Research Article:

Teacher's Dialogic Prompts That Scaffold Students' Participation in Classroom Argumentation: A Case of a Biology Teacher

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ABSTRACT

In this qualitative case study, a male biology teacher teaching Bioethics in Senior High School was purposely selected for the documentation and examination of the types and functions of dialogic prompts he used to scaffold his students' participation in classroom argumentation. Using various data such as classroom transcripts from audio- and video-records, interviews and field notes, these were subjected to microlevel analyses using the constant comparison method. Using an analysis framework with codes from literature that were subsequently merged with data-driven codes, thematic analysis yielded three types of dialogic prompts: conceptual, analytical, and reflective with several functions such as providing background information, giving extended 'think-time', guiding students to formulate counterarguments, eliciting examples that either support or refute a claim, and asking issue-based questions which were sometimes backed up by stating personal arguments and reiterating students' responses. Excerpts from video transcripts revealed that these dialogic prompts elicited students' ideas which resulted to argumentative and collaborative inquiry. Findings of the study suggest that students' participation to classroom argumentation should be understood together with teachers' provision of dialogic scaffolding. More than conceptual and factual knowledge, teachers' dialogic scaffolding for argumentation is a promising method for the gradual enhancement of students' communication skills and honing of their reasoning skills. Since the results are only conclusive to the case teacher, the study informs the potentials of dialogic scaffolding to support classroom argumentation. It is therefore recommended that for future professional development efforts, both in-service and pre-service teachers should be influenced towards intentionality of harnessing talk inside the classroom as a tool to enhance the implementation of classroom argumentation.

Keywords: Dialogues, dialogic prompts, dialogic learning environment, students' participation, teachers' dialogues

INTRODUCTION

Classroom argumentation has always been associated with classroom talk through dialogues. However, it requires scaffolding to harness students' participation. Dialogic scaffolding begins when a teacher provides multiple points of discussion that direct the students towards a productive meaning-making of their content through interactions between and among themselves. It aims to foster interactive, collaborative, and supportive learning environment (Alexander, 2010) wherein students' insights are backed up by the teacher's dialogues.

In this study, the teacher's dialogues were used as 'movers' for students to participate in classroom argumentation. It was conceptualised from the notion of *Collective Argumentation* (Brown & Renshaw, 2000) which demands increasing the number of participants from individual student's questioning to small group explaining and clarifying differences in ideas, and finally to whole class dialogic inquiry. Moreover, it is also inspired by earlier research findings which claim that responsive teachers can use dialogues for students to become active agents in the knowledge construction (Engle & Conant, 2002).

This study focuses on Mr. Chris, a Grade 10 Special Science Teacher in the Philippines, who, based on a preliminary interview expressed that he intentionally framed his Bioethics Class for classroom argumentation. As this study present claims specific to Mr. Chris' case, results will serve as an initial understanding of how intentionality for dialogic scaffolding improves classroom argumentation. With the increasing number of international studies conducted on dialogic scaffolding, results would also contribute to the scant studies in the Philippine setting.

Classroom Argumentation

The science standard, *Engaging in argument from evidence* addresses one of the goals of the core scientific practices which is the provision and development of students' science content knowledge through their engagement in the social aspects such as constructing, critiquing, and reflective participation in the scientific community (National Research Council [NRC], 2012). In response, classroom argumentation has been advocated with its significant role in developing scientific literacy and conceptual understanding (Zohar & Nemet, 2002) as well as in writing and talking in the language of science (Cavagnetto, 2010).

Linking scientific literacy and classroom argumentation, science educators have noted several advantages. First, argumentation enhances the quality of student learning through reasoning (Erduran & Jimenez-Aleixandre, 2008). Second, students are compelled to develop rational thinking (Bricker & Bell, 2008; Kuhn, 2010). Finally, students become familiarised with scientific inquiry and gain the confidence in their way of thinking (Driver et al., 2000). In oral argumentation, the interactions occur in a dialogic manner that exhibits a fair play of discourse using questions, verifications and elaborations. Thus, there

should be a dialogic interaction that occurs in an orchestrated social process in which both the teacher and students are open to exchange ideas with detailed explanations.

Scaffolding the Argumentation in Biology Classroom through Dialogic Prompts

In order to harness the potentials of classroom argumentation in science classrooms, dialogue must involve both the students and the teacher. In a dialogic classroom, Alexander (2010) claimed that the teachers play a very important role in establishing rules for interaction, modeling behaviours, and assigning speakers in the dialogic sequence. Four strategies were suggested, and this include: using high-level thinking, encouraging student to express their ideas, acknowledging and responding to student responses, open-ended questioning, and eliciting student responses before giving feedback (Mercer & Littleton, 2007).

Following the suggested strategies, succeeding empirical studies suggested different ways on how teachers scaffold students in an argumentative classroom (McNeill & Pimentel, 2010; Martin & Hand, 2009; Simon et al., 2006). In the longitudinal study of Martin and Hand (2009), teachers' scaffolding for argumentative classroom developed from factual or recall questions to more open-ended questions. Scaffolding through dialogic prompts were also used in Biology in recent study and results show that pre-service biology teachers used different dialogic talk in scaffolding students' participation during their discussion on the structure and function of the cells, genes, and chromosomes (Hiltunen et al., 2020). However, even with structured inquiry, lecture type was still prevalent, and less talk was observed. Thus, the current study fills in the gap of existing research as it documents how dialogic prompts were used. How the teacher's dialogic prompts encouraged students to present multiple perspectives would shed light on how bioethical issues are understood and argued upon with dialogic scaffolding.

Research Questions

This study is guided by the following research questions:

1. What types of dialogue were mostly used by Mr. Chris to scaffold students' participation to classroom argumentation in their Bioethics class?

2. How did Mr. Chris' dialogic prompts serve as "movers" for students' participation to the whole classroom argumentation?

METHODS

Research Design

This study sought to understand how Mr. Chris' (a pseudonym), utilised dialogic prompts in scaffolding his students' participation in classroom argumentation. The qualitative single case study research design was employed (Yin, 2009). He was purposively selected because

his lessons were rich in dialogic interaction as the topics were mostly bioethical issues. Based on his initial interview, he said that he specifically chose classroom argumentation in his Bioethics class (*they should be exposed on how to exercise their decision-making since they* [must] *possess the innate sense of self-awareness towards ethical issues.*). Since the data were gathered on the third grading period of the school year 2018, students were already used to classroom argumentation. As a unique feature, Mr. Chris is the only teacher of Bioethics in the entire school. He was allowed to draft his own curriculum for the school year with the school principal's trust on his skills and knowledge from his Masters in Bioethics studies overseas. The suitability of this design lies behind its provision for an "intensive, holistic description, and analysis of a single instance" (Merriam, 1998, p. 21). Using this design, Mr. Chris' enactment of dialogic prompts to implement classroom argumentation in his Bioethics class was documented and analysed.

Context

This study explored the dialogic component of classroom argumentation in a Bioethics class as a Biology Elective Course for Grade 10 in a Special Science High School in the Philippines. Mr. Chris' dialogic prompts were documented and iteratively analysed in terms of how they encouraged students' participation to classroom argumentation in a whole-class discussion. The lessons were mainly composed of bioethical issues which included genetic engineering, human gene therapy, ethics on quarantine procedures, and the issues on the establishment of universal standards of research.

Each classroom session lasted for 50 minutes. To start the discussion, one student was assigned to present background information on some prevalent issues in science. Their presentation usually lasted for 15 minutes which was followed by whole class discussion. During the presentation, student-presenters also provided the class with an argumentative statement related to their topic which they prepared beforehand. Table 1 presents the topics with the corresponding argumentative statements that were used in this study.

Table 1. Discussion topics that were observed in the Bioethics class of Mr. Chris

Topic and number of sessions	Issue/s presented	Argumentative statement/s
Genetic engineering (1)	Genetically modified organisms	Are genetically modified crops safe to eat?
Human gene therapy (1)	Use of embryos for therapeutic purposes	Are you in favour of using human embryos to cure some diseases such as cancer or to reverse aging?
Ethics on quarantine procedures (1)	Mandatory quarantine before entering a country after finding out that an arriving traveller is sick	Do you have the right to refuse quarantine?
Universal standards of research (2)	Research involving human samples	Are human samples allowed to withdraw participation anytime during the research?

After the presentation, Mr. Chris reiterated the argumentative statement/s and encouraged others to present their arguments or counterarguments with valid evidence. Students were facilitated and instructed to strengthen their claims using ideas from different fields such as health, politics, economics, religion and ethics to name a few.

Student-presenters used slide presentations, video clips, and photos which enriched the information they provided to their peers. Their presentation was graded using rubrics which were earlier discussed with them. The criteria included in the rubric are the quality of the argumentative statement/s which they formulated and prepared and the background information that were provided that stirred other students' ideas during the whole class discussion. Each student had a minimum of three presentations within the grading period that is composed of three months (approximately 72 days). They were allowed to choose their topics of interest at the start of the grading period to give them enough time to prepare through personal research.

Participants

The case teacher

The teacher (Mr. Chris, a pseudonym) involved in this study was purposively selected. He is a Special Science Teacher (30's in age), has been teaching General Biology (Ecology) for almost 10 years, and holds two master's degrees: one in Environmental Education which supports his knowledge and skills on pedagogy and one in Bioethics which inspired and qualified him to create a Bioethics elective class for Junior High School. He also holds a bachelor's degree in Biology which supports his deep knowledge of biology content. These credentials justify his competence in teaching the Bioethics Elective course.

The student participants

Twenty-four students aged 15 to 16 years old, who belong to an intact class in Grade 10 Junior High School in a Special Science School were involved in this study. As an elective course, they were given the freedom to choose this course from the start of the school year. Most students spoke bilingually (Filipino - English) but dominantly spoke English in class. Mr. Chris, however, encouraged them to speak in Filipino whenever they encountered difficulty in expressing their opinions. During the observation period of this study, the students were noted to be mostly good English speakers and were able to express their opinions well.

Data Collection and Analysis Procedures

Several data sources were used to document the classroom interactions in Mr. Chris' Bioethics class. This included five classroom transcripts with a total of 240-minute video and audio recorded classroom interactions, classroom observations, and field notes.

Together with a research assistant, these were transcribed, and the author conducted a document screening of the lesson transcripts against the video- and audio-records. All these data were analysed using the constant comparison method (Corbin & Strauss, 2014) to generate the themes that represented Mr. Chris' dialogic prompts and their functions in the dialogic scaffolding.

Classroom transcripts were divided into segments which were analysed line-by-line. Initial codes and themes were generated following the Scheme for Educational Dialogue Analysis (SEDA) (Hennessy et al., 2016, p. 18) which proposes "hierarchical and nested levels of analysis" at micro (communicative acts), meso (communicative events), and macro (Communicative situations) levels. This coding scheme was chosen as it allowed for the interpretative diagnosis on how dialogic the sequences of interactions are between the teacher and the students across the five lessons. Analysis conducted for the transcripts were mostly focused on the micro level.

In the initial microlevel analysis, the segmented sentences were assigned a code in the spreadsheet. Each segment or unit contained several codes initially that were narrowed down in the succeeding iteration based on a more general "talk move" they provide for interaction. Initial coding was done for all utterances regardless of whether they were from the teacher or from the students to gain in-depth understanding on how Mr. Chris and the other students' prompts elicited others turn in the dialogic sequence. However, during the creation of themes, analysis was focused on Mr. Chris dialogues.

Simultaneous initial coding was done by the author and another researcher who is familiar with classroom argumentation. These were then merged and 20% of the coded data were verified by an outside expert who agreed at 95% with the initial coding. Agreement was established between the researcher and the expert for the remaining 5% to arrive at the final codebook used to code and recode the entire data transcripts.

Trustworthiness and Ethicality

To ensure the objectivity of this study, Guba's (1981) criteria for trustworthiness was followed for credibility, transferability, dependability, and confirmability. Credibility was established by obtaining various data forms, audit checking of the initial transcripts, and external checking of an outside expert. In the external checking, 20% of all the data sources were cross-checked to ensure the accuracy of the codebook that represented Mr. Chris' dialogic prompts. Transferability was ensured by providing a detailed account of the lessons, the demographic characteristics of Mr. Chris and his students, the instructional procedure, the students role in the classroom discussion (e.g., student presenters), and the procedures of classroom interactions. Dependability was established through the in-depth description of the research context, design, and data collection and analysis procedures.

Prior to the conduct of the study, the researcher sought the approval of an Institutional Review Board. To ensure the welfare of the research participants, consent forms were personally accomplished by Mr. Chris and by the students. It was stated in the consent

forms that withdrawal from participation was allowed anytime. Thus, since the transcripts involved the whole class, some segments where students did not specify their voluntary participation were excluded in the analysis. After data transcriptions, the teacher and his students were assigned with pseudonyms.

RESULTS

Types of Dialogue Mr. Chris Used to Scaffold Classroom Argumentation

Using the coding framework that was derived from the SEDA, the totality of the data used in this study resulted to the coding framework in Table 2. Using this coding framework, thematic analyses on the data resulted to the identification of three types of dialogic prompts: conceptual, analytical, and reflective.

Table 2. Coding framework to analyse the functions of Mr. Chris' dialogic scaffolding prompts

Code	Functions
Hint (Hint)	Provides background knowledge. Notifies students to relate the topic to prior knowledge.
Prerequisite knowledge (Pre knowl)	Clarifies students' understanding of related terms. Asks the students to contextually define scientific terms.
Ideas and explanations (Ide and exp)	Clarifies the evidence based. Asks for explicit explanation of the scientific terms.
Argumentative (Arg)	Presents an argumentative statement and challenges students.
Probe (Probe)	Asks for elaborations. Plays a "devil's advocate" to encourage counterargumentation.
Reflection (Refl)	Directs the students towards real-life connections. Presents statements or questions that invoke reflections.

Conceptual dialogic prompts comprised of those that gave hints and explored students' prerequisite knowledge. In the sample dialogue (Table 3), Grace mentioned pain tolerance as an example when they were resolving issues on using humans as research samples. During the observation, Mr. Chris recapped this to extend their discussion, but Carl introduced the Nazi experiment. He tried to challenge Carl to relate his ideas to the earlier answers of Grace. With Mr. Chris' conceptual dialogues, hints provided the students with background knowledge and notified them to relate their topic to prior scientific knowledge. These prompts were also used to elicit clarifications about students' understanding of how scientific terms were contextually used in their current lesson.

Analytical dialogues were prompts used to generate students' ideas, explanations, and arguments. Using these dialogues, Mr. Chris tried to clarify students' statement and evidence for their claims. Moreover, he tried to ask the students' to explicitly explain how

they contextually used scientific terms. Further, Mr. Chris used this prompt to present argumentative statements that challenged the students. In the sample transcript in Table 3, he challenged Gem which led her to elaborate her answer about the scientific or ethical values of research. In challenging them, he tried to acknowledge both sides of an issue that are free of hidden assumptions. Through this, he minimised students' overinterpretation of his initial stance.

The last type of dialogue was reflective dialogic prompts. He used these dialogues to probe further and enable students to exercise their reflective thinking such as in the sample transcript in Table 3. In situations where everyone supported certain arguments, he probed further by playing a "devil's advocate" to elicit counterarguments or rebuttals.

Table 3. Type and example of dialogic prompts provided by Mr. Chris from the data transcripts

Type of dialogic prompt	Sample transcript
Conceptual	Mr. Chris: Ok…now, can you give me an example which shows that the increase in scientific value equals the increase of the ethical value? (Hint) Grace: Sir, pain tolerance. Coz you are conducting a research, but you are giving them pain…. Mr. Chris: Pain tolerance…ok, it can be… (Pre knowl) Carl: Nazi experiment!? Mr. Chris: Nazi experiment! Carl, can you relate this to Grace' answer? (Pre knowl)
Analytical	Mr. Chris: Ok, yeah, are there girls with limited egg cells who want to donate their egg cells to form a blastocyst? (Refl) Gem: That is why we have menopause…so why do you consume your egg cells for research?
Reflective	Mr. Chris: Like if it contradicts the universal standard, will it always be considered wrong? (Probe) Rivaldo: Sir, it's like the evil is done for the good… Mr. Chris: So, do you mean to say that contradictions are acceptable? (Ide and expl)

Analysis showed that in the five video recordings, Mr. Chris played a key role to stimulate the richness of the students' argumentative statements by scaffolding their discussion. This supports the previous authors' description of students as active inquirers (Martin, 2006) with proper scaffolding. Their inquiry process allowed them to extend the dialogic interactions with collective efforts for knowledge building.

Functions of the Mr. Chris' Dialogic Prompts

Based on the iterative analysis, the three types of dialogic prompts served different functions. Although more fine-grained functions were associated to each type of prompt, thematic analysis showed that these can be lumped together into five different themes. These were used to prompt students "towards more sustained levels of formal-operational thinking by providing them with regular opportunities for dialogue with others" (Corson, 1988, p. 66).

Providing background information

Based on the observation, Mr. Chris usually started the lesson by summarising the students' individual presentation, connect the issue to basic science content, or associate the topic to various fields. In his sample dialogues in Table 4, when they were discussing about the safety and uses of GM crops, he mentioned the possible widespread impacts of GM production on "hunger, the economy, politics, and even health." Thus, students were prompted with various ideas to frame their arguments. This prompt also increased students' perspectives such as when he mentioned the "promise for cure against childhood diseases" using embryos in human gene therapy. Based on the observation, this increased the depth of their discussions when he associated reflective and analytical statements from the background knowledge that he provided. Similarly, he also applied this dialogic scaffolding prompt during their discussion about ethics in quarantine and the universal standards in research. When he introduced the threats to public health as a consequence for not agreeing to undergo mandatory quarantine, students were given reflective moments to weigh the consequences of their possible choices of action. When they were arguing about the issue of withdrawal from being research subjects, his dialogue prompted the students about their rights and responsibilities for information through written consent. He was able to provide background information that were open-ended and reflective which made the students respond with varying viewpoints.

Providing extended 'think-time'

During the classroom observations, Mr. Chris' provision of 'think time' were noted and this allowed the students to formulate their arguments. It is not considered dialogic but the widespread utilisation during the discussion served "as if" a dialogic prompt. It helped him ensure turn-taking for distributed participation. Table 4 presents some of his dialogues which contain pauses that gave students enough 'think-time' to formulate their arguments.

Guiding students to formulate counterargument

In this dialogic scaffolding strategy, Teacher Chris' dialogues probed and challenged the students to organise their thoughts using questions that seemed to elicit predictions implied by *"What would happen if…"* statement. This can be observed in Table 4 such as when he asked, "but is it really accessible?" during their discussion on ethics on quarantine procedure and his statement, "how about the reputation of the lab?" when they were resolving an issue related to the universal standards of research. With reflective dialogues which were used to guide students to formulate counterarguments on social and moral issues, scientific concepts were readily applied to avoid fragmented learning. It was observed that as soon as Mr. Chris scaffolded the students using this prompt, he stepped back in the argumentative discussion which gave them the opportunities for dialogic interaction. This led to a discursive classroom environment with a shared leadership in the learning process that is collaborative, negotiated, and dialogic.

Eliciting examples that either support or refute the claim

In some of the classroom observations, there were few instances when the issues were complex, and students were not able to readily interact. However, Mr. Chris tried to enhance students' participation by asking examples in order to sustain the argumentative environment. Usually, when Mr. Chis used this dialogic prompt, he reiterated or resurfaced students' prior ideas to direct them to the significant points they raised. Moreover, he acknowledged students' efforts to enhance their knowledge from their reading assignments and prompted them to use these materials during the discussion (You mentioned scientific obstacles of gene therapy. Can you mention some based on your readings?). Recapitulating statements also stimulated students to sustain their participation. With conceptual dialogues, students presented content-based knowledge on the one hand and with analytical or reflective dialogues such as the dialogue, "You mentioned scientific obstacles of gene therapy," students were afforded of critical thinking on the other.

Asking issue-based question

In this dialogic scaffolding prompt, Mr. Chris tried to acknowledge that as scientific knowledge expands, issues arise that require proper decision making. As such, students should be made aware by incorporating these issues during the learning process. What is unique in Mr. Chris class was their utilisation of bioethical issues which was appropriated for classroom argumentation. However, he scaffolded the students to recall previous content-based ideas such as when he prompted them to recall about mutation during their discussion on gene therapy. It was noted during the observation that the students took turns in recalling how mutation occurs and applied it to the current issues that they were discussing.

According to Zeidler et al. (2011), when SSI-approach to learning is properly implemented, learning becomes transformative that is deep, moral, and personal. This was evident in this study when he asked the students with "How about if you are on a medication but you are required for longer quarantine? Who will take care of your medicines?" During their discussion on this topic, students took turns to express their personal arguments and plethora of beliefs.

Stating personal arguments and reiterating

These two dialogic scaffolding practices, though were occasionally observed in both the classroom observations and transcripts, were noted to back up some of the frequently enacted dialogic scaffolding practices. To specify, Mr. Chris' statement of his personal arguments was his way of articulating his thought processes which encouraged students to engage in resolving the issues at hand. Moreover, reiterating was his way of putting emphasis on students' arguments making other students reflect and articulate their ideas. These strategies also gave students the opportunity to further assess the issue leading them to make sense of their previous knowledge for richer and elaborated claims. Through

recapitulating, students recognised the value of their ideas to sustain the discussion. However, more than this, his personal arguments served as an opposing view prompting the students' counterarguments. This supports the contention of Billig (1996) when he stated, "humans do not converse because they have inner thoughts to express, but they have thoughts because they are able to converse" (p. 141).

Table 4. Functions of the dialogic prompts and representative sample in each topic

Functions of the dialogic prompts	Sample dialogic prompts
Providing background information	Production of GMOs are often associated to issues on environment, world hunger, the economy, politics, and yes, even health.
	Human gene therapy carries with it a promise of childhood diseases.
	International law takes serious action to possible threats to public health…
	Usually, instructions are given for participants before they sign consent forms.
Giving extended 'think-time	How do you know if scientific value is already compromised? (12 seconds pause)
	The therapeutic promise is costly, but would it be for everyone? (9 seconds pause)
	Isolation and quarantine are considered "police power" actions in the health sector. How can you distinguish the two? (10 seconds pause)
	How do you consider having both rights and privileges before withdrawing from being a research participant? (12 seconds pause)
Guiding students to formulate counterarguments	The idea of increased production is good, but how about the possibility of built-in resistance to pests of GM crops?
	Yes, it is available, but is it really accessible?
	But can you really invoke your right to say "No" for being quarantined.
	Yes, is mandatory to report misconduct in research; how about the reputation of the lab?
Eliciting examples that either support or refute the claim	Can you cite an example of how GM crops solved hunger issues?
	You mentioned scientific obstacles of gene therapy. Can you mention some based on your readings?
	Which among the health facilities do you think you have the right to access?
	Can you name some global organisations in-charge of research standards? How do they differ from one another?
Asking issue-based question	Have you looked into the production of new toxins?
	Is there a possibility for mutation that may be manifested in the next generation?
	How about if you are on a medication? Who will take care of your medicines?
	What about universalism…like is there a one size fits all global standards?

Table 4. (*Continued*)

Functions of the dialogic prompts	Sample dialogic prompts
Stating personal arguments and reiterating	In my opinion, scientists cannot detect immediately or predict allergies associated with GMOs
	My stand is provided that germline is preserved…
	For one, agreeing for quarantine is not only for yourself, but for the whole population…
	What I propose is that any research should take into consideration the social benefits...

DISCUSSION

The idea of dialogue with a central role in cognitive development can be traced back to the Socratic tradition of questioning and challenging students to think by themselves (Lyle, 2008). In fact, according to Corson (1988), students can be 'prompted towards more sustained levels of formal operational thinking by providing them with regular opportunities for dialogue with others' (p. 66). In Mr. Chris' class, the dialogic exchange and meaning making was derived from the multiple perspectives that the students elicited from his dialogic prompts. These were embedded in any of the conceptual, analytical, and reflective dialogic prompts with varying functions. This supports Brown and Renshaw's (2000) ideas of Collective Argumentation who proposed that teacher's dialogic prompts should increase students' participation. In this study, these were embedded in any of the conceptual, analytical and reflective dialogic prompts which encouraged students to work together as they build each other's agency to achieve coherent thinking and consensus. Classroom argumentation was utilised as the platform for them to express their agency in the learning process when they were encouraged to ask questions, state their points of view, challenge and critique the new knowledge to convince their peers.

Interesting light is shed on the findings of this study when students' uptake of their teachers' dialogic prompts resulted to shared opportunities for talk. Providing each other 'wait time' served a dual purpose: first is for their voices to be properly heard and articulated; and second is the opportunity for proper uptake of their dialogues. Through 'distributed talk' opportunities, multiple perspectives were brought into the discussion that increased the argumentative exchange of ideas.

Based on the overall iterative analyses, students were able to configure their learning of content when they were responsive to their teachers' provision of autonomy in discussion which encouraged them to question, propose, and challenge each other rather than simply assimilating facts (Engle & Conant, 2002). With Mr. Chris' intentions to move away from the traditional Initiation Response Evaluation (IRE) pattern of classroom interaction, students' science content and argumentative agencies were simultaneously developed— a response to NRC's advocacy of students' critical analysis of socio-scientific issues (NRC,

2012). This also supports the proposal of Zohar and Nemet (2002) that more than conceptual and factual knowledge, teachers' dialogic scaffolding for argumentation is a promising method for the gradual enhancement of students' communication skills.

Recognising the value of their scientific knowledge capitals in his dialogic prompts, Mr. Chris allowed their classroom inquiry process to extend beyond science content learning through a process that mirrored the interwoven nature of social interaction in knowledge building. Moreover, the functions of his dialogic prompts were utilised to let his students as laypersons experience the complex nature of scientific argumentation. This supports Driver et al. (2000) whose advocacy is to let students be familiarised with scientific inquiry. As he acknowledged the value of their knowledge bases, his dialogic prompts were devoid of arresting the application of science topics within the confines of the classrooms. Through his thoughtful prompts, the classroom turned into dialogic teaching and learning environment which scaffolded the students during their exploration and debate of current scientific theories and applications.

CONCLUSIONS AND IMPLICATIONS

To conclude, results of this study support the notion that success in implementing classroom argumentation depends on a teacher's scaffolding intentions. In this study, three types of dialogic scaffolding prompts were used as scaffolds: conceptual, analytical, and reflective. Each of these had different functions to sustain the students' participation in classroom argumentation. The study therefore implies that with teachers' provision and utilisation of appropriate dialogues, students were empowered to think and learn. Through dialogic scaffolding, students derive meaning of the scientific knowledge from multiple voices embedded in any of the conceptual, analytical, and reflective dialogic prompts. These dialogues provided the students with personal and collective agency to support each other in experiencing argumentation as an epistemic practice.

LIMITATIONS AND RECOMMENDATIONS

The main purpose of this study was to document the types of dialogue used by Mr. Chris and how they acted as 'movers' for the students to participate in classroom argumentation. I used the special case of Mr. Chris who academically possesses content knowledge in Bioethics. Thus, one limitation of this study is that results are not representative of all teachers with intentions to implement dialogic scaffolding for classroom argumentation. Another limitation is that during the iterative microanalysis, only the types and functions of dialogic prompts were considered. In previous studies on dialogic exchange, the network of dialogues was explored which was not done in this study. It is therefore recommended that future studies conduct social network analysis to determine the extent of participation of each student to ensure distributed scaffolding for all students. This is particularly important when some extremely active students tend to dominate the discussion.

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