage in Riyadh. *International Education Studies*, 10(12), 109–129. <https://doi.org/10.5539/ies.v10n12p109>
- Ambang, O. A., Alloggio, S., & Tandlich, R. (2019). Moral Reciprocity, Ethics of Appropriation of Indigenous Medicinal Plant Knowledge and Associated Biopiracy. *Acta Educationis Generalis*, 9(2), 24–65. <https://doi.org/10.2478/atd-2019-0007>
- Ardana, I. M., Wisna Ariawan, I. P., & Hendra Divayana, D. G. (2017). Measuring the Effectiveness of BLCS Model (Bruner, Local Culture, Scaffolding) in Mathematics Teaching by using Expert System-Based CSE-UCLA. *International Journal of Education and Management Engineering*, 7(4), 1–12. <https://doi.org/10.5815/ijeme.2017.04.01>
- Ariawan, I. P. W., Simatupang, W., Ishak, A. M., Agung, A. A. G., Suratmin, Adiarta, A., & Divayana, D. G. H. (2018). Development of ANEKA Evaluation Model Based on Topsis in Searching the Dominant Aspects of Computer Learning Quality Determinants. *Journal of Theoretical and Applied Information Technology*, 96(19), 6580–6596.
- Astuti, N. L. P. W., & Kasiyan. (2018). The Values of Taksu in Pendet Dance at Saraswati Balinese Dance Studio Yogyakarta. *Advances in Social Science, Education and Humanities Research*, 327, 274–279.
- Berghaus, P. T. (2016). The Problems of Authority and the Want of Apprenticeship in Soldiers' Character Development. *Journal of Moral Education*, 45(3), 324–337. <https://doi.org/10.1080/03057240.2016.1204272>
- Bredemeier, B. L., & Shields, D. L. (2019). Social Justice, Character Education, and Sport: A Position Statement. *Quest*, 71(2), 202–214. <https://doi.org/10.1080/00336297.2019.1608270>
- Can, D., & Can, V. (2020). Fairness in Resource Distribution: Relationship between Children's Moral Reasoning and Logical Reasoning. *Acta Educationis Generalis*, 10(3), 66–86.

- Chan, C. W. (2020). Moral Education in Hong Kong Kindergartens: An Analysis of the Preschool Curriculum Guides. *Global Studies of Childhood*, 10(2), 156–169. <https://doi.org/10.1177/2043610619885385>
- Cheek, A. E., Idol, W. A., Jones, J. L., & Holden, K. B. (2019). Infusing Technology throughout Teacher Preparation Programs to Support Preservice Teacher Development. *Journal of Special Education Apprenticeship*, 8(2), 1–14.
- Davis-Becker, S. (2013). Construct Maps: Do They Make the Unclear Clear? *Measurement: Interdisciplinary Research and Perspectives*, 11(4), 174–176. <https://doi.org/10.1080/15366367.2013.857980>
- Diken, E. H. (2020). The Opinions of Science Teachers on the Weaknesses and Strengths of LGS and TEOG Systems (The Case of Kars Province). *Journal of Curriculum and Teaching*, 9(2), 20–32. <https://doi.org/10.5430/jct.v9n2p20>
- Divayana, D. G. H., Sudirtha, I. G., & Suartama, I. K. (2021). Digital Test Instruments Based on Wondershare-Superitem for Supporting Distance Learning Implementation of Assessment Course. *International Journal of Instruction*, 14(4), 945–964. <https://doi.org/10.29333/iji.2021.14454a>
- Divayana, D. G. H., Ariawan, I. P. W., Adiarta, A., Parmiti, D. P., Mahendra, I. W. E., & Parmithi, N. N. (2018). Development of ANEKA-based countenance model integrated with Tri Hita Karana-SAW in evaluating student's character and quality of computer learning in Bali. *Journal of Engineering and Applied Sciences*, 13(15), 6303–6315.
- Divayana, D. G. H., Suyasa, P. W. A., & Widiartini, N. K. (2021). An innovative model as evaluation model for information technology-based learning at ICT vocational schools. *Heliyon*, 7(2). <https://doi.org/10.1016/j.heliyon.2021.e06347>
- Eun, B. (2019). The Zone of Proximal Development as an Overarching Concept: A Framework for Synthesizing Vygotsky's Theories. *Educational Philosophy and Theory*, 51(1), 18–30.
- Gray, K. M. (2018). *Characterizing Environmental Health Literacy Related to Fish Consumption Advisories: Knowledge and Beliefs of Informal Educators in a Southeastern State*. North Carolina State University.
- Halonen, J. S., Nolan, S. A., Frantz, S., Hoss, R. A., McCarthy, M. A., Pusateri, T., & Wickes, K. (2020). The Challenge of Assessing Character: Measuring APA Goal 3 Student Learning Outcomes. *Teaching of Psychology*, 47(4), 285–295. <https://doi.org/10.1177/0098628320945119>
- Haynor, M. I. (2018). *Applying a Constructivist Approach to the Assessment of Compositions in a Secondary Technology-Based Music Classroom*. Boston University.
- Henrich, A., Slougher, J. M., Anderson, J., & Bahuaud, E. (2016). Addressing Negative Math Attitudes with Service-Learning. *PRIMUS*, 26(8), 788–802. <https://doi.org/10.1080/10511970.2016.1174967>
- Hermiono, A., & Arifin, I. (2020). Contextual Character Education for Students in the Senior High School. *European Journal of Educational Research*, 9(3), 1009–1023. <https://doi.org/10.12973/eu-jer.9.3.1009>
- Johnson, N. C. (2017). *Expanding Competence: Supporting Students to Engage with Each Other's Mathematical Ideas*. University of California, Los Angeles.
- Kartal, G., & Kici, D. (2020). Reflection through Drama and Concept Maps for Preservice Teacher Education in Information Communication Technologies. *Education and Information*

- Technologies*, 25(6), 4861–4881. <https://doi.org/10.1007/s10639-020-10194-4>
- Kazu, I. Y., & Is, A. (2018). An Investigation about Actualization Levels of Learning Outcomes in Early Childhood Curriculum. *Journal of Education and Training Studies*, 6(3), 66–77. <https://doi.org/10.11114/jets.v6i3.2928>
- Kim, Y. (2020). Partial Identification of Answer Reviewing Effects in Multiple-Choice Exams. *Journal of Educational Measurement*, 57(4), 511–526. <https://doi.org/10.1111/jedm.12259>
- Kural, M., & Kocakulah, M. S. (2016). Teaching for Hot Conceptual Change: Towards a New Model, beyond the Cold and Warm Ones. *European Journal of Education Studies*, 2(8), 1–40.
- Leopold, H., & Smith, A. (2020). Implementing Reflective Group Work Activities in a Large Chemistry Lab to Support Collaborative Learning. *Education Sciences*, 10(7), 1–19.
- Little, J. (2019). Connecting Mathematics with Science to Enhance Student Achievement -- A Position Paper (pp. 452-459). *Mathematics Education Research Group of Australasia*.
- Mahayukti, M.A., Dantes, N., Candiasa, I.M., Marhaeni, A.A.I.N., Gita, I.N., & Divayana, D. G. H. (2018). Computer-based Portfolio Assessment to Enhance Students' Self-Regulated Learning. *Journal of Theoretical and Applied Information Technology*, 96(8), 2351–2360.
- Martins, M., & Justi, R. (2019). An Instrument for Analysing Students' Argumentative Reasoning When Participating in Debates. *International Journal of Science Education*, 41(6), 713–738. <https://doi.org/10.1080/09500693.2019.1579005>
- McCormick, Marleen; Buttrick, Hilary; McGowan, R. (2018). Ethics of Entrepreneurship: Should We Be Teaching Students the Inevitable Moral Dilemmas That Challenge All Entrepreneurs? *Journal of Learning in Higher Education*, 14(1), 29–36.
- McGowan, Richard J.; Buttrick, H. G. (2017). Teaching Environmental Ethics: Moral Considerations and Legislative Action. *Journal of Learning in Higher Education*, 13(1), 49–54.
- Mottet, T. P. (2015). FORUM: Affective Learning. Affective Learning from a Cognitive Neuroscientific Perspective. *Communication Education*, 64(4), 508–510. <https://doi.org/10.1080/03634523.2015.1064144>
- Murray, J., & Cousens, D. (2020). Primary School Children's Beliefs Associating Extra-Curricular Provision with Non-Cognitive Skills and Academic Achievement. *Education 3-13*, 48(1), 37–53. <https://doi.org/10.1080/03004279.2019.1572769>
- Ndiung, S., Dantes, N., Ardana, I., & Marhaeni, A. (2019). Treffinger Creative Learning Model with RME Principles on Creative Thinking Skill by Considering Numerical Ability. *International Journal of Instruction*, 12(3), 731–744. <https://doi.org/10.29333/iji.2019.12344a>
- Pardo, N. (2020). Character Development Assessment in Imagine Schools. *Journal of Character Education*, 16(2), 69–72.
- Raihani, R. (2018). Education for Multicultural Citizens in Indonesia: Policies and Practices. *Compare: A Journal of Comparative and International Education*, 48(6), 992–1009. <https://doi.org/10.1080/03057925.2017.1399250>
- Rees Lewis, D. G. (2018). *Beyond Problems on a Platter: Creating Tools for Teaching Planning in Real World Design*. Northwestern University.
- Rhames, M. A. (2019). The “F-Word” of Social and Emotional Learning: Faith (pp. 1-8). *American Enterprise Institute*
- Sellbjer, S. (2018). ‘Have you read my comments? It is not noticeable. Change!’ An analysis of

- feedback given to students who have failed examinations. *Assessment & Evaluation in Higher Education*, 43(2), 163–174. <https://doi.org/10.1080/02602938.2017.1310801>
- Seo, B.-I. (2019). An Investigation of How 7th Grade and 8th Grade Students Manipulate Mathematical Writing Elements. *Perspectives in Education*, 37(2), 141–159.
- Setyaningsih, N., Rejeki, S., & Ishartono, N. (2019). Developing Realistic and Child-Friendly Learning Model for Teaching Mathematics. *Journal of Research and Advances in Mathematics Education*, 4(2), 79–88.
- Suartama, I. K., Triwahyuni, E., Sukardi, A., & Hastuti, W. D. (2020). Development of E-Learning Oriented Inquiry Learning Based on Character Education in Multimedia Course. *European Journal of Educational Research*, 9(4), 1591–1603. <https://doi.org/10.12973/eu-er.9.4.1591>
- Suastika, I. N., Suartama, I. K., Sanjaya, D. B., & Arta, K. . (2021). Application of multicultural-based learning model syntax of social studies learning. *Cypriot Journal of Educational Sciences*, 16(4), 1660–1679. <https://doi.org/10.18844/cjes.v16i4.6030>
- Sugiarto, D., & Sumarsono, P. (2014). The Implementation of Think-Pair-Share Model to Improve Students' Ability in Reading Narrative Texts. *International Journal of English and Education*, 3(3), 206–215.
- Sugiharni, G. A. D., Setiasih, N. W., Mahendra, I. W. E., Ardana, I. M., & Divayana, D. G. H. (2018). Development of Alkin Model Instruments as Evaluation Tools of Blended Learning Implementation in Discrete Mathematics Course on STIKOM Bali. *Journal of Theoretical and Applied Information Technology*, 96(17).
- Sugiyono, Y. K., & Hong, J. (2020). The Aspirations of Young Indonesian Children. *Global Studies of Childhood*, 10(2), 202–209. <https://doi.org/10.1177/2043610619869704>
- Sukmayadi, V., & Yahya, A. H. (2020). Indonesian Education Landscape and the 21st Century Challenges. *Journal of Social Studies Education Research*, 11(4), 219–234.
- Sulistyaningsih, D., Purnomo, & Aziz, A. (2019). Development of Learning Design for Mathematics Manipulatives Learning Based on E-Learning and Character Building. *International Electronic Journal of Mathematics Education*, 14(3), 197–205. <https://doi.org/10.29333/iejme/3996>
- Susilana, R., & Asra. (2013). Development of Quality Assurance System in Culture and Nation Character Education in Primary Education in Indonesia. *Malaysian Online Journal of Educational Sciences*, 1(2), 17–24. <https://doi.org/https://files.eric.ed.gov/fulltext/EJ1086212.pdf>
- Walle, John A. Van DeElementary and Middle School Mathematics, T. D., Karp, K. S., & Bay-Williams, J. M. (2013). *Elementary and Middle School Mathematics, Teaching Developmentally*. Pearson Education, Inc.
- Winthrop, R., & McGivney, E. (2017). *Can We Leapfrog? The Potential of Education Innovations to Rapidly Accelerate Progress. Skills for a Changing World*. Center for Universal Education at The Brookings Institution.

ARTIKEL YANG PUBLISHED

(31 Desember 2021)

The expansion of sociocultural theory-oriented mathematical learning model

Home / Archives / Vol. 16 No. 6 (2021): December / Articles

Made I Ardana
Universitas Pendidikan Ganesha, Department of Mathematics Education, Singaraja, Indonesia
ID <https://orcid.org/0000-0002-0629-8704>

Wisna I Putu Ariawan
Universitas Pendidikan Ganesha, Department of Mathematics Education, Singaraja, Indonesia,

Gusti Ayu Dessy Sugiharni
Institut Teknologi dan Bisnis STIKOM Bali, Department of Information System, Denpasar, Indonesia

PDF

Published: Dec 31, 2021
DOI: <https://doi.org/10.18844/cjes.v16i6.6493>

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

- Home
- Abstracting & Indexing
- Make a Submission
- Publication Ethics
- Open Access Policy
- Article Processing Charge
- Register
- Login
- About the Journal
- Editorial Board
- Author Guidelines
- Archives You can find all other published issues of the journal from the link provided below.
- Archives 2006-2015
- Become Reviewer

The+Final+Version....pdf

Show all

The expansion of sociocultural theory-oriented mathematical learning model

I Made Ardana ^{a*}, Department of Mathematics Education, Universitas Pendidikan Ganesha, Jalan Udayana No.11, Singaraja 81119, Indonesia, <https://orcid.org/0000-0002-0629-8704>

I Putu Wisna Ariawan ^b, Department of Mathematics Education, Universitas Pendidikan Ganesha, Jalan Udayana No.11, Singaraja 81119, Indonesia, <https://orcid.org/0000-0002-2996-6648>

Gusti Ayu Dessy Sugiharni ^c, Department of Information System, Institut Teknologi dan Bisnis STIKOM Bali, Jl. Raya Puputan No.86, Denpasar 80234, Indonesia, <https://orcid.org/0000-0003-2578-0456>

Suggested Citation:

Ardana, I. M., Ariawan, I. P. W., Sugiharni, G. A. D. (2021). The expansion of Sociocultural Theory-oriented Mathematical Learning Model. *Cypriot Journal of Educational Science*. 16(6), 3016-3032. <https://doi.org/10.18844/cjes.v16i6.6493>

Received from August 15, 2021; revised from October 09, 2021; accepted from December 02, 2021.

©2021 Birlesik Dünya Yenilik Arastırma ve Yayıncılık Merkezi. All rights reserved

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*

* ADDRESS FOR CORRESPONDENCE: I Made Ardana, Universitas Pendidikan Ganesha, Udayana Street No.11 Singaraja–Bali, 81116, Indonesia
E-mail address: ardanaimade@undiksha.ac.id / Tel.: +62 857-9234-5155

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 \geq 85%	Very high
2.	70% \leq Score < 85%	High
3.	55% \leq Score < 70%	Enough
4.	40% \leq 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 of 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 of 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.

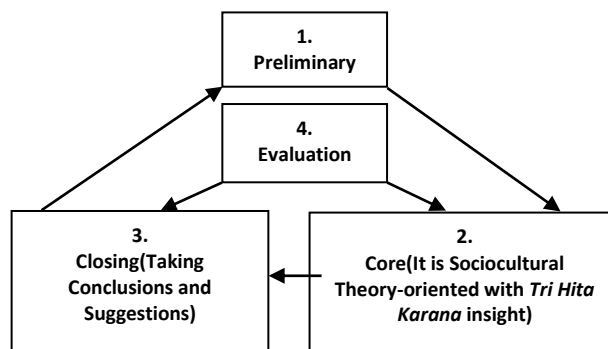


Figure 1. Syntax of Sociocultural Theory-oriented Mathematics Learning Model with *Tri Hita Karana* insight

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.

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.

References

- Abdulkarim, A., Komalasari, K., Saripudin, D., Ratmaningsih, N., & Anggraini, D. N. (2020). Development of a Unity in Diversity-Based Pancasila Education Text Book for Indonesian Universities. *International Journal of Instruction*, 13(1), 371–386. <https://doi.org/10.29333/iji.2020.13125a>
- Afshar, H. S., & Hamzavi, R. (2017). An Investigation into the Characteristics of Iranian EFL Teachers of Senior Secondary Schools and Language Institutes. *Iranian Journal of Language Teaching Research*, 5(1), 21–36.
- Agussalim, A., Widjaja, S. U. M., Haryono, A., & Wahyono, H. (2021). Pancasila Economic Character Literacy Program for High School Students. *International Journal of Instruction*, 14(1), 235–252. <https://doi.org/10.29333/iji.2021.14114a>
- Alade, F. (2018). *Character Portrayals in STEM-Focused Educational Television Shows and Their Impact on Children's Attitudes towards STEM*. Northwestern University.
- Alghamdi, M. S. (2017). The Reality and Difficulties of Employing ICT in Teaching from the Perspective of Math Teachers of Middle Stage in Riyadh. *International Education Studies*, 10(12), 109–129. <https://doi.org/10.5539/ies.v10n12p109>
- Ambang, O. A., Alloggio, S., & Tandlich, R. (2019). Moral Reciprocity, Ethics of Appropriation of Indigenous Medicinal Plant Knowledge and Associated Biopiracy. *Acta Educationis Generalis*, 9(2), 24–65. <https://doi.org/10.2478/atd-2019-0007>
- Ardana, I. M., Wisna Ariawan, I. P., & Hendra Divayana, D. G. (2017). Measuring the Effectiveness of BLCS Model (Bruner, Local Culture, Scaffolding) in Mathematics Teaching by using Expert System-Based CSE-UCLA. *International Journal of Education and Management Engineering*, 7(4), 1–12. <https://doi.org/10.5815/ijeme.2017.04.01>
- Ariawan, I. P. W., Simatupang, W., Ishak, A. M., Agung, A. A. G., Suratmin, Adiarta, A., & Divayana, D. G. H. (2018). Development of ANEKA Evaluation Model Based on Topsis in Searching the Dominant Aspects of Computer Learning Quality Determinants. *Journal of Theoretical and Applied Information Technology*, 96(19), 6580–6596.
- Astuti, N. L. P. W., & Kasiyan. (2018). The Values of Taksu in Pendet Dance at Saraswati Balinese Dance Studio Yogyakarta. *Advances in Social Science, Education and Humanities Research*, 327, 274–279.
- Berghaus, P. T. (2016). The Problems of Authority and the Want of Apprenticeship in Soldiers' Character Development. *Journal of Moral Education*, 45(3), 324–337. <https://doi.org/10.1080/03057240.2016.1204272>
- Bredemeier, B. L., & Shields, D. L. (2019). Social Justice, Character Education, and Sport: A Position Statement. *Quest*, 71(2), 202–214. <https://doi.org/10.1080/00336297.2019.1608270>
- Can, D., & Can, V. (2020). Fairness in Resource Distribution: Relationship between Children's Moral Reasoning and Logical Reasoning. *Acta Educationis Generalis*, 10(3), 66–86.

- Chan, C. W. (2020). Moral Education in Hong Kong Kindergartens: An Analysis of the Preschool Curriculum Guides. *Global Studies of Childhood*, 10(2), 156–169. <https://doi.org/10.1177/2043610619885385>
- Cheek, A. E., Idol, W. A., Jones, J. L., & Holden, K. B. (2019). Infusing Technology throughout Teacher Preparation Programs to Support Preservice Teacher Development. *Journal of Special Education Apprenticeship*, 8(2), 1–14.
- Davis-Becker, S. (2013). Construct Maps: Do They Make the Unclear Clear? *Measurement: Interdisciplinary Research and Perspectives*, 11(4), 174–176. <https://doi.org/10.1080/15366367.2013.857980>
- Diken, E. H. (2020). The Opinions of Science Teachers on the Weaknesses and Strengths of LGS and TEOG Systems (The Case of Kars Province). *Journal of Curriculum and Teaching*, 9(2), 20–32. <https://doi.org/10.5430/jct.v9n2p20>
- Divayana, D. G. H., Sudirtha, I. G., & Suartama, I. K. (2021). Digital Test Instruments Based on Wondershare-Superitem for Supporting Distance Learning Implementation of Assessment Course. *International Journal of Instruction*, 14(4), 945–964. <https://doi.org/10.29333/iji.2021.14454a>
- Divayana, D. G. H., Ariawan, I. P. W., Adiarta, A., Parmiti, D. P., Mahendra, I. W. E., & Parmithi, N. N. (2018). Development of ANEKA-based countenance model integrated with Tri Hita Karana-SAW in evaluating student's character and quality of computer learning in Bali. *Journal of Engineering and Applied Sciences*, 13(15), 6303–6315.
- Divayana, D. G. H., Suyasa, P. W. A., & Widiartini, N. K. (2021). An innovative model as evaluation model for information technology-based learning at ICT vocational schools. *Heliyon*, 7(2). <https://doi.org/10.1016/j.heliyon.2021.e06347>
- Eun, B. (2019). The Zone of Proximal Development as an Overarching Concept: A Framework for Synthesizing Vygotsky's Theories. *Educational Philosophy and Theory*, 51(1), 18–30.
- Gray, K. M. (2018). *Characterizing Environmental Health Literacy Related to Fish Consumption Advisories: Knowledge and Beliefs of Informal Educators in a Southeastern State*. North Carolina State University.
- Halonen, J. S., Nolan, S. A., Frantz, S., Hoss, R. A., McCarthy, M. A., Pusateri, T., & Wickes, K. (2020). The Challenge of Assessing Character: Measuring APA Goal 3 Student Learning Outcomes. *Teaching of Psychology*, 47(4), 285–295. <https://doi.org/10.1177/0098628320945119>
- Haynor, M. I. (2018). *Applying a Constructivist Approach to the Assessment of Compositions in a Secondary Technology-Based Music Classroom*. Boston University.
- Henrich, A., Sloughter, J. M., Anderson, J., & Bahuaud, E. (2016). Addressing Negative Math Attitudes with Service-Learning. *PRIMUS*, 26(8), 788–802. <https://doi.org/10.1080/10511970.2016.1174967>
- Hermiono, A., & Arifin, I. (2020). Contextual Character Education for Students in the Senior High School. *European Journal of Educational Research*, 9(3), 1009–1023. <https://doi.org/10.12973/eu-jer.9.3.1009>
- Johnson, N. C. (2017). *Expanding Competence: Supporting Students to Engage with Each Other's Mathematical Ideas*. University of California, Los Angeles.
- Kartal, G., & Kici, D. (2020). Reflection through Drama and Concept Maps for Preservice Teacher Education in Information Communication Technologies. *Education and Information*

- Technologies*, 25(6), 4861–4881. <https://doi.org/10.1007/s10639-020-10194-4>
- Kazu, I. Y., & Is, A. (2018). An Investigation about Actualization Levels of Learning Outcomes in Early Childhood Curriculum. *Journal of Education and Training Studies*, 6(3), 66–77. <https://doi.org/10.11114/jets.v6i3.2928>
- Kim, Y. (2020). Partial Identification of Answer Reviewing Effects in Multiple-Choice Exams. *Journal of Educational Measurement*, 57(4), 511–526. <https://doi.org/10.1111/jedm.12259>
- Kural, M., & Kocakulah, M. S. (2016). Teaching for Hot Conceptual Change: Towards a New Model, beyond the Cold and Warm Ones. *European Journal of Education Studies*, 2(8), 1–40.
- Leopold, H., & Smith, A. (2020). Implementing Reflective Group Work Activities in a Large Chemistry Lab to Support Collaborative Learning. *Education Sciences*, 10(7), 1–19.
- Little, J. (2019). Connecting Mathematics with Science to Enhance Student Achievement -- A Position Paper (pp. 452-459). *Mathematics Education Research Group of Australasia*.
- Mahayukti, M.A., Dantes, N., Candiasa, I.M., Marhaeni, A.A.I.N., Gita, I.N., & Divayana, D. G. H. (2018). Computer-based Portfolio Assessment to Enhance Students' Self-Regulated Learning. *Journal of Theoretical and Applied Information Technology*, 96(8), 2351–2360.
- Martins, M., & Justi, R. (2019). An Instrument for Analysing Students' Argumentative Reasoning When Participating in Debates. *International Journal of Science Education*, 41(6), 713–738. <https://doi.org/10.1080/09500693.2019.1579005>
- McCormick, Marleen; Buttrick, Hilary; McGowan, R. (2018). Ethics of Entrepreneurship: Should We Be Teaching Students the Inevitable Moral Dilemmas That Challenge All Entrepreneurs? *Journal of Learning in Higher Education*, 14(1), 29–36.
- McGowan, Richard J.; Buttrick, H. G. (2017). Teaching Environmental Ethics: Moral Considerations and Legislative Action. *Journal of Learning in Higher Education*, 13(1), 49–54.
- Mottet, T. P. (2015). FORUM: Affective Learning. Affective Learning from a Cognitive Neuroscientific Perspective. *Communication Education*, 64(4), 508–510. <https://doi.org/10.1080/03634523.2015.1064144>
- Murray, J., & Cousens, D. (2020). Primary School Children's Beliefs Associating Extra-Curricular Provision with Non-Cognitive Skills and Academic Achievement. *Education 3-13*, 48(1), 37–53. <https://doi.org/10.1080/03004279.2019.1572769>
- Ndiung, S., Dantes, N., Ardana, I., & Marhaeni, A. (2019). Treffinger Creative Learning Model with RME Principles on Creative Thinking Skill by Considering Numerical Ability. *International Journal of Instruction*, 12(3), 731–744. <https://doi.org/10.29333/iji.2019.12344a>
- Pardo, N. (2020). Character Development Assessment in Imagine Schools. *Journal of Character Education*, 16(2), 69–72.
- Raihani, R. (2018). Education for Multicultural Citizens in Indonesia: Policies and Practices. *Compare: A Journal of Comparative and International Education*, 48(6), 992–1009. <https://doi.org/10.1080/03057925.2017.1399250>
- Rees Lewis, D. G. (2018). *Beyond Problems on a Platter: Creating Tools for Teaching Planning in Real World Design*. Northwestern University.
- Rhames, M. A. (2019). The “F-Word” of Social and Emotional Learning: Faith (pp. 1-8). *American Enterprise Institute*
- Sellbjer, S. (2018). ‘Have you read my comments? It is not noticeable. Change!’ An analysis of

- feedback given to students who have failed examinations. *Assessment & Evaluation in Higher Education*, 43(2), 163–174. <https://doi.org/10.1080/02602938.2017.1310801>
- Seo, B.-I. (2019). An Investigation of How 7th Grade and 8th Grade Students Manipulate Mathematical Writing Elements. *Perspectives in Education*, 37(2), 141–159.
- Setyaningsih, N., Rejeki, S., & Ishartono, N. (2019). Developing Realistic and Child-Friendly Learning Model for Teaching Mathematics. *Journal of Research and Advances in Mathematics Education*, 4(2), 79–88.
- Suartama, I. K., Triwahyuni, E., Sukardi, A., & Hastuti, W. D. (2020). Development of E-Learning Oriented Inquiry Learning Based on Character Education in Multimedia Course. *European Journal of Educational Research*, 9(4), 1591–1603. <https://doi.org/10.12973/euler.9.4.1591>
- Suastika, I. N., Suartama, I. K., Sanjaya, D. B., & Arta, K. . (2021). Application of multicultural-based learning model syntax of social studies learning. *Cypriot Journal of Educational Sciences*, 16(4), 1660–1679. <https://doi.org/10.18844/cjes.v16i4.6030>
- Sugiarto, D., & Sumarsono, P. (2014). The Implementation of Think-Pair-Share Model to Improve Students' Ability in Reading Narrative Texts. *International Journal of English and Education*, 3(3), 206–215.
- Sugiharni, G. A. D., Setiasih, N. W., Mahendra, I. W. E., Ardana, I. M., & Divayana, D. G. H. (2018). Development of Alkin Model Instruments as Evaluation Tools of Blended Learning Implementation in Discrete Mathematics Course on STIKOM Bali. *Journal of Theoretical and Applied Information Technology*, 96(17).
- Sugiyono, Y. K., & Hong, J. (2020). The Aspirations of Young Indonesian Children. *Global Studies of Childhood*, 10(2), 202–209. <https://doi.org/10.1177/2043610619869704>
- Sukmayadi, V., & Yahya, A. H. (2020). Indonesian Education Landscape and the 21st Century Challenges. *Journal of Social Studies Education Research*, 11(4), 219–234.
- Sulistyaningsih, D., Purnomo, & Aziz, A. (2019). Development of Learning Design for Mathematics Manipulatives Learning Based on E-Learning and Character Building. *International Electronic Journal of Mathematics Education*, 14(3), 197–205. <https://doi.org/10.29333/iejme/3996>
- Susilana, R., & Asra. (2013). Development of Quality Assurance System in Culture and Nation Character Education in Primary Education in Indonesia. *Malaysian Online Journal of Educational Sciences*, 1(2), 17–24. <https://doi.org/https://files.eric.ed.gov/fulltext/EJ1086212.pdf>
- Walle, John A. Van DeElementary and Middle School Mathematics, T. D., Karp, K. S., & Bay-Williams, J. M. (2013). *Elementary and Middle School Mathematics, Teaching Developmentally*. Pearson Education, Inc.
- Winthrop, R., & McGivney, E. (2017). *Can We Leapfrog? The Potential of Education Innovations to Rapidly Accelerate Progress. Skills for a Changing World*. Center for Universal Education at The Brookings Institution.