The Stage's of Sharing Knowledge among Students in Learning Environment: A Review of Literatur

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Abstract
Students engagement is still a challenge that often faced by math teachers in the daily classroom. Lack of quality math-talk, and one-way communication process while discussing the subject matter resulted in inhibition in developing students knowledge. Thus, this article reviews literature related to knowledge sharing among students in the classroom, factors that potentially influence the knowledge sharing flow among students, and future research opportunities. The literature search was conducted using ERIC and Researchgate database. The main features of each reviewed article are categorized based on the variables that affect the pattern of knowledge sharing, which involve classroom factors and personality traits. Based on the literature review results, there are four stages of knowledge sharing among students, such as asking, explaining, elaboration, and posing problem. These four stages are still theoretical framework so further research should be done to measure their effectiveness in enhancing student learning engagement.

Keywords: knowledge sharing Stages, knowledge sharing scaffolding, knowledge sharing behavior

1. Introduction

The idea that active students engagement improve students learning is not new, but to implement them properly in a daily classroom is still a challenge that is often faced by the mathematics teacher. Based on Wagganer study (2015), what usually happens in everyday math class is that students eager to participate in mathematical discussion but lack of math-talk quality. The process of communication that occurs is one way because they often jump to the solution and that could lead to a passive learning. It seems like not everybody knows what it means to be actively engaged in math class.

Based on Imm and Stylianou studies (2012), there are differences of views between teachers and students on the causes of low student learning engagement in the classroom. Based on their finding, the lack of student knowledge is sometimes viewed by teachers as a form of students' reluctance to be actively involved in the learning process. Meanwhile, according to the students, the reason they prefer silence is that they are afraid to take the wrong risk when answering teacher questions. As a result, the questioning, explanation and clarification process is generally done by teachers.

A passive student learning pattern was also discovered by Ampadu (2013) through his research of 22 junior high school students in the Cape Coast Metropolitan of the central region of Ghana while investigating students' views of what they should do to succeed in learning mathematics. Based on his finding, most students believe that if they follow the instructions and procedures exemplified by the teacher then their answers will be automatically correct. Only 27.6%

of students view the use of different problem-solving methods as part of their success in learning math.

The three conditions above show that the effectiveness of student interaction and participation is not determined simply by looking at the frequency of student interaction during class discussions. In other words, even though active students indicate an active class but a busy class may not necessarily indicate an active class.

The social interaction between students with their peers, teachers, and their learning environment is one of the main elements that mediate the development of students' knowledge during the learning process. However, to maximize the potential of students learning interaction, teachers' must have the ability to condition students to explain each other in order to facilitate the exploration of reasoning and point of view, and the exchange of ideas among students in forming a common understanding (Goos and Reshaw, 1996; Jeong and Chi, 2007).

Suyanto (2015) and Hidayah et al (2016), in their study found that generally teachers in Indonesia are less able to attract students to ask questions when implementing a scientific approach in mathematics. Extra grades to motivate students in asking, only responded with low-level question form. In the end, the questioning is done by the teacher and the discussion process generally comes from the questions in the textbook. As a result, students see the process of communicating the results of the discussion became less interesting so that the development of high-order thinking ability of students is not achieved maximally.

Meanwhile, the findings of Wiratmaja et al (2014) show that the lack of teachers' ability to develop classroom environments that facilitate the open exchange of student ideas leads to problem-based learning (PBL) implementation not optimal in improving mathematics self-efficacy in students. On the other hand, students low self-efficacy can lead students to become passive learners (Abdullah et al, 2012), not confident and have a negative attitude towards mathematics (Sharma, 2014). Consequently, students' anxiety toward mathematics becomes increasing (Yüksel and Geban, 2016) and student academic performance decreases (Magnano et al, 2014).

The description of the above results is not intended to demonstrate the failure of teachers when implementing a learning approach in the everyday class or to state that the two approaches of learning are not effective in achieving the learning objectives. In this case, the author is only trying to see other potential that may be hidden and missed by the researchers so that it does not touch the root of the problems of daily math teaching. For example, Lirnawati (2016) claimed in her study that the think-pair-share (TPS) model is more suitable to measure students' ability than as a learning strategy in mathematics. According to her, the learning process will be more effective if it done with classical learning. But the problem is, she interprets the stages of share as a student activity in sharing the results of group discussions with other classmates. Yet when viewed from the mechanism of TPS, share stages have actually started since students paired with their group while discussing the problems faced. In theory, the meaning of sharing has two main contexts, namely collecting or receiving knowledge, and disseminating or contributing knowledge (Alhady et al, 2011). Thus, share also can be seen as a process of sharing questions that contain certain difficulties, sharing ideas and students' perspective on the problem, which can lead them to the search for the right solution. Based on all the problems in the research above, it appears that the lack of teachers ability in facilitating and guiding students to communicate in both directions in sharing knowledge becomes the base of problems in implementing learning strategies.

Knowledge sharing activities are part of the social interaction between all the learning components in the classroom. The activity involves the exchange of knowledge among participants who during the process are communicated and formed to develop the knowledge that each participant has (Chikoore and Ragsdell, 2013). This has been demonstrated previously in the Akram

and Bokhari (2011) study that, knowledge sharing activities are positively related to individual performance levels. The basic principles underlying these activities can develop students' appreciation of the essence of knowledge (Burch, 2007) and improve the process of student collaboration in solving problems (Ghadirian, 2014). However, the variety of characteristics of students in one class (both in terms of knowledge, learning experience, and personal emotions that each student has), often becomes a barrier to the smooth flow of knowledge sharing. In fact, although some students are able to see their friends as an important source of knowledge but a lack of students 'self-belief to their ability (Mohd et al 2012) and their group ability, and the high element of competition among students, often lowers students' motivation to share knowledge and engage in interaction discussions (Chikoore and Ragsdell, 2013; Liu et al, 2014). emphasis

The importance of suppression of knowledge sharing in the learning process has inspired some researchers to examine more deeply the meaning and usefulness for the students. But most of the research is done on the distance learning process for students at college level (See, Chiu, 2010; Mohd et al, 2012; Chikoore and Ragsdell, 2013; Majid and Citra, 2013; Liu e al, 2014). Generally the main focus of their research is the investigation of factors that can foster and impede knowledge sharing among students as well as create a learning environment that facilitates knowledge-sharing activities through technology (such as internet and certain software) so as to replace face-to-face meetings as they usually do occurs in the conventional class. On the other hand, research on knowledge-sharing activities in the context of conventional classroom learning is still rarely done especially for junior high school students. Although Nuriadin et al (2015) has been able to prove that the concept of sharing knowledge can be used as an active learning strategy in improving students' reflective thinking skills. This is why the author sees the need for further research to identify the meaning and mechanism underlying the knowledge-sharing process so as to optimize the learning process in the classroom.

This study, thus, aims to determine how knowledge-sharing activities can drive student learning engagement. First, the authors review and integrate the pedagogical aspects of knowledge sharing activities to investigate how environmental characteristics, scaffolding, forms of knowledge, individual behavior in knowledge sharing, knowledge sharing among students, and the process of creating new knowledge in shaping student learning engagement. This review is intended to investigate the components that can be developed as a knowledge sharing mechanism among students of a learning community. The concept of mechanism here is a form of learning stages aimed at facilitating students sharing knowledge. Second, the results of this review are accompanied by future research needs.

This study begins with a brief explanation of the review strategy used by the authors in identifying the literature sources relevant to the aims of this study described in the method section. Furthermore, the researcher describes the data of literature review that has been done. Then, the author presents the discussion and conclusion. Finally, the authors present some direction for further research.

2. Method of Study

This article is a literature review of several journals from ERIC databases and researchgate. In addition, several proceedings are also selected from the database which have been published in the last six years. The process of selecting the source of the literature is tailored to the theme of this article, which is knowledge sharing activity in the learning process of mathematics. The snowball method is used to review the reference (source) that is used as reference by each literature source studied. The review process is done narratively to describe conceptualization, the factors that influence and benchmark knowledge sharing activities, and the development of knowledge sharing

activities components in the learning process based on theories and empirical results from selected literature sources.

All selected literature sources are categorized into several categories to assist the authors in explaining the main features of this study. This category is structured by adopting the framework of common knowledge-sharing patterns proposed by Chong et al (2014), namely personality traits, classroom factors, and technological factors. Of the three patterns, technological factors are not used because the knowledge sharing stages that will be generated in this article are intended for conventional teaching process (involving face-to-face) without using technology. The personality traits are used to describe the behavior and perceptions of students in sharing knowledge. While classroom factors are used to describe teachers scaffolding, sharing and creating knowledge process, and sharing strategies.

3. Results

Six articles were choose as the main source that author see qualified for coverage for this review. A more detailed explanation about those articles will be described below.

Study 1: Sharing Knowledge Scaffolding

Ng'ambi and Hardman (2004) conducted a study of 25 university students who take distance learning with the use of *web-based communicative space* to create a form of knowledge sharing scaffolding based on students question. The authors use the scaffolding technique proposed by Wood (1976) and the concept of social influence on students' cognitive development by Vygostky to create a learning environment that facilitates discursive interaction of students, both among students and teachers. In this case, social interactions that can strengthen interest, sharpen the focus and orientation of students on the purpose of the given task, and model the skills of critical engagement. The authors used Dynamic environment Frequently Asked Question (DFAQ) as a learning medium that has two texts in it that trigger the cognitive conflict within students so that it is motivated to produce relevant questions. Therefore, Sharing knowledge activity is seen as a form of learning from each other using sharing and seeking knowledge through question and responses.

Research data collection is done through observation and interviews. Sharing knowledge activity is seen as a form of sharing and seeking knowledge through question and responses. The result of this study showed can shape a learning environment that facilitates students to share knowledge through questions and responses that they ask even though it wasn't produced by themselves so the scope of their learning became more widespread. Therefore, students are encouraged to regulate their own learning process. Through questions and responses that were recorded in DFAQ, teachers can adjust the shape of scaffolding that will be done by modeling the form of questions and responses are appropriate to the students' needs.

A similar approach is also done by Choi et al (2005) in facilitating the students to master the ability of metacognition and learning through effective peer-questioning scaffolding during the discussion online. The Author forms a peer-questioning scaffolding framework based on three assumptions. The first assumption was adopted from Palincsar and Brown (1984) about the need for external support to increase the frequency and quality of students' metacognitive questions. The second assumption is adopted from Forman and Cazden (1985) on the need for guidance that can direct the type of student questions to trigger articulation, cognitive conflict, and co-construction of knowledge in students. The third assumption was adopted from Piaget (1985) and Webb and Palincsar (1996) about the depth of students' reflective ability to reorganize their knowledge when receiving critical and personal questions from their own friends. Research results indicate that when students are conditioned to generate questions, it will be able to facilitate the reconstruction of students' ability to reflect and monitor their own understanding so that they can improve and

rearrange their knowledge. The role of the teacher is to led students question in a form of clarification or elaboration question, counter-argument (an argument opposite to that expressed by other friends), and question-oriented context or perspective.

Study 2: Sharing and Creating Knowledge Processes, and Sharing Knowledge Strategy

Yeh et al (2012) utilizing the theory of knowledge management (KM) based on Nonaka and Takeuchi (1995) to develop a learning model that was integrated with e-learning towards 36 student teachers. The blended KM model developed by the author involves the process of knowledge sharing, knowledge internalization, and knowledge creation. The development is based on the views of Alavi and Leidner (2001) on knowledge sharing as a major component of the KM system that can influence one's creative behavior, Kinney's (1998) view of KM used as an organizational mechanism to improve the process of knowledge creation, as well as the views of Nonaka and Takeuchi (1995) about knowledge internalization as the main process of explicit knowledge change into tacit knowledge so as to serve as a liaison between knowledge sharing and knowledge creation. This experiment was carried out for 17 weeks. The study results, both quantitatively and qualitatively, demonstrate that the blended KM model can effectively improve students' knowledge, dispositions, and creativity. Online sharing and evaluation conducted on every creative product that has been produced by students, community learning and discussion, as well as the practice of creativity strategy has a profound effect on every aspects of students creativity. Peer observation and evaluation of the task group and feedback related to students creativity can create and enhance students knowledge and dispositions during learning. Last, product creation and scaffolding committed teachers are critical to skill improvement.

Jaleel and Verghis (2015) also conduct a study using Nonaka and Takeuci four modes of knowledge creation (1995) consist of socialization, externalization, combination, and internalization to explore the effectiveness of e-learning in enhancing students knowledge creation process in secondary classroom. Socialization is used to describe student behavior in sharing their experience and know-how with other classmate. It is an acitivity that involves the creation and exchanging process of students tacit knowledge. Externalization is used to describe students attempts to rationalize tacit knowledge and articulate it into explicit concepts and formal models. Combination is used to describe students involvement in combining and exchanging different explicit knowledge to explicit knowledge with others. Where as internalization is used to describe students attempts to transform explicit knowledge into tacit kowledge and internalize the improvement of individual experiences in the form of shared mental models. As for learning environment, the authors used Vygotsky socio-cultural theories of learning (1978) as learning principles with regard learning as a social activity and participation involving mutual enggagement with other members of the the group in negotiating meaning. The authors also used the idea of constructivism using Porter et al. (1995) and Choo (1996) point of view about the dynamics of prior knowledge and the creation of new knowledge to create knowledge building environment so that students can act as a producers of knowledge when learning new Materials. The authors believe that to transform educational practices, teachers need to understand the nature of knowledge it self in order to provide new ideas about how students active engagement, meaningful learning and knowledge advancement could be facilitated.

Using two group postest-only towards 80 secondary school students in 9^{th} grade, authors found that e-learning environments provide rich variety of experiences to enhance students knowledge creation process than tradisional classroom environments. In their study, the role of multimedia technology does make a great contribution for the teachers ability to transfer and share valuable knowledge to learners.

The used of Nonaka and Takeuci four modes of knowledge creation (1995) once again done by Nuriadin et al (2015) in their study as knowledge sharing learning strategy to enhance students mathematical reflective thinking ability. Knowledge sharing strategy in their study compries of socialization, externalization, combination, and internalization. In this study, the authors slightly change the order between combination and internalization but the main principle in each phases were still the same. Even though their study using managemen knowledge as one of the main concept for knowledge sharing strategy but they didn't use the term tacit and explicit knowledge explicitly as it is in Nonaka and Takeuci (1995). Instead, they used prior knowledge and learning experience as tacit knowledge and discussion result and written expression toward concept that their learn as explicit knowledge. The authors used pretest-posttest control group of 140 students in 8th grades of Senior High School in Tangerang City Indonesia. Resulf of the study shows that students who learn by knowledge sharing strategy gains so much improvement in mathematical reflective thinking abiliy rather than students in conventional class.

Study 3: Students' Perceptions and Knowledge Sharing Behaviour

Majid dan Panchapakesan (2015) conduct a study in the classroom setting to investigate students' knowledge sharing behavior with their classmates, frequency and type of knowledge shared, preferred communication channels, and factors that motivate or hinder students to shared their knowledgeIn their study, knowledge sharing is seen as an important component of the collaborative learning process. Students perceptions and behavior in sharing knowledge is measured using a questionnaire towards 220 students in 12th grade who came from two higher secondary schools Kerala state of India.

They found that the most selected learning resources by students is the internet. However, classmates and teachers become students' second choice that they seen as an important source of information. Meanwhile, most of the students see knowledge sharing as attempt to clarify or discuss the examination-relatted matters, and to solve the problems associated with the material being studied. Furthermore, authors also found that the frequency of students in sharing their knowledge with their classmates will be higher when the task or the problem to be solved doesnt involve grading from teachers. It was also report that students are more motivated to share their knowledge if they working on a common topic assigment with their classmate in a group assignments. The resource materials are most commonly shared among students are "class notes/hand outs" which comes from the teacher. Only a fraction of the students who are willing to share the tasks that have been completed. The thought of being cheated almost hinder their willingness to share their knowledge.

Most of the students prefer to communicate in a face to face interaction. The closseness, a chance to capture the non-verbal clue and feedback or a quick response from their friend to seek clarification are the elements held in face to face interactions. Most of students preferred classroom as their best option to share their knowledge, such as answering question, seeking clarification, making a comment on the topic under discussion, and responding to a question that being ask or comment made by others. Most of the students are motivated to share their knowledge to develop friendships with other students, self satisfaction, to improve understanding of the concept learned in the class. Another reasons were to get reward or marks for class participation and to impress teachers. In addition, most of the students feels that class discusions and group projects were considered as the most effective method for encouraging them to share their knowledge and viewpoints. Learning through collaborative bring mutual inter-dependence aspect that encourages them to actively share their personal knowledge and ideas with their group members. In other hand, lack of time and lack of in-depth relationship among students were likely to inhibit knowledge

sharing activities. Moreover, the fear of the posibility any differences in opinion may disrupt friendships and not knowing what they have to share were also hinder the activity.

4. Discussion and Conclusion

Based on the data outlined in the six articles above, it is seen that the process of knowledge sharing is not only a term of participation and learning interaction of students, but can also be viewed as a learning strategy that can help students to collaborate with teachers and other students in acquiring new knowledge and solve the problem. One of the educational implications of the research in study 2 shows that knowledge sharing activities support the collaborative process of students in constructing their own knowledge and triggering the process of creating new knowledge. This means that the learning environments should facilitate the students' ideas to get out into the world and make them available to be discussed, interconnected, criticized, revised, and superseded.

In study 3, it appears that the desire to be part of a community is a considerable factor in influencing willingness to share knowledge. But the willingness of the student may be limited by the fear of the possibility of being cheated by another friend. This show that the students do not quite understand the difference between the concept of knowledge sharing and the use of information in an unethical way. This condition is in accordance with the views of Wangganer (2015) which expresses the students' lack of understanding that working with their group (friends) means working towards the same goals causes students to choose to work individually.

Based on studies 1 and 2, knowledge sharing activities minimally involve two related parties, namely the knowledge giver and the recipient of knowledge. In study 1, the process of knowledge sharing is greatly framed by questioning activity. Asking is a reflection of a knowledge seeking activity because it is a person's internal process in formulating his curiosity about something that is externalized by proposing it or presenting it to others. In study 1, it was reported that in order to smooth the flow of knowledge sharing, the task given should trigger student cognitive conflict. This means students' curiosity may come from confusion or because of the cognitive conflicts experienced by students. Therefore, teachers need to master scaffolding techniques that can provoke students in asking.

In Study 1, explaining activities can be viewed as a form of response to a given question. In study 3, this activity can also be viewed as a student feedback on a friend's question. Therefore, explaining activities can be considered as knowledge-sharing activities.

In learning mathematics, the process of explaining is part of an effort to communicate mathematical ideas that students have to a question or a mathematical problem. In the process of explaining, students are encouraged to link the separate pieces of information from a problem to make it easier for their friends to understand. In addition, the process of explaining can also be done to him when the questions present come from within himself. The process of self-explanation has a working principle that is different from the process of explanation in others. Self explanation is internal and personal while the explanation on others is more interpersonal. Therefore, the process of asking and explaining basically shows the first two phases in the process of knowledge sharing, namely socialization and externalization as shown in study 2

In Study 3, it was reported that generally students can see the process of sharing knowledge as a questioning activity, answering questions, clarifying, and commenting on the material being discussed. In Study 1, it was reported that the role of teachers is to direct students to ask clarifying and elaboration questions, as well as self-oriented questions. This shows that the elaboration process becomes part of knowledge sharing activities.

By definition, elaborating means adding symbolic construct to what students are trying to learn to be more personally meaningful (Weinstein et al., 1988: 17). In this case, the process bridges

the formation of new personal knowledge because as students consciously focus the processing of new information with their relevant knowledge, experience, and beliefs, it will help students to provide connection points to previously meaningless symbol data into things Important because it is added or used to modify the relevant personal knowledge. As a result, the elaboration process can create personal meaning, which is a reason of why new information is important for students to learn.

Elaboration is a process that facilitates students to organize their knowledge into a more coherent structure and integrate new information with existing knowledge structures. In the study 2, it is mentioned that externalization is a student effort in rationalizing tacit knowledge and articulating it into the concept of explicit and formal model. While combination is a process of combining different explicit knowledge. Therefore, the elaboration process reflects the process of externalization and the combinations mentioned in study 2.

In study 2, it was revealed that knowledge sharing activity can trigger the presence of new knowledge. Through internalization, students transform explicit knowledge into tacit knowledge and internalize the development of individual experiences into shared mental-model forms. This means there is a particular process that facilitates students to reflect and evaluate the information and knowledge they have learned before into other relevant but relevant situations. According to Stoyanova and Ellerton (1996) the problem-posing activity shows students' efforts in constructing their personal interpretation of the concrete situation based on their experience which is then formulated as a meaningful problem. Therefore, the process of internalizing knowledge can be supported through the activity of proposing new problems.

New problem-generating or question-making activities can also be used to determine the accuracy or correctness of solutions that have been offered or obtained before. In this case, the students can be invited by the teacher to compare the solutions obtained with their arguments, and to identify the possibility of other methods of solving or improper reasoning.

Overall, study 2 shows the basic characteristics of the knowledge sharing process among students. While studies 1 and 3 show the working principles and factors that influence the smooth flow of knowledge sharing. Therefore, the composite of the three studies shows the components that can be used as the stages of students to share knowledge as described in this chapter of discussion. The stages of sharing knowledge are: (1) asking, (2) explaining, (3) elaboration, and (4) forming new problems. These four stages can be seen as knowledge sharing cycles that have interrelated nature.

5. Future Research Directions

Publications on knowledge-sharing activities are generally aimed at distance learning and at higher levels of education. The stages of sharing knowledge described in this article are for face-to-face (conventional) learning and can be applied with or without technology. Based on the characteristics of each stage, these four stages can be implemented in the process of daily teaching which in one class has students with diverse thinking skills. However, this stage will not run smoothly without the help of the teacher as a student facilitator to share knowledge. Therefore, teacher scaffolding techniques play a role and need for further studies to examine the effectiveness in facilitating the movement of sharing knowledge stages. Further studies are also needed to test the effectiveness of the stages of sharing knowledge generated in this article. In addition, testing the correlation of each of these stages on student motivation and perception in sharing knowledge is also very necessary to measure its success.

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