Journal of Positive School Psychology
2022, Vol. 6, No. 5, 8965 – 8974

http://journalppw.com

Correlation Between Social Attitude and Computational Thinking Ability

Budhi Akbar[1*], Elsa[1]

[1] Biology Education, Universitas Muhammadiyah Prof. Dr. HAMKA, Jalan Tanah Merdeka No. 20, Rambutan, Pasar Rebo, Jakarta Timur, DKI Jakarta, 13830, Indonesia

*Email: budhi.akbar@uhamka.ac.id

ABSTRACT

Problem-solving skills are an essential ability in the 21st century. The low ability of students to solve problems is e one of the fact in Indonesian education. Computational thinking (CT) is being promoted as a way to think problem-solving skills that students must develop in the digital era. The relationship between various cognitive and non-cognitive variables has been discussed in other studies. In this study, we explored the relationship between non-cognitive variables and CT through the correlation between social attitude and CT. This study aimed to determine the relationship between social attitude and CT as a result of the implementation of problem-based learning in Biology class. This study was conducted in March 2022 in one of the state high schools in East Jakarta, Indonesia. Data was collected through biology teacher interviews, social attitudes questionnaires, and computational thinking tests. Social attitudes questionnaires and computational thinking are administered to a sample of 71 students in grade 10th. The Pearson correlation analysis results show statistically significant correlations between social attitude and CT (r= 0,461). The correlation means good students' social attitudes are also good in CT.

Keywords: computational thinking, problem-solving skill, social attitude

Introductions

21st-century life was full of development of science and technology rapidly. It made the students prepare themselves to face the challenges in the digital era (Sovey et al., 2022). That situation required the people to have special skills to compete and survive. It consisted of seven core skills: technical, information management, communication, collaborative creativity, critical thinking, and problem-solving (Laar et al., 2020).

Biology was one of the subjects that belonged to the 2013 curriculum. Biology was science. Applying scientific knowledge and practice was crucial to solving the problem and making decisions based on science and good consideration (Shin et al., 2021). The goal of Biology at Senior High School in Indonesia was to support the urgency of application and practice of science. 2013 curriculum expected the learning process of Biology at Senior High School in Indonesia could grow spiritual and social attitudes and supply knowledge and skills to the students to make them solve the problem in their daily life (Juanengsih & Juriah. 2016).

The result of a survey of the *Programme for International Student Assessment* (PISA) in 2018 showed that Indonesia got an average score in the science sector was under the average score with score 396, while the average score of the *Organisation for Economic Co-operation and Development* (OECD) was 489 (OECD. 2019). the characteristic of the PISA question required the students to do an analysis based on their knowledge and then apply it to different conditions, whether in or out of the school area (Balitbang Kemendikbud. 2019). it showed that PISA evaluates how well students' ability to use their knowledge to give the solution to the problem happened. The result of that survey showed that students' ability to solve the issues and reasoning was still low.

One of the ways to increase the ability of problem-solving was to apply computational thinking. Computational thinking is the process of solving problems by simplifying the complex problem into the more straightforward part and the solution in simple ways (Lestari & Annizar. 2020). Computational thinking could increase problem-solving skills and thinking ability in the non-computer sector (Fishelson et al., 2020; Maulina et al., 2021). computational thinking was an essential skill that was prepared and owned by everybody (Yildiz-Durak et al., 2021; Sovey et al., 2022). The computational thing would direct the students to formulate a thought and express the solution to the problem using an algorithmic method and could be used in various contexts (Weintrop et al. 2015).

The computational thinking component was abstraction, algorithmic thinking, decomposition, generalization, or pattern recognition and evaluation (Czismadia et al. 2015). Those components built the computational thinking process to support the way of problem-solving (Roman-Gonzales et al., 2016; Korkmaz et al., 2017). The computational thinking process was essential to problem-solving because it needed identification and problem recognition to get the best solution to a problem (Labusch et al., 2019). computational thinking was done by adopting the way of computer working or technology that required the students to identify the problem and solve it simply. Computational thinking needed to be

integrated into learning activities in order to make the students used to do it (Fitriani et al. 2021).

Biology class was the appropriate class to increase computational thinking. The biological process was a system, so learning how a system works needs to be proven by thinking algorithmically and having a good ability to solve the problem. This was the reason why the biology class was an appropriate class to increase computational thinking (Peel & Friedrichsen. 2018). The enhancement of computational thinking in biology class was also proved by Nuraeni et al. (2020) study showed that the application of web-based learning used *Snap* programming in biology class could increase students' computational thinking ability.

The learning process must consider the appropriate learning strategy to get a skill (Sovey et al., 2022). An appropriate learning process that was used to teach computational thinking was collaborative learning. The interaction in the collaboration learning process would shape meaningful learning. Collaborative learning would make the possibility of students to discuss and share their knowledge to solve the problem happened. The collaboration took a role in computational thinking ability because it facilitated the students to ask, explain the problem, and share thought with other students with different understandings and ways of dealing with issues (Chowdhury et al. 2018). The collaboration helped decrease student difficulties and increase performance, so it created the situation that supports the computational thinking process.

An interview with the biology teacher at Senior High School in Jakarta, where the research was done, showed that the learning activity used *Problem Based Learning* (PBL). PBL syntax was a learning organization stage that supports the students to deliver the information that they had known related to the problem, so it would make the possibility of discussing, collaborating, and another step, it was an investigation as individual or group required the students to collaborate to collect relevant information, and analysis also evaluation of problem-solving that required the students to present work and reflect on it (Yolantia et al. 2021). Those steps encouraged the students to increase their social attitude and students problem-solving ability. PBL developed problem-solving ability about science with prior applied knowledge and collaborative learning, which was done by interacting with other people (Kadir et al. 2016; Magaji 2021). PBL in biology learning could develop students' characters (Bahri et al., 2021).

Social attitude is someone's ability to understand the thinking, feeling, and other people's attitude so that they can interact well and act effectively in any situation (Rahim et al. 2018). Indicators of social attitude based on Directorate General of Primary and Secondary Education 2017 assessment guidelines were honesty, discipline, responsibility, tolerance, mutual cooperation, polite and courteous, and confidence. Manners supported computational thinking skills: belief in facing complexity, persistence with difficult problems, tolerance with ambiguity, ability to face open problems, and ability to communicate and cooperate with others to reach the goals together (ISTE & CSTA. 2011). The social attitude was formed by personality. One of predictor from computational thinking ability was personality that was openness to experience (r=0,41), extroversion (r=0,41), dan conscientiousness (r=0,27). The results of this study were in line with research Yildiz-Durak et al. (2021) which was said that the significant predictor of computational thinking skills was someone's personality that was agreeableness (r=0,461), openness to experience (r=0,259), and extroversion (r=0,22). The other research also reveals the correlation between computational thinking and basic cognitive abilities. The research of Gonzales-Roman et al (2016) explained that there was strong relationship between computational thinking ability with problem-solving ability (r=0,44), reasoning ability (r=0,44), and spatial ability (r=0,44).

Although there was research that revealed the correlation between computational thinking ability with cognitive and non-cognitive variables, as long as we know, there has been no empirical research done to reveal the relationship between social attitudes, which are more specific according to learning objectives in Indonesia with computational thinking ability. Its competence was vital to be owned by the students to face the challenges in 21st century. So, it was essential to reveal the correlation between both competencies. This research would reveal social attitude ability developed through Biology learning in Indonesia in predicting someone's computational thinking ability. This research aims to reveal the correlation between social attitude and students' computational ability. The result of this research could be a reference to develop students' computational ability, especially Indonesian students in Biology class.

Metode

This research is done in one of Senior High schools in East Jakarta in March 2022. The population in this research was all of the student's grades X major in Math and Science (MIPA), which consisted of 5 classes with amount 180 students. Group of those students could be said population because students' cognitive ability relatively the same based on students' achievement when they were accepted to the school after they passed the same selection process, there was no superior or non-superior program class, in addition, the students were in cognitive development which was equal because they were in age around 15-16 years old. The sample which is used in this research was 71 students. It was divided into 2 classes and sorted by cluster random sampling technique. The method that is used in this research was correlational descriptive. The researcher did not do treatment manipulation but direct to set the character of a situation when the research was done. This research measured the correlation between students' social attitude as the independent variable and computational thinking ability as the dependent variable.

The technique of collecting data in this research was the interview, the questionnaire instrument of social attitude, and test of computational thinking ability. The biology teacher interviews to get the information about learning strategy, learning method, learning technique, and instructional media used. The data from the interview process became a resource of information about the process of forming social attitudes through Biology learning. A questionnaire instrument of social attitude is used to measure students' social attitude through self-assessment that is done by the students. The researcher developed a questionnaire instrument of social attitude and validated by the expert. The questionnaire of social attitude consisted of seven indicators that is adapted from the Directorate General of Primary and Secondary Education 2017 about assessment guidelines, they were honesty, discipline, responsibility, tolerance, mutual cooperation, polite and courteous also confidence. Questionnaire consisted of 46 points of statements which is divided 23 positive questions and 23 negative questions. This questionnaire instrument used four scales by Likert. Score for positive statement, strongly agree got score 4, agree got score 3, did not agree got score 2, and strongly did not agree got score 1. Otherwise, score for negative statements, strongly agree got a score 1, agree got a score 2, did not agree got score 3, and strongly did not agree got score 4. Grid of questions of the questionnaire instrument about students' social attitudes could be seen on table 1.

Table 1. Grid of questionnaire instrument about students' social attitude

No.	Component of Social attitude	Indicators of Social attitude
1.	Honest	Students can be trust in their speech, action and doing their work.
2.	Discipline	Students can be discipline orderly and obey the rules and applicable provision.
3.	Responsibility	Students can do the task and obligations to their selves, society, nature, social environment, culture environment, country, and God.
4.	Tolerant	Students can appreciate and respect diversity of background, views, and beliefs about something when they work together and do something in group.
5.	Mutual cooperation	The students can cooperate with the other to get the goals together.
6.	Polite and courteous	Students can be nice in speaking and behaving.
7.	Confident	Students believe in their selves' ability to do the action.

The instrument of computational thinking ability is used to measure students' ability in finishing the questions about the problems that should be done using computational thinking components. The measurement of computational thinking ability used written test instrument that is adapted from instrument's developed by Blokhuis et al (2016), that instruments consist of 10 multiple choice questions and 8 filling gap questions. That instrument is divided into 3 categorizes based on degree of difficulty. Question in category A had the lowest difficulty (8 questions), question in category B had medium difficulty (8 questions), and question in category C had the highest difficulty (8 questions). Scoring guidelines for questions in category A was +6, wrong got score 0 and did not answer got score 0, scoring guidelines for question category B if the answer was correct got score +9, wrong got score -2 and did not answer got score 0. Scoring guidelines for questions in category C if the answer was correct got score +12, wrong got score -4, did not score got score 0. Test of instrument covers all components computational thinking ability that is adapted from Czismadia et al (2015) that was abstraction, algorithmic, decomposition, generalization, and evaluation. The grid of questionnaire instrument about computational thinking ability could be seen on Table 2.

Table 2. Grid of test of instrument about Students' Computational Thinking Ability

No.	Component of Computational Thinking	Indicators of Computational Thinking
1.	Abstraction	Students can choose or reduce some things to be removed and important information to be kept in order to be easier to think without missing something important.
2.	Algorithmic thinking	Students can think in an order and rules in understanding the situation and arrange steps solutions to solve the problems happened.
3.	Decomposition	The students could share the problem faced into small parts to be understood, solved, developed, and evaluated separately so that the process was easier to do.
4.	Generalization	Students can identify the correlation between new problems are faced with the previous problems that can be solved.

5.	Evaluation	Students can ensure that the steps, systems and resulting solutions can work efficiently.

Analysis of data in this research is done by using software SPSS 22. Analysis of descriptive is done to know mean, modus, standard deviation, and do score categorization. Interpretation of score categories could be seen on Table 3.

Table 3. Categorization of Social attitude Questionnaire Scores and Computational Thinking Test

Interval	Category
M+1,5SD >X	Very High
M+0,5SD< X ≤ M+1,5SD	High
M-0,5SD < X ≤ M+0,5SD	Medium
M-1,5SD < X ≤ M-0,5SD	Low
X ≤ M-1,5SD	Very high

(Azwar. 2012)

Prerequisite test is done by normality test and linearity test. Normality test is done by knowing the data in the research whether it was distributed or not. Normality test is done by Kolmogorov-Smirnov One-Sample Model test. The decision-making guideline for the normality test is if the value of Asymp Sig (2-tailed) > 0,05 so it could be said that the data was normally distributed. Linearity test is done to know the data of the research was linear or not. Linearity test is done by using ANOVA test with the criteria if score of Sig. deviation of linearity > 0,05 so it could be said that the data had linear pattern. So, the hypothesis could be continued with parametric test.

Hypothesis test is done to know the correlation between social attitude and students computational thinking ability. Hypothesis test in this research is done to do Pearson Correlation test with the criteria if the score of Sig. < 0,05 so there was a significant correlation between variable tested (Tanti et al. 2020). Strength of relationship between two variables could be seen based on r score in Pearson Correlation with the criteria could be seen on Table 4.

Table 4. Correlation Coefficient Interpretation

No	Interval coefficient	Relationship degree
1.	0,80-1,00	Very High
2.	0,60-0,79	High
3.	0,40-0,59	Medium
4.	0,20-0,39	Low
5.	0,00-0,19	Very Low

(Arikunto. 2018)

Result and Discussion

The research used sample amount 71 students which were divided into two classes. Research sample personal information could be seen on Table 5.

Table 5. Research Sample Personal Information

No.	Information		Frequent	(%)
1.	Gender	Male	33	46%
		Female	38	54%
2.	School Origin (Junior High Schol)	Public Junior High School	57	80%
		Private Junior High School	10	14%
		Religion based Junior High School	4	6%
		Home schooling	0	0%

The information from Table 5, 54% of the students became sample was female and 46% was male. Background study of the students was Junior High School, most of them were from public school 80%, then

private junior high school were 14%, religion-based school 6%, and no one student from home schooling.

The analysis result of descriptive statistic on data score social attitude (table 6) showed that most of the students included into the medium as much 28 from 71 students with presentation as much 39%. the maximum score as much 85 and minimum score as much 40. the students who included into low category as much 21 from 71 students with presentation 30%, in high category as much 18 from 71 students with presentation as much 25%, in category very low as much 3 from 71 students with presentation as much 4%, in very high category as much 1 from 71 students with presentation 1%. Mean score for the data was 75, modus score was 78, and deviation standard score was 6.

Table 6. Descriptive Statistical Analysis of Social attitude Score Data

Interval	Frequent	(%)	Category
$84 > X$	1	1	Very High
$78 < X \leq 84$	18	25	High
$72 < X \leq 78$	28	39	Medium
$65 < X \leq 72$	21	30	Low
$X \leq 65$	3	4	Very Low
Maximum score	85		
Minimum score	40		
Mean	75		
Modus	78		
Deviation Standard	6		

Analysis result of descriptive statistic on computational thinking ability score (Table 7) showed that most of the students belong to medium category as much 33 from 71 students with presentation as mush 46%. The maximum score was 53 and minimum score was 10. There are 20 students belong to low category as much 20 from 71 students with category 28%, in high category as much 9 students from 71 students with presentation as much 13%, there are 3 students belong to very low category from 71 students with presentation 4%, and there are 6 students from 71 with presentation 8%. Mean score for those data was 25, modus score as much 30, and standard deviation as much 8.

Table 7. Descriptive Statistical Analysis of Computational Thinking Ability Score Data

Interval	Frequent	(%)	Category
$38 > X$	6	8	Very High
$30 < X \leq 38$	9	13	High
$21 < X \leq 30$	33	46	Medium
$13 < X \leq 21$	20	28	Low
$X \leq 13$	3	4	Very low
Maximum score	53		
Minimum Score	10		
Mean	25		
Modus	30		
Deviation Standard	8		

Precondition test was normality test which is done on social attitude score result and computational thinking ability. The result of precondition test showed that social attitude score results and computational thinking ability that is gotten was normally distribute and linear pattern. The result of that precondition become the basis for being able to continue hypothesis testing using parametric statistics, namely Pearson Correlation.

Hypothesis testing was conducted to see the relationship between social attitudes and computational thinking skills. The results of the Pearson Correlation test can be seen in Table 7.

Table 8. Pearson Correlation Test Results Between Social Attitude Data and Computational Thinking Ability

	Computational Thinking
Social attitude	0,461**

N= 71; **p < 0,05

The relationship between the seven indicators of social attitudes and computational thinking skills can be seen in Table 9.

Table 9. Pearson Correlation Test Results Between Seven Indicators of Social Attitude and Computational Thinking Ability

	Social attitude indicator						
	Honest	Discipline	Responsibility	Tolerant	Cooperation	Polite and courteous	Confident
Computational thinking ability	0,384**	0,186	0,298**	0,344**	0,441**	0,257**	0,321**

N = 71; **p < 0,05

Data on the Table 8 showed that Pearson Correlation test between social attitude with computational thinking ability produced Sig. Value *(2 tailed)* < 0,05. it showed there was a correlation between social attitude and computational thinking ability. Value of r_{hitung} that is gotten from Pearson Correlation test between social attitude with computational thinking ability was 0,461. That value of r_{hitung} showed that based on Arikunto criteria (2018) which could be seen on table 4, so between social attitude and computational thinking ability had a positive relationship in medium strength.

The correlation which is showed by data of Pearson Correlation test on Table 8 could interpret that social attitude was predictor from computational thinking ability, in other word that enhancement of social attitude would affect on enhancement of computational thinking ability. The result of this research is supported by the statement from ISTE & CSTA (2011) that said computational thinking ability is supported by personality. The result of this research is also supported by Román-gonzález et al (2017) dan Yildiz-Durak et al (2021) that showed there was a correlation between non-cognitive aspect that was students' personality computational thinking ability. Personality is related to someone's attitude and behavior. Social attitude was really important to support students' performance that is included into learning process. A good social attitude would make the students were able to do good collaboration to get the goal of learning process (Bialangi & Kundera. 2018). a Good social attitude would make the students became opened personality in facing problem. Attitude is related to students' performance in problem-solving (Sturm & Bohndick. 2021). problem-solving was a goal from computational thinking ability. Attitude would push the students to interaction in any difficult conditions and really important to support the students to collaborate in solving complex problem if it is done by her/his self (Missiroli et al. 2017). A good social attitude would support the students to cooperate in solving problem. 21st century life required the people to collaborate in order to find out the solution from every complex problem in this century. The habit of collaboration would form good social attitude then would open students' mind to face the problem. Good social attitude would guide the students to use the components of computational thinking in problem-solving. Good social attitude would create the positive atmosphere when the students are faced into a problem dan solve the problem with computational thinking process that was solve the complex problem to be simpler. It was in line with statement from ISTE & CSTA (2011)that computational thinking is supported by the attitude; being confidence in the face of complexity, persistence in working with difficult problems, tolerance for ambiguity, ability to deal with open problems, also the ability to communicate and cooperate with others to get the goal together. Students' awareness of social attitude, used it in facing the problem then used it in solving the problem would affect their development of computational thinking ability that was the ability to think fast, appropriate, and easy to face a problem.

Computational thinking ability is really needed in 21st life century encouraged a lot of research that discuss about the way to improve that ability through learning process. Every subject needed to inserted habituation of computational thinking. The research that discussed about learning to improve computational thinking ability much centered on the application of learning strategies in the form of project-oriented learning game-based learning, and cooperative learning (Anistyasari et al. 2020). that learning strategy was a learning strategy that contained application of student collaboration. Project-learning oriented had the principals that support the students to get a scientific experience that began with a problem or question that could be solved computationally, collaboration, and use cognitive ability (Shin et al. 2021). Problem-oriented learning had syntax that supported collaboration learning that is done made the interaction with others (Kadir et al. 2016; Magaji. 2021). game-oriented learning gave a change to get collaboration in some players and cooperative learning that is done in groups by sharing works to the members of the group then unite it to get the final result (Anistyasari et al. 2020). Collaboration required interaction one to another students, students to school residents, even to outside school community. Interaction that happened would form student's social attitude. Collaborative learning strategy were many used in an effort to improve computational thinking ability showed that collaborative activities can have an effect on increasing computational thinking ability.

Biology was one of the subjects that was appropriate to be applied by collaborative learning. Interview result with the subject teachers at the school explained that learning strategy that is used in the biology

class ample was problem-based learning and learning activity was full of discussion between students. Learning process that is done by the students in Biology class is started with concrete problems that occur in everyday life that relevant with the material to be discussed. The students in group discussed and collaborate to solve the problems given. That learning strategy showed that students would have collaborative learning process. That learning process would help the students to improve the ability to solve the problem and collaboration to find out the solution from the problems given. Good collaboration would make the students easy to know the goals together and could solve difficult problem in other creative ways (Kong et al. 2018). Collaboration that occurred through learning strategy practice the ability to work together in groups to get a goal. Collaboration ability to solve problems in group would familiarize students to be able to manage their social attitude ability in order to collaborate to make solving problem ran effective and efficient opened their mind to use it in their daily life to form a computational thinking process that was solving problem using 5 components (abstraction, algorithmic, decomposition, generalization and evaluation). This strengthens the results that social attitudes had a relationship with computational thinking ability. Collaborative learning could be used to improve computational thinking ability because through collaborative learning was developed social attitude that was predictor from computational thinking ability. Problem-based learning that is done in Biology class formed social attitude, there are seven indicators as together with computational thinking that is showed by value result of Pearson Correlation that could be seen on Table 8.

Data on table 9 showed that six indicators of social attitude with value $p < 0,05$. it showed that there was a significant correlation between each indicator of social with computational thinking. The strength of relationship of each indicator with computational thinking ability based on Arikunto criteria (2018) was medium strength for the relation of computational thinking ability-collaboration, low strength to relation for computational thinking-honest, computational thinking ability-tolerant, and computational thinking ability-confident. That relation showed that cooperation, honest, tolerant, confident, responsibility, honest, tolerant, confident, also polite and courteous were predictor of someone's computational thinking ability. It means, the better someone's attitude in six indicators so computational thinking ability would be better too. In addition to finding a relationship between the six indicators of social attitudes and computational thinking, also it is found the result that there is no significant correlation between one of the indicators of discipline as part of social attitudes with computational thinking.

First predictor from computational thinking ability was honest. Honest was behavior that could be trust in word, deed, and work (Direktorat Pembinaan SMA Kemendikbud. 2017). ISTE & CSTA (2011) issued operational definitions from computational thinking ability, computational thinking ability was process of problem-solving that included (but unlimited) on characteristic formulated the problem with the possible way to use computer and other device to help to finish it, set and analyzed the data logically, represent data through abstraction like model and simulation, automatic the solution through algorithmic thinking (a series of sequential steps), identified, analyzed, and applied the solution that probably had the goal to reach the most effective and efficient combination of measures and resources, and generalized and transfer the process of this problem-solving to some problems. The character of computational thinking required honest in doing that job. Computational thinking ability to process problem-solving needed to be done honestly in order to make the effective solution to answer the problem existed. The process of identifying the problem to determining the solution needed to be done suitable to data that is found in real so the solving could be the best solution to solve existing problems.

The results of this study indicate that Students' computational thinking ability is highly predicted by mutual cooperation. The attitude of cooperation was a person who liked to work together to get the goals together (Direktorat Pembinaan SMA Kemendikbud. 2017). The attitude of cooperation showed that one could work well in a group to find out solutions to a problem to achieve a goal together. The research results are supported by statement of ISTE & CSTA (2011) that supporters of computational thinking ability included the ability to deal with open problems and worked together with other people to get the goal together. In addition, it was also supported by research result of Román-gonzález et al (2017) and Yildiz-Durak et al (2021) said that Extroversion personality and agreeableness are related to computational thinking skills. Extroversion individuals tended to be social, active, enthusiastic individuals so they had an interest in collaborative learning (Yildiz-Durak & Saritepeci. 2018). These characteristics were very important to improve computational thinking skills. Personal agreeableness had a tendency to cooperate (Román-gonzález et al. 2017). Working together was synonymous with cooperation (for example; I invited other people to solve problems together, I discussed when I had different opinions, and so on). The habit of working together formed a person who was opened to the viewed of others so as it formed broad insight in dealing with a condition and build a positive perspective on what is being done.

The results of this research also showed that tolerance was a predictor of students' computational thinking ability. Tolerance was an attitude of respecting the diversity of backgrounds and views (Direktorat Pembinaan SMA Kemendikbud. 2017). The results of the study are supported by the statement of ISTE & CSTA (2011) that one of the attitude supporting computational thinking ability was tolerance for ambiguity. Tolerance made a person more appreciative of differences, including when there were differences of opinion or when there was a double meaning of something. Differences of opinion or

multiple interpretations of something were prone to occur when did work in groups. Failure to deal with these differences of opinion would lead to be failure to reach a solution from the problem that wanted to get the goal together. So that the attitude of tolerance was related to problem-solving abilities, including in the computational thinking process because intolerant people was not used to think in simpler terms in facing of complex things. The results of this research was also supported by the results of research (Yildiz-Durak et al. 2021) which stated that personal agreeableness was related to computational thinking ability. Tolerance is supported by broad insight so that you could look at things from various perspectives so that making agreement on a problem became more effective. The characteristic of agreeableness personality was to strengthen the individual's influence in the discussion and made individual did a lot of work in computational thinking (Stajkovic et al. 2018). Agreeableness had aspects of caring and sensitivity to others. These characteristics made it easier for a person to be involved in the problem-solving process without conflict. The results of this research was also supported by research Román-gonzález et al (2017) which stated that personal openness to experience was related to computational thinking ability. Personal openness to experience had aspects of having an interest in others, this person had an interest in learning things that came from other people so that these characteristics went hand in hand with an attitude of tolerance (example: I learnt things from other people's ideas, I accepted the decision that has been mutually agreed upon, and so on).

Another predictor of computational thinking ability found in this research was self-confidence. Self-confidence was belief in someone's ability to do something (Direktorat Pembinaan SMA Kemendikbud. 2017). The results of this study were supported by the statement ISTE & CSTA (2011) that the attitude that supported the ability to think computationally, among others, was a belief in the face of complexity and communication skills. Self-confidence made a person surer of what he or she was doing in the face of a condition. In addition, the results of this research was supported by the results of research Román-gonzález et al (2017) and Yildiz-Durak et al (2021) which stated that personal extroversion was related to computational thinking skills. One aspect of the extroversion personality was self-confidence (Román-gonzález et al. 2017). Extroversion people tend to be more confident in doing things. Individuals who had good self-confidence would have a sense of desire to carry out learning tasks because they believed themselves to be able to carry out their duties well. Self-confidence would make a person tent to believe in his ability to face everything that happened including in facing life side by side with technology and required the ability to think computationally as it is today. Self-confidence would make it easier for someone to express what he or she thought so that it would have an impact on the problem-solving process.

The attitude of responsibility was another predictor of computational thinking ability which was found in this research. The attitude of responsibility was the attitude of a person to carry out his or her duties and obligations (Direktorat Pembinaan SMA Kemendikbud. 2017). The results of the study were supported by the statement ISTE & CSTA (2011) that the attitude of supporting computational thinking ability was one of persistence in working with difficult problems. The attitude of responsibility made a person felt that he or she had to solve the problems what he or she was experiencing even though it was difficult. The attitude of responsibility made a person felt that he or she had to solve the problems what he was experiencing even if it was difficult because it was his or her responsibility. The results of this study are also supported by the results of research (Román-gonzález et al. 2017) which stated that personal conscientiousness was related to computational thinking ability. Personal conscientiousness had aspects of perseverance and fulfillment of commitments (Román-gonzález et al. 2017). This aspect of personal conscientiousness was in line with the attitude of responsibility that always strived to carry out duties and obligations as a fulfillment of commitments to what were the duties and obligations. (Example: I do a good job, and so on).

The next predictor of computational thinking ability found in this study was politeness and courtesy. Politeness and courtesy were attitudes both in speaking and behaving (Direktorat Pembinaan SMA Kemendikbud. 2017). The results of this research were supported by the statement of ISTE & CSTA (2011) which states that attitudes that supported computational thinking skills included tolerance for ambiguity, the ability to communicate and cooperate with others to achieve goals together. The ISTE attitude was supported by a polite and courteous attitude. Tolerance, good communication skills, and cooperation should be carried out by prioritizing politeness and courtesy (Example: I behave well towards others, I respect elders, and so on).

The information on table 9 showed that discipline attitude did not have a significant relationship with computational thinking ability. Someone who had a disciplined attitude tent to obey to the rules that apply in doing something (Direktorat Pembinaan SMA Kemendikbud. 2017). Computational thinking made a person thought faster when faced with a problem. This speed in thinking made someone who has computational thinking skills tent to like a short process in solving a problem. Someone with this character often did not like the rules that seem to limit his or her work.

The results of the research that we have done, showed that social attitudes could be a predictor of computational thinking ability. Thus, in teaching it was important not only to apply problem-solving and computational thinking activities regularly in learning Biology, but also to strive to develop students' social attitudes. The process of integrating computational thinking ability in Biology learning could be done by forming social attitudes through collaborative learning so it would form thinking habits to solve complex problems

effectively and efficiently in accordance with the objectives of computational thinking.

Conclusion

The results showed that there was a significant correlation between social attitudes and students' computational thinking abilities. The higher the social attitude, so students' computational thinking ability would get higher too. Indicators of social attitudes that became predictors of computational thinking ability were mutual cooperation in the moderate category, honesty, tolerance, self-confidence, responsibility, and courtesy in the low category.

References

Anistyasari, Y., Ekohariadi & Munoto, 2020. Strategi Pembelajaran Untuk Meningkatkan Keterampilan Pemrograman dan Berpikir Komputasi: Sebuah Studi Literatur. *JVTE: Journal of Vocational and Technical Education*, 2(2), hal.37–44.

Arikunto, S., 2018. *Prosedur Penelitian: Suatu Pendekatan Praktik*, Jakarta: Rineka Cipta.

Azwar, S., 2012. *Realibilitas dan Validitas*, Yogyakarta: Pustaka Belajar.

Bahri, A. et al., 2021. Problem-based Learning to Develop Students' Character in Biology Classroom. In *Asia-Pacific Forum on Science Learning and Teaching*.

Balitbang Kemendikbud, 2019. Pendidikan di Indonesia Belajar dari Hasil PISA 2018, https://simpandata.kemdikbud.go.id/index.php/s/tLBwAm6zAGGbofK/download/Laporan Nasional PISA 2018 Indonesia.pdf.

Bialangi, M.S. & Kundera, I.N., 2018. Pengembangan Sikap Sosial dalam Pembelajaran Biologi: Kajian Potensi Pembelajaran Kooperatif. In *Proceeding Biology Education Conference*. hal. 138–145.

Blokhuis, D. et al., 2016. *UK Bebras Computational Thinking Challenge 2016*, UK: University of Oxford. http://www.bebras.uk/.

Chowdhury, B. et al., 2018. Analysis of Collaborative Learning in a Computational Thinking Class. In *Proceedings of the ACM SIGCSE conference, Baltimore, Maryland, USA, Maryland, USA*. hal. 143–148.

Czismadia, A. et al., 2015. *Computational Thinking: a Guide For Teachers*, https;//eprints.soton.ac.uk/424545/1/150818_Computational_Thinking_1_.pdf.

Direktorat Pembinaan SMA Kemendikbud, 2017. *Panduan Penilaian Oleh Pendidik dan Satuan Pendidikan Sekolah Menengah Atas*.

Fishelson, R.I. et al., 2020. The Associations Between Computational Thinking and Creativity: The Role of Personal Characteristics. *Journal of Educational Computing Research*, 58(8), hal.1–33.

Fitriani, W., Suwarjo & Wangid, M.N., 2021. Berpikir Kritis dan Komputasi: Analisis Kebutuhan Media Pembelajaran di Sekolah Dasar. *Jurnal Pendidikan Sains Indonesia*, 9(2), hal.234–242, 10.24815/jpsi.v9i2.19040.

ISTE & CSTA, 2011. *Operational Definition of Computational Thinking*, http://www.iste.org/docs/ct-documents/computational-thinking-operational-definition-flyer.pdf.

Juanengsih, N. & Juriah, 2016. Pembelajaran Konstruktivisme Berbantu Media Video/Animasi untuk Meningkatkan Hasil Belajar Biologi Siswa Kelas X MIPA 3. *Edusains*, 8(1), hal.108–113.

Kadir, Z.A. et al., 2016. Does Problem-Based Learning Improve Problem-solving Skills ? A Study among Business Undergraduates at Malaysian Premier Technical. *International Education StudieS*, 9(5), hal.166–172, http://dx.doi.org/10.5539/ies.v9n5p166.

Kong, S., Chiu, M.M. & Lai, M., 2018. A Study of Primary School Students' Interest, Collaboration Attitude, and Programming Empowerment in Computational Thinking Education. *Computers & Education*, https://doi.org/10.1016/j.compedu.2018.08.026.

Korkmaz, Ö., Çakir, R. & Özden, M.Y., 2017. A Validity and Reliability Study of The Computational Thinking Scales (CTS). *Computers in Human Behavior*, 10.1016/j.chb.2017.01.005.

Laar, E. Van et al., 2020. Determinants of 21st-Century Skills and 21st-Century Digital Skills for Workers : A Systematic Literature Review. *Sage Open*, hal.1–14, 10.1177/2158244019900176.

Labusch, A., Eickelmann, B. & Vennemann, M., 2019. Computational Thinking Processes and Their Congruence with Problem-Solving and Information Processing. In *Computational Thinking Education*. Springer Singapore, hal. 65–78, http://dx.doi.org/10.1007/978-981-13-6528-7_5.

Lestari, A.C. & Annizar, A.M., 2020. Proses Berpikir Kritis Siswa dalam Menyelesaikan Masalah PISA ditinjau dari Kemampuan Berpikir Komputasi. *Jurnal Kiprah*, 8(1), hal.46–55, https://doi.org/10.31629/kiprah.v8i1.2063.

Magaji, A., 2021. Promoting Problem-Solving Skills

among Secondary Science Students through Problem Based Learning. *International Journal of Instruction*, 14(4), hal.549–566, https://doi.org/10.29333/iji.2021.14432a.

Maulina, H., Abdurrahman, A. & Sukamto, I., 2021. How to Bring Computational Thinking Approach to The Non- Computer Science Student's Class??? *Jurnal Pembelajaran Fisika*, 9(1), hal.101–112, http://jurnal.fkip.unila.ac.id/index.php/JPF.

Missiroli, M., Russo, D. & Ciancarini, P., 2017. Cooperative thinking, or: Computational Thinking Meets Agile. *IEEE 30th Conference on Software Engineering Education and Training (CSEE&T)*, hal.187–191, 10.1109/CSEET.2017.37.

Nuraeni, A. et al., 2020. Identifikasi Ectranous Cognitive Load Siswa Dalam Mengembangkan Computational Thinking Skill Melalui Pembelajaran Biologi. *Jurnal Pendidikan Sains Indonesia*, 10(1), hal.115–124, 10.24815/jpsi.v10i1.22924.

OECD, 2019. What 15-year-old Student in Indonesia Know and Can Do. *Programme for International Student Assessment (PISA) Result from PISA 2018*, http://www.oecd.org/pisa/Data.

Peel, A. & Friedrichsen, P., 2018. Algorithms, Abstractions, and Iterations: Teaching Computational Thinking Using Protein Synthesis Translation. *The American Biology Teacher*, 80(1), hal.21–28, http://doi.org/10.1525/abt.2018.80.1.21.

Rahim, A., Civelek, I. & Liang, F.H., 2018. A Process Model of Social Intelligence and Problem-Solving Style for Conflict Management. *International Journal of Conflict Management*, 10.1108/IJCMA-06-2017-0055.

Roman-Gonzales, M., Perez-Gonzales, J.-C. & Jimenez-Fernandez, C., 2016. Which Cognitive Abilities Underlie Computational Thinking ? Criterion Validity of the Computational Thinking Test. *Computers in Human Behavior journal*, hal.1–14, 10.1016/j.chb.2016.08.047.

Román-González, M. et al., 2017. Extending the Nomological Network of Computational Thinking with Non-cognitive Factors. *Computers in Human Behavior*, https://doi.org/10.1016/j.chb.2017.09.030.

Shin, N. et al., 2021. Promoting Computational Thinking Through Project-based Learning. *Disciplinary and Interdisciplinary Science Education Research*, 3(7), https://doi.org/10.1186/s43031-021-00033-y.

Sovey, S., Osman, K. & Matore-Mohd, M.E., 2022. Exploratory and Confirmatory Factor Analysis for Disposition Levels of Computationl Thinking Instrument Among Secondary School Students. *European Journal of Educational Research*, 11(2), hal.639–652, https://doi.org/10.12973/eu-jer.11.2.639.

Stajkovic, A.D. et al., 2018. Test of Three Conceptual Models of Influence of The Big Five Personality Traits and Self-Efficacy on Academic Performance: A Meta-analytic Path-analysis. *Personality and Individual Differences*, 120, hal.238–145, https://doi.org/10.1016/j.paid.2017.08.014.

Sturm, N. & Bohndick, C., 2021. The Influence of Attitudes and Beliefs on the Problem-Solving Performance. *Front. Educ. 6:525923*, 10.3389/feduc.2021.525923.

Tanti et al., 2020. Relationship Attitude Natural Science to Responsibility in Junior High School. *Jurnal Pendidikan Sains Indonesia*, 8(2), hal.306–318.

Weintrop, D. et al., 2015. Defining Computational Thinking for Mathematics and Science Classrooms. *Journal of Science Education and Technology*, 10.1007/s10956-015-9581-5.

Yildiz-Durak, H. & Saritepeci, M., 2018. Occupational Burnout and Cyberloading among Teacher: Analysis Personality Traits, Individual, and Occupational Status Variables as Predictor. *The Social Science Journal*, http://doi.org/10.1016/j.soscij.2018.10.011.

Yildiz-Durak, H., Saritepeci, M. & Dunya, B.A., 2021. Examining the Relationship between Computational Thinking, Lifelong Learning Competencies and Personality Traits Using Path Analysis. *Bartın University Journal of Faculty of Education*, 10(2), hal.284–294, 10.14686/buefad.888374.

Yogesh Hole et al 2019 J. Phys.: Conf. Ser. 1362 012121

Yolantia, C. et al., 2021. Penerapan Modul Problem Based Learning terhadap Self Efficacy dan Hasil Belajar Peserta Didik. *Jurnal Pendidikan Sains Indonesia*, 9(4), hal.631–641, 10.24815/jpsi.v9i4.2150.