Patterns of Science Lecture Discourse in L2 Setting

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Abstract

This paper looks into macro structural patterns of a science lecture discourse, particularly in Non Native Speaker (NNS) of English setting in a university in Malaysia where English is used as the medium of instruction (MOI). The objective of this research is to investigate the macro structural patterns, further, specific strategies employed by the lecturer in a science lecture. There are two lectures compared, analyzed, and discussed qualitatively. Meanwhile the data are collected through non-participant observation, video-recording, and interview. Generally, the findings show that both lectures have similar macro structural patterns namely the introduction, the main, and the end parts. The specific strategies employed are review, concept introduction, definitions, explanations, exemplifications, analogy, key idea highlight, and relations of topics/sub-topics. However, what to highlight from the findings is that the lecturer always introduces concepts and let the students understand it before going further. Understanding concept is regarded as the key point of studying science. It is hoped that insights gleamed from this research will assist such lecturers to organize their lectures and to make science lectures interesting.
***Key Words**: macro structure pattern, science lecture discourse*

Introduction

This research investigates the macro structure of a science lecture discourse in a university in Malaysia where English is used as the medium of instruction. Structural patterns become important issue in this study of spoken discourse, predominantly in classroom and lecture discourse. An inability to recognize macro structure is seen by a number of applied linguists as one of the main problems, especially for non-native speakers in understanding lectures (Lebauer 1984; Chaudron and Richards 1986) because knowledge of macro structure is likely to aid comprehension. Hence a student who is used to the macro structure of his L1 will find difficulties in approaching and processing a different language/second language (L2. Previous researches (Chaudron and Richards 1986; Tudor and Tuffs 1991; Flowerdew and Miller 1992) have indicated that L2 listeners often have difficulties in following the structure of a text for a substance of comprehension, even though sometimes they have no lexical obstacles at all (in Yang 2007: 23).

In a study of comprehension of engineering lectures by non-native speakers, Olsen and Huckin (1990) claim that although students may understand all the words of a lecture, they may still fail to understand the main points and logical argument. This lack of understanding Olsen and Huckin attribute to a failure to employ knowledge of the overall discourse structure (as well as background of knowledge). Meanwhile, Lebauer (1984 in Huang 2005), in a study of NNS revealed that students, who are not aware of the macro structure of a lecture or the conventions and cues which indicate key concepts in lectures delivered in a foreign language, have found difficulties in following such lectures. As academic lectures are to facilitate academic scholarship, it is imperative that there is an uptake so that the taught content forms the content schemata of the students. Thus, having procedural schema of the lectures is a crucial aspect of comprehensibility.

In another NNS study Tudor and Tuffs (1991 in Allison and Tauroza 1995: 159) have found that expectations regarding the macro discourse organization will influence L2 listeners' comprehension. This supports one of the key implications of their study that students who are habituated to lectures, which follow a regular discourse pattern, will have difficulty with ideas, which are presented in an alternate manner. They claim that the problems that several of their L2 subjects had with an unusually elaborate discourse organizations were due to a lack of familiarity with the structure and goals of the discourse as a whole. Those above discussions bring to a suggestion that knowledge of the linguistic/discoursal structure is necessarily needed by both lecturer and students because it will be of value for lecturers to deliver a lecture in a well-structured and an optimally effective way.

Young (1994) identifies and describes some prominent macro structures of a university lecture. She describes the macro structure in terms of 'strands' or 'phases'. She distinguishes six phases split in two groups—three metadiscoursal strands (discourse structuring, conclusion, and evaluation phases) which comment on the discourse itself; and the other three which mark university lecture (interaction, theory, and examples phases).

Domizio (2008: 285) mentions that lectures should consist of beginning, middle and end parts. This is actually not so different from Young's (1994). Structuring the lecture this way can help students to follow the lecture easier. Further, it also provides a framework for preparing the slides. Domizio (2008) states that in the introductory part of the lecture a lecturer mentions the learning objectives and topics, further, provides an outline of the lecture so that the structure can estimate how far students go through at one point in time. In addition, it is also important to review previous lectures. He continues, in the main part of the talk a lecturer communicates some key ideas, develops topic further, if and when appropriate, making it clear how each part of the lecture relates to the next (Domizio 2008). It is important to keep this part of the lecture well organized and easy to be understood. At the end of the lecture the lecturer summarizes the main points and, if relevant, suggests areas for future study. This end part indicates to students that the lecture has ended and the lecturer is ready to answer questions in the discussion session at the end when it is necessary (Domizio 2008).

Method

This research uses purely qualitative method. In general, qualitative methods are subjective and humanistic as they deal with meanings. It is different from quantitative method which is regarded as more objective and scientific as they deal with numbers (Clarke and Dawson 1999: 38). Further, the data are gathered through three ways namely non-participant observation, video-recording, and interview.

The researcher conducted observations, as a non-participant observer, on 8 August and 12 September 2008 by directly observing the two lecture sessions at the Faculty of Science and Technology in a university in Malaysia from the same lecturer. The first lecture is about 'forces' while the second one is about 'centre of mass'. The first lecture lasts approximately one and half hour while the second lecture lasts approximately one hour. During the observation the researcher brings and uses recording field notes. The researcher stays in the lecture hall and observes everything from the very beginning until the very end of the lectures. Furthermore, in this research, the video recording process is also done in the same days of observation to collect data. A technician helps recording the two lectures. Then, the recordings are converted to DVD version and transcribed manually using a notebook and a headset. In transforming the video-recording into a transcribed form, the details of gestures, intonations, and postures during the lecture are also noted. After all, the transcriptions were typed in a Ms. Word program. The researcher also interviewed a Professor (specialist informant) from Faculty of Science and Technology who has been teaching science more than 25 years and has participated in many teaching training sessions during her career as a lecturer. This interviewee becomes the researcher's specialist informant because she has been a practicing member of the disciplinary culture in which the genre is routinely used (Bhatia 1993: 34). This is to help the researcher to analyze macro-structural pattern. During the interview, she is made aware of the objectives of this research and her consent is sought.

Participants, events, and setting are called as a series of vignettes (Flowerdew 2002). Even though there are lecturer and students as participants, but this study only focuses on the lecturer. The lecturer is a professor of physics in the Faculty of Science and Technology. She has more than twenty years teaching experiences and teaches both undergraduate and postgraduate courses. During her career, she participates in many teaching professional development programs, seminars, and workshops. Moreover, the event of this discourse is the two science lectures and part of physical mechanic course. The first lecture recorded discussed 'forces' while the second lecture talked about 'centre of mass'. Further, the setting of this lecture event is in a large lecture theatre which can accommodate approximately 200 students. The lecturer used microphone during the lecture and spoke from the front of the room, about 2 or 3 meters away from the first row of students. Sometimes she walked around and approached students. The lecture lasts approximately one to two hours.

Discussion

From the findings, it has been identified that there are similarities and differences on the macro structure of both LE (1) and LE (2). All data sample in this section are the results of data collection which include observations, video-recordings, and interview. Let us look at both lectures in turn.

Lecture 1

From the results of video-recordings and observations, it can be noted that basically, science is all about concepts. Thus, the lecturer employs lecture strategies which highlight concepts, definitions of concepts, explanations of concepts, and exemplifications.

Introduction Part

The data reveal that in the introduction of LE (1), the lecturer reviews previous lecture by highlighting key concepts, explanations, exemplifications, relations of knowledge or topics/sub-topics. After that, the lecturer introduces lecture topic to the students. This finding is not exactly the same as Young (1994), and Domizio (2008). In the introduction part of the lecture they require review of previous lecture, topic introduction, objective of the lecture, and outline of the lecture. However, this is relevant with the information that the researcher got from the specialist informant.

a) Old knowledge with new knowledge (review).

The lecturer begins the lecture by referring to the previous lecture, a kinometics (lines 1-3). Even though the general idea of the 'review' is about motion, but the lecturer also talks about kinometics. The lecturer aims at evoking the schema of the students toward some concepts that they have learned from the previous lecture. It is also done in order to bridge the students to the current topic of the lecture which is about 'forces'. This activity can be recognized from Data Sample 1 below. This finding is similar to Domizio (2008). He agrees that in the introduction of a lecture there must be a review of the previous lecture.

1 L You have been studying for so far (..) you have been learning
2 about kinometics (hh) (..) these are basically properties of
3 motion, (.) right?

Data Sample 1: LE (1)

Moreover, it is also interesting that in lines 5-25 of Data Sample 2 below, the lecturer evokes the schema further by revisiting vision, velocity and acceleration (lines 5-7) and to relate kinometics with 'vectors' and again revisits motion in line 13. The lecturer, then, relates vectors to magnitude and direction by saying that when they talk vector in the same time they talk about both magnitude and direction (lines 20-22). In addition, she also mentions two dimensional motions (line 18) and types of motion (lines 24-25). Here too, parts of review show that the lecturer highlights key concepts and their relationships. This is in line with Domizio (2008) who states that it is important to relate previous lecture topic with the most current one.

Data Sample 2: LE (1)

5 L (.)You need to understand about visions and velocity
6 and acceleration (…) [movement of hand in circular
7 motion] and, (…) as you go along, (.) try to understand
8 ahh (.) different techniques ahh.. that you need to use
9 (.) in order to manage (.hh) problems (.) about
10 kinometics (..)So we, (.) ahh are learning about what we
11 call (..) vectors (.) and (.) at the end (.) of las:t weeks
12 lecture, [L pacing right to left]
13 I was talking to you about different types of motions
14 (.)[L points her hand to indicate right from start] Right,
15 from the start it was linear motions, one dimensional
16 motions(.) And I said, we move on into two dimensional
17 motions(.)
18 Now, two dimensional motions, [indicates by showing
19 2 fingers] that was the time I would say there was a need
20 for vectors(.)Ok. Then(.hh) when we are talking about
21 vectors you are talking both (/)about magnitude and
22 direction [hand movement]You can change magnitude
23 (.) as well as you can change: (.) direction(.) Whatever
24 it is, (.) it will lead to different types of motion(.) Ok (.)
25 so when you talk about (..)

In continuing with her review, Data Sample 3 below shows the lecturer explains relative motion using the escalator as an example (lines 49-67). Together with paralinguistic features, i.e. gestures (lines 50-51), she demonstrates the relative motion of the escalator to a stationary object (line 49). When she and the escalator move, it helps to make her move faster (lines 56-58). She highlights that it was the idea of relative motion (line 65). According to Morell

(2007) exemplification is very important in order to develop a discourse and she found the same results in her investigation on the students' participation in lecture discourse in NNS of English setting in Spain.

Data Sample 3: LE (1)

48 L Yes, and that is when, you go to the supermarkets right (/) ? Now,
49 the escalator can be (.hh) stationary (L's hand is posed in a straight
50 line indicating the movement of the escalator) (..) [points to the stairs
51 in the lecture hall] like this. that means, [moves to it] I walk on my
52 own. [climbs the stairs while explaining] (..) step by step. (..)at the
53 same time, it can be moving(..) [stops, and gestures upward
54 movement with hand] so, you just imagine this is an escalator. I move
55 one step (..) but the escalator move, (.5) it helps to make me move
56 (/) (…) faster. So right now, maybe you are seeing me (hh) step by
57 step, but if I have the escalator, (..) at the same time I'm moving, (..)
58 then you see me moving faster. [Continues gestures but looks at each
59 student in the front row for understanding]. So, this is when relative
60 motion comes in,(.) [goes back to the floor and indicates idea with a
61 finger to the head] idea of relative motion is seen. Ok. The escalator
62 is relative to you (/) [points to student], (..) (/) me, with relative to the
67 escalator. Ok?

a) Introduction to lecture topic

After reviewing the previous lecture, the lecturer sets up the lecture framework by announcing the topic of the lecture in a form of positive sentence (lines 214-215). Again, this finding is similar to Morell (2007) and Domizio (2008). They argue that in the introduction part of a lecture, the lecturer has to mention the topic of lecture. This part can be elicited from Data Sample 5 below.

Data Sample 5: LE (1)

214 L Not social, sorry, physical pheno::mena. (.3) Ok.
215 You are going to learn about forces. Just what (/)
216 is forces? (.3)

Main Part

The main part of the lecture focuses on development of lecture topic (Domizio 2008). From the results of video recordings and observations, it is revealed that in developing the body of the lecture, the lecturer employs such specific strategies namely concept introduction, definition, explanation, exemplifications, analogy, key idea highlight, and relations of knowledge or topics/sub-topics. These specific strategies are employed by the lecturer in various ways. Let us turn to the following data sample.

a) *Concept Introduction-Relations of Knowledge*

In Data Sample 6 below the lecturer begins to develop the topic of the lecture through concept introduction and relations of knowledge. Lines 220-221 through question and answer process, the lecturer establishes that this is not a new topic and having confirmed that they have learned it in upper secondary (lines 228-229) and pre-university (line 230), the rhetorical question 'Otherwise, you are going back to form 4, right?' (lines 231-232) to remind the students that the topic will be dealt with at a higher level and not to cover only the basics. Further, in line 236 the lecturer tries to relate old and new knowledge. She asks the students topic of physics which deals with forces. They, then, revisit Newton's law of motion (line 245).

Data Sample 6: LE (1)

218 L (.5) Can I give you about a few minutes? I have to tackle this.
219 Few minutes to think about it. Just (/) what:: is forces:? (..)You
220 have learn about forces, (/) haven't you?
221
222 S (..) yes

223	L	when did you (/) learn about forces? [moves back to questioning
224		students].
225	S	(.5) form four (mumble)
226	L	form? (/)
227	S	form 4
228	L	look at that. Form 4. some more? (..) finish off there?
229	S	(inaudible responses)
230	L	Form 5, Form 6. now,(.) you haven't to be going deeper. Ok?
231		Otherwise, you are going back to form 4. right?
232		
233	S	(( ))
234	L	(inaudible) So, Now, what is (/) forces? (..)Can you explain to me
235		what is forces? Now, when you talk about forces, what are the
236		topics of physics are you going to deal with? (.4) Forces and (gap)
237		
238	S	(.6) (no response)
239	L	What are the topics (/) of physics (…) that you are going to learn,
240		when you are going to talk about forces?
241		
242	S	(..) motion [echoing]
243	L	(.hh) Mo::tion. Motion. Forces and motion. What laws:: (/) did
244		you learn in the past?
245	S	Newton's law.
246	L	Newton's law of (gap) ?
247	S	(.4) motion
248	L	How many of them?
249	S	(.5) 3
250	L	3. ok. Just reflect(hh) about them. (unclear). Think about the 3
251		laws.

b) Concept Introduction-Definition-Explanation of Concept

Once the topic has been introduced, the lecturer moves to topic development. In Data Sample 7 below, the researcher finds that the lecturer employs a different pattern of topic development from Data Sample 6 discussed previously. Here, the lecturer begins with concept introduction, followed by definition, and then explanation. The lecturer introduces the concept of no-net forces (line 404) to the students. Right after mentioning the concept, she asks the students for a definition or meaning of no-net forces (line 404 and 408). Failing to get a response from the students (line 407), she poses one more question (line 417), to no avail (line 414). Right after that, the lecturer tries to explain the concept of no-net forces to the students through a question-answer process. In line 410, the question 'Are you sure there is no difference?' shows that she has heard the answer but has found it to be the worn one. She shows that the answer is wrong. This is similar to the I-R-I (Initiative-Response-Initiative) which shows a breakdown from the I-R-F (Initiative-Response-Feedback) tripartite dialogue. The hesitations in line 414 prompted a reformulation (line 415) using the key word 'exist'. As the students are able to comprehend this, she then moves to another sub-topic, 'vertical forces'.

Data Sample 7: LE (1)

404	L	<u>No net force.</u> (/)_ when I use the word no net force, does that mean
405		there is no force so ever? (/) [emphasises on no net force with hand
406		gestures]
407	S	(no response)
408	L	What is? What is the meaning of <u>no (/) net</u> force?
409	S	(.8) (mumbles of no difference)
410	L	Are you sure there is no differences?
414	S	(.3)(no response)
415	L	What is the meaning of no net (/) force? The forces <u>exist?</u> or they

S (.5)exists.
L What are (/)the forces::, the vertical (/) forces:: that are acting on you ri::ght:: now?

c) Concept Introduction-Definition-Key Idea –Exemplification

In a latter part of the lecture, a different approach is undertaken. Here, in Data Sample 8, the lecturer begins the discussion by introducing the students to concept of contact (line 477) and, again, through a question-answer process the students' knowledge of the meaning of contact (line 478) is determined. Line 480 shows that the students do not know how to define the concept. Here, the lecturer begins to define contact in a very simple way (line 483) in a tentative fashion hedging it with 'sort of' and highlights the key of learning contact, which is physical contact (line 490). This is followed by examples of physical contact (lines 500).

Data Sample 8: LE (1)

L leave it to you (..) [moves back onto podium] now, again here, there are two (.3) types of forces. You all have been told about this in the past (..) but to what extend, [hand gestures] you sort of categorize:: the forces, ok, here it says two types, [points 2 fingers](..) two classes (/) of forces, (..) contact. Are you familiar with the word contact? (/)Are you familiar with the word contact? Contact, (..) what does contact means?
S (no response)
L What does, what does the word contact mean?
S (inaudible response)
L Sort of come in, touch, come in contact, right? [points to both students and herself] We are now having contact hours, right? (/) This is having lectures, right? (/)
S (no response)
L This is one form of having contact hours with all of you. Ok, (/) it says here contact ( ), involve (/) phy::sical (/)contact, (..) that's the key word. Physical contact, (..) what do you mean by physical contact? Can you (/) just show me an example of physical contact that is immediate to you. (…)
S [student shows something]
L Right. You are holdin+g it, anything else? Physical contact, up there. [points towards students] (..) Sorry, not you. ((laughter)). physical contact (/), can you show me? (/)
S ( )
L (.4)Now, (…) other examples of physical contact, so you see what is physical contact as long as, (..) it

d) Concept Introduction-Explanation of Concept-Relations of Knowledge-Exemplification

As the lecturer moves on to another topic, 'field forces' (line 505), in Data Sample 9 below, in developing the topic of lecture the lecturer begins with introducing the students with a concept, giving explanation, and mentioning examples. Here, the lecturer and the students are actually discussing forces acting through empty space (line 505). First, the lecturer exposes the students to concept of gravitation and revisits electromagnetic field (lines 508 and 513). After that the lecturer explains those concepts (line 516) and, again, revisits physical contact (line 523). She, then, mentions some examples of physical contact (line 530). The lecturer revisits physical contact because she tries to highlight that physical contact actually opposes field forces (line 537). Taking a long turn, she also emphasizes that it is easier to understand forces involved physical contact than field forces because physical contact is more concrete while field forces is more abstract (line 536).

Data Sample 9: LE (1)

504 L (..) that is physical contact. Now the next one is field
505 forces acting through empty space. What kind of field
506 are you familiar with? (/)
507 S (..) gravitation
508 L Gravitational field, (…) can you see gravity?
509 S No
510 L Can you feel gravity?
511 S Yes
512 L You can feel gravity. Ok, er, (…)what are the fields
513 have you learned? Electro::magnetic field (.4) Any
514 other field?
515 S (mumble)
516 L Electric, magnet,(..) same. (…) Any other field? I don't
517 know whether you all think about nuclear (hh) as well.
518 These are weak (.) electromagnetic field. Er.. fraction.
519 Anyway, the main thing is that you have the
520 gravitational field, as well as the elec:tro:magnetic
521 field. Ok, I don't want to go into electromagnetic field,
522 yeah, (…) you can deal with it when the time comes.
523 So, no physical contacts is required and there on the
524 other side of it you see the examples (..) of the different
525 (.) physical contacts that you can have, (.4) you can
526 find, yeah. (.3) for objects. [points to slides]. You don't
527 have to go for those examples, (…) you have (hh) it
528 with you. You have it with you, you are actually
529 experien::cing (/), yeah, (..) what I mean by physical
530 contact. The fact that you are sitting on the chair, (..)
531 that is one form of physical contact. You are hold::ing
532 a pen (/) , (..) another form of physical contact, just
533 almost any examples that you can have (..) ahh that you
534 can ahh (..) you know? (.4) Err..look around and give
535 me the examples. Now, (..)so, (..) personally, it will be
536 easier, for you to understand (hh) forces that involve
537 contact as oppose to the field forces. It is easier for (..)
538 you to manage: (/) problems that relate to gravitational
539 forces (.) because you can actually see: things
540 happening, but more (..) difficult will be the
541 electromagnetic forces because it sort of more abstract
542 especially, when you are going to talk about object or
543 material at the atomic molecular level.

e) *Concept-Explanation of Concept-Exemplification-Further Explanation*

Yet another pattern that emerges is elicited from Data Sample 10 below. Here the order employed is concept introduction, explanation of concept, exemplification, and followed by further explanations. This begins in line 555 where the lecturer introduces the students to the concept of calibration again through a question answer process. Line 556 indicates no response which resulted in the next turn (line 557). The lecturer repeats the question and then through exemplification, namely the use of thermometer, she demonstrates the movement of mercury up and down the bottle (line 602). She, then, continues explaining the application of calibration (e.g. spring) (line 619).

Data Sample 10: LE (1)

552 L mention (..) but there you are, its all these. Next, (.3)
553 more about forces, now I'm not going to err.. maybe,

you see the kind of word that is important here is to calibrate. (/)Do you understand what is calibration?

S (no response)

L Do you understand what is (/) calibration? ok. All of you (/) have been using thermometers? Actually, what is happening in the thermometer? (..) (.hh) What happens? What do you see (/)happening in the Thermometer?

S (…)(no response)

L You just see the? (gap) (..)the moving, the motion of? (/)

S Mercury

L Mercury, sometimes (hh) it's alcohol, right? Up and down. So it's actually a change in the? (gap) [movement of hand up and down]

S (no response)

L (…) Change in what? (…) Can I have your bottle please? So you see (..) a change in what? [takes a water bottle] oh this(..) not the, you have more water in your bottle? (.6) Or less. What happen, you just see (/) if I were to press this, what happen::? What happen if I were to press this? [presses the bottle] The level of the water (/) (gap) ?

S (..) raise

L (.4) Goes up. (.5)What influences, the level of the water?

S (..) the force

L The force:: that I exert. So, this is one way, whereby you can make use (/) of the level of water to know:: what is the co::rres::ponding:: force (hh) applied to it. Can you understand (/) me? Like the thermometer, you see, moves up and down. When does it move up? When does it move up? (…)

S when the

L When the temperature, raises. [hand gestures] Inversely, conversely when the temperature goes down, the level of the mercury, goes down. (.hh) So, what do you mean by calibrate? Which means, to say that you check the level of water, (..) you (…) have some other: ways of checking, (..) to know the temperature of water, so you start giving marks. (/) Can you understand that?

S [heads shaking in concern]

L ok, so if is very long, you say ah, if it is at this level when the water is freezing (.3) can you see? can you understand that (/) ? [picks up the bottle and explains using it]

S (no response)

L for example, you said that this level goes up if the pressure that I apply is high. so I may say ok, the pressure that I apply or the force that I apply is in terms of Newton. It goes right way up here, (.3) now, I know I can measure somewhere else. It's equivalent to ten, Newton. (.4) Right. So, I put a mark here. 10 Newton.

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609 one, Stronger, And very strong. (.3) So. what do I do? I
610 put the marks. Ok. (..)So, next time I don’t have to
611 actually read the force. I just know what to do, I apply
612 the force here (hh) and I look where it is, that the level
613 has araisen to and I know(…), what is the strength of
614 the force that I have applied. That is the meaning of
615 calib::ration, Ok, can you see what is the meaning of
616 calibration (/).Now I can use this as an instrument to
617 make measurement regarding the force that I apply to
618 the bottle. So, the word calibration is also generic, you
619 can apply it at any time.
620 [points to slides] So, here it says a spring can be used to
621 calibrate the magnitude of the force. Ok, So what does,
622 what , (..) what happens so you just see the marks,
623 which is the same, I was using the (..) bottle, there you
624 just apply the force (..) in this case it’s a downward
625 force. Just now, was applying the force. Gripping it and
626 then what happens to the needle as you can see and then
627 you start making marks. So, that is the meaning of
628 calibration. Ok, let’s see(.8) Now

e) Concept Introduction-Relations of Knowledge-Definition -Relations of knowledge

In Data Sample 11, the lecturer goes through concept definition, relations of knowledge, definition, and then relation of knowledge in the construction of ‘inertia’. Again the pattern is derived from a question-answer process, but made specific with the word ‘exactly’ (line 747). As mentioned earlier, precision is crucial in science. In this data sample, lines 747-770 is a monologue similar to other lecture discourse. In line 747 she cautions the students of new information and relates inertia and reference/initial frame (line 753).

Data Sample 11: LE (1)

747 L What exactly is inertia (/)? (.) Ok, what did it says there?
748 [refers to slide] If an object does not interact with other
749 objects, it is possible (..) to identify a reference frame (..)
750 in which the object has zero (hh) acceleration. Now you
751 may not be used to this type of information, you are
752 more used to another one that is coming, this is also call
753 the law, of inertia. It defines a special set of reference
754 frame, called initial frames. We’ll come back to that
755 afterward. What do (/) I mean by initial frame?
756 Whenever you want to talk about motion, talk about
757 forces, you do need to consider frames, ya. Like the,
758 Cartesian coordinate system that provide you with some
759 kind of frame. Ok, now, any reference frame that moves
760 with constant velocity, relative to an initial frame is
761 itself, an initial frame. Now, this kind of statement, can
762 be quite (..) confusing: (..) Ok, last week we did talk
763 about the

End Part

There is no video recording data of the end part of LE (1) because that part was not recorded. However, the researcher has ethnographic notes of part in LE (1). The end part was rather abrupt with the lecturer reminding the students of the meeting the week after.

Lecture 2

All data discussed in this section are derived from observations, video-recordings, and interview. A difference between this lecture 2 (LE 2) and LE (1) is the fact that here, a large part of the lecture time was spent by the lecturer as she went through the result of a quiz conducted the week before.

Introduction Part

LE (2) is a lecture on 'centre of mass' but this concept is not immediately introduced to the students. The lecturer also fails to mention the objective and outline of the lecture. This finding is different from that of Young (1994) and Domizio (2008).

a) Introduction to lecture topic

As mentioned earlier, the lecturer introduces the students to the topic of LE (2) after a discussion on the quiz. This is followed by some recommendations as to how she intends to make the lesson simpler to be understood (lines 317-318). Right after that, she mentions that they were to understand 'centre of mass' (lines 319-320). Here, the lecturer goes through a question-answer process. She poses a question (line 321), the students respond (line 322), and the lecturer gives her feedback (line 323). Please refer to Data Sample 12 below.

Data Sample 12: LE (2)

310	L	you refer to the textbook. (.4) Erm:: collect the questions, don't
311		forget (.4) return the examination questions.
312		
313	S	(.17) [shuffling or papers or books]
314	L	(.23)Students, in this hall. Imagine:: each one of you is particle.
315		[referring to a student in particular] you, don't like to be particle
316		(/)? I know you, don't like but there you are, this is just to make
317		the lesson:: simpler for you to understand. [to the class] imagine
318		yourself, to be particles. You are to understand:: the centre of
319		mass. (..) Each one of you, have you own coordinate. Am I right
320		or wrong (/)?
321		
322	S	Yes (.3)
323	L	Ok now, there only three of you, three particles. [points to 3
324		students] ((laughter)) This is quite simple. Three students here
325		(/), you are not going to draw ? a three person on a piece of
326		paper. You're going to just draw a dot (/). Yeah::? Right (/)?
327		Where is the (/)

Main Part

Like the body of LE (1), the data reveal that in developing the body of LE (2), the lecturer employs such specific strategies namely introduction of concept, definition, explanation, exemplifications, analogy, key word highlight, and relations of knowledge or topics/sub-topics. In addition, it can be seen that the lecturer employs code-switching during the lecture as well. These specific strategies are employed by the lecturer in some patterns. Let us turn to the data.

a) *Concept Introduction–Analogy-Explanation*

In the main part of LE (2) the lecturer employs a strategy which is slightly similar to that of LE (1). There are also some patterns revealed here. In Data Sample 13, the lecturer begins with the introduction of concept, followed by an analogy and explanation. Right after introducing and highlighting concept of centre of mass (line 319), the lecturer makes an analogy by asking the students to be particles and a system of particle (line 323). These are concepts that are important to physics and engineering. The students have to understand the concept first, before the lecturer can move on to the calculation of the centre of mass (line 326). In line 332 as the lecturer moved around she noted that the students were not doing the task correctly (line 327). So, in line 323 she nominated a student and in 329-330 volunteered a student to demonstrate to the amusement of the class (line 331). In line 337, the lecturer explains her teaching strategy (demonstration) which indirectly shows how sensitive she is to her students' needs. This method of demonstration followed by explication arises when the concept point of reference or point of origin is introduced (lines 343-345). Again further in the lecture, by using a ruler (line 353) she demonstrates the centre of mass.

Data Sample 13: LE (2)

314	L	(.23)Students, in this hall. Imagine:: each one of you is particle.
315		[referring to a student in particular] you, don't like to be particle

317 (/)? I know you, don't like but there you are, this is just to make
318 the lesson:: simpler for you to understand. [to the class] imagine
319 yourself, to be particles. You are to understand:: the centre of
320 mass. (..) Each one of you, have you own coordinate. Am I right
321 or wrong (/)?
322 S Yes (.3)
323 L Ok now, there only three of you, three particles. [points to 3
324 students] ((laughter)) This is quite simple. Three students here
325 (/), you are not going to draw ? a three person on a piece of
326 paper. You're going to just draw a dot (/). Yeah::? Right (/)?
327 Where is the (/) centre of mass, as far as they are concern? Can
328 the person here, where is the centre of mass (/)? Lift up your
329 hand.(.5)
330
331 S (.3) [Student in the centre lifts up her hand] ((laughter))
332 L Ok, this is the centre of mass. [reprimands the student]. Don't
333 be shy. You are helping your friends to understand. ((laughter)).
334 ok, this are just simple. Alright? (..) Centre of mass. When you
335 look in your book, there are just points (.hh). Can you have a
336 look in your, where is it (/)? There you are (.hh). page 203. that
337 2 blue dots. So, (..) if I were to take your friends, to represent
338 (..) the particles or the points, then you can have the impact, (..)
339 the feeling is better, but how are you going to tell me the
340 position of the centre:: of mass (/). Which means to say that (..)
341 you need to have the (/) point of reference, the origin. Where
342 are you going to take it? (/) You, (..) [points to a student], where
343 is your point of origin? [students points to the centre of mass].
344 That is centre of mass. (.hh) Wrong. Look (/) at this. [points at
345 the starting of the table]. This is suppose to represent the x-axis.
346 Imagine it to be straight ok. It is curved. You imagine it to be
347 straight now. (..) Ok? Where do you measure::? The position of
348 each one of the particle. Where (/)? From here. Right? From
349 here. So, what is the position of the centre of mass? (..) I can
350 take a ruler, oops [slips a stair] and start measuring it. (.7) But,
251 you are going to count. How do you do it? (.5) that is more
352 important for you, all of you have, maybe (don't remember)
353 how to do it. (.4) But, you just look (/), the first particle is say
359 x1, from here:, the origin::. The second particle is? (..) X ?
361 S (..) 2

b) *Concept Introduction-Exemplification-Concept analogy*

Here, as she moves along to another topic, she employed the strategies of concept introduction, exemplification, relations of knowledge, and explanation. First, she introduces solid body to the students (line 536). After that, examples of solid body were given (duster and bench) in line 539. Then she brings the analogy of the students' big stretch together as a solid body and a new term, 'integration is introduced (line 549). Please refer to Data Sample 14 below.

Data Sample 14: LE (2)

536 L about the equation. Look at 99.(..) it says there solid body? What do
537 you mean by solid body(/)?
538 Just now, (..)I was talking about particles, now this is solid body.
539 [shows the duster as an example]. You look at the benches. The
540 benches, you don't divide it right, but look at the chairs, (..) 1,2,3,4.
541 (.4) so the benches you can regard it as a whole body. How are you
542 going to determine the centre of mass for a solid? that means (..) it is

not been split into particles. This is a good example of particles. (..) But if all of you get stuck together somehow, can glue all of you up, cannot free yourself (..)than you become ( ) solid particle. So, how do you that? You see the use of integration. Are you with me (/)? Are you with me?

c) *Concept Introduction-Definition-Explanation-Key idea highlight*

In another variation, Data Sample 15 shows the lecturer comes with concept introduction, definition, explanation, and key idea. Here, the lecturer introduces the students to the concept of conservation of momentum (line 613). In attempting to get the students to explain the meaning of conservation through several questions (lines 618-622) and code-switching, she is able to use a synonym to conservation, i.e. does not change. Then she elicits from the students the idea of collision in relation to momentum, conservation of momentum, and the principle to find the speed (lines 637-642).

Data Sample 15: LE (2)

L you all heard, I'm asking this question. Have you all heard principle:: of conservation of momentum (/)?
S Yes.
L What does that mean (/)? What is the meaning of conservation of momentum (/)? What does that mean?
S (.7) [no response from student]
L What is the meaning of conservation of momentum (/)? (..) Ahh:: *Apa makna* conservation of momen::tum(/) ? (..)*Apa makna* conservation of momentum? (..) Are you having a problem with the English term (/) or *apa ini*? (..) The idea? *Apa makna* conservation of momentum? The momentum does not? (.6)
S Change.::
L Does not change. (.5) *Apa makna* does not change? *Biasanya*, when you talk about momentum what do you talk about?
S Collision
L Collision (/). Conservation of momentum:: *apa maknanya*? Before collision and ? (/)
S (.4) After:: collision::
L After collision. Ok, this 2 objects are moving, collide (.5) and what happen? Either they get stuck and stop *atau* they move. Right? So,(.4) *ini ada* momentum, this 1 also *ada* momentum. So what do you do, you just add them up (.5). So, *kalau* conservation of momentum, what does that mean? The momentums before and after must (/)
S Must be the same.
L Be the same. So, that is the principle that you need to use to find the speed after that (..) as well as the ( ) so,

End Part

The end part of LE (2) is similar to the end part of LE (1). This part is different from Diamond, Sharp and Ory (1983), Young (1994), and Domizio (2008) who require summarization and suggestion for further study at the end of a lecture. Again this part is abrupt.

Data Sample 16: LE (2)

L You come back, on Monday morning, *kat mana ini*?
S Fssk [inaudible]
L fssk *ye. (.10)* Ok, I'll see you on Monday morning and
talk about it.

Conclusion

As stated in introduction, this research attempts an in-situ approach to uncover the real discourse that is used by a science lecture. Hence the research paradigm selected is utmost importance. Domizio (2008) proposed three phases of a lecture namely the introduction, the main, and the end phase while Diamond, Sharp and Ory (1983) used the term opening, body and closing. The recognition of the introduction part in a lecture compels lecturers and teachers to be concerned of 1) the objective of the lecture, 2) how to introduce a new topic, 3) and how to serve an outline of the lecture. In addition, having knowledge of how the main part of a lecture is organized may raise awareness of on how to explain the materials to the students effectively.

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