

Lesson Study

Report and Reflections

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The lesson study introduction

Lesson study is a useful approach to improve teaching in various situations and at different levels. Though several literature combine lesson study with teaching mathematics, I believe that this can be adapted to any subject. Planning together, teaching, observing, debriefing and re-teaching will lead to professional growth. Taking the role of a leader to craft an engineering lesson with other teachers have helped me not only to grow professionally but also personally. During this process, I enriched my curiosity towards learning from this experience, developed my identity as a learner and as a researcher and felt motivated to improve.

Selecting a group of teachers – who are they, how did you select them and why?

For the lesson study, I have selected two teachers Mr. Marco Sciberras and Ms. Jo-Anne Azzopardi

Mr. Marco Sciberras is a head of department who has been teaching Engineering Technology since its introduction in secondary schools in Malta. Mr. Sciberras teaches electronics to Year 11 students in another school in Malta. I chose to team up with a colleague from another school in Malta because I am the only teacher who teaches electronics to engineering students in our school in Gozo. I asked Mr. Sciberras to participate, because I meet him up regularly during HOD meetings and I am aware of his passion for teaching electronics.



Ms. Jo-Anne Azzopardi is also a head of department who teaches Mathematics in our school. Though Ms. Azzopardi is less knowledgeable in the subject content, I selected her to be part of the lesson study team because she can give an input and contribute towards the logistics, planning and analysis of the lesson prior and afterwards during post-session. Ms. Azzopardi will also be able to share her ideas on different teaching strategies that may be used to deliver particular content while anticipating on the students' attitudes in relation to particular tasks. Since Ms. Azzopardi and I share the same staff room, I chose to team up with her because this would not only reduce any time constraints, but also both of us are in a position to understand more the intention of lesson study while being more aware of the phases involved in the process.

The initial meeting – how did you conduct this?

In my case I have set up two different face-to-face meetings, one held on the 27th of November 2018 with Mr. Sciberras and another one held on the 28th of November 2018 with Ms. Azzopardi. During the first meeting

with Mr. Sciberras, I explained to him the purpose of conducting the lesson study, together with different phases that it involves. I also made him aware about the necessity of meeting up to discuss and reflect upon our decisions. Knowing that Mr. Sciberras is a person who believes in hands-on and practical activities, I explained that the lesson study process “is driven by practice and the standard to which its outcomes are judged are practice-based” (Lewis, 2016 p.529).

Selecting what to teach, what class to teach and when to teach the lesson

Class to teach

In case of engineering technology, the syllabus is designed on 3 different units which are covered respectively from Year 9 to Year 11. We thus planned a lesson study which relates to electronics, which is part of Year 11 syllabus.

What to teach

The development of our idea emerged after discussing together various engineering topics together with their content from the Year 11 syllabus. In our discussion we agreed that lesson study should be a stepping stone to help the students widen their knowledge on the whole subject apart from that particular lesson. One of the lesson phases includes instructions [kyo] to students, to use particular electronic components as their [zai] material in order to reach the aim of the lesson.

By building electronic circuits using different components, students need to decide upon which switch to use so that a circuit will operate as instructed. This would help students to draw up hypothesis and arrive to conclusions about particular functions of various switches. Ultimately, this leads to the aim of the lesson [kyozai] that is to acquire knowledge about various types of switches together with their usage.

In circuitry, switches are widely used components. Being able to identify the right switch with the right function is essential, since it may affect the behaviour of a particular circuit. More so, students will be able to identify and appreciate the functions of different switches that they come across in their daily lives. This topic will serve as an introduction to relay switches, as well as a guide for students to select appropriate switches when designing their circuits which they will ultimately build up themselves.

When to teach

We planned to deliver the lesson on 18th January 2018. Since Year 11 students finish most of the content by the end of January, before their annual exams, most of the content must be covered by then. This will give us the opportunity to use content covered in other topics in order to deliver the lessons content in a more fruitful way.

The lesson planning process

Planning a school-based lesson study included a number of meetings in which we have:

1. Discussed the syllabus content and required resources

We discussed content which will be covered through the lesson study. We also discussed ways of how to deliver it. Automatically, this brought the need to discuss the materials, apparatus and components which are required to deliver the lesson. At this stage we dealt with suggestions and disagreement upon certain topics and issues related both to content and apparatus.

2. Researched various sources to build up resources to build our own *kyozai* which will be used:

- as a learning resources such as the worksheets used during the lesson.
- to build up a (PowerPoint) presentation which will be used to facilitate learning.
- to create notes which sustain the content which has been covered.
- to assign homework to students.

3. Anticipated students' prior knowledge on the subject (switches) even though this topic has never been taught before, students will surely know some basic information gained from other subjects and from life experience.

4. Planned how we are going to link what we intend to teach in conjunction with other topics which have been already taught. This included developing a list of apparatus (including electronic components) and knowledge related to it that students need to be familiar with, this includes:

- knowing basic symbols used to represent a switch
- identifying symbols of electronic components represented in schematic diagrams
- be able to read and interpret a schematic diagram
- know about the internal connection of a breadboard
- know-how and be able to use a breadboard
- know-how and be able to use a multimeter, particularly to carry out a continuity test.

Using the multimeter to test the function of each switch is an important strategy. This will help students to relate an appropriate switch to a particular circuit. The circuit descriptions provided to students, which relate to real life situations, are intended to increase students' interest and understanding of the topic.

5. Developed the questions, circuits and scenarios.

Since the focus is on switches, students will be given various simple circuits which they are familiar with, but which all need a different type of switch to operate. In relation to this, students will be given a written description of how each circuit is expected to function. The circuits will only behave according to the given description if the students use the proper type of switch. The aim of providing a circuit description is not to diverge student's thinking on the circuit operation but to use such information to remain focused on identifying and using the right switch. As a starting point, students will be given a brief description of the task and recapitulate quickly important points about the breadboard and multimeter. The aims are to:

- allow students to inquire themselves about switches and record their findings on the given worksheets.
- be knowledgeable about different types of switches and the terminology related to them.
- move on from the idea that a switch is only a button that when pressed, it switches a device either on or off.
- test and try out different types of switches to make the circuit function according to a given description.

6. Anticipate difficulties that students may encounter and predict some common mistakes.

Some difficulties that the student may encounter are:

- identifying the leads / connections of particular switches. This difficulty may occur since students may make assumptions about the switch connections rather than using a multimeter to identify them
- drawing up hypothesis to arrive to conclusions to identify particular switches for particular functions. Such difficulty may occur if not understanding concretely how a particular switch operates or how the circuit should ultimately behave.

Predicted mistakes are:

- incorrect connections on the breadboard, this may be due to the excitement to finish quickly and move on to the next circuit. This may also be due to negligence or incomplete understanding of the connections found inside the board.
- incorrect placement, orientation or polarity when connecting components to the breadboard. This may be due to wrong interpretation of the circuit diagram.

7. Developed a strategy to help and facilitate learning.

When noticing mistakes and malpractices, the teacher will notify that particular group. This will be done by stating (to the group) that the work or practice being done is incorrect. Rather than posing

answers to the students, I will suggest the group to discuss amongst themselves to try to find out what mistake/s have been done and how these could be resolved.

8. Developing questions to be asked to the students during the lesson to help the students learn and to help them move forward, especially if they feel stuck at any particular stage of the process.
9. Seating plan for students.

The rationale found in the lesson plan provides more information regarding these aspects.

Delivery of the lesson

When delivering the lesson, I felt satisfied with regards to the fact that what we have developed and analysed together, is being received in an optimistic way by the students. While conducting the lesson, I felt the value of planning and analysing the lesson together (Lewis, 2016). This was evident by the students' attitudes and behaviour. Throughout the lesson, the students listened actively and engaged with each other to complete the given tasks. During the first task I expected the students to take less time, while taking more time to complete the third task. I felt a sense of competition between the groups while they were building up the circuits during the third phase. The fact that real life examples were included in the PowerPoint presentation during the fourth phase, made the students appreciate the importance of this lesson.

During the neriage stage (second phase), students were expected to use different techniques and/or thoughts to solve a given task, while they compare and discuss their way of solving it [the given scenarios] with others (Fujii, 2016). As a matter of fact, this was evident, while roaming around the groups, I have listened to the discussions where students were giving their opinions about what switch / switches should be used to solve the given scenario. During this stage, students listened to each other. All groups consider all the given opinions, before progressing to building up the circuit. This stage was useful because students were able to expand their knowledge on the process of how to tackle a problem. In addition to this, students became aware that their classmates have paid attention to details and/or instructions which lead to be more decisive in their selection to solve the given solution. I intervened in the discussion by posing questions to help the students determine which strategy is mostly appropriate and effective to move on to the next phase of building-up the circuit.

Since this has been my first time participating in a lesson study, I felt a bit tense in having colleagues of mine observing, however as the lesson progressed, I felt more at ease. In addition to this, I believe that this had little or no effect on the students, since they performed as they usually did in previous engineering lessons.

Having decided to assign a particular scenario to a group rather than assigning all scenarios was a good decision since this made it possible to keep the timing and finish the lesson on time.

The lesson study debriefing

The debriefing session was extremely important because it helped me reflect upon the lesson. I was able to express to my colleagues how I felt while delivering the lesson. During the lesson debriefing meeting, we have analysed the students' work and feedback forms as all this will give us information on what to improve. More so this session gave me the possibility to compare and contrast my thoughts not only with other teachers involved in the lesson study, but also with those of the observers being expressed on the observation sheets. Having gone through all the comments in the observation sheet, I can confirm that most of the lesson planning was fruitful and the students perceived it according to our expectations. I have gone through each phase and analysed the comments. The following comments have caught my attention, the observers have stated the following:

Phase 1	
understand the task and the work they need to carry out related to it.	<i>'Students physically investigated the switches discussed together and agreed on the function of each switch'</i> <i>'...students understood the task ...were clear about what was expected of them'</i>
use the multimeter to investigate switches and identify their connections	<i>'Students used the multimeter to investigate...worked well together and participated equally'</i> <i>'Each group used accurately the multimeter and identified correctly the connections'</i> <i>'Students needed some guidance from the teacher, but they managed to use the multimeter...'</i>
collate information by using tablets to investigate and generate knowledge about the given switches	<i>'Students used tablets as a research tool to gather information...Teamwork prevailed during this activity'</i> <i>'...students were able to use tablets to connect online to acquire more knowledge on each switch'</i> <i>'...had an open discussion on the matter'</i>
contribute to discussion within their group	<i>'Students in each group collaborated together...'</i> <i>'discussion was inevitable'</i> <i>'Discussion by all members of the group prevailed student participated and communicating well with each other'</i>

Phase 2	
read carefully and analyse the given information related to each scenario	<i>'Students worked individually reading and analysing the information given...'</i> <i>'The Students were engaged reading the scenarios'</i>
discuss with each other the given scenario	<i>'took an active part in the discussion'</i> <i>'all the groups discussed their scenario based on their knowledge and on the equipment provided'</i> <i>'everyone was well engaged in the discussion...'</i>
agree with each other upon which switch or switches should be used for each scenario	<i>'discussion was ongoing'</i> <i>'the groups seem to have agreed on the switches and the circuit'</i> <i>'...full analysis was taking place at choosing the correct and best switch for each scenario'</i>

Phase 3	
use the given components to build up the given circuits related to given scenarios	<i>'Teamwork was highly evident...'</i> <i>'Students were engaged in using the components provided and followed the circuit printed on the worksheet.'</i> <i>'Each group successfully made use of the given components...'</i>
operate circuits with the intention of trying that particular switch or switches which will enable the circuit to function as per the given description	<i>'...building of circuits was followed by their [switches] operation'</i> <i>'Students were satisfied with their work as switches used for their circuits performed well according to the needs of the circuit'</i>
discuss the circuit behaviour and where necessary they have decided to change their decision, therefore change the switch or switches.	<i>'...opportunity to view each other's work was given...students became increasing familiar to such activity...'</i> <i>'...some groups tried out different switches to reach the final working solution.'</i> <i>'Students in each group discussed the behaviours of the components as they actually worked in the circuit.'</i>

Phase 4	
understand that the content of the presentation is related to different switches which were used during the lesson	<i>'...short video clips and images made it very interesting and easier to understand.'</i> <i>'...students compared their findings (from their worksheet)from past/ to the content of the presentation.'</i>

	<i>'Students were able to make the connections between the content of the presentation and the different switches used throughout the lesson.'</i>
Understand the terminology related to switches	<i>'...students continued updating their notes in part1 with the content of the presentation.'</i> <i>'No difficulties were encountered regarding the terminology...'</i>
Relate the discussed switches to other equipment that we generally use.	<i>'...demonstration in relation to the use of switches to uses in real life and everyday use of other equipment...'</i>

Such comments shows that overall the lesson was positively received by the students. This was also reflected in the students' feedback. The follow statements caught my attention:

Question 1: Did you enjoy the lesson? If so what did you enjoy most?

'I enjoyed the practical part.'

'Yes, working as a group and figuring out the answers by discussing was the most enjoyable part.'

'Yes. I enjoyed building the circuits which involved switches.'

'Yes, I enjoyed the group work and we showed how a good teacher teach'

'Yes, I love most the practical part'

Question 2: Did you feel that the lesson was somehow different that the others? State why?

'It was more entertaining than the others...'

'Yes it was more practical than usual'

'Yes, normally we would not look up information about a topic on our own.'

'Yes, instead of only theory, the lesson was more practical'

'Yes, because we taught ourselves, not the teacher'

Question 3: What have you learnt from this lesson?

'About different switches'

'I learnt that different switches are used for different things'

'I have learned more about switches, maybe even more if it were just a presentation '

'These are so many types of switches for many different uses'

'That working in groups help you learn more ...'

'Switches and teamwork '

'How to build a circuit'

Such statements help us realise how much students enjoy hand-on activities. Students have remarked that they enjoyed researching themselves rather than accepting the knowledge presented by the teacher. A particular student have also remarked that in this way, he felt that he has learnt more. Most of the students enjoyed teamwork as well.

During the debriefing session we have discussed to reduce the amount of switches from the 1st task (i.e. phase 1). This was also evident when analysing the students' work, where not everyone was able to complete fully the task. This brings the need to change the given circuits and scenario as well. Once again, most of the students work showed that they were able to complete only two scenarios. (Others who have more than two scenarios completed did so during another lesson because they were interested in building those particular circuits.) We have discussed the idea of presenting two scenarios instead of four, then each scenario would be assigned to two different groups. After finishing the assigned scenario, a group may opt to do the second one especially if there is ample time left. This change will enable the possibility of adapting different switches to the same scenario. This can also further the student analysis, discussions and learning amongst the groups.

When analysing the observation sheets of 3 individual students, the following points have caught my attention:

Jason

- did not fully engage with the rest of the group they were assigned with
- was only receptive, rather than participating and discussing. The observer remarked *'he rarely had anything to share', 'he slightly contributed to discussion, but it was more on filling in task sheet rather than on sharing knowledge', 'happy to allow his peers to make the decisions... and work'*
- asked questions with regards to the scenarios presented by the teachers

Jason may be that type of student who does not like to work in groups. If I had to re-teach this lesson to Jason, I had to observe more all the pupils to make sure that they are interacting with each other, while every now and then give prompts to individuals who lack to participate in conversations or who do not collaborate.

Lucas:

- *'Gave his input'* and followed what needs to be done. He was well-engaged and used both resources (i.e. tablet and multimeter) for the first task.
- He contributed his ideas to the whole group while *'discuss[ing] and shar[ing] ideas before doing practical work and testing.'*
- Knew which resources to use and followed instructions well while sharing his ideas.
- *'Discuss[ed] and agree[d] on what is needed to use for the circuit to work correctly.'*
- Engaged in hands-on activities and diagnosed a problem *'to check what was wrong and make it work.'*
- *'Was pleased when the circuit worked correctly.'*
- Was attentive and seemed to be following the teacher's PowerPoint presentation.
- Had to refer to one of his colleagues to assure himself about particular terminology related to switches

Lucas seemed to enjoy the lesson especially the hand-on aspect. Though, he did not lead the group he was a follower who contributed immensely to the group. Distributing a note to give information about the terminology related to switches, would avoid the situation where students like Lucas prefer to ask their colleague to reassure themselves about particular knowledge, instead of asking the teacher.

Luke:

- Took initiative and took the role of a leader in his group.
- Though very willing to share with the rest of the group, he tends to take over.
- Helped others to progress when they were stuck
- Rather than discussing, he stated what needs to be done, while the other group members agreed with him and followed. His observer noticed that *'most of the time he took the decisions and the others followed.'*
- *'Encourage[d] the others to help and discussed with the group how to build the circuit.'*
- was more concerned to build another circuit rather than paying attention to the PowerPoint presentation.

Though it is normal and essential to have leaders when doing group work, one must be aware that such students should not take over. Knowing Luke, I am sure that he was taking over for good intentions to make the circuit work as soon as possible and to move on to the next one; but yet this may hinder the others from learning. Giving different roles to each member may help to assist the leader while controlling not to take over completely.

Benefits and challenges of integrating lesson study within your school

Benefits

Lesson study is beneficial because it enables a professional learning community characterised by ‘shared values and vision; shared and supportive leadership; collective learning and its applications; supportive conditions for the maintenance of the community and shared personal practice’ (Hard and Sommers, 2008 p.9) to collaborate, take ownership and reflect towards the same goal, which is to create a lesson that allows us to learn how to improve our teaching by observing our students learning. Lesson study is beneficial because teachers are able to ‘reflect on the outcomes of the lesson using teaching and learning as the criteria of reference’ (p.529)

Challenges

As stated by Lewis, (2016) ‘time is a primary issue’ (p.534), working with a teacher who is not only located in another school but also on another island, in Malta, made the lesson study processes more challenging. However, making use of technology such as emailing and skype helps in facilitating and overcoming this issue.

Since the majority of the lesson involved hands-on tasks which required the physical use of electronic components, this was quite an issue since not each component was available at the school workshop. Being supported by the school leadership team namely the head of school and the assistant head in charge of vocational subjects made it possible to acquire these resources.

References

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