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Case Study of Interactive Teaching of Science "Food and Digestive System": Developing Communication Skills Towards Science Literacy of Grade VIII Junior High School Students

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NOVELTY

This research focuses on a case study conducted by two teachers who have a science education background on interactive science teaching carried out during learning with the material "food and digestive system". The novelty of this research from previous relevant studies is a case study that focuses on communication skills towards science literacy in one of the schools in Ponorogo. When previous studies conducted case studies, they were only in the form of interactive multimedia or evaluations used by teachers. In contrast to these studies, this study examines several indicators of communication skills which are important for students to have in today's increasingly advanced era.

ABSTRACT

Communication skills require students to be able to manage, understand, develop and create orally and in writing. The use of teaching methods that generally use conventional models, learning activities that are not formed in groups cause students' science communication skills to be lacking so that learning activities are more teacher-centered. This learning causes students' science communication skills to be difficult to develop,

especially towards understanding or science literacy. The development of this science interactive teaching case study aims to develop communication skills towards science literacy of grade VIII junior high school students. The type of research used is mix method. This research involved the subjects of Science 1 and Science 2 teachers in class VIII and students from 2 classes with a total of 32 people taught by the two teachers. Data analysis was conducted through transcript coding using N-Vivo assistance and statistical analysis from SPSS statistics and minitab. Based on the results of the study, it shows that from the three indicators that have been described, there are significant differences in interactive teaching carried out by Science Teacher 1 and Science Teacher 2. This is due to the different perspectives held by the two teachers in the communication skills approach used. Science teacher 1 emphasizes more on exploration activities while science teacher 2 focuses more on discussion activities.

Keywords

interactive; science; communication skills; science literacy; teaching.

1. Introduction (Word Style "Heading 1)

This research project was conducted from the researcher's experience during science teaching which is expected to improve communication skills through interactive teaching to achieve the desired learning objectives. This can be done through the application of emphasizing classroom discussion activities that focus on the dialog that occurs between teachers and learners in the form of small groups (McMahon, 2012; Tapango, 2024). Various forms of small-group learning have been shown to improve academic performance and attitudes towards learning (Knight & Wood, 2005; Simanungkalit, 2021).

Communication skills require learners to be able to manage, understand, develop and create communication orally, in writing and multimedia (Iskandar, 2019; Zulfa & Rosyidah, 2020). During the learning process, a learner can be hampered by the learning process if he cannot communicate the ideas and ideas he has from his mind (Sintiawati et al., 2021). Facts have shown that current science teaching does not provide many opportunities for learners to be able to explore the ideas that exist in their own minds but, instead, teachers have more opportunities to be able to deal directly with their ideas. Conversely, the emphasis on science teaching that has been done is not in line with the learning theory of science constructivism.

Constructivism is aimed at learners in junior high school who generally support a constructivist teaching model. In line with this teaching model, it is based on learners' ideas developed through investigation or discussion (Harlen & Qualter, 2004; Wardana & Ahdar Djamaluddin, 2021). The constructivism teaching model, which focuses on eliciting and developing learners' individual ideas through inquiry and science-based focus, is a challenge for teachers during classroom learning activities (Driver et al., 1994; Erickson, 2000). In addition, teachers also find it difficult to engage different ideas from a large group of learners. From these problems, the process of composing one idea with another will be difficult for learners to do. So that the possibility for students to obtain new information or ideas that can help students understand a problem cannot be done optimally and affect students' science literacy.

This is in accordance with the results of a comparative study conducted by PISA-OECD (Programe for International Student Assessment-Organization for Economic Cooperation and Development) which shows that the average science literacy test score of Indonesian students is 383 from the International average science literacy test score of

500 (Deryati et al., 2013; Fajzrina et al., 2023; Yusmar & Fadilah, 2023). Based on the average value of Indonesia's science literacy, referring to the process of science, namely involvement in solving a problem such as identifying or interpreting evidence and explaining the conclusions of students who tend to be lacking. Science communication helps students develop abilities such as understanding scientific concepts, science processes and engagement with science directly so that it can advance science, especially literacy in Indonesia (Shivni et al., 2021; Sugiarto, 2023).

2. Method (Word Style “Heading 1)

The use of teaching methods that generally use conventional models, learning activities that are not formed in groups cause students' science communication skills to be lacking so that learning activities are more teacher-centered. This learning causes students' science communication skills to be difficult to develop, especially also affecting understanding or science literacy. Research focuses on developing communication skills towards science literacy as a collective proximal development (Vygotsky & Cole, 1978). Learning is not only influenced by the pedagogical focus but also the abilities that are considered relevant to the science environment driven by that assessment (Biggs & Tang, 2011; Fitriyana et al., 2020; Kuh, 2008; Morgan et al., 2007).

In the field of science education, a framework has been developed to analyze the "communication skill focus" of teachers in two areas, namely by comparing dialogical with authoritative and interactive with non-interactive (E. Mortimer & Scott, 2003; Zahro et al., 2019). In these studies, dialogic can refer to the extent to which learners' ideas can be considered and given value in the field of science in the classroom.

Furthermore, teaching can be categorized into several communication skills, namely: 1) interactive/authoritative (IA), 2) non-interactive/authoritative (NA), 3)

interactive/dialogic (ID), 4) non-interactive/dialogic (ND). The development considers the imagination of ideas, especially in the differences between ideas that will be influenced by learners who communicate/dialogue (Kanah & Mardiani, 2022; Scott et al., 2006).

Communication skills also play a role in building closer relationships between teachers and learners to share knowledge, thoughts and experiences (Hayati et al., 2023; Urwani et al., 2018). Learners' communication skills need to be developed in order to improve various abilities including cognitive abilities, emotional abilities and social abilities (Arifudin, 2022; Diana, 2019). With low communication skills, it will cause students' multiperceptions and misconceptions so that learning objectives are not conveyed properly (Aeni et al., 2017; Sintiawati et al., 2021; Zulfa & Rosyidah, 2020).

Science learning requires students to be able to communicate their findings (Rahmi & Pratiwi, 2023; Sintiawati et al., 2021). There is a habit of teacher-centered learning activities, especially seen in the pattern of whole-class interaction, which can limit the involvement of students' ideas in discussions (Alexander, 2008; Intania et al., 2023; Myhill et al., 2005). Classroom conversations are generally conducted through question and answer sessions, where the teacher asks questions and evaluates learners' responses in the form of feedback responses (Anita & Bentri, 2023; Sinclair & Coulthard, 1975). Therefore, the researcher felt interested in conducting a study entitled "Case Study of Interactive Teaching of Science "Food and Digestive System": Development of Communication Skills for Science Literacy of Class VIII Junior High School Learners".

Figure 1

3. Result and Discussion (Word Style “Heading 1)

The use of the four communicative approaches in each case study is presented in Tables 1 and 2. The tables provide further insight into the different time scales at which the case studies of Science Teacher 1 and Science Teacher 2 taught the overall communicative approach. There is no clear evidence of a cycle of ID, IA, and NA communicative skills approaches as seen by (Indiantoro et al, 2023; Mortimer & Scott, 2003) in learning, but there is a complex combination of dialogic interaction to "open" and authoritative interaction to "close" learning discussions.

Table 1

Table 2

As can be seen in tables 1 and 2, case study 1 started with a combination of ID and IA communication skills approaches; but the dominant one used in science teaching overall was IA or authoritative interactive. This is related to the teaching practice activities. Case study 1 is characterized by the situations and conditions created by science teacher 1 with frequent exploration activities from direct observation of materials during practicum activities. This is in line with Jan Lightghart in 1859 that exploration-based learning can strengthen existing knowledge while helping to discover new knowledge (Marlina et al., 2019). The IA communication skills approach is interpreted by reviewing and recapitulating conceptual ideas through objects around students.

The case study of Science teacher 2 focused on the ID or interactive dialogic communication skills approach to discussion. This ranged from 37% to 48% of the classroom teaching time of the three classes taught by Science teacher 2. The highest percentage of ID talk occurred in core learning activities related to the exploration of learners' ideas through collaborative group discussion activities and with the teacher during presentations in front of the class. This is in accordance with Needham's

constructivist learning model, prioritizing systematic/planned learning. One of them is through the discussion step as a phase of structuring initial ideas to reconstruct new knowledge (Andriani, 2020; Sundram & Romli, 2023). In addition, in this activity, students also interpret knowledge from the investigation while making observations. Not only collecting ideas, students are also required to be active in asking questions, which is clearly visible at the beginning of the series of lessons.

Figure 2

Through differences in the use of communication skills approaches by case study teachers towards different science literacies and this is summarized in figure 1. Some of them, collecting and summarizing ideas as a sign that these ideas are important (Gantina et al., 2021) and science teacher ideas from group work to develop scientific activities (Aiman et al., 2019; Lemke, 1990; E. Mortimer & Scott, 2003). This article discusses three indicators of communication skills towards science literacy.

3.1 Share thoughts, information & discoveries with others: ID

Figure 3

In case studies 1 and 2, the sharing of ideas, thoughts, information and discoveries to others from learners was done at the beginning of a series of lessons through stimulus questions by the teacher. The expression of ideas in the stimulus formed the potential to gather different views held by each learner. In addition, providing optimal stimulus can help the brain to capture knowledge through meaningful experiences (Fajzrina et al., 2023; Sujarwo et al., 2022).

Using the pronoun "we" to stimulate learners' questions or ideas can be done such as; "do you want to share your ideas?". With a sense of ownership of learners' ideas, learners will feel more free and will not be attacked/ pressured. Although idea generation

does not have to be in the form of questions, it contributes to positioning them as science scientists (Millah et al., 2022; Ningrum & Putri, 2021).

Idea pooling allows for collective ideas, provides linguistic resources in dialog and learners are emotionally more comfortable expressing their ideas. The focus of communication skills associated with this is ID (Scott et al., 2006; Sriati, 2020). The emergence and sharing of thoughts or learners can be seen as a collective process towards the view of science in conceptual understanding. This is in accordance with Piaget's 1971 view that learners are required to be able to adapt and evaluate their knowledge (Sugrah, 2019). This can be seen from the transcripts of case studies 1 and 2 below (P for researcher and G1 for science teacher 1 and G2 for science teacher 2).

Extract from Case Study Transcript 1

P : During learning, students look active, what do you do so that students can develop their communication skills?

G1 : At the beginning of the lesson, they are given a stimulus. What do they know or do, so that later it can provoke questions. With the different conditions of each learner, some are quick to adapt, some are silent. If in class, there are still students who are "babbling", well that as a teacher directs them to be better.

Extract from Case Study Transcript 2

G2 : I prioritize dialogical learning. This is because I do more discussions with students, so that they are actively involved in learning.

P : During learning, students look active, what do you do so that students can develop their communication skills?

G2 : By providing space for discussion or opinion for students. Given that in this independent curriculum, the teacher only acts as a facilitator, so that the activeness of students is the main thing that must be done during learning..

3.2 Discuss the results of an activity regarding a problem or an event: ID

Figure 4

This section discusses how the ID communicative approach is used to discuss the results of activities regarding a problem through discussion activities from ideas developed by learners and discussing the results of illustrative practical work. In case study 1, science teacher 1 frees learners to actively explore learning resources. These activities are supported by observations by students to add insight based on the data obtained (Jusuf, 2018; Monika & Farida, 2022). In line with the theory of constructivist learning by Slavin (1994) that the learning process students are required to find, check, evaluate and transform information obtained through their ideas (Budiati, 2013).

Case study 2 by Science teacher 2 prioritizes teacher discussion with learners to shape socioemotional and develop learners' communication skills. In fact, Science teacher 2 conducted a diagnostic test to find out students' communication skills. Diagnostic tests aim to find out the difficulties/misconceptions of students about the material to be taught as well as to measure students' communication skills (Permana & Bakri, 2022; Wirabhakti, 2020). In addition, students also make presentations in front of the class to convey the results of the discussion.

When the teacher provides time for students to explore, it aims to develop the insight of students' ideas about the material being studied (Syaparuddin et al., 2020). From these problems, learners' perspectives develop, especially when presenting the results of discussions as a responsibility to the task. This activity is an example of the construction

of ideas to discuss the results of activities regarding a problem through the ID communicative approach. The ID communicative approach refers to the everyday meaning that learners associate. This can be seen from the transcripts of case studies 1 and 2 below (P for researcher and G1 for science teacher 1 and G2 for science teacher 2).

Extract from Case Study Transcript 1

P : What do you do with these gadgets in learning?

G1 : When students work on assignments, for example when making observations. To observe it, it takes a lot of time, with this, students are given the space to explore through the internet network. So that students have more insight.

P : What interactive learning activities do you do to make this bored and often sleepy science learning more fun?

G1 : It emphasizes exploration. Through combining with practice using literacy books and gadgets, it already takes up a lot of time.

P : Are learners given free space to express their opinions?

G1 : When conducting discussions in group work, then make presentations. In these activities, students have their own opinions and the teacher plays a direct role in directing students in their implementation. So that there is a common view both between students and between teachers and students.

Extract from Case Study Transcript 2

P : Are there any specific activities devoted to practicing learners' communication skills?

G2 : There is no special activity, I just do a presentation of the results of the students' discussion.

P : Does the learning emphasize authoritative or dialogical?

G2 : I prioritize dialogical learning. Because I do more discussions with students, so that they are actively involved in learning..

3.3 Summarize, summarize and summarize conceptual knowledge: IA

Figure 5

The third indicator of the communication skills focus is the activity of inferring, summarizing and summarizing knowledge. In case study 1, the approach targeted summarizing results procedurally. This is to teach learners to generalize the results of investigations from observations/discussions. This section shows an example of learning indicators of communication skills with different points of view between case study 1 science teacher 1 and case study 2 science teacher. Where differences through different patterns produce generalizations that are reinforced through repetition by the teacher. This repetition is related to the material "food and digestive system" by the teacher according to the level of understanding of students.

Making generalizations requires more understanding if the purpose of conducting such activities whether it is experiments or collaborative discussions is more than just to find answers to questions or problems at hand, for example how to calculate the calories needed based on the case that has been given, here learners also build knowledge that can be applied in other contexts. This is a sophisticated form of understanding of the key epistemological features of science and differs from everyday discourse in that it has high learning demands (Leach & Scott, 2002). This can be seen from the transcripts of case studies 1 and 2 below (P for researcher and G1 for science teacher 1 and G2 for science teacher 2).

Extract from Case Study Transcript 1

P : Do learners do summarizing activities during the learning process?

G1 : By themselves, with their opinions. During learning, after students make observations, where each group is given a task, that's where the teacher knows the opinions of each group. So that students are given space to freely argue according to their views during learning.

Extract from Case Study Transcript 2

P : Do learners do summarizing activities during the learning process?

G2 : Yes, of course. In the closing activity, students must be able to conclude from what has been learned, while the teacher only straightens out things that may not feel right from the students' opinions. By concluding, it is hoped that students know the benefits of the learning objectives carried out in learning activities.

Talking about the experience of abstraction form representation symbolization so that construction can be seen as an example of the role of communication activities in creating generalizations that support the transition of everyday life into science literacy activities (Firdaus, 2020; Wertsch, 1991). In the case study, there was strong evidence from the summative assessment conducted by the teacher that most learners had used the two-part structure of the desired generalization. Whole-class interactions extend access to science literacy as a source of knowledge that connects to the field of science (Lemke, 1990; Putri, 2023; Yusmar & Fadilah, 2023) and learners who have a talent interest in natural science are guided by the Science 1 teacher to participate in science olympiads. This can be proven through examples of activities by teachers in the picture below.

Figure 6

Emphasis by the teacher is a generalization process that raises questions teaching procedural and conceptual knowledge can motivate learners (Agusta, 2020; Tang et al.,

2010). Thus, the IA communicative approach supports understanding aspects of the process of scientific inquiry, science literacy and broad access to science through its application. However, it reduces learners' comfort and ownership of learning activities if it is not a major part of dialogic activities.

3.4 Science Literacy

Figure 7

The National Education Association has suggested several 21st century skills that are needed to improve communication skills. These skills include interpreting thoughts and ideas effectively in written and spoken form. The ability is supported by supporting knowledge. One of them is through science literacy. This can be formed to improve the ability to understand science material, especially in basic science concepts (Antika & Marpaung, 2023; Arifudin, 2022; Robbia & Fuadi, 2020).

To be able to communicate well, basic knowledge is needed, one of which is science literacy. Several activities have been carried out to develop and improve the level of science literacy of students at SMPN 4 Ponorogo. Such as morning literacy activities for students every day. The hope is that it can increase students' interest in reading. In addition, the school also provides library facilities.

In addition, case studies 1 and 2 integrate technology in the form of "gadgets" during learning. In line with George Marisson's book, learning that uses gadgets as learning media has the aim of increasing literacy, cooperation, intensive and innovative communication between students and teachers (Arifin, 2022). However, it is necessary to adjust the situation, conditions and time by the teacher in order to create conducive learning.

In case study 2, through morning literacy activities from cultums by students who have been scheduled and from reading texts sent through the "whatsapp" group. The teacher has a role in accompanying students in literacy activities in a special literacy book which will later be signed by the teacher who has the first hour teaching schedule in class. When students carry out literacy activities, several supporting questions are given to find out the understanding of what has been read before. In this way, the teacher will correct the answers from various perspectives owned by students. This can be seen from the transcript of case study 2 below (P for researcher and G2 for science teacher 2).

Extract from Case Study Transcript 2

P : Currently students have problems with reading, how do you overcome this?

G2 : The school already conducts literacy activities every morning with the hope of improving students' literacy. Literacy is through texts sent by homeroom teachers to each class grub, then students are asked to read and answer the questions that have been provided.

Figure 8

Another strategy used is the use of gadgets by teachers during learning which breaks the link between observation and explanation. Instead, they explore through other learning resources to improve learners' science literacy. This difference challenges the empirical view of science and gives teachers the opportunity to discuss different explanations. One example is by finding out the course of the digestive system in the human body by utilizing internet media, as illustrated in the following quote:

Extract from Case Study Transcript 1

G1 : It emphasizes exploration. Through combining with the practice of using book literacy and gadgets, it already takes up a lot of time. In addition, by following

the times, where students like to hold gadgets more than books, teachers also utilize gadgets in learning. However, teachers also limit their use, there are times to use books and there are also times to use gadgets.

In comparison, in case study 2, using "gadgets" as learning media, especially in providing additional sources of material from the teacher. One of them is by providing pdf files of material that is not in the package book or LKS to students. In addition, teachers also use "gadgets" to provide evaluation with the help of online-based quizzes "quiziz". As illustrated in the following quote.

Extract from Case Study Transcript 2

G2 : During learning, I use gadgets to evaluate the material that has been learned through "quiz". In addition, I also use gadgets to send pdf files of material that might add insight to the material learned. This is what students really like during learning so that they hope not to feel bored when learning in class.

Variations in such activities contribute to diversity, coupled with the different ways in which different learners perceive and understand them. In order to develop communication skills towards univocal science literacy (E. F. Mortimer, 1998), both teachers drew attention to certain visible features of the situation and focused on them. By adopting a communication skills focus that aligns children's experiences and science content, teachers can draw attention to salient features of their experience of the phenomenon, while valuing learners' observations. Strategies for developing multivocality are: bringing together different observations and valuing extended observations expressed both orally and in writing. The strategy for developing univocality is to focus on selected observations and select points of communication that are developed in class. Making connections between observations and explanations is also important in

providing explanations and developing children's understanding of the nature of science especially in the material "food and digestive system".

The realization of shared experiences to make discussions meaningful and relevant. This is in accordance with the implementation of the independent curriculum which applies Ki Hadjar Dewantara's national education philosophy which upholds the ability to reason critically which reflects noble character but prioritizes meaningful understanding for students (Rahayu et al., 2022; Rahayuningsih, 2022). In line with the opinion presented by (Wells, 1999) that although language becomes a tool in connecting observing understanding among participants will be too large. However, application is intended as an opportunity for dialog in scientific inquiry to develop communication skills.

3.5 Interactive Teaching

Figure 9

Interactive teaching in case study 1 science teacher 1 and case study 2 science teacher 2 has a significant difference. This can be seen from figure 8 above, where science teacher 1 applies all forms of approaches in developing students' communication skills. In addition, science teacher 1 relies on the exploration of learning activities, for example laboratory practicum activities. Meanwhile, Science teacher 2 applies a variety of approaches tailored to the material, for example game activities to determine material understanding. The game is with the help of media in the form of "quiz". To find out more, please refer to the case study transcript below.

Extract from Case Study Transcript 1

P : What kind of interactive science learning have you done?

G1 : Interactive learning that has been done by me is by doing practicum activities. This activity is carried out so that learning can run effectively, the teacher conveys not only in theory but also practically.

P : What methods/approaches do you often use when learning?

G1 : When learning, incorporate all forms of approaches. Because each child has a different view/interpretation. Try to do everything you can.

P : What interactive learning activities did Mr. Munif do to make this bored and often sleepy science learning more fun?

G1 : It emphasizes exploration. Through combining with practice using book literacy and gadgets, it already takes up a lot of time. For this reason, the teacher synergizes through ice breaking so that students are not tense during learning in class and learning is silent / static. During this learning, Mr. Munif did not see any tension, because students tend to be active during learning.

1 Extract from Case Study Transcript 2

P : What kind of interactive science learning have you done?

G2 : The interactive learning that I have done is by doing practicum activities. These activities are carried out so that learning can be more varied, not only done in class.

P : What methods/approaches do you like to use when learning?

G2 : I use various methods or approaches, such as differentiated learning, project-based learning, and so on. It all depends on the material to be taught and the condition of the students who will do the learning.

P : What interactive learning activities do you like to do so that science learning, which seems boring and often makes you sleepy, can be more fun?

G2 : In order not to get bored, ice breaking should be given in the middle of learning, but I still have not done this. Meanwhile, what I have done is to provide games from "quiziz" which is very popular with students during learning so that they hope not to feel bored when learning in class.

Interactive learning is needed because of the low quality of Indonesian education, especially with the lack of school science learning media facilities. This supports learning that is not monotonous. In this learning, the enculturation of students in the classroom which is generally dialogic with a shared understanding that scientific discourse and science literacy involves argumentation is the result of lessons in the focus of communication skills (Zahro et al., 2019).

In case study 2, the classroom approach that supports learners to generate and debate ideas is in line with the teacher's view on the importance of developing ideas and interests. Whereas in case study 1 science teacher 1 prioritized learner outcomes from exploration or observation activities. In addition, both case studies 1 and 2 have talk of organizing resources to support the approach. As research presented by (Alexander, 2008; Antony, 2022; Yolanda et al., 2023) on dialogical teaching emphasizes the potential for learner involvement in the value of the results of the discussion. In line with this, dialogic talk does not only focus on reasoning (Surawan, 2020; Wegerif, 2008).

3.6 Quantitative Analysis

Table 3

The basis for making the Kolmogorov-Smirnov Normality Test decision, namely if the significance value (sig)> 0.05 then the data is normally distributed and if the significance value (sig) <0.05 then the data is not normally distributed. Based on the data obtained, the results show that the data is normally distributed. So, then the research can

carry out testing using parametric statistics, namely ancova and one tailed t-test to analyze research data.

Table 4

Based on the results of the output above, the sig. value of science literacy is 0.041 which is the sig value. <0.05 so it can be said that science literacy has an influence on students' communication skills. In addition, based on the output of the test results, it shows that the sig. value of science teachers is 0.012 so it can be said that the difference in science teaching between science teacher 1 and science teacher 2 partially affects the level of communication skills. To determine the effect of science literacy and differences in science teaching on students' communication skills simultaneously can be seen from the significance of the corrected model. It can be seen that the sig. value is 0.031 which is sig. < 0,05 . This shows that simultaneously, science literacy and science teaching by science teachers affect the communication skills of students.

Table 5

Based on the results of the one-tailed t-test output from Minitab presented in the table above, it is known that the P-value is 0.027. Because the P-value of IPA 1 and IPA 2 classes <0.05, it can be stated that H0 is rejected. So it can be concluded that there is a significant difference between interactive teaching of science conducted by science teacher 1 and science teacher 2. This difference indicates that interactive teaching conducted by both teachers results in the development of different communication between students taught by science teacher 1 and science teacher 2. This difference is based on the application of different teaching between science teacher 1 and science teacher 2. If science teacher 1 prioritizes exploration activities with students directly,

while science teacher 2 is more based on significant in-depth discussion activities and takes a full socioemotional approach to students.

Providing a pleasant atmosphere for students when teaching takes place makes them more motivated to learn. Learners' enjoyment of the learning atmosphere raises the ability of learners to be able to experience development, especially in their communication skills. This is in accordance with the theory put forward by Jean Piaget that the development of learners depends on changing learners and active interaction with the environment. One of the things related to active interaction with the environment is through a socioemotional approach that focuses on how learners can respond or respond to things that happen in their environment (Naldi, 2018; Neviyarni, 2020).

4. Conclusion

Based on the results of the research, it was found that interactive science teaching carried out by Science Teacher 1 and Science Teacher 2 was not carried out optimally to develop communication skills towards science literacy of VIII grade students of SMPN 4 Ponorogo. This can be seen from the results of interviews and data analysis conducted. Nevertheless, this case study has used various approaches linked to communication skills through the learning process. In addition, the results of learning that has been associated with communication skills about the contribution that can be given by whole-class teaching related to the emergence of students' ideas through various indicators of communication skills.

On the other hand, science teaching models need to be clarified for teachers to meet learning objectives. This case study shows a new role in exploring ideas to expand the mainstream view in the literature through science literacy from various sources. Learners are emphasized on brainstorming or discussion to build shared understanding.

In the case study, the collection of ideas in the initial or introductory activities can be seen as a conceptual knowledge resource that can be utilized by everyone.

In both case studies, different discussion activities were implemented. In case study 1, science teacher 1 emphasized discussion among students collaboratively and exploration through internet media. Meanwhile, case study 2 science teacher 2 uses discussion activities between teachers and students directly. Both are in accordance with the demands of the independent curriculum which prioritizes students as the main actors of learning but still frees students in developing their ideas or ideas.

Case study 2 science teacher 2 provides an example of open learning planning in learning science practices and theories and doing practice through practicum activities. Meanwhile, case study 1 science teacher 1 is closer to the community of practice with observation and exploration activities through practicum in the laboratory. One of the challenges is in developing communication skills among students who have different levels of ability. This difference can be overcome by using interactive multimedia that can connect the context or material associated with technology such as animation or artificial intelligence. This can be used as further research for researchers who have the same interests as this research.

Acknowledgment

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Table Lists

”**Table 1** Case study 1 percentage of lesson time in science teacher 1's class by communication skills approach” (number 9, page 9)

Class	Duration (minute)	Percentage of communication skills approach time				Percentage of lesson time in WCT
		ID	IA	ND	NA	
1	80	25	16	5	8	54
2	80	20	30	4	6	60
3	80	15	32	7	10	64

WCT, whole class 8 teaching by Science teacher 1

”**Table 2** Case study 2 percentage of lesson time in Science Teacher 2's class based on communicative approach” (number 10, page 9)

Class	Duration (minute)	Percentage of communication skills approach time				Percentage of lesson time in WCT
		ID	IA	ND	NA	
1	80	45	14	3	8	70
2	80	37	5	5	12	59
3	80	48	10	2	9	69

WCT, whole class 8 teaching by Science teacher 2

”**Table 3** Normality test results of case study data based on communicative approach” (number 16, page 21)

Test	Kolmogorof-Smirnov		
	Statistic	df	Sig.
Pretest IPA 1	0.154	32	0.051
Posttest IPA 1	0.139	32	0.121
Pretest IPA 2	0.138	32	0.129

”**Table 4** Ancova test results with type III pretest covariates” (number 3, page 22)

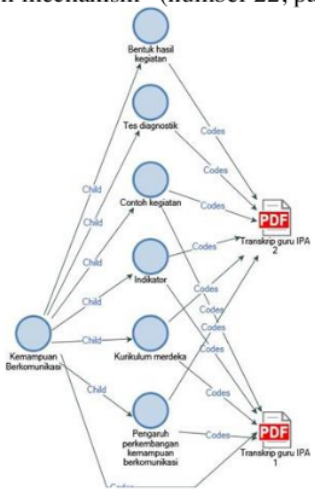
Source	Analysis of Variance		
	df	F	Sig.
Corrected Model	2	3.672	0.031
Intercept	1	168.248	0.000
Science Literacy	1	0.669	0.041
Science Teacher	1	6.737	0.012

”**Table 5** One-tailed t-test results” (number 14, page 22)

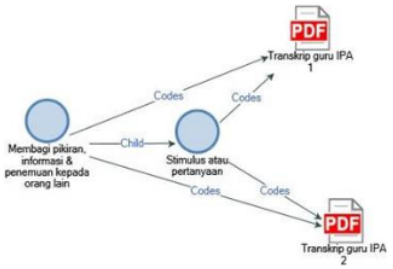
	N	Mean	StDev	SE Mean
IPA 1	32	82.09	8.02	1.4
IPA 2	32	83.41	9.71	1.7
Difference = mu (IPA 1) - mu (IPA 2)				
Estimate for difference: -1.31				
95% upper bound for difference: 2.40				
T-Test of difference = 0 (vs <): T-Value = -0.59 P-Value = 0.027 DF = 62				
Both use Pooled StDev = 8.9049				

Figure Lists

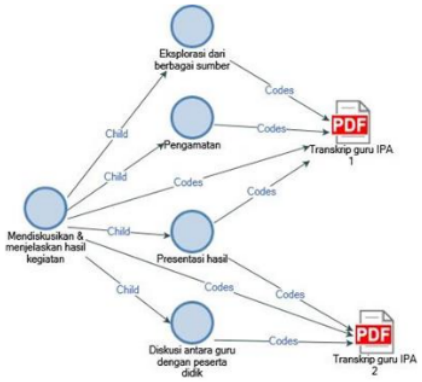
“Figure 1 Case study research mechanism” (number 22, page 8).



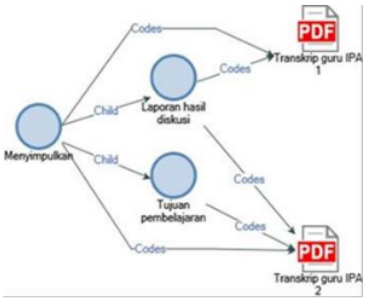
“Figure 2 The focus of communication skills in terms of the coding results of the case study transcripts of science teacher 1 and science teacher 2” (number 7, page 10).



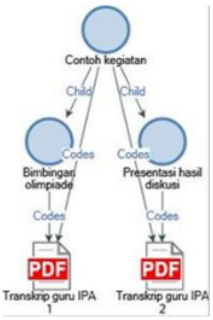
"Figure 3 The first indicator of the focus on communication skills in terms of the coding results of the case study transcripts of science teacher 1 and science teacher 2" (number 15, page 10).



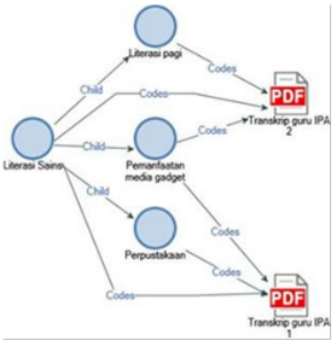
"Figure 4 The second indicator of the focus on communication skills in terms of the coding results of the case study transcripts of science teacher 1 and science teacher 2" (number 2, page 12).



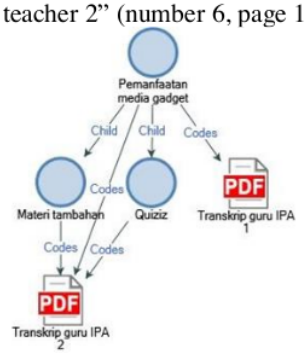
"Figure 5 The third indicator of the focus on communication skills in terms of the coding results of the case study transcripts of science teacher 1 and science teacher 2" (number 2, page 14).



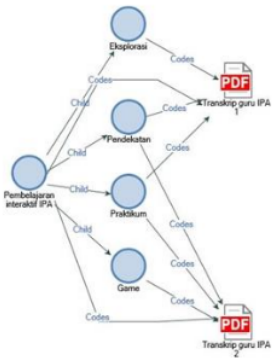
"Figure 6 Examples of activities from the focus of communication skills based on the coding results of the case study transcripts of Science Teacher 1 and Science Teacher 2" (number 12, page 15).



"Figure 7 Science literacy in terms of the coding results of the case study transcripts of science teacher 1 and science teacher 2" (number 6, page 16).



"Figure 8 The use of gadgets in terms of the coding results of the case study transcripts of science teacher 1 and science teacher 2" (number 10, page 17).



"Figure 9 Interactive teaching of science in terms of the results of coding the case study transcripts of science teacher 1 and science teacher 2" (number 13, page 19).

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Although a graphical abstract is optional, its use is encouraged as it draws more attention to the online article. The graphical abstract should summarize the contents of the article in a concise, pictorial form designed to capture the attention of a wide readership. Graphical abstracts should be submitted as a separate file in the online submission system. Image size: Please provide an image with a minimum of 670 × 670 pixels (h × w) or proportionally more. The image should be readable at a size of 5 × 13 cm using a regular screen resolution of 96 dpi. Preferred file types: TIFF, EPS, PDF or MS Office files.

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Alfi Mufidah

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