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Student Experiences Of Mathematics Lectures At Singapore Polytechnic

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Abstract
Polytechnic lecturers frequently hear complaints from many mathematics students that mathematics is difficult and tedious. Students are keen to do well and would have no problems with practical-oriented modules, but a mathematics course with a need to work through mathematical problems seems to be a different challenge altogether. This paper describes an action research whereby students' in-class thinking and feelings were studied in a series of 5 lectures over a period of 2 weeks, covering two chapters of the Year 2 Engineering Mathematics module. Guided reflections of the 49 students, in the form of checklist, were administered at intervals of approximately 30 minutes. Each reflection, apart from the first, took about 5 minutes to complete. During each reflection, the lecturer completed a similar checklist about her own lesson events. The data from the students and lecturer checklists will provide information about differences, if any, in their experience of the mathematics lectures. The changes in student reflections within and across lectures will be examined using descriptive statistics and pictorial representations. Through this study, the lecturer became more aware of students' in-class thinking and feelings. From the interviews conducted after each lecture, the lecturer understood some difficulties faced by her students as well as the strong points of the lectures. The presentation will provide further details and draw some implications on how to use student in-class reflections to improve lectures in mathematics.

Introduction
After having taught in a top junior college for more than six years, the first author made a switch to the polytechnic to teach the 40^{th} to 80^{th} percentile of the cohort. Since then, she has taught Engineering Mathematics at Singapore Polytechnic (SP) for the past ten years. This task seems to be getting more difficult in recent years because with more junior colleges being built, more students who are weak are admitted into the polytechnics, with the cut-off for ELR2B2 (English Language, 2 relevant subjects and any 2 other subjects excluding CCA) as high as 26, compared to previous scores of less than 20 (lower score means higher achievement, the best score being 5). However, the content requirement, though cut recently, is still rather rigorous to the majority of the students. It is frequently heard among lecturers' discussions that a large number of the students are disinterested and are found to be frequently late or absent from classes. The lecturers, on the other hand, frequently hear from the students that Engineering Mathematics is difficult and tedious. The first author is one of the complaining lecturers and at the same time, also a listener to the laments of her students. In recent years, lecturers resort to conducting remedial lessons and to spend countless

consultation hours helping these 'disinterested' students when the examinations are approaching. The students by then would be ready to spend any number of hours seeking quick fixes so as not to repeat the particular module.

Is there a way to bridge the efforts of the lecturers and the lack of motivation in the students, and to 'save' the lecturers and students from these ardent last minute quick fixes that occur twice in a year? At the recent National Day Rally, Prime Minister Lee Hsien Loong calls for schools to "teach less to our students so that they will learn more". Is there a way to motivate the polytechnic students to plan ahead and to aim to learn the required content within curriculum time and not to rely on last minute fixes, with the lecturers "feeding" the students to tackle the upcoming examinations?

Armed with this motivation, the first author embarked on this study to gather in-class thinking and feelings of her students, hopefully, to gain some insight into the gap in the intent of the lecturer and the motivation of her students, so that more appropriate actions can be taken to help them.

Background

Peterson et al. (1982) reported that students who used specific cognitive strategies, such as relating the information taught to prior knowledge, did better on the achievement test than students who did not report such strategies. Their study pointed to the importance and the need to research the kinds of thoughts that students engage in during classroom teaching. Wong (1985) found that incongruence between students' perceived actual teaching activities and preferred teaching activities correlated negatively with mathematics scores. There is a tension between what students experience and what they prefer, leading to weaker performance. From the study of Peterson and Miller (2004), it was concluded that since instructional context played an important factor in the quality of students' experience, teachers should understand how to structure and monitor meaningful learning experiences for students to maximize learning and motivation. Peterson and Miller call for more research to explore how students of various developmental levels experience different instructional context so as to provide valuable insight into the teaching-learning process.

Apart from researching into students' in-class thinking and perceptions of lessons, it is also important to match these to those of the teacher. Bell et al. (1993) discovered that the mismatch between the teacher's perception and that of the students' becomes more pronounced as lessons become "more open with an increasingly process oriented agenda" (p. 2.72). This mismatch can be lowered if substantial interventions are designed so that students are made aware of the mathematical processes and purpose of a particular lesson. In another recent study, Shimizu (2002) reported the discrepancies in perceptions of classroom events between the teacher and the students. In a typical Japanese lesson, it is the intent of the teacher to teach mathematical concepts through problem solving processes and discussion, structuring the lesson around a climax or "Yamaba" in Japanese. In spite of having some similarities in perceptions, Shimizu (2002) shed light on the resultant construction of different meanings associated to the same events experienced by both the teacher and the students. The "yamaba" may be perceived differently, or in some instances, may not be perceived at all by the students.

In fact, Peterson (1988) emphasised the importance of the teacher's awareness of the cognitional knowledge and metacognitional knowledge, both general and specific, in

the teacher and the student. With such realisation to form the basis for thoughtful teaching and a conceptualisation of important aspects of students' cognitions, a teacher can organise classroom activities that engage students for effective thinking and reflection during classroom learning. In an effort to keep a group of inservice teachers abreast of trends in mathematics education, Wong (2000) conducted a 2-hour lesson on fractals with in-situ reflections so that these experienced teachers could reflect on their feelings and cognitive conflicts while learning new content.

This brief review provides the background for the present study. It aimed to collect students' in-class reflection so as to have a better understanding of their needs in order to better support their learning of a difficult subject.

Method

Participants

In this study, the participants were 49 second year engineering students of the Diploma in Electronics, Computer and Communication Engineering at SP. These students were a selected group of students, identified, using data-mining technique, to be taught by the coordinators of each module so as to increase the cohort's success rate by keeping the attrition rate as low as possible.

Procedure

A week before the study was carried out, students were informed of the nature of study. Individual student consent was obtained. A 2-page survey of student background was also collected. This student background was designed to obtain information on students' habit and support in studying mathematics, outside of curriculum hours: normal places of study, resources at home to aid the study of mathematics, hours spent a week in studying/doing mathematics, common time of study, past experiences of studying mathematics, language spoken at home, confidence in mathematics, encouragement from family members, help in mathematics homework and ways of studying mathematics. This data will not be presented here.

The study involved a series of 5 lectures over a period of 2 weeks in Term 1 of the first semester of the academic year 2004/05, covering two chapters of the Year 2 Engineering Mathematics module. As the lectures were conducted in a lecture theatre, there was not much seatwork for the students. Moreover, the module design, lecture-tutorial system, is such that lectures are meant for exposition of content, followed by tutorial exercises to be attempted by students at home and then to be discussed during tutorial lessons the following week. Guided reflections of the 49 students, in the form of checklist (Appendix), were administered at intervals of approximately 30 minutes. Each reflection, apart from the first, took about 5 minutes to complete. During each reflection, the lecturer completed a similar checklist about her own lesson events. Volunteers were interviewed and their interviews were audio-taped.

Instrument

The instrument for the students is given in the Appendix. Question 1 was the same for both the students and the lecturer, asking them to indicate their own feelings. However, for questions 2 to 9, the lecturer was asked to indicate how the items might apply to her students. Reference was made to the emotional and motivational items found in Peterson and Miller (2004).

Results and Discussion

The data collected from the students and lecturer checklists were summarized and coded in Excel file. SPSS was used to obtain descriptive statistics of the data. For this paper, we will only discuss the results of reflections in lecture 1. A more complete analysis of the 5 lectures and student background will be presented later.

Lecture 1

The lecture took place from 3 pm to 5 pm on a Tuesday afternoon. One student was absent. Three reflections were conducted; the first was administered 25 minutes into the lecture, and the other two at subsequent 25 minutes intervals. Table 1 shows the lesson events of this lecture.

Table 1

The lecture events as planned by the lecturer

Time Interval	Lesson Events
5 min	▪ Review: Laplace and Inverse Laplace functions
5 min	▪ Introduction
5 min	▪ Steps to solving differential equation using the method of Laplace transforms
10 min	▪ Example 1 (Easy)
10 min	▪ Reflection 1
10 min + 15 min	▪ Example 2 (Intermediate)
5 min	▪ Reflection 2
10 min	▪ Lecture Break
10 min + 15 min	▪ Example 3 (Difficult)
5 min	▪ Reflection 3
5 min	▪ Preview of next lesson

The lecture was on solving differential equations using the method of Laplace Transforms. It was a new topic but needed knowledge on Laplace and inverse Laplace functions, which were taught in the preceding 4 weeks. After having explained the theory and going through an example, ten minutes were allocated for students to first attempt the next two examples before explanation from the lecturer. Students were asked to complete as much as they can, within the given time. The lecturer would walk around the lecture hall to check on students' working, prompt students to next steps in their solutions, and to answer questions and doubts, individually or in small groups. Slower students could use this time to look through and understand earlier example(s) or to seek clarification from peers or the lecturer. After the allocated time, the lecturer would explain and show the solution stepwise, using PowerPoint presentation. In the midst of her explanation, where appropriate, short discussions and interruptions were allowed for the weaker students to seek clarification from their immediate neighbours.

***Question 1** – How do you feel now?*

The eight items in this question measure the students' feelings during the progress of the lecture.

The negative semantic differential items were reverse scored so that the means in Table 2 reflect the positive poles. The Cronbach alphas of all the items were 0.87 (reflection 1), 0.77 (reflection 2) and 0.84 (reflection 3). These values show that students'

responses were quite consistent with each reflection, supporting that the student data were quite reliable.

Table 2
Mean scores of students' and lecturer's scores for Question 1: Feelings (7-point scale)

Item	Students (S) /Lecturer (L)	Mean score (S)/ Raw score (L)			Overall Mean
		Reflection 1	Reflection 2	Reflection 3	
*1a: sad – happy	S	4.13	4.65	4.87	4.55
	L	7.00	6.00	7.00	6.67
1b: difficult – easy	S	3.78	4.33	4.00	4.03
	L	1.00	3.00	2.00	2.00
1c: lonely – sociable	S	4.22	4.36	4.42	4.34
	L	7.00	7.00	7.00	7.00
*1d: detached – engaged	S	4.50	4.65	4.64	4.60
	L	7.00	7.00	7.00	7.00
*1e: drowsy – alert	S	3.85	4.64	4.57	4.35
	L	7.00	7.00	7.00	7.00
*1f: passive – active	S	4.14	4.50	4.61	4.42
	L	7.00	7.00	7.00	7.00
*1g: confused – clear	S	4.16	4.57	4.87	4.53
	L	7.00	6.00	7.00	6.67
1h: bored – excited	S	3.46	3.81	3.87	3.71
	L	7.00	7.00	7.00	7.00
Grand Mean	S				4.32
	L				6.29

* These items were reverse-scored.

There were clear differences in the feelings between the lecturer and the students. Except for the item on "difficult – easy" (item 1b), the lecturer had entries of 6 and 7 for all items as compared to students' mean responses of approximately 4. The lecturer had more positive feelings about the lecture than her students. This confirms studies by Bell et al (1993) and Shimizu (2002) that there are discrepancies in perceptions of classroom events between the teacher and the students. The item on "difficult – easy" shows a reverse in feelings between the lecturer and the students. For the section before the first reflection, the lecturer felt the lesson was quite difficult as she had to manage the class, monitor the students' learning and also administer the instrument. This feeling eased up at reflection 2 (as things began to settle down), but dropped again in reflection 3, as she now sensed that some students still did not fully understand the topic in spite of her having gone through 3 examples in much detail. For the students, this item measured their sense of the difficulty level of the lesson. They reported the lesson to become more difficult from reflection 1 to reflection 2, in line with the use of a more difficult example. This level of difficulty, however, dropped toward the end of the lesson in spite of a more difficult example, indicating a better understanding in the students.

As the lecture progressed, scores from the students show that they became happier (item 1a), more sociable (item 1c), more active (item 1f), clearer (item 1g) and more excited (item 1h). These feelings in a lesson are related. As the students understand the lesson better (clearer), they will feel motivated to clear any little doubts with their peers, which may explain their responses to the "social" item. Upon clearing their doubts with their friends, both parties would feel happier, the recipient happier because

(s)he had understood better and the student who had explained to her/his peer would feel happier because of her/his ability to explain the mathematical concept. As a result, students would also feel more sociable, more active and more excited. In spite of lecture-tutorial structure of the module, the lecturer also allowed for some discussion and peer explanation as the lecturer was aware that in not doing so, some students who fail to understand may lose interest in the lesson totally.

The level of engagement (item 1d) was quite even throughout the lecture. This suggests that students were occupied throughout the lecture. The level of alertness (item 1e) also peaked at reflection 2, albeit at a moderate level around 4.6.

The overall feeling scores of each student were computed using the means across these eight items. The overall mean scores for each reflection are given in Table 3.

Table 3
Overall feel of the students

	N	Minimum	Maximum	Mean	Std. Deviation
Mean score of feeling in Reflection 1	48	1.00	6.13	3.92	1.19
Mean score of feeling in Reflection 2	48	1.00	6.50	4.42	0.98
Mean score of feeling in Reflection 3	48	1.25	7.00	4.48	1.13
Grand Mean				4.27	

The general feeling, score of 4.27, of the students toward the lecture is encouraging as it improved as the lesson progressed. This observation further confirmed the earlier interpretation from Table 2 and is also supported by comments made during the interviews.

Table 4
Activities reported by students

Activity	Frequency		
	Reflection 1	Reflection 2	Reflection 3
1 – Doing the problems on my own.	2	14	13
2 – Day dreaming.	12	5	7
3 – Taking / copying notes.	15	17	16
4 – Talking to my friends about other things (not mathematics).	7	5	1
5 – Paying attention to what the lecturer was saying.	25 (L)	17 (L)	17
6 – Discussing mathematics with my friends.	3	5	4
7 – Doing my tutorial homework.			
8 – Planning for activities after class.	3	6	6
9 – Correcting my mathematics work.		5	1
10 – Taking part in questions & answers.	2	4	2
11 – Reading or looking up information in the handout.	2	6	4
12 – Waiting for lecturer to come around to help me.	2		1
13 – Working on what the lecturer asked us to do.	3	3	6 (L)
14 – Others (please explain):	4	4	5

Question 2 *– What was the* ***main*** *activity you were doing just before you were asked to do this reflection?*

This item was designed to find out the main activity that students were doing just before each reflection. Although the main activity was asked for, many students responded with multiple activities. All such responses were also taken into consideration and summarized in Table 4. Hence, the total for each reflection will add up to more than 48, the sample size for lecture 1. The notation (L) shows the lecturer's response.

The most common activities reported were 5 (pay attention) and 3 (take notes). This confirmed the lecture structure whereby it was a mainly teacher-directed lesson with the students listening. A large increase in number of students who reported activity 1 (do problems on my own) from reflection 1 to that of 2 and 3 suggested some change in lesson activities. Just before reflections 2 and 3, the lecturer had encouraged the more able students to try the lecture examples and then to compare with the lecturer's solution shown in PowerPoint. Here, the perception of the lecturer (lecturer's entries were both 5) and the students were in agreement. As a result, there was also a significant drop in numbers of responses to day dreaming (Activity 2) and talking to friends about other things (Activity 4). The low count of waiting for help (Activity 12) was also because of the lecture structure. The students were occupied throughout the lecture (confirmed by the score of 4.6 for the item on engagement in Question 1), either trying the lecture examples, listening to the explanation of the lecturer or discussing with peers.

However, in the third reflection, the lecturer's response was Activity 13 (Working on what the lecturer asked us to do), in contrast to students' reported responses of mainly activities 5 and 3. The lecturer had expected the students to be rather confident by then to attempt the third example on their own. The 13 students who reported Activity 1 might actually be following the lecturer's expectation to work on what the lecturer asked them to do, on their own, and not copying the lecturer's PowerPoint solution, thus making a possible total of 19 responses, 40%, to Activity 13. The majority of the students (69%), however, were paying attention to the lecturer's explanation of the last example and copying down the solution.

Table 5

Frequencies about purpose of Lecture 1

Activity	Frequency		
	Reflection 1	Reflection 2	Reflection 3
1 – Revise previous work.	23	27	22
2 – Become better at writing mathematics.	7	17	13
3 – Apply mathematics to other modules.	8	4	8
4 – Learn how to discuss mathematics with friends.	2	5	4
5 – Think or reason better in mathematics.	5	9	5
6 – Learn to develop skills to work in groups.	1	2	2
7 – Learn new mathematical skills or concepts.	18 (L)	17 (L)	12
8 – Enjoy learning mathematics.	4	4	4
9 – Learn how to use technologies that use mathematics, e.g., computer, calculator.	0	1	1
10 – Others (please explain):	1	2	2 (L)

***Question 3** – The previous part of this lecture helped you to:*
This item was designed to find out how the part of the lecture just before the reflection had helped the students in their learning. These items relate to the objectives of the different parts of the lecture. Here, the students were allowed multiple responses. The responses are summarized in Table 5.

Although the topic taught was new, a new mathematical skill and concept, it required knowledge about Laplace functions and inverse Laplace functions, which were taught at the beginning of the term. This explains the many responses from the students on Activity 1 (Revise previous work) and Activity 7 (Learn new mathematical skills) for all three reflections. The lecturer had herself opted for Activity 7 (Learn new mathematical skills), in agreement with more than one-third of the students for both reflections 1 and 2. For reflection 3, however, the lecturer had opted for Activity 10 (Others), whereby she expected students to have understood the topic better. There is a discrepancy here with the responses from the students whereby most of them reported activities 1, 2 and 7; revising previous work, become better at writing mathematics and learning new mathematical skills or concepts. This discrepancy in reflection is understandable because the understanding of the students would be better after they attempt the tutorial for this lecture since the students had reported positively to the lecture, in general.

There were not many students (10% or 20%) who chose Activity 5 (think or reason), probably because these students still had difficulty with the method and was listening to the lecturer's explanation for each example, thus there was not much room for independent thinking and reasoning. The 10% or 20% students above were probably the ones who attempted the examples when the lecturer had given the class 10 minutes to try each lecture example (Examples 2 and 3). A sizeable (35% and 27%) number of students felt that doing the examples just before reflections 2 and 3, respectively, had helped them to become better in writing mathematics. However, very few students (8%) noted that the lecture had helped them to enjoy mathematics, even though they were relatively happy (4.55 on item 1a) but not particularly excited (3.71 on item 1h) about the lecture.

Means of responses to Questions 4 to 8 (6-point scale)

Item	Students (S) /Lecturer (L)	Mean score (S)/ Raw score (L)			Overall Mean
		Reflection 1	Reflection 2	Reflection 3	
Q4 – Was this part of the lecture **important**?	S	4.63	4.67	4.73	4.67
	L	6.00	6.00	6.00	6.00
Q5 – Was it hard to **concentrate** during this part of the lecture?	S	3.13	2.88	3.35	
	L	2.00	2.00	5.00	3.12
					3.00
Q6 – Was this part of the lecture **challenging** to you?	S	3.81	3.54	4.02	
	L	6.00	6.00	5.00	3.79
					5.67
Q7 – Do you have the skills to **cope** with this part of the lecture?	S	3.38	3.64	3.71	
	L	6.00	6.00	6.00	3.57
					6.00
Q8 – How **much** mathematics were you learning at this part of the lecture?	S	3.78	4.19	4.25	
	L	6.00	6.00	6.00	4.07
					6.00
Grand Mean	S				3.84
	L				5.33

Questions 4 to 8
These items were designed to find out the students' perception of the importance of the lecture, whether they could concentrate, if the lecture was challenging, if they have had skills to cope with the lecture and the amount of mathematics that they had learnt. The lecturer responded as how these statements might apply to her students. The mean score of their responses are summarized in Table 6.
Table 6

Students' responses to Q4 (importance), Q7 (skills to cope) and Q8 (amount of mathematics learnt) increased as the lesson progressed. This is encouraging as it shows that as the lesson progressed, they found that they were learning more mathematics, thus more equipped with mathematical skills, and hence, the greater importance that they place mathematics. Overall, the students found this part of the lecture important with a mean value of approximately 4.67 in a scale of 1 to 6.

The students generally found the part of the lecture between reflections 1 and 2 least challenging (Q6) and easier to concentrate (Q5). The lecturer had taught a new example just before reflection 1 and was repeating the steps to solving differential equations with another example of intermediate level of difficulty just before reflection 2, thus giving rise to a feel of being less challenging and hence, easier to concentrate.

For four of the five items, the lecturer had given the highest possible rating of 6, as she felt that the materials covered in the lecture were important and challenging, yet within the ability of her students to cope with so that they could learn more mathematics. These expectations were obviously much higher than what the students were reporting. She also expected the students to be able to concentrate during the last part of the lecture, which many students were not able to.

Question 9 – Write down one thing you still do not understand.
This was a free response item.

Table 7
Count of responses to Question 9

Responses	Reflection			Total Count
	1	2	3	
No response	4	7	7	18
Irrelevant comments	17	31	29	77
Specific maths problems	27	10	12	49
Total number	48	48	48	

Instead of writing about specific mathematics, 61% of the entries were expressions of students' feelings of the lessons, for example, "so far so good", "understand everything", "no question", "I think I understand everything" and "I am doing ok so far"; but not their problems in Mathematics. Among the entries related to mathematics, there was only one entry that expressed a specific problem: "Step1, to rewrite the equation". The rest were general difficulties: "shifting theorem", "partial fractions", "inverse Laplace", "differential equation" and "Math". The number of such responses reduced from 27 to 10 and 12, respectively, after the first reflection, probably an indication that they had a better understanding of the lecture as the lesson progressed.

In order to obtain more specific responses, students need to be given more time so that they are able to write in more detail. In this study, they were given only 5 minutes to complete each reflection. Students also need to be given some training to be able to reflect in more specific details and precision.

Interviews

The interviews were conducted before noon, the day after. From the eight interviews conducted, it was found that students were generally happy with the lecture as they had found the lecture very clear. Students had expressed appreciation that they were allowed to discuss with their friends during the lecture. This had helped them to clear their doubts immediately so that they would not be lost and could proceed to the next part of the lecture. To them, this was an important element in the lecture as it had offered them a non-threatening learning environment. As there could clear their doubts immediately, they felt motivated to proceed on with the lecturer even though at times it was a little difficult to them. Two of them had suggested that the lecture could be improved if the lecture had been interjected with jokes. They would then not find the lecture boring and feel drowsy at times.

Summary and Conclusion

In this paper, the authors outlined a piece of action research conducted at Singapore Polytechnic in August 2004, to study the in-class thinking and feelings of both the lecturer and her students through a 1-page checklist, found in the Appendix. The results of the reflections in the first 2-hour lecturer were discussed.

This paper had uncovered both differences and similarities in perception between the lecturer and her students. Through this study, the lecturer became more aware of the differences in perceptions between her and her students. From the interviews conducted after this lecture, the lecturer understood some difficulties faced by her students as well as strong points of the lectures favoured by the students. This insight will lead to more thoughtful planning, to help her better structure her lessons and to organize lecture activities that favour the students so as to engage the students even more, for effective thinking and reflection during classroom learning in order to maximize learning in her students, both the more able and the weaker ones.

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Appendix

Student Experiences of Mathematics Lectures (SEML): Singapore Polytechnic

Name: _____ **Date:** _____ **Time:** _____

Aim: This is **not** a test, and your responses will **not** be graded. There are **no** right or wrong answers. Please answer the questions as honestly as you can. If you have difficulties with the lecture, please mention here so that we can help you learn mathematics better. **Thank you.**

1. How do you feel now? For each pair of adjectives, tick the circle that is closest to your feeling.

	Very	Quite	Somewhat	Neither	Somewhat	Quite	Very	
Happy	○	○	○	○	○	○	○	**Sad**
Difficult	○	○	○	○	○	○	○	**Easy**
Lonely	○	○	○	○	○	○	○	**Sociable**
Engaged	○	○	○	○	○	○	○	**Detached**
Alert	○	○	○	○	○	○	○	**Drowsy**
Active	○	○	○	○	○	○	○	**Passive**
Clear	○	○	○	○	○	○	○	**Confused**
Bored	○	○	○	○	○	○	○	**Excited**

2. What was the **main** activity you were doing just before you were asked to do this survey? Tick **one** only.

❑	Doing the problems on my own.	❑	Planning for activities after class.
❑	Day dreaming.	❑	Correcting my mathematics work.
❑	Taking / copying notes.	❑	Taking part in questions & answers.
❑	Talking to my friends about other things (not mathematics).	❑	Reading or looking up information in the handout.
❑	Paying attention to what the lecturer was saying.	❑	Waiting for lecturer to come around to help me.
❑	Discussing mathematics with my friends.	❑	Working on what the lecturer asked us to do.
❑	Doing my tutorial homework.	❑	Others (please explain):

3. The previous part of this lecture helped you to: (may tick more than one)

❑	Revise previous work.	❑	Learn to develop skills to work in groups.
❑	Become better at writing mathematics.	❑	Learn new mathematical skills or concepts.
❑	Apply mathematics to other modules.	❑	Enjoy learning mathematics.
❑	Learn how to discuss mathematics with friends.	❑	Learn how to use technologies that use mathematics, e.g., computer, calculator.
❑	Think or reason better in mathematics.	❑	Others (please explain):

1 = Not at all (Not much); **2 – 3**: Somewhat; **4 – 5**: Quite; **6**: Very (a lot)

4.	Was this part of the lecture **important**?	1	2	3	4	5	6
5.	Was it hard to **concentrate** during this part of the lecture?	1	2	3	4	5	6
6.	Was this part of the lecture **challenging** to you?	1	2	3	4	5	6
7.	Do you have the **skills** to cope with this part of the lecture?	1	2	3	4	5	6
8.	How **much** mathematics were you learning at this part of the lecture?	1	2	3	4	5	6

9. Write down one thing you still do not understand. (Use page overleaf.)