

Perceptions of pre-service chemistry teachers on the utilization of productive lesson study as a framework for teaching and learning

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(Received 14 May 2017; Accepted 25 July 2017)

The present study determined the perceptions of pre-service teachers on utilizing productive lesson study as a framework in teaching high school chemistry. Participants of the study were thirty (30) junior pre-service chemistry teachers from a state-funded teacher education institution in Manila, Philippines. Participants were exposed to a training-workshop on lesson study and productive pedagogy prior to getting their perception. Lesson study is a form of collaborative lesson planning while productive pedagogy is a framework for evaluating effectiveness of a teaching strategy based on intellectual quality, connectedness, recognition of difference and supportive classroom environment. Results of the study indicated that although most of the participants agreed to utilize the framework, most of them did not grasp the essential process of productive lesson study. On the other hand, all of them agreed that the framework will help improve the teaching skills of teachers and will therefore result to a greater achievement in chemistry among students. Disadvantages that they foresee in the framework include time element and exclusivity. The productive lesson study process will take much of their time and that formulated research lessons might be exclusive only to a group of students and may not be applicable to all.

Keywords: Productive Pedagogy, Lesson Study, Productive Lesson Study, pre-service chemistry teachers

INTRODUCTION

Lesson study has been used in Japan for many years. It is a form of classroom inquiry where teachers often plan, teach and observe collaboratively and share results in a single class lesson. Internationally, it is an arising method for studying classrooms and professional development in teachers. However, in the Philippines, only a few numbers of researchers are studying the varied use of lesson study and most of these research projects are coming from the University of the Philippines National Institute for Science and Mathematics Education Development (Lucenar-io, Yangco, Punzalan & Espinosa, 2016).

Pieces of evidence show that lesson study is an effective method however, the technique is commented to have lacking theoretical basis that is reflected on lessons and teaching. Therefore, the study integrated productive pedagogy as a framework for evaluating teaching effectiveness. This pedagogical framework was developed in the State of Queensland, Australia to determine if a common language can assist teachers in changing their practices towards quality teaching. Productive pedagogy can further be used in the country through the recent introduction of K-12 Curriculum where quality, inclusivity and relevance are the three integral pillars for the future of school education in the country. These three basic visions of the curriculum are focused on the different dimensions of the productive pedagogy. This means that productive pedagogy framework can directly contribute towards having teachers equipped for adapting the new curriculum.

Integrating lesson study and productive pedagogy was first done by Espinosa, Elipane and Atweh in 2014. They coined the title "Productive Lesson Study" for the said integrated framework. In their study, they used lesson study as a tool to prepare for lessons while the productive pedagogy as a language structure to reflect in classroom teaching in the K-12 basic education in the Philippines.

The main objective of this study is to determine the perception of pre-service chemistry teachers about productive lesson study as a framework in teaching chemistry in high school.

In particular this study seeks to answer the following research questions:

1. How do pre-service chemistry teachers see themselves as a teacher utilizing the productive lesson study framework?;
2. Do pre-service chemistry teachers think this framework will help improve academic achievement in chemistry compared to traditional teaching?;
3. What are the perceived advantages and disadvantages of this framework?; and
4. Do pre-service chemistry teachers suggest that this framework be utilized in the K-12 basic education schools?

Background: Productive Pedagogy

From 1998 to 2001, a large commissioned research project was funded by the Department of Education in Queensland. The project was known as the Queensland School Reform Longitudinal Study (QSRLS) in which the concept of productive pedagogy was developed. Productive pedagogy is a balanced theoretical framework that enables teachers to reflect critically on their current classroom practices, where they can choose and develop strategies related to either what they are teaching or the variable styles, approaches, and backgrounds of their students. In a way, it serves as a means of engaging in conversations about teaching practices with colleagues and focusing on the individual needs of the students, all the while using a common professional vocabulary (Chapius 2003). Productive pedagogy is especially helpful for teachers if they want to consider the following: (1) if all the students they teach engaged in intellectually challenging and relevant curriculum in a supportive environment, despite their different backgrounds; (2) if they think that their teaching and assessment practices support or hinder their students' learning outcomes; and (3) if they are seeking opportunities where they can critically reflect upon their work with colleagues (Martin & Guy, 2002).

Productive pedagogy has been widely adapted not only in Australia but also in various other countries as a research tool and metalanguage that supports teachers in critically reflecting on their current practices (Mills *et al.*, 2009). It tackles several important issues such as addressing methodologies that gives importance to pedagogical processes, supporting critical approach to differences, including students' perspectives, and recognizing the significance of content knowledge in the assessment of quality pedagogy. Although the main focus of the study is confined to the classroom, it is important to emphasize that the teachers alone cannot make the difference simply by changing their practices. In order to realize high quality outcomes, the collective support of the school communities and the systems where they are situated are required.

There are twenty productive pedagogies categorized into four major dimensions: intellectual quality, connectedness, recognition of difference, and supportive classroom environment (Gore, 2001). In using this model, classroom observers are asked key questions for each pedagogical strategy in order to focus on that aspect of the classroom. These are then given a code between 1 to 5 based on the quantity or quality of that pedagogy present in the class (Lingard, Hayes, Mills, 2003). A study by Mills, Goos, Keddie, Honan, and Wright (2009) presented a refined methodology that addresses the importance of pedagogical process. They also substantiated the inclusion of particular items within the framework, supported a critical approach to issues of difference including students' perspectives and recognized the significance of content knowledge in the assessment of quality pedagogy.

Based on documented pedagogical practices conducted by the QSRLS from 24 different schools in Queensland, both in primary and secondary levels, a model was created that incorporated Nancy Fraser's concept of the politics of redistribution of resources, that is, recognizing the varying contributions of different groups, and representations. Using this model, pedagogies are then differentiated to support the role of schooling as a good in itself, a positional good, and a good that contributes to making a difference in a diverse society. The reality is that the social and economic situations that many students live with make the task of providing them with more equitable outcomes become more difficult. The model then theorizes the redistributive, precognitive, and representative justice possibilities of productive pedagogies, which leads to more equitable outcomes, especially for marginalized students (Lingard, 2013).

One study explores the results of a pilot study involving the experiences of fourth year teacher education students who attempted to apply the fundamentals of productive pedagogy during their internship (Gore, Griffith, & Ladwig, 2001). They concluded that productive pedagogy must be introduced earlier in the teacher education curriculum so that it becomes part of the students' teaching practices. The language of productive pedagogies, as perceived by pre-service teachers, helps them develop their critical thinking. In addition, students realize that in order to achieve improved student outcomes, they must recognize the use of higher order thinking, connectedness, and recognition of and interacting with student differences within a supportive classroom setting (Zyngier 2005).

As more studies emerge, one exploratory paper cited the need for teachers to use more productive pedagogies in order to improve students' learning (Sytsma, 2006). From this, it was

suggested that teachers need to be more radical still in order to be more effective. They need to consider the idea that they may be able to produce their own acts of learning within their professional learning communities. The way pedagogy is practiced changes over time, therefore teachers can become productive pedagogues to meet not only their own learning needs but also the needs of their students and society as a whole. This paper further elaborates that professional learning communities are able to support teachers in producing learning and also how productive pedagogues can become leaders within the act of learning.

Lesson Study

Teachers have been used to being independent when it comes to their teaching strategies. Most of the time the only gauge they use to assess themselves are outcomes of students in examinations, projects and other classroom activities. Further, they also rely on the evaluation of their superiors like their head teachers, and at times, supervisors. Educational researchers and developers have been working hard to change this norm. Much focus now is given to reflective assessment of teachers of their own or a colleagues' teaching practices and its effects on student learning. This work is evidenced by the productive pedagogies Framework designed in Queensland School Reform Longitudinal Study in 2001 that allows teachers to reflect critically on their work (Martin and Guy, 2002).

Lesson study that has its origin in Japan is founded on the same idea of reflective assessment. But unlike that of productive pedagogy framework, this is collaborative. Teachers will work together to plan a lesson in a backward design. Backward design is planning based on decided goals of an effective long-term learning for the students (Perry & Lewis, 2009).

The process of lesson study involves bringing teachers together to plan a lesson. By their individual experiences put together, their lesson plan is expected to be rich and well-constructed. These same individuals will carry out the planned lesson in a class where one teacher in the group will conduct the lesson while the others are meant to observe and gather evidences on student learning and development. After the implementation, the group will meet to discuss and reflect on the observations made which will be used to improve the lesson plan itself as well as the delivery or instruction (Perry & Lewis, 2009). This is collaborative work.

By definition, lesson study is a cooperative approach between teachers and coaches to discuss queries of each one about their work and to consolidate inputs from the experts regarding these concerns. The questions and answers will come from the same experts who are the members of the group. Therefore, in this set-up all members of the group, teachers and coaches, are of equal footing and both continue to grow as learners (Lewis, 2011).

The potentials of lesson study incorporation and use of pre-service teachers in mathematics to put theories into practice for better and deeper understanding of mathematical concepts has been studied by Elipane (2011). The results showed possible problems on how the student teaching practicum is implemented as well the direction of its goals. Primarily, pre-service teachers lack sufficient time to reflect and make sense of the reforms of their beliefs and practices in teaching as diagnosed through lesson study.

Another study was done in Thailand with first grade teachers which consist of two in-service and one pre-service teacher from Kookham Pittayasan School. The outputs, lesson plan, observations and reflections, support the idea that cooperating teachers and pre-service teachers are better working collaboratively than in an authoritarian set-up (Kanauan, 2013).

The various results of lesson study researches in both pre-service and in-service teachers clearly show a shift in the beliefs of teachers. For one, the study of Inprasitha (2013) resulted to teachers re-evaluating their beliefs in teaching mathematics, learning mathematics and social contexts. There is an initial shift from a teacher-centred approach to a more open strategy that practices providing space to their students during difficulties in learning. In support to this shift, Cajkler (2014) claimed that teachers engaging in lesson study tend to understand their students better, develop a stronger teacher community and use a teacher-centred approach less frequently.

In the lesson study theoretical model cited in the article of Lewis (2009), lesson study improves teaching in three pathways concentrated in the teachers themselves. The changes target the beliefs and knowledge, professional community and teaching-learning resources through investigation, planning, research lesson and reflection as lesson study features.

METHODS

Study Design

The study utilized the exploratory case study research design. According to Stake (1995) and Yin (2003), case study is based on the constructivist approach wherein meanings are objectively created or constructed from the actions and experiences of the participants. Yin (2003) reiterated further that exploratory case study explores situations about an intervention that has no clear outcomes. The present study explores the perceptions of pre-service chemistry teachers on the use of productive lesson study as a framework in teaching and learning.

Participants

A group of thirty (30) junior pre-service chemistry teachers from a state-funded teacher education institution in the City of Manila, Philippines participated in the study. They were currently enrolled in a course entitled "Strategies and Instrumentation in Teaching Chemistry" and were a semester away before their practicum in teaching (internship).

Data Collection Procedure

One meeting was utilized for a training workshop on the use of lesson study and another meeting for productive pedagogy. The invited resource person on lesson study is an expert in the field. The resource person completed his Ph.D. degree with a research project on lesson study and has also conducted numerous studies utilizing lesson study in Japan, Denmark and the Philippines. On the other hand, the invited resource person for productive pedagogy is a well-known education researcher and expert in the field of productive pedagogy who has taught in different universities in Australia.

Right after the introductory workshops, a questionnaire was handed to the participants asking about their perception about productive lesson study. The questionnaire contains four open-ended questions: (1) How do you perceive yourself as a

chemistry teacher utilizing the productive lesson study framework?; (2) Do you think the productive lesson study framework will help improve academic achievement in chemistry among K-12 basic education students? Why or why not?; (3) What might be the possible advantages and disadvantages of this teaching framework?; and (4) Would you suggest that this framework be utilized in K-12 basic education schools? Why or why not?

The participants used the English language to talk about their perceptions so the transcripts were encoded as is.

Data Analysis Procedure

The analysis of the transcripts involves the following steps: (1) Reading and rereading of transcripts; (2) thematic coding and categorizing; and (3) interpreting the text. During the reading and re-reading stage, the researchers look for patterns and connections keeping in mind the aims and objectives of the study. The next stage is thematic coding and categorizing wherein the transcripts were indexed and categorized to establish a framework of thematic ideas about it. The last stage is the making meaning out of the thematic ideas arising from the coding stage.

FINDINGS

Theme I: Productive lesson study is collaborative and reflective.

Apparently, while workshops on lesson study and productive pedagogy were conducted, it seems that most of the participants did not grasp the essence of the teaching and learning framework. But it is still interesting to note that some of them have complete understanding of the framework after attending the workshops.

Some agreed to use the entirety of the framework while some others would like to implement it with caution. Participant 25 would like to use the framework because it will help in improving one's teaching strategies by watching other teachers teach and by sharing one's experience in teaching: "*I see myself implementing productive pedagogy that will help me improve my practice by seeing other teachers teach.*" Participant 1 shares the same view on productive lesson study. This participant also mentioned that the framework will help teachers improve their teaching by reflecting on their own teaching and from hearing comments and suggestions from colleagues:

By using productive lesson study, I'll get to hear some comments from my co-teacher, I'll get to rethink about my principles and goals in teaching, as well as, consider very well the learner's interest, capabilities and the interest so that the strategy I'll employ would help the class appreciate the lesson.

Participant 9 agreed that the framework is an effective way of improving one's teaching skills by hearing comments and suggestions from colleagues. However, should only be done once in every month:

I can say that I will use the productive lesson study on a monthly basis. It is very efficient and convenient way of revising and reflecting on your lesson plan and teaching strategies because you have the help of your co-faculty by sharing thoughts and ideals. This process will enable the both of us to improve at the same pace and we can keep each other on track to ensure the welfare and the development of our students.

In a follow-up interview, the participant argued that the framework is time consuming and therefore should be utilized on a once a month basis.

While participant 15 agreed with the efficiency of the productive lesson study with the same reason that comments and suggestions from colleagues will help improve one's teaching skills, the participant decided to be selective in accepting suggestions from colleagues. The participant mentioned that only strategies which are applicable to the learning style of the students will be accepted:

I think I will be an effective teacher... I sense it because there are experts that will help me in planning my lessons. Even though I am new to the industry I will give my best in creating my lesson and will consider the comments and suggestions of my colleagues. But in terms of the comments of my colleagues, I will be selective which to consider or not. I am not doubting the capability but since I am the one more engage with my students, I know them more compared to the experts and perhaps some of their suggestions are not possible so I will be a little bit selective.

Although a majority of the participants agreed to the effectiveness of productive lesson study and they are also willing to utilize the framework as they start their teaching career, participant 8 decided to use the traditional methods instead of using the framework. The participant seems to have a lot of questions regarding the framework:

If I decide to put productive lesson study as one of my techniques in teaching students, I can perceive or see myself as a teacher having lots of questions and trivia for the topics I will be discussing. But the truth is, I really cannot imagine myself using productive lesson study as my technique for teaching because I'm still used to the traditional technique that most teachers are currently using, and that is very common to us future teachers.

When asked in a follow up interview, the participant said that it's tedious to familiarize oneself about the processes of the productive lesson study framework.

Theme 2: Productive lesson study will promote better outcomes for students

Since most of the participants agreed to employ productive lesson study as a framework in teaching and learning, it is expected that they will also agree that it will help improve academic achievement among basic education students. Participant 2 emphasized that this framework will help teachers improve their teaching and the end result will be an improvement in the academic achievement of the students:

Absolutely, because the academic achievement of the students depends on the ways the teacher teach every lesson. So if the teacher improves his/her teaching strategies, the students might get most likely the highest possible learning.

Participant 13 shares the same view about the framework:

With collaboration of different minds, teachers would be able to come up with the effective strategies to use in teaching which will help the students to be fully interested in the lesson and become motivated to learn. I think interested and motivated students tend to understand lessons better and the concepts will retain into their mind. This is enough reason for them to improve and achieve more.

Participant 4, on the other hand did not agree that the framework will help students improve academic achievement:

...it would be a difficult for the students since it is a new approach to them. Using an approach [familiar to them] could be suitable to be their transition stage into another productive approach.

Participant 8 shared the same sentiments. The participant even added that the framework should start at the elementary level not on the secondary level so that students will get used to it. Apparently, the participant's understanding of the framework is limited since it is not a framework for students but for teachers:

For me, I think that productive lesson study will be effective IF we implement it to the basic education students, ESPECIALLY the ELEMENTARY STUDENTS. Because if we use it for elementary students, they can develop and discover things at the EARLY stage of education, wherein if this lesson study continues, more knowledge will be given to them and they will learn to be independent EARLY. For me, if this will be done for secondary students, and they are not familiar with this technique, then everything can be BACK TO START.

Theme 3: Productive lesson study as a quality professional development for teachers

The participants also cited some perceived advantages and disadvantages of the framework. Majority of them mentioned that the framework will help teachers prepare and develop good research lessons or lesson plans by planning collaboratively and by maintaining a balance among the four facets of productive pedagogy. They even mentioned that the end goal of this strategy is for the holistic development of students. However, they notice that the lesson study cycle will take much of the time of the teachers.

Participant 1:

Advantage: I think that productive lesson study would open really great opportunities for teachers and for students to enjoy learning in class. One good reason is because the teacher would really put his head and heart to work on the instructional materials or method he/she thinks would be effective and get students engaged and students would certainly benefit from this effortful design and revision of lesson. This method offers comprehensive examination of selected teaching strategy to teach particular lesson. The strengths and weaknesses of the method could be highlighted and suggestion for revisions can be shared from the observers. Since the strategy chosen is tested before the actual teaching in class. It helps teachers to think about their objectives again and check if their chosen method needs modification or should be changed to help achieve it. Finally, this can help teachers to be mentally and psychologically prepared for their lesson and the students' difficulties are addressed better or more prompt with more pair of eyes really watching students work or respond in class. Disadvantage: However, this strategy would take long. Also, I think it may be distracting for some students to have observers in class.

Participant 2:

For me, the major advantage of the productive lesson study is the opportunity to be improved immediately. Basically, in this approach or technique, the teacher will conduct what he/she has planned while there are observers that will give comments

and critique the presentation just after it was finished. The presentation will be improved based on the comments. Since the observers are usually veteran or professional teachers, I think these comments are very reliable. On the other hand, the only disadvantage that I can see in this approach is that, it is a bit time consuming because it usually seek for the room of improvements that is why it undergoes post conference. But then, the overall impact of productive lesson study to me is quite good because even though it is time consuming, the time consumed is spent productively for important purposes.

Participant 4:

Productive lesson study is very helpful in a way that there would be a great percentage of effectiveness of the lesson due to careful and detailed planning. Another advantage of this strategy is that the lesson planning cannot be prepared only by one instructor because there is critique session with other instructors so that it makes the lesson very rich in information. One problem that can be encountered using the said strategy is the time framework. I would be time-consuming knowing that after presenting the lesson, a post conference will follow until it ends with final planning process.

Participant 8:

For me, I think that productive lesson study is a good technique for the teachers because in a productive lesson study, it tends you to make an early planning of your lesson plan, so that when critique came, and when you heard the opinions of the observers on the execution of your lesson plan, you'll be able to know on how to improve your lesson plan. In addition, one of the advantages of productive lesson study is that you can think of many ways or planning your lesson plan. However, I think that one of the disadvantages of productive lesson study is the time that you will take on planning your lesson plan. Usually, it takes several hours to think and finalize your plan.

Participant 14:

In reality check, productive lesson study is a very helpful tool in every teacher as well as in every students who are the recipient of this study. Here, teachers are given a chance to think critically, create and implement what he or she wants to teach for the students to easily grasp information, new knowledge and become globally competitive. This lesson study makes the teachers go beyond the traditional way of teaching. It manifest the high order of thinking of the teachers in such way that the students also think critically to attain the means and ends of the lesson. However, it takes too much of the time from the planning stage up to the post conference.

Participant 19:

One of the advantages of productive lesson study is that we can develop or produce an excellent lesson plan or excellent teachers because as we all know, one of the purpose of lesson study is to train beginning teachers. By this, those teacher will know how to present the lesson in class that the students will cooperate, appreciate the lesson and also to learn the lesson and one of the disadvantage of this lesson study is that, it will take more time to develop a lesson. We know that this lesson study undergo a cycle and that takes much time.

Participant 22:

A lesson study is a great help for teachers to be more prepared in their lesson presentation. One remarkable thin here is that you can also seek help to your co-workers/teachers in creating

your lesson plan because through that more diverse ideas and teaching strategies can be obtain to create a very good lesson plan. One of the best part of the lesson study is the post reference. Post reference helps to unveil the hidden flaws of your lesson plan which is a good thing because by identifying what is lacking in your presentation will be a great help for your own improvement. Moreover, the disadvantage of lesson study is that it requires more time.

Although participant 9 believes that the teaching framework is good, one of the disadvantages that he noted is that not all students have the same abilities and skills. Meaning, not all populations of students in chemistry have the same learning abilities and skills in acquiring knowledge:

Productive lesson study can be advantageous in many ways and one of them is being a tool for professional teachers to improve teaching principles and strategies. This provides a constant overview for teachers on what they can expect from their students if they could improve and constantly keep an eye on their development. It is also disadvantageous for most teachers because the process of conducting a lesson study is quite time consuming and the method that they have concluded at the end of the research will just be used on students who have a different set of abilities and skills.

Another disadvantage noted by participant 15 is that students might get uneasy when there are many teachers observing their classes very frequently. Participant 15 commented on the culture of Filipinos as well that when new programs are implemented they will always expect good results even at a very early stage of the implementation:

One of its advantages is that you get to know more strategies that you can use in exercising your lesson plan with the great help of your colleagues. There is a saying that two heads is better than one. In planning your lesson plan, your colleagues will help you plan it and that will greatly help you to have a good output because you are not enclosed and limited to your own biases and views. On the other hand the disadvantages that I saw are when the critics will be observing the demonstration in the execution of the lesson plan. It is helpful for the presenter however it may not be with the student because it might intimidate the students to actively participate if there are too many eyes watching them learn. Reality check, the attitude and culture here in the Philippines is far way more different with Japan especially in educational aspect. And since it is still a fresh strategy, the results might not work as how it was plan or it might fail at first and results might not be seen immediately. It can cause dilemma to our educational system temporarily because of the Filipino mentality of "get-the-result-quickly-mentality". Filipinos want abrupt and drastic change after a certain new program is being implemented.

Theme 4: Productive lesson study as a framework

With the many benefits of productive lesson study as mentioned by the participants, they surely recommended the implementation of the framework in the K-12 basic education schools. They said that the framework will benefit both the teachers and the students. The teachers will be able to improve their skills in teaching. Students, on the other hand are benefited by the new skills acquired by the teacher.

Participant 5:

...it might help us, teachers, to be more innovative and creative in making lesson plans that will engage students in a true learning process. Help them to have an interest in studying more on his/her lessons. Share his/her knowledge to others and apply it on the outside world. Technologies will also be involved in this process/ productive lesson study that will also help students/ teachers to have an easy access on lessons. We will create students holistically.

Participant 21:

I will suggest [the use of productive lesson study]. First I saw that this research lesson is very effective in a progressive country of Japan so why not try it to the Philippines. Lesson study will be a great help to our teachers because they will help them criticize and evaluate more the learning style of their students. Then, if the teachers are effective in teaching the student will definitely learn.

Participant 9, however, took into consideration the lesson study cycle as time consuming and that it should not be implemented on a daily basis:

[I recommend] but not on a daily basis. This process can be employed in our education system to help our current professional teachers. But this process must be done on either a monthly basis or quarterly to give teachers enough time to observe, analyse, revise and reflect. Smaller groups of teachers can help improve or education system for they are interacting directly with their students compared with higher officials.

Participant 24 reiterated that the framework is a good training for beginning teachers to improve their teaching skills:

I will suggest the use of productive lesson study because of the following reasons: (1) it is a training for beginning teachers to use another principle/approach that will help develop, improve and refine the knowledge, skills, attitudes/values. (2) it also engage teachers to research on educational research. Because an educational research can identify the strength and weaknesses of a specific strategy and omit the dead-woods of specific approach/strategy. And lastly, (3) it enhance the content/materials to textbook. Not the traditional way of reading and answering books. It may start with an answer that will stimulate students motivation and critical thinking skills.

DISCUSSION

Perhaps it was a very challenging role among the participants to give a feedback on a teaching framework when they do not have a firsthand experience. It was quite evident as most of them have difficulty describing the processes involved in productive lesson study. Majority of the participants, however, agreed to utilize the framework as they start their career in teaching even if they do not have complete understanding of what the framework is about. What most of them understand is that the framework will help them improve their skills in teaching by planning a lesson collaboratively, being observed while teaching and getting feedback from the observers right after. While these pieces of information are true, they forgot that the primary reason of collaborative lesson planning is sharing of knowledge in teaching a certain topic. The participants expect themselves to be a receiver

of information only. Probably because they are still pre-service teachers and they do not have much to share yet. Elipane (2011) reported that pre-service teachers lack sufficient time to reflect and make sense of the reforms of their beliefs and practices in teaching as diagnosed through lesson study. Hence, the tendency is just for them to be a receiver of information. On the other hand, Kanauan (2013) supported the idea of utilizing lesson study to pre-service teachers because the framework makes the cooperating or critic teacher and the pre-service teacher works collaboratively during the practicum. In this case, the set-up is not authoritarian and therefore the framework will encourage the pre-service teachers to express themselves and at the same time develop the skill of being open to constructive criticism to become a better teacher.

It is highly evident that majority of the participants believe that the framework will certainly improve the academic achievement of students in high school chemistry. Thus, they are recommending that the productive lesson study be utilized in the K-12 basic education schools although some of them commented that it will take time before they become familiar with the whole process of the productive lesson study. They even mentioned that they can see the whole process as very time consuming and requires mastery in skills.

Familiarizing oneself with the dimensions of productive pedagogy is more difficult than that of the process of lesson study. Integrating each of the dimensions of productive pedagogy to every research lesson is another story. Gore, Griffith and Ladwig (2001) concluded that productive pedagogy must be introduced earlier in the teacher education curriculum so that it becomes part of the students' teaching practices. The conclusion came from the result of their study on pre-service teachers who utilized productive pedagogy during their internship or practicum. This notion is also true among the participants. They reiterated that it will take a long time and continued practice before they can master the skill in integrating the dimensions of productive pedagogy to their research lessons. Moreover, the participants mentioned that the productive pedagogy will be a metalanguage that will support them as teachers in reflecting critically on their current practices.

CONCLUSION AND RECOMMENDATIONS

Productive lesson study is a promising framework for teaching and learning in the K-12 basic education as it provides a structure in conducting collaborative lesson planning and evaluating effectiveness of a teaching strategy based on the dimensions of productive pedagogy. However, the process and the structure of productive lesson study are not simple and that it requires in-depth research and mastery before adapting this approach. As a recommendation, a new set of participants should try-out at least one cycle of the productive lesson study before getting their perception regarding the framework. This method should be conducted in addition to the training workshop on the use of lesson study and productive pedagogy.

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