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How student discussions during group work influence learners' performance when doing a Department of Education prescribed life sciences activity.

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APPENDICES

APPENDIX 1: Department of Education Gr 11 Life Sciences Activity and Memo

Research Assignment

Animal Diversity

This assignment is made up of two parts:

1. A table
2. An essay

1. Table

The Animal kingdom contains about 30 phyla, however in Grade 11 we are only going to look at six:

Porifera, Cnidaria, Platyhelminthes, Annelida, Arthropoda and Chordata.

Using various resources (books, internet, magazines) you are required to draw up a table where you compare the body plan of the above 6 phyla with respect to:

- Their symmetry
- Number of tissue layers developing from the embryo
- Absence or presence of a coelom
- Presence or absence of a through gut.

Your table should also include a column for a diagram of a representative from each phyla, which is South African.

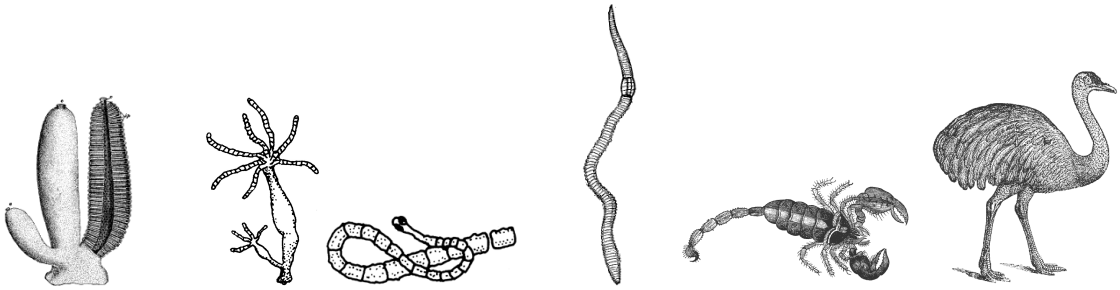
2.Essay

A series of key evolutionary changes have led to today's animal phyla. An animal's body plan results from a pattern of development programmed into the animal's genes by natural selection.

Using the table you have constructed you are required to write an essay where you explain the body plans of the different phyla in the context of evolution.

You will need to consult various sources where you look at phylogentic trees which explain the development of the body plan from the Porifera to the more advanced animals the Chordata.

		TOTAL	**LEARNER MARK**
Table	LO 1 LO 2	20	
Essay	LO 1 LO 2 LO 3	30	
CONVERSION		**TOTAL x 0.4 = 20**	



TASK 1: RUBRIC: PRESENTING DATA IN TABLE FORM

Assessment Criteria	Performance Indicators			
	0	1	2	Comment
Heading	Not present	Incomplete	Complete	
Descriptive Column Headings	Not present	Incomplete	Complete	
Descriptive Row Headings	Not Present	Incomplete	Complete	
Format of Table	No horizontal and vertical lines in borders	Incompletely Drawn	Table drawn completely	
Data entered correctly for the Phyla				
Porifera	Not done All Incorrect	Some information incorrect	All information correct	
Cnidaria	Not done All Incorrect	Some information incorrect	All information correct	
Platyhelminthes	Not done All Incorrect	Some information incorrect	All information correct	
Annelida	Not done All Incorrect	Some information incorrect	All information correct	
Arthropoda	Not done All Incorrect	Some information incorrect	All information correct	
Chordata	Not done	Some information incorrect	All information correct	

	All Incorrect			
TOTAL				**20**

TASK 2: COMMUNICATION IN WRITING (ESSAYS)

Assessment Criteria	Performance Indicators				
	0	**1**	**2**	**3**	**Comment**
Relevant Facts concerning Defining the following terms					
Symmetry	Incorrect	Correct			
Diploblastic/triploblastic	Incorrect	Correct			
Coelom	Incorrect	Correct			
Through Gut	Incorrect	Correct			
Relevant Facts concerning the Evolution of the following					
Porifera	Not done	Incomplete	Correct with interesting detail		
Cnidaria	Not done	Incomplete	Correct with interesting detail		
Platyhelminthes	Not done	Incomplete	Correct with interesting detail		
Annelida	Not done	Incomplete	Correct with interesting detail		
Arthropoda	Not done	Incomplete	Correct with interesting detail		
Chordata	Not done	Incomplete	Correct with interesting detail		
Logical Flow of descriptions	No logical flow	Only parts of the description have a logical flow	The description has a logical flow with some mistakes.	A logical flow throughout	
Sentences focused on the subject	Sentences are not focused on the subject	Sentences focused on the subject but mistakes	All sentences focused on subject.		

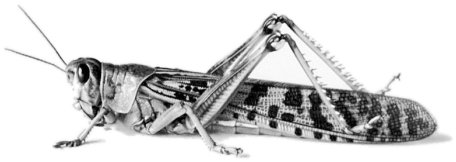
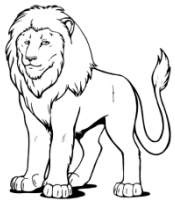
		occur.			
Correct use of grammar and spelling	More than 60% spelling and grammar errors.	40-59% spelling and grammar errors	39-1% spelling and grammar errors	No spelling or grammar errors,	
Use of paragraphs	No paragraphs used	Incorrect use of paragraphs	Correct use of paragraphs.		
Plagiarism	Plagiarism throughout	Pliagiarism in some places	No plagiarism		
References	None or incorrectly referenced.	1-2 references. Referencing is correct	3 more sources correctly referenced		
TOTAL					30

Research Assignment Memo

Animal Diversity

Table comparing the body plan of Podifera, Cnidaria, Platyhelminthes, Annelida, Arthropoda and Chordata with respect to their symmetry, number of tissue layers, coelom and through gut.

Phylum	**Symmetry**	**Number of tissue layers developing from the embryo**	**Absence or presence of a coelom**	**Presence or absence of a through gut**	**Diagram of a South African Representative**
Porifera	Asymmetrical	No true tissue layers	Coelom Absent	Absent	Photo of an *Ircinia* sp sponge 
	Radial	Diploblastic Two body	Coelom Absent	Gut has only one opening the mouth.	Diagram of a Portuguese man of war

Cnidaria		layers		No through gut	
Platyhelminthes	Bilateral	Triploblastic Three body layers	No Body Cavity Acoelomate	Gut has only one opening the mouth. No through gut.	Diagram of a pork tapeworm 
Annelida	Bilateral	Triploblastic Three Body Layers	Coelom Present	Through gut present	Diagram of an Earthworm 
Arthropoda	Bilateral	Triploblastic Three Body Layers	Coelom Present	Through gut present	Diagram of a Locust 
Chordata	Bilateral	Triploblastic Three Body Layers	Coelom Present	Through gut present	Diagram of a lion 

ESSAY MEMO

A series of key evolutionary innovations has led to today's animal phyla

The innovations are to do with:

Symmetry:

- This refers to the arrangement of body parts around a point or central axis.
- Radial symmetry is the arrangement of the body parts around a central axis.
- A bilaterally symmetrical animal has a configuration with left and right halves that mirror each other.

Number of tissue layers developing from the embryo

- Diploblastic: Having a body cavity made of two cellular layers – an ectoderm and an endoderm
- Triploblastic: Having a body cavity made of three cellular layers: an ectoderm, mesoderm and an endoderm.

The coelom

- The coelom is a fluid filled cavity that occurs within the mesoderm.

A through gut

- A through gut is one with an anterior mouth and posterior anus.

- From the Protist ancestors who were single celled organisms the multicellular animals evolved.

The **Porifera**

- are primitive simple multicellular animals who are asymmetrical: have not true tissue layers
- They are made up of different cell types whose activities are coordinated with each other.
- The sponges are filter feeders. Food is digested within the sponge's cells.

The **Cnidarians**

- A major evolutionary innovation that occurred among the Cnidarians is the extracellular digestion of food. The more advanced groups of animals have retained this type of digestion.
- Their gut has one opening, the mouth.
- Exhibit radial symmetry: moving equally well in all directions.
- They possess two body layers and are said to be diploblastic. They have a sac body plan and exist as polyps or medusa.

The **Platyhelminthes**

- Have a sac- like body plan but have three germ layers and are said to be triploblastic.
- They are bilaterally symmetrical. Bilateral symmetry was a major evolutionary advancement among animals because it enabled different parts of the body to become specialized in different ways.
- There is the development of a nervous system and muscles.
- Bilateral symmetry allowed animals to evolve a definite head end, a process called cephalization. Animals with heads are often active and mobile moving through their environment head first with sensory organs concentrated in the front.

- They are the simplest animals to have organs.
- They lack any internal body cavity other than the gut and are said to be acoelomate.
- The gut only has one opening the mouth this means that the food and waste must enter and leave through the same place.

The **Annelids**

- The annelids have a coelom. Now the digestive system and the body wall can move independently and internal organs can become more complex. Coelomic fluid can become help with respiration, circulation and excretion: it can also act as a hydrostatic skeleton.
- Like the platyhelminthes, this group of animals is bilaterally symmetrical and is triploblastic.
- The development of a through gut was also a major evolutionary advancement where waste could leave the body through a different opening: allowing the gut to become more specialized.
- The annelids are the first animals to show segmentation: the building of the body from different segments. The great evolutionary advantage of this is that a small change in a single segment can produce a new kind of segment with a specialized function: give rise to some segments modified for reproduction and some for getting rid of waste.
- The annelids also show a closed circulatory system and solid ventral nerve chord.

The **Arthropoda**

Like the Annelids the Arthropods show bilateral symmetry, are triploblastic, have a coelom and a through gut.

The success of the arthropods is attributed to a

- Flexible exoskeleton,
- Specialization of body regions
- Jointed appendages.
- A high degree of cephalization
- A variety of respiratory organs
- Reduced competition through metamorphosis

The **Chordata**

Like the Annelids and Arthropods show bilateral symmetry, are triploblastic, have a coelom and a through gut.

- At some time in their life history they all have a notochord, dorsal hollow nerve chord and pharyngeal pouches.

- The embryonic notochord is usually replaced by a vertebral column. The vertebral column is part of the strong flexible endoskeleton, which is living anf grows with the animal.

- Together with the skeleton the muscles allow for rapid and efficient movement.

- A skull enclosed the brain. During vertebrate evolution: the brain increased in complexity and specialized regions developed to carry out specialized functions.

- High degree of cephalization is accompanied by complex sense organs.

- Vertebrates have an efficient way of extracting oxygen from their environment and getting rid of carbon dioxide.

- The kidneys are important excretory and water regulating organs.

References:

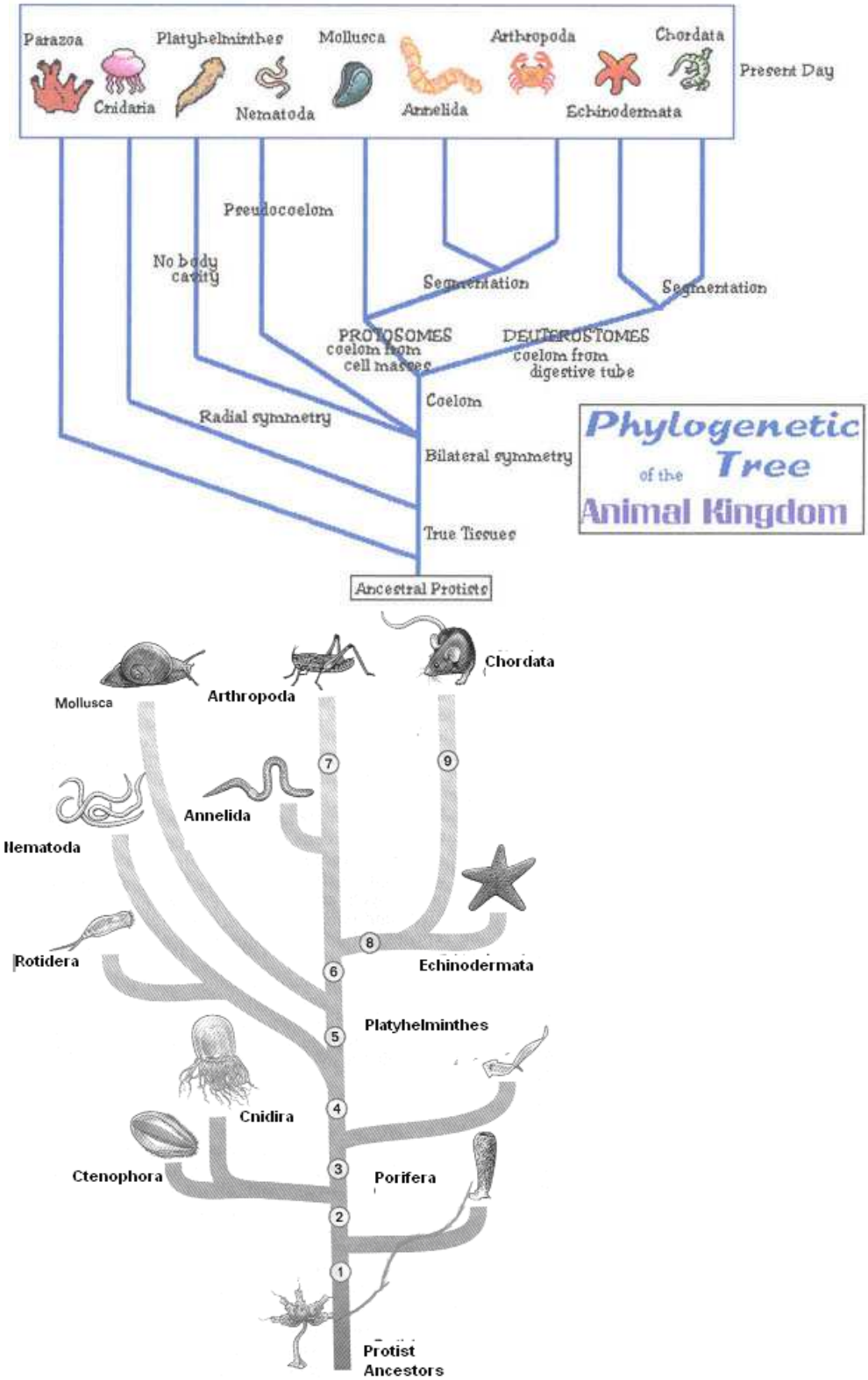
classic.sidwell.edu/.../animalia/amphioxus.html

Johnson, GB and Raven PH 1998 Biology Principles and Explorations Holt, Rinehart and Winston, New York

Mader S.S. 1996 Biology Fifth Edition WCB McGraw Hill, Boston

Included TWO phylogentic trees

From: classic.sidwell.edu/.../animalia/amphioxus.html



(from Johnson e*t al* 1998)

APPENDIX 2 Ethics permission letters

Permission Letter for SCHOOL

Protocol Number: 2011ECE063C

August 2011

The Principal

Dear

Re: Request for permission to conduct my research at Bracken High school

I am currently studying towards my Masters Degree in Science Education from the University of the Witwatersrand. I request permission to conduct my research at XXX High School.

My research project is focussing on how Gr 11 student discussions during group work influence learner performance. This research involves video and audio recording of a one hour group work activity with a Gr 11 class which I teach. The group work activity will be completed during class time. Following the group work lesson the learners will be asked to complete a questionnaire which will allow me to determine from a student's perspective, the influence of the group work on their learning.

All information that is obtained during this research project will be kept strictly confidential. Any sharing or publication of the research results will not identify the school or any of the participants by name, pseudonyms will be used. Learners are free to withdraw from the research at any time for whatever reason, without penalty.

I trust that you will kindly grant me the consent to conduct my research.

Sincerely,

Mrs J Woolway	Supervisors:	Mrs A Msimanga	Mrs G Moletsane
011 868 1056		011 717 3073	011 717 3248



Protocol Number: 2011ECE063C

Parent Information Sheet

August 2011

Dear Parent:

I am currently studying towards my Masters Degree in Science Education from the University of the Witwatersrand. I would like to include your child, along with his or her classmates, in a research project on how student discussions during group work influence learner performance. The purpose of this information sheet is first, to explain to you what my research entails and how it will involve your child and secondly, to request your permission for your child to participate in this project.

This research will include video and audio taping a one hour group work activity which will be completed during class time. The recordings will be transcribed, allowing me to complete observation schedules. Following the group work lesson your child will be asked to complete a questionnaire which will allow me to determine from a student's perspective, the influence of the group work on their learning.

Your child's participation in this project is **completely voluntary**. In addition to your permission, your child will also be asked if he or she would like to take part in this project. Only those children who have parental permission and who want to participate will do so, and any child may stop taking part at any time. You are **free to withdraw your permission** for your child's participation at any time and for any reason **without penalty**. These decisions will not affect your child's status or grades in any way.

The information that is obtained during this research project will be kept strictly confidential and will not become a part of your child's school record. Any sharing or publication of the research results will make use of pseudonyms, ensuring that your child remains anonymous.

Please complete the attached informed consent forms, please indicate whether you **do or do not** grant permission for your child to participate in this project; or to be video and audio recorded. Please sign and return the informed consent forms to me.

I look forward to working with your child. I think that my research will be enjoyable for the children who participate and will help them to use group work as an effective way of learning.

If you have any questions about this project, please contact me using the information below.

Sincerely,

Mrs J Woolway

011 868 1056

Supervisors: Mrs A Msimanga

Phone Number: 011 717 3073

Mrs G Moletsane

011 717 3248

Protocol Number: 2011ECE063C

August 2011

Parent Informed Consent Form for Participation in research project.

I do/do not (circle one) give permission for my child_____ (name of child) to participate in the research project on how student discussions during group work influence learner performance.

Your child's involvement in the research project is voluntary and your child is free to withdraw from the study at anytime without any penalty or prejudice. Any sharing or publication of the research results will make use of pseudonyms, ensuring your child's anonymity.

_____	_____	_____
(Print) Parent's name	Parent's signature	Date

Protocol Number: 2011ECE063C

August 2011

Parent Informed Consent Form for Video Recording

.

I do/do not (circle one) give consent for my child _____ (name of child)

to be videotaped during the group work activity.

Your child's involvement in the research project is voluntary and your child is free to withdraw from the study at anytime without any penalty or prejudice. Any sharing or publication of the research results will make use of pseudonyms, ensuring your anonymity. Recordings will allow me to complete an observational schedule which will be used as part of the results for my research project. The recordings will be kept confidential and destroyed after 5 years

_____	_____	_____
(Print) Parent's name	Parent's signature	Date

Learner Information Sheet

Protocol Number: 2011ECE063C

August 2011

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Dear Learner:

I am currently studying towards my Masters Degree in Science Education from the University of the Witwatersrand. You are invited along with your classmates, to participate in a research project on how student discussions during group work influence learner performance. This research involves video and audio taping a one hour group work activity which will be completed during class time. The recordings will be transcribed, allowing me to complete observation schedules. Following the group work lesson you will be asked to complete a questionnaire which will allow me to determine from a student's perspective, the influence of the group work on your learning.

Your participation in this project is **completely voluntary**. Only those children who have parental permission and who want to participate will do so, and **you may stop taking part at any time** for any reason without penalty. These decisions will not affect your status or grades in any way.

The information that is obtained during this research project will be kept strictly confidential and will not become a part of your school record. Any sharing or publication of the research results will make use of pseudonyms, ensuring your anonymity. All recordings, both audio and video will be kept at the University of the Witwatersrand for five years by my supervisors after which time they will be destroyed.

Please complete the attached informed consent forms, please indicate whether you **do or do not** want to participate in this project; as well as granting permission to be video and audio recorded. Please return the informed consent forms to me.

I look forward to working with you. I think that my research will be enjoyable for the children who participate and will help them to use group work as an effective way of learning.

Sincerely,

Mrs J Woolway	Supervisors:	Mrs A Msimanga	Mrs G Moletsane
011 868 1056	Phone Number:	011717 3073	011 717 3248

Protocol Number: 2011ECE063C

Learner Informed Consent Form for Participation in research project.

I _____do/do not (circle one) give permission to participate in the research project on how student discussions during group work influence learner performance.

Your involvement in the research project is voluntary and you are free to withdraw from the study at anytime without any penalty or prejudice. Any sharing or publication of the research results will make use of pseudonyms, ensuring your anonymity.

_____	_____	_____
(Print) Learner name	Learner's signature	Date

Protocol Number: 2011ECE063C

Learner Informed Consent Form for Permission to be videotaped.

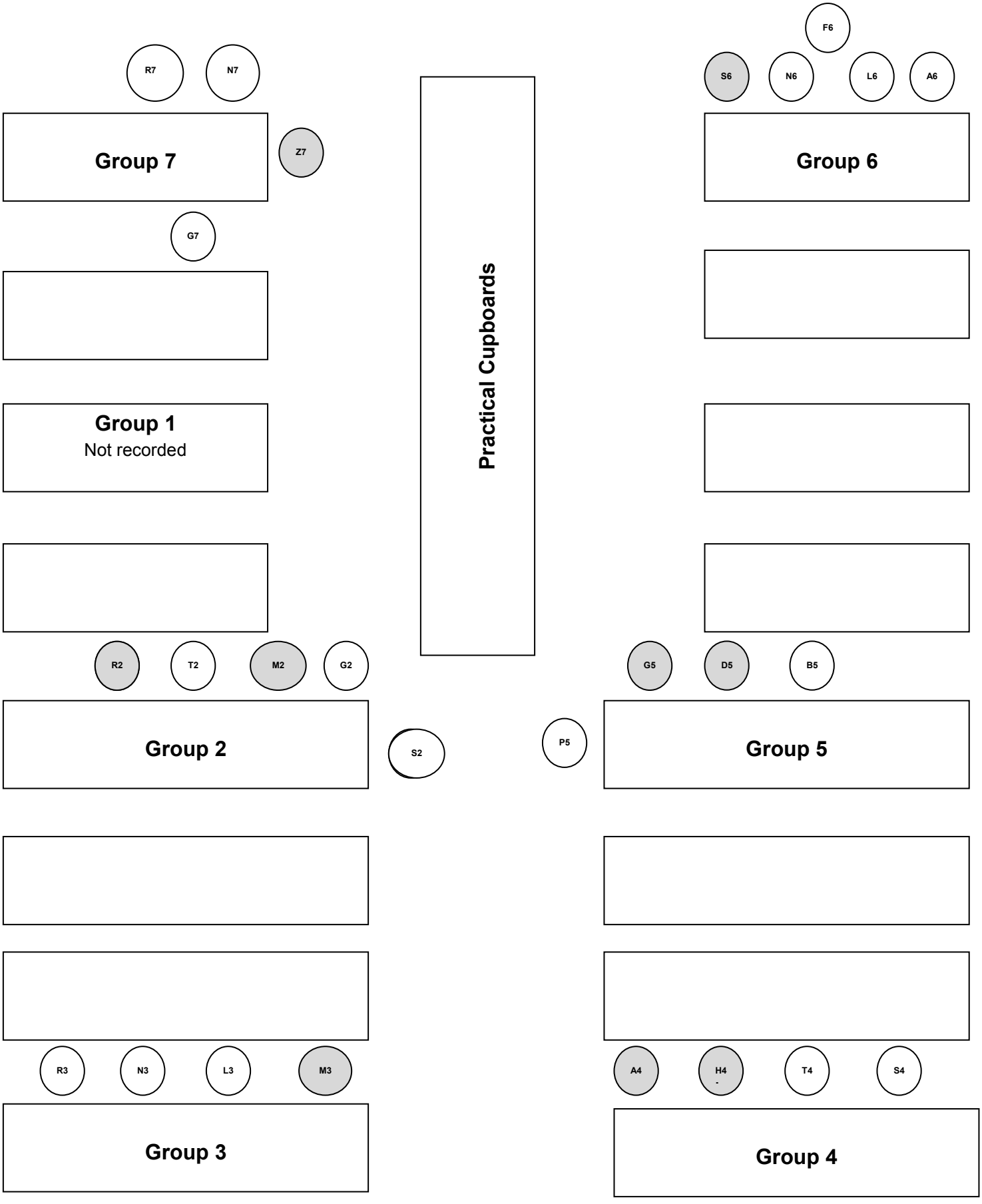
I _____ do/ do not (circle one) give consent for me to be videotaped during the group work activity.

Your involvement in the research project is voluntary and you are free to withdraw from the study at anytime without any penalty or prejudice. Any sharing or publication of the research results will make use of pseudonyms, ensuring your anonymity. Recordings will allow me to complete an observational schedule which will be used as part of the results for my research project The recordings will be kept confidential and destroyed after 5 years.

_____	_____	_____
(Print) Learner Name	Learner's signature	Date

APPENDIX 3: POSITION OF GROUPS IN CLASS

(Unshaded circles represent students who completed all parts of the research)



APPENDIX 4 : Observation schedule: "Qualities of Communication"

(adapted from Kutnick and Berdondini, 2009)

NAME OF STUDENT _____ Sheet No: _____

		Coregulation (each member actively participates either verbally or nonverbally		**Unilateral:** (one group member dominates the activity ignoring the other member).	**Disrupted**	**Disengaged**
Min	**Sec**	**Symmetrical:** (sharing of kdge mutually amongst equals.)	**Asymmetrical:** (responsibility is shared amongst group members, but some may be more active and others more attentive.			
1	10					
	20					
	30					
	40					
	50					
	60					
2	10					
	20					
	30					
	40					
	50					
	60					
3	10					
	20					
	30					
	40					
	50					
	60					
	20					
	30					
	40					
	50					
	60					
Total						

APPENDIX 5: Observation schedule: "Frames of Activities"

NAME OF STUDENT: _____ Sheet No: _____

Min	Sec	On-task					Task Prepare Routine	Social	Off -task		Other
		Active			Passive						
		Formative		Not Formative							
		Explaining	Feed back	Other	Listening	Other			Active	Passive	
1	10										
	20										
	30										
	40										
	50										
	60										
2	10										
	20										
	30										
	40										
	50										
	60										
3	10										
	20										
	30										
	40										
	50										
	60										
Total											
20											

APPENDIX 6: Research questionnaire

HAVE YOUR SAY.

Dear Grade 11 Learner.

This questionnaire forms part of a research project looking at the influence of group work when doing a Gr 11 Life Sciences assessment activity.

Having completed the individual and group work activities, which form part of the project, it would be appreciated if you would answer the questions which follow as honestly as possible, as your opinion forms part of the research. Please note that there are no wrong or right answers, what matters are that your answers reflect what you truthfully think.

You can be assured that:
Although you are required to give your name, on this questionnaire, you will remain anonymous and your answers will remain confidential.

Name: _____

1. Which of the following language(s) do you speak at home to your family?
(Place a cross in the box. You may cross more than 1 box)

Afrikaans		English		IsiNdebele	
IsiXhosa		IsiZulu		Sesotho sa Leboa	
Sesotho		siSwati		Tshivenda	
Xitsonga		Other			

2. Rank the following as reasons why you think assessment in Life Sciences is necessary.
(1 = very important, 2 = important, 3 = necessary and 4= not important)
(Note: You may use a number more than once)

☐ Used to gather marks, to determine if you should pass or fail at the end of the term/year.

☐ Allows teachers to determine how much you know.

☐ Provides opportunities that allow you to improve your understanding in Life Sciences.

☐ Is government policy.

Questions 3-6 are each made up of two parts. In the first part you need to place a cross (X) in the column, and then explain your answer in the space provided.

		PART 1				**PART 2**
		Strongly disagree	**Disagree**	**Agree**	**Strongly Agree**	**Comment**
3	The group work helped me understand the activity better.					
4	Listening to other group members helped me with my final write up.					
5	When I was given the opportunity to talk in the group, I felt that I was being listened to.					
6	The comments provided by group members on my work, influenced what I wrote in my final write up.					

7. Would you recommend use of group work when doing this activity with next year's GR 11 group, or should the learners do it only as an individual exercise?

_____
_____
_____
_____
_____

Thank you for taking time to complete this questionnaire.

APPENDIX 7: Transcript from group 6

1	A6:	Cos what we need to do. What we must here we have to explain like why these are better? Why these are why these are organisms are better?
2	L6:	Oh ok.
		Pause
3	L6:	Since why the …*Pause*
4	N6:	Guys we have to discuss the 6 differences at with…
5	L6:	Yes.
6	N6:	And and so which one are we going to discuss first?
7	L6:	Porifera.
8	S:6	Discuss what?
9	N6:	Which one are we discussing first?
10	L6:	The Porifera, there.
11	S6:	The first one. Why are you writing this here?
12	N6:	Uh uh it's all. There's a…
13	S6	You must turn it.
14	N6:	Sure. *Inaudible*
15	F6:	Say something, someone say something.
16	N6:	The symmetry, it looks radically sym um symmetrical.
17	S6:	Asymmetrical. I got its asymmetrical.
18	L6:	Its asymmetry.
19	S6:	Ja, What is this nonsense?
20	N6:	No, I got it from the book from the library.
21	S6:	I got it from the Internet.
22	N6:	Is it asymmetrical?
23	S6:	Ja.
24	L6:	Asymmetrical.
25	S6:	Ja, its really. 1:16
26	L6:	Asymmetrical.
27	A6:	Which means it doesn't move.
28	S6:	What do you mean it doesn't move?
29	A6:	It's like just. For example I've got the sponge.
30	S6:	Ja. Which means?
31	N6:	And now I have it contains an internal skeleton.
		Didn't maám say it has to like move?
		Pause
32	S6:	Are we doing the skeleton now?
33	N6:	You guys, *inaudible* now the number of tissue layers.
34	A6:	Where did you get this?
35	L6:	I wasn't sure if I could find it in the book?
36	S6:	The number of tissue layers …
37	A6:	You will it says here, it has to obtain obtain their food from water. 2:03
38	L6:	Yes.

39 S6: Obtain their food from?
40 F6: No.
41 A6: Obtain their food.
42 N6: No, number of tissue layers.
43 S6: From what?
44 A6: From water inside of them.
45 S6: Water inside the food?
46 A6: Ja, it says so here it obtain the… It take it takes it from water inside of them.
47 S6: It doesn't say how they obtain. It doesn't say you must know how they obtain their food.
48 F6: No (*F6 talks here and no-one listens either they can't hear or they are ignoring him.)*
49 A6: It just says about asymmetry.
50 S6: Symmetry. Oh.
Maám, oh. You won't believe.
51 M: Oh ok. What are you guys discussing?
52 SLNA: The symmetry?
53 M: Symmetry.
54 L6: Yes.
55 M: So what are you saying?
56 S6: Yes, she was talking about it. She got it wrong and now we say it's asymmetrical. The sponges are asymmetrical we helped her.
57 M: Radial.
58 L6: Asymmetrical
59 N6: Yes (*nods her head)*.
60 M: What does it mean if its asymmetrical?
61 A6: It doesn't move?
62 S6; No, no I don't think. I said its asymmetrical. I said anyway you can cut it anywhere and you won't you can cut it and you won't get them the same.
63 M: Is he right?
64 S6: Yes.
65 A6: Ja because if you cut it bilaterally, it will be the same as both sides.
66 S6: *inaudible*
67 M: If you cut it like this, is it the same on both sides?
68 S6: No, its asymmetrical.
69 M: Can you cut it anyway to get it the same on both sides?
70 L6: No.
71 M: No. Which ones can you cut anywhere to get the same on both sides?
72 A6: Bilateral.
73 S6: Chordata Arthropod, Cnidaria, Platyhelminthes.
74 M: And and which one is, what does radially mean?
75 S6: Like two maám. Like it makes the same when you cut it bilaterally. You know what bilaterally is.
76 N6: Like number of cell parts or something.
77 L6: Divide it into two parts.

78 M: So what are we?
79 A6: We are bilateral.
80 L6: Bilateral.
81 S6: Yes.
82 M: How can you cut it in two?
83 S6: Ja, down the middle.
84 M: And radial?
Pause
85 F6: It means you cut it.
86 M: If you cut it this way? Do you get the same?
87 S6: Not radial.
88 L6: Like you cut it in equal, parts sides.
89 M: Ok so if you have the starfish.
90 L6: Yes maám.
91 M: And you cut it this way, will you get two equal halves?
92 S6: No you won't.
93 M: And you cut it this way? Would you get two equal sides?
94 S6: No.
95 N6: You, yes, yes.
96 S6: Yes.
97 M: If you cut it this way again.
98 S6: Yes.
99 M: And you cut it that way again.
100 S6: No.
101 M: Radially is… What is the advantage of being bilaterally symmetrical?
Pause
102 S6: Sh, no, I don't think we are done with radial, now we are bilateral I think we must.
103 N6: I don't understand this.
104 M: What do you think we have?
105 S6: Top and bottom. We do have a top and bottom. Uh, when you cut us like this.
106 L6: Maám I have …
107 N6: Maám isn't the right hand side said to be the mirror image of the left hand side.
108 M: So they've got equal sides.
109 N6: Yes.
110 M: But the top is different from the bottom.
111 A6: So it is different, different structures.
112 M: Where is there specialization the most?
113 S6: The top.
114 M: The top. Where is the specialized the most?
115 S6: Top
116 A6: Top
117 S6: It is specialized.
118 M: Very.
119 M: Having a top and a bottom you can specialize.

120 L6: Maám isn't it isn't bilaterally symmetry. Doesn't it allow for animals to develop a head?
121 S6: Bilateral, bilateral is.
122 M6: You've got it Lerato.
123 N6: Whooooo.
124 M6: What's in your head?
125 S6: A brain a left and right side of the brain.
126 L6: Doesn't this part of the body then like let you to see danger and predators?
127 M: Can you sense danger equally well from all sides?
128 S6: Yes we can.
129 M: Can you see what is going on behind you?
130 L6: No, Maám.
131 S6: No, but you can see what is coming.
132 M: *Inaudible*
133 *S6:* Yes Maám.
134 M: Can you move equally well in all directions?
135 S6: Yes.
136 M: Can you run as fast backwards as what you can forwards?
137 S6: No.
138 L6: No.
139 S6: So, Maám you are saying running forwards and backwards.
140 L6: So does radially symmetry help organisms to react to different uh from .
141 M: So how are they different to us?
142 S6: For one thing they are flexible.
143 M: They are they are quite flexible. But…if you think about like a jellyfish, will it see danger coming from behind and in front of it?
144 S6: Yes.
145 L6: Yes.
146 M: We can move very fast from one direction. What can they do?
147 A6: Move fast in many directions.
148 M: We are like specialized in moving one direction. The disadvantage is that we don't know what is going on behind us. Do you understand?
149 N6: Yes. Maám.
150 S6: And asymmetrical?
151 M: Asymmetrical is they kind of just sitting there.
152 S6: Asymmetrical they are just sitting there.
153 M: They don't even move.
Must we discuss that? All right?
Inaudible. Then they are all writing 7:46
154 S6: Bilateral.
155 N6: Guys I forgot what we said.
156 S6: We don't have movement it's here. The radial it don't have movement with this s symmetry. Like the jelly fish the jelly fish will have bits and pieces the jelly fish. Movement.

157 N6: No.
158 S6: It never.
159 N6: What do you mean?
160 S6: No.
161 A6: You say what?
162 S6: No, it can't have movement.
163 S6: It is.
164 S6: It would be this these first things. Like the blue bottle, you know what I …
165 A6: Yes.
166 S6: also the jelly fish .
167 S6: That's why …
168 S6: Maám was trying to say to us. Saying that you have a top and bottom part, making it making, but uh making it making, making its brain.
169 N6: Ok guys, you are so funny but the …
170 L6: But you know. Yes.
171 N6: So the uh …
172 L6: Yes.
173 N6: The number of tissue layers in the Cnidaria. I wasn't sure about it.
174 S6: Three.
175 S6: I've got three.
176 L6: Two.
177 N6: I also got two.
178 A6: Because, ja.
179 L6: It's two.
180 N6: Number of tissue layers.
181 S6: Tissue.
182 A6: No, it hasn't got three.
183 S6: Two.
184 A6: Yes.
185 L6: It is.
186 S6: Yes. *Fixes notes* Thanks guys
187 N6: Structure. You say zero.
188 S6: There are .You guys have many points.
189 L6: And the why is it that the the. Why is it that the coelom.
190 N6: The coelom.
191 A6: Because it's not round it doesn't have a true point.
192 S6: The second one.
193 A6: … of balance.
194 S6: Number of tissue layers, three?
195 L6: What?
196 S6: Ja.
197 N6: So
198 S6: The second one. The number of tissue layers. Three?
199 A6: Aaaw that's too much.

200 L6: That's two.
201 S6: Two?
202 N6: You guys you we are not going to finish.
203 S6: Guys, you do it like this and this.
204 A6: It's like this. *Shows S his table*
205 S6: Like this how?
206 N6: Ok guys, the coelom. 9:56
207 S6: The coelom.
208 N6: What is it?
209 S6: A coelom?
210 N6: I said a coelom.
211 S6: It doesn't have.
212 A6: Ja, it doesn't have a coelom.
213 L6: Wait I'll tell you.
A laughs
214 S6: A coolom. Funny a coolom.
Everyone laughs
215 S6: *Gets notes back from F6.* Give it to me bra.
216 N6: Ja and it has got a through gut.
217 A6: Ja, its got a through gut.
218 L6: Define it.
219 A6: It means it like …
220 S6: Ja a through gut. Ja it . Say what you mean.
221 A6: It doesn't have a mouth and it doesn't have a hole for the …
222 S6: It doesn't have a mouth?
223 A6: Ja.
224 N6: Sis.
225 S6: What do you mean sis?
226 L6: Haai sis.
227 S6: How how do you suppose it goes to the …
228 A6: Ja, its like the sponge.
229 S6: Ja, the sponge is the same is. The natural one. The next one.
. Radially symmetrical.
230 A6: Radial.
231 S6: Ja, ja. Are you sure?
232 S6: F6?
233 F6: Sure.
234 S6: Number of tissue layers?
235 F6: Two.
236 A6: Two.
237 S6: I have three, three.
238 L6: So, that means Di-plo-blas-tic, right.
239 S6: Diploblastic.
240 L6: Ja, ja whatever it is.

241 S6: What does diploblastic mean?
242 N6: Cells that can , cells that …
243 S6; Wooa Wooa. That is coelom, number of cells.
244 F6: It has two.
245 N6: And then its got a no coolom, coelom celer whatever.
246 S6: Coelom absent?
247 N6: Yes.
248 L6: Yes.
249 A6: And no through gut. Cos think about it. A jelly fish eats and then it comes out the same hole.
250 S6: Ja, that's what I am saying. It has no coelom nor through gut.
251 N6: No, ja that's what I have. It has a simple structure thing enteron. Ja, I have what you have.
252 A6: What does it say for through gut?
253 S6: It can pass through the same hole opening it use the same as same as internally.
254 N6: I have got that too.
255 S6: Ja.
Pause 3 sec
256 S6: It is the same as it has the same as one thing. It has one opening for three functions.
257 A6: Three functions?
All laugh.12:22
258 A6: But do they?
259 S6; Hey, no. I don't think so.
S6 talks to F6 and gets his notes which he reads .
260 N6: The internet. I don't know this.
261 S6: That looks the same as mine. *Hands F6 back his notes.*
262 N6: What must we do?
263 S6: Well let's look at that's, that Plathelth whatever ja .the one with the flat worms.
264 N6: Platyhelminthes?
265 S6: Bilaterally symmetrical it is.
266 N6: Ja.
267 S6: Number of tissue layers?
268 L6: I have three.
269 F6: *Indicates three*
270 N6: Ja.
271 L6: Because …
272 S6: Triploblastic.
273 A6: Oh yes, because they have got mesoderm. Hey.
274 N6/L6: Ja.
275 S6: Mesoderm. You should write something down (*to N6)*.
276 A6: You said bilaterally means if you cut them in half. It's the same.
277 S6: Same as this . ja.
278 F6: And the, coolom is?
279 S6: Coelom?

280 N6: Coelom is absent.
281 S6: Coolom.
282 F6: Ja.
283 N6: Coolom.
284 S6: Absent.
285 F6: Ok I don't have it.
All laugh
289 S6: And then food is often. It twitters it's got digest fine material that it. I don't know where I got this. I don't know what that means. I have it I don't know what it means.
290 A6: Say again.
291 N6: I said that. Whooo. What what specific. Whooo, it facilitates mmmm.
292 S6: Facilitates.
293 N6: Facilitates digestion and food which is the mouth.
294 S6: Food for the mouth. Has it got two openings?
295 A6: Ja. It has there's no through gut.
296 F6: It has a blind gut there is only one opening.
297 L6: Yes.
298 S6: No through gut.
299 L6: .It just has one.
300 S6: What is that?
301 F6: *Inaudible.*
302 S6: The through gut. Ok next: annelid.
303 N6: A tapeworm. Phew this doesn't even look like a tapeworm.
304 S6: No, its not a tapeworm.
305 N6: Sure it is a tapeworm.
306 S6 Ne.
S6 and F6 laugh
307 F6: I said it is bilaterally .
308 S6: Symmetrical.
309 A6: Ja.
310 S6: Earthworm?
311 F6: Ja.
312 S6: Number of tissue layers developing?
313 N6/L6/A6/F6: Three
314 F6: I said three.
315 S6: Coelom present?
316 L6/A6: Yes.
317 S6: All right.
318 L6: Meaning, meaning that …
319 S6: Has it got a through gut?
320 A6: Huh?
321 S6: It has a through gut.
322 A6: It has a through gut.
323 A6: When you say your coelom what does it mean, like?

324	N6:	I've got it, me.
325	S6:	This worksheet the coelom
326	N6	Yeeeowh, here I've got it. Mesoderm which lies with coelom develops into muscle which lies on the body wall aids with movement.
327	S6:	Movement *L6 shows A6 her work.*
328	L6:	Read this part. I said the mesoderm
329	N6:	Yes you have it.
330	A6:	Ooooh.
331	*S6:*	Movement?
332	N6:	That's what I have.
333	L6:	Yes.
334	A6:	Coelom which lies in a muscle tissue layer.
335	S6:	Where did you get these worksheets?
336	L6:	HHmmmm.
337	L6:	Say anything.
338	S6:	Haai!
339	A6:	Let me copy, coelom.. Let me see. *A6 copies L6 work.*
340	N6:	And the coolom is exploited as protection.
341	S6:	The coelom?
342	N6:	The coelom is protected. Haai na na, there's protection against predators.
343	L6:	And the the …
344	S6:	What the coelom is?.
345	N6:	There's protection against predators and provides for a hydrostatic skeleton. It says.
346	F6:	*inaudible 16:30*
347	A6:	Ja, but a hydro hydrostatic skeleton. We have a exoskeleton.
348	S6:	Ja, no.
349	S6:	We don't have an exoskeleton.
350	A6:	We have an endoskeleton. But how do we have a coelom then?
351	S6:	*S6 reads off notes* .It says the coelom is the, the coelom provides space between the inner and outer mesoderm. The space can be filled by tissues and organs example um muscles and blood.
352	A6:	Oooh.
353	S6:	I don't understand this? What is that? What is it?
354	A6:	It is like, its um we've got our frame.right, we've got our skin tissue .
355	S6:	Oooh muscles and…
356	A6:	Yes and moving back.
357	S6:	They do .They do
358	A6:	We do.
359	S6:	So, do they.
360	A6:	Ja, they do they have it as a coelom. so it's like they can't use it that well. It's just.
361	S6:	Okkkkaaay. Okay all right.
362	N6:	Thanks A6.

363 A6: That's no problem sweetness.
364 S6: So it's just organs ne?
365 A6: Ja.
366 N6: You guys must talk now (*To L6)* and you (*to F6)*
367 S6: Hey, Sego haai, next Arthropoda. Haai next. *18:00*
368 N6: We didn't even talk about the movement or did we? Is it just me?
369 L6: *Shrugs her shoulders*
370 S6: Ekskus man if you say so. What is it?
371 N6: What is it you guys said?
372 S6: Bilaterally symmetrical.
373 A6: Huh?
374 S6: Bilaterally symmetrical.
375 N6: Where are we now?
376 S6: Arthropod.
377 A6: Arthropods are hard insects.
378 S6: Ja.
379 A6: So they also have exoskeleton.
380 S6: Ja and number of layers? Three? Did you say three?
381 A6: Ja, ja number of layers.
382 S6: So it means that. This skeleton is out.
383 A6: Ja.
384 S6: Not in.
385 A6: They have an exoskeleton.
386 L6: So you say that.
387 A6: Just put in exoskeleton.
388 S6: Present.
389 N6: Ok but did you guys know why?
390 S6: Why what? Protection from predators.
391 L6: Why? Why?
392 N6: Maybe mine is dumb.
393 L6: No why?
394 N6: Resistance from changing shape.
395 A6: Ja, you said, resistance of changing shape.
396 S6: What?
397 A6: It resists them from changing shape.
398 S6: It resists them from. Ja remember we did it yesterday. Maám said, it thing makes sense. Because they are so small.
399 N6: Guys I need you to assist me with the very first one.
400 F6: *inaudible*
401 N6: But never mind. *19:26*
402 F6: *inaudible*
403 F6: Next
404 N6: I drew a rat.
405 S6: Chordata.

406 L6: I drew a fish
407 S6: You must look here.
408 N6: That looks like a rat also.
S6 and N6 laugh.
409 S6: Now its symmetry. A6?
410 A6: Hhhhmmmm.
411 S6: Bilaterally symmetry?
412 A6: Ja.
413 S6: Chordata?
414 A6: Ja.
415 S6: Number of developing layers? Three?
416 A6: Ja.
417 S6: Coelom present? Ja.
418 A6: Ja.
419 S6: Obviously there is a through gut.
420 A6: Yes.
421 S6: And if there isn't then .haai poo isn't going to come out of you.
All laugh.
422 S6: Plan B also.
423 F6: Plan C
424 A6: Now there must be an advantage of a bottom?
425 S6: He?
426 A6: Now there must be an advantage of having a bottom and top bit. *20:16*
427 S6. There'd be. If you cut it like this.
428 N6: Guys I need, Jesus.
429 S6: There's no. Ja there is. There's no layers. There's no parts of the others. Cutting you know a part of the the ... You know like that if you cut it like this it brings no particular shape. With the starfish no matter how you cut it, it's going to stay, there's no particular shape. Same with a sponge.
430 N6: Guys please.
431 S6: A sponge.there's no.
432 N6: Pass the …
433 S6: What? Um fannan.
434 N6: That is what maám is saying about.
435 S6: What don't you understand about the different sponges? *21:00*
436 N6: Its symmetry.
437 S6: Hey?
438 N6: It's asymmetrical.
439 S6: Ja.
440 L6: Meaning that it doesn't have symmetry.
441 S6: When you cut it, it looks different?
442 N6: Ok with the irregular body containing an internal skeleton.
443 S6: Internal skeleton?
444 A6: What skeleton?

445 S6: Gee.
S 6and A6 laugh.
446 S6: Haai.
447 N6: Listen, I don't know where I got this. It was either that book there; no it's not in our notes.
448 S6: It doesn't have a internal skeleton.
449 A6: Ja just.
450 N6: That book says it has an internal skeleton. That book says that.
451 S6: The book is lying.
452 A6: No it doesn't. It doesn't even have a skeleton.
453 S6: What does it need a skeleton for? It's on the floor. It's a sponge.
454 N6: Sponge got something in it?
455 A6: Like sticking bones in it.
456 S6: Internally?
457 S6: What are you talking about?
S and A laugh.
458 N6: Ok what they ?
459 S6: Oh ja for the movement and they are in water.
460 A6: Ja.
461 S6: Because their movement that's why.
462 A6: And they Ja
463 N6: Because why?
464 L6: Check.
S6 and N6 laugh
465 S6: It's right here. *(S6 points to N6's table.)*
S6 and N6 laugh.
466 S6: So now do you understand? *22:13*
467 N6: No guys. Why are they asymmetrical?
468 S6: No matter where you cut it, it can be different.
469 N6: I can't write that no matter where you cut it.
470 S6: Let me show you. You see that half and you see this half. This is the reason they are
471 N6: I need it for my table. You see from the other.
472 S6: What table?
473 N6: Like it must be proper. I can't write when you cut it there
474 F6: Yes that's what explaining.
475 S6: Ja, that is what I am explaining. This is the scientific. This is the scientific formula really and truly: no matter where you cut it is going to be different. Like bilaterally symmetrical, if you cut it in half it is going to be the same, the same on either side. When radial no matter where you cut it it's going to be the same. So with us it only we only we've got it like this it won't be the same?.It won't be, it won't be the same for us. Take the heart it is in the middle. Do you understand?
476 L6: *Shakes her head.*
477 S6: *Nah?* No understanding?
478 N6: I do understand.

479 L6: I understand all right. Ja.
480 N6: What is this .So it is not diploblastic? Uuh Uh So what what is it?.
481 S6: Diploblastic is when it when the organsism has two layers. Right.
482 N6: You guys just sort this out
483 S6: Oops two layers when diploblastic *Directed to A*?
484 A6: Ja. di
485 S6: Ja, one?
486 A6: Monoblastic .
487 S6: Meaning ?
488 A6: But it doesn't really have one.
489 S6: Ja, aaayy.
490 N6: Guys you see now you made me explain what I have. I said it's diploblastic
491 S6: Ja.
492 N6: And you guys said it's none.
493 S6: Meaning?
494 N6: I said it's diploblastic and you guys said it's none.
495 S6: No it isn't, it doesn't have the space. It doesn't have space.
496 N6: If, if …
497 S6: It is. It's a sponge it's a sponge. a sponge, no. Different things. Different things. It's the same yes.
498 N6: F6 has something fishy?
499 S6: What?
500 F6: What do I have?
501 N6: If these two are right then hey. I am going to be different
502 S6: Us we can do it. Like this.
503 N6: You guys are talking nonsense.
504 S6: No.
505 N6: That book lies.
506 S6: Yes that book.
507 F6: I, I said.
508 N6: I mean we should ask Maám.
509 S6: Maybe it lies. It lies. Lies. Does it?
510 F6: Yes.
511 S6: Maybe it does. Must I call maám then you can ask her? Ask ma' am? Gee She's busy.
512 F6: Ask her.
513 S6: About this book. How am I going to do this thing? With all these lies. It's amazing.
514 L6: Ja there.
515 A6: Like this essay meaning that each and everything has to be two?
516 S6: No.
517 N6: Two what is it?
518 N6: *Inaudible* It says two

A6 is writing notes. 24:36
L6 and A6 have their own conversation

L6:: and then that there and cells. Ja there. Because each has got the animal and like lines the part that runs th. mesoderm. It is called the .

A6: Ja Reads L notes out softly to himself.

L6: Yes

519 S6: Two. Two?
520 N6: Two.
521 S6: I said it's thirty. I said for example, thirty.
522 N6: Guys, we seem to have issues.
523 L6: What, isn't it like cells?
524 A6: Ja.
525 S6: What do you mean?
S and N laugh
526 L6: Ecto, endo like two whatever.
527 S6: Two layers like us.
528 L6: Ja.
529 S6: Like us.
530 L6: Ja. Name them cells like ectoderm, endoderm and middle layer mesoderm.
531 S6: We've have twitter at last we've got the same there.
532 N6: I never said that .No but.
533 A6: Now but more serious guys. There's ectoderm and mesoderm. *25:55*
534 S6: Mesoderm.
535 A6: And endoderm.
536 L6: Yes.
537 S6; Which one is the mesoderm?
538 A6: Mesoderm is the lining on the …
539 N6: What is this?
540 A6: Through gut.
541 L6: Ja.
542 A6: That means that like it is the ectoderm becomes the skin. From there the different 6
lining of the mesoderm
543 S6: Ja.
544 A6; Ja.That's the mesoderm it lines the organs. The endoderm is where all the organs 6
are.inside.
545 L6: Yes *26:16*
546 S6: Endoderm is where the organs are?
547 A6: Ecto is the skin.
548 S6: Ecto?
549 A6/S6: Endo.
Endo means the middle here.
550 S6: Endo meso ecto
551 A6: Ja, ecto,
552 S6: Ecto.
553 A6/S6: Meso, endo.
554 L6: Haai.
555 L6: So what's the meaning? Ne?
556 N6: What?
557 F6: For example because it's?
558 S6: We don't know. We don't know. We don't know.

559 L6: Then Porifera. See now?
560 S6: No. So can I ask first guys? How are you going to do this? Can you do it like?
6 The sponge …
561 A6: Didn't maám say like we have to do it like on natural selection?
562 S6: Ja.
563 A6: Like evolution. You just say like why this has this and that.
564 S6: That's how you should do the table you should write and explain it. You should write it.
565 A6: That's why the table gives it to you as well. You just have to follow it.
566 F6: I said but I didn't write it like that .
567 S6: Are you sure?
568 A6: Because start with the sponge.
569 S6: The sponge to the jellyfish.
570 A6: Ja, the sponge, jelly fish, then uh the leech.
571 S6: The flat worm.
572 A6: Ja,. flatworm.
573 S6: The leech and then. Is there anything to put before the flatworm?
574 A6: *Shakes his head.* Because it has three tissue layers. Doesn't it?
575 S6: Doesn't it go by. because it you know. *S is rather animated with his hands around his mouth.* .Sure
576 A6: Ja
577 F6: Ja.
578 S6: No. Ne eege
579 F6: I want it to.
580 *S6 gives F6 his notes*
581 S6: You know how I am going to do this?
582 A6: Ja.
583 S6: Like you said. Ja, like we discussed.
584 A6: Compare all of them.
585 S6: Ja, Everything we are writing like every like animal here. Is the same as we've got here. F6, is it necessary. .Haai F6
586 F6: I've got it.
587 S6; We've got it here. *S shows A his table.* You must do it here. You must do this. Look at all the animals. Haai. This table this table here from the top.
588 S6: Do you guys know what to do?
589 L6: Hmmmmm?
590 S6: Do you know what to do?
591 N6: Gee's like guys does it make sense, you know maám said we must like.
592 S6: My the animals one
593 N6: Ja.

N6 and L6 are working on their own.

S6: Did you find it. *S6 is talking to the girls.*

The sponge doesn't have.

N6: The exoskeleton

L6: Ect, meso

S6: Ecto Ectoderm. We say why. Mesoderm.

N6: ectoderm.

594	L6:	Did you ask maám. Must we do it or all together? You are discussing. Everything.
595	S6:	Ja, ja, like we said here, you must take out each class and each kingdom and explain each kingdom. So I am going to do that... *S6 looks at L6 tables and shows with his hands from the top to the bottom..*

APPENDIX 8: Transcript from group 7

Group 7 Transcript

1	N7:	You do this? Ok
2	G7	Let's do symmetry.
3	N7:	Are you are you starting?
4	G7:	Are you're starting?
5	Z7:	So I'm starting, sure
6	G7:	You must tell us how.
7	N7:	Speak louder.
8	Z7:	Um Sure. From my understanding um, um ah ya. From my understanding basically Uh the Porifera is ah what you call it, eh you know. What is the name it doesn't have a, cell shape.
9	N7:	Um Asymmetrical.
10	Z7:	Ja Asymmetrical. Ok it is now; it is the sym. Um, ja.
11	N7:	It is?
12	Z7:	Symmetry is is like thing. Basically if, if like like, I can cut you in half ne like. You know what I am saying like this, into two mirror images, bi uh laterally symmetrical is um .
13	G7:	Ooooh.
14	Z7:	Ja, that's what symmetry is.
15	N7:	So symmetry is …
16	Z7:	So for example, bisymmet , um bisymmetra symmetrical so if I can cut you up like this and then afterwards there will be 2 halves.
17	G7:	Some equal.
18	Z7:	Ja same equal.
19	R7:	So bi is when you look at Porifera …
20	Z7:	Ja.
21	G7:	Ja, double
22	G7:	So if it is like radial then it is …
23	Z7:	Radial. Um. But then when it is radial I don't know maybe I can cut you up like this and afterwards. I don't know.
24	N7:	Radial is when, isn't radial when.
25	G7:	Radial. Radial you can cut
26	N7:	No, you can cut it any way but it will still look the same.
27	Z7:	Ja. It will still look the same.
28	R7:	Ja.
29	Z7:	Like the starfish, for example.
30	N7:	Ja, you can cut anyway anyhow like that and it will still look the same.
31	Z7:	Oh.
32	G7:	So.
33	Z7:	Um, so.

34 N7: Like, let me say why. Like, the jelly fish and the hydra and the … it's right there .

35 Z7: Like so, it is sort of understandable that a sponge, um, like you know, the SpongeBob then it has no symmetry is it. No, it has no structure.
So it is asymmetrical.

36 N7: I think you mixed up the asymmet, one asymmetrical and the radial.

37 N7: Asymmetrical, is when when you cut it it still looks the same.

38 Z7: Sure.

39 G7: No. No, its no symmetry. It doesn't have no symmetry. So what's what's sponge SpongeBob?

40 N7: Isn't it.

41 R7: Asymmetrical.

42 N7: It is like a sponge. You cut it like this it is the same.

43 R7: Ja, like what I have done it what I have here.

44 N7: It's the same.

45 R7: Asymmetrical is like what I have done what I have here. I think you can divide it into, halves equal parts so, its so you SpongeBob it's a a mirror on one side.

46 N7: No, symmetry so then it is like …

47 N7: No symmetry .

48 N7: No No No.

49 N7: No Asymmetrical. No asymmetrical.

50 Z7: R7 you are wrong. R7's wrong If you look look at the at the what you call it at the what you ca at the at the suffix its bi bi means two. So basically if I can slice Bob into two parts it will be easier. Both sides they will be the same. Sure.

51 N7: Yes that is what I am thinking. You know something, asymmetrical and there's no sides are the same.

52 G7: Yes.

53 N7: Like you cut this way and that way you will never find sides the same.

54 G7: Yes.

55 N7: Radial is when you if can cut anyway and it will still be the same.

56 Z7: There it tells you in the book here. Um.

57 G7: Ok, so why does this Porifera the sponge ne …

58 N7: Ja.

59 G7: Why, why do they have? Why are they have asymmetrical? What is the advantage?

60 Z7: Disadvantage? Your...

61 G7: Let's think.

62 N7: The advantage of being asymmetrical. The advantage of being asymmetrical. Uh.

63 N7: The advantage.

64 R7: Isn't it because like they can go anyhow and any time.
Ja so .

65 Z7: They can go.

66 R7: Ja .
Isn't it that like they can go anyhow and …

67 Z7: They can take anything.

68 R7: Ja, without having to worry about anything. So if they want to go this way they go this way and if they want to go that way they go that way.
69 R7: Ja.
70 N7: Basically so they can go anyhow.
71 R7: Ja.
72 N7: And then what's the disadvantages.
73 Z7: Um disadvantages .Sponges which are limited to the ocean you know.
74 G7: Ok we can.
75 N7: Yes, I know that actually um maybe the one side can't go as' as perfect. Like if they have a a proper structure. Now they are not really a proper structure. Because now they don't have a proper structure. And they couldn't get they don't have proper they don't have proper structure.
76 Z7: What about skeletons. Skeletons, do you know about that?
77 G7: Ok the disadvantages is that it doesn't have a proper structure.
78 Z7: It doesn't have proper …
79 N7: It has no proper structure.
80 N7: And then radial what is the advantages of radial?
81 Z7: I'm not sure.
82 G7: Um. Ok let's do one thing at a time. Like the SpongeBob's.
83 N7: No we should do symmetry over first.
84 Z7: Ok.
85 G7: Ja, let's do symmetry over first.
86 R7: But maám said we must it's better to …
87 N7: Ok, its no. No, we want to finish one.
88 G7: To analyze one thing.
89 N7: R7 we have already analyzed symmetry, we, we discussed symmetry. And are we happy with symmetry? So just leave it.
90 N7: So radial symmetry. What's the advantages?
91 G7: Ok so, ok ok so for the …
For the Nigeria, what is this?
92 N7: The jelly fish just say the the jelly fish what is the advantage?
93 Z7: Um about symmetry?
94 G7: Yes it's its radial
95 N7: Yes ok basically,
96 R7: It's bilateral.
97 N7: When you when you cut the jelly fish like it makes it like when you cut like the side of it still has everything.
98 Z7: When you said when you said SpongeBob is radial.
99 G7: SpongeBob isn't radial.
100 N7: SpongeBob isn't?
101 G7: Radial guys radial. What I understand from radial. Isn't it like round?
102 N7: What I, no jelly fish is not round?
103 N7: Radial is when it is in …

104 R7: Ja, it can move like something. Right. Remember when Ma'am said when you can cut it like this anyhow anyway and you will still get two exact halves such as. When you cut this side anywhere anyhow like this more then this side like when you are finished you still just going to the same side. It is …

105 G7: Ok, like the starfish let me think of the starfish.

106 R7: Like the starfish.

107 N7: But what but what's the advantage of a jelly fishes?

108 G7: The advantages of the …

109 N7: Radial symmetry what are the advantages?

110 G7: Radial.

111 R7: Well, if you are a jelly fish is basically you are a shape. Porifera, jelly fish they are a shape like water on the inside of a bottle. . Like when you you go to one side of. Remember how like ma'am explained it. Advantages.

112 N7: But now you are talking about that the liquid and stuff like when you explain stuff like that it all goes to the gut .

113 R7: *Inaudible* they don't have a definite.

114 N7: They don't have a definite but aren't they only exoskeleton.

115 R7: Only The cell wall whatever. No.

116 N7: What are the disadvantages?

117 R7: What I am trying to say, is , like the structure .think about it. Let's say, they don't have a heart. That allows the jelly fish. *Inaudible* it allows you. *Inaudible* so like I said, like a skeleton. Radial allows …

118 Z7: So like you said. But it's not a real skeleton. It's not like ours like this. Um If your arm is like this you can't break it. Ja

119 N7: I know what she is getting to.

120 Z7: I know but I don't think the jelly fishes they don't have a skeleton too. I think they mostly have. What's what's that thing. Guys so …

121 G7: Guys, let's not forget what we are supposed to be talking about.

122 R7: We are talking about the disadvantages of radial symmetry.

123 N7: Yes.

124 Z7: No. No.

125 N7: Ok Let's skip radial for now go to bilateral.

126 Z7: That's what I am saying. That's what I am saying.

127 G7: Ok let's leave the Nigeria. We will come back to it. Ok so the plats What what stuff. The plats.

128 N7: No, the plats with the plats. The plats, the platyhelmintheses, and the annelida and the arthropoda and the chordata are all bilateral.
So what's the advantage of bilateral, gener genera?

129 Z7: Ahhh.

130 G7 So bilateral means.

131 Z7: It must stick to two two two parts
Porifera is one.

132 N7: It means bilateral it means the advantage of bilateral the the advantage of that if your eye this eye doesn't work. The other one will take the other will work.

133 Z7: Also like something's are symmetrical. For example take the sponges. If I had to take the sponges. Take the sponges for SpongeBob you know.
134 G7: That's a disadvantage.
135 N7: Can I tell you what I think?
136 N7: It means the advantages of bilateral If this eye doesn't work then the other eye will work. And I will see with this eye.
137 Z7: Function?
138 G7: No, but if you don't have this side.
139 N7: Everything that is important. Everything that is important.
Is in the middle.
But it is kind of in the middle.
140 Z7: : So so you cut it
141 N7: Your heart is kind of in the the middle. Your liver is like kind of in the middle.
Everything that is what kind of in the middle. But kind of in the middle (*laughs)*
that's what this the right side of the body.
142 G7: You guys maybe the advantages. That it has a structure.
143 Z7: Ja its proper structure.
144 G7: It has a proper structure.
145 G7: So things …
146 R7: Bilateral.
147 G7: So things function properly and structurally inside. So write the structure.
148 R7: Advantages ne?
149 N7: It has a structure.
150 Z7: It has a structure. Cool. Some of advantages is ? Can you give me a pen?.
151 G7: The disadvantages.
152 Z7: Thanks.
153 N7: And then what's a disadvantage?
154 N7: Um the disadvantage.
155 G7: Um.
156 N7: Do flat worms got?
157 Z7: We can get our textbook now get our text book.
158 G7: No use this (*points to his table)*
159 N7: Ok uh the disadvantages. Um.
160 R7: Um.
161 Z7: You said the if one part is cut in half it can can't function.
162 G7: That doesn't make sense.
163 N7: And the thing is if it's your eye, your heart.
164 G7: If you cut like this.
165 N7: And your heart is on the side.
166 G7: It's not about your movement. It's about this.
167 Z7: Ok, so what's the difference with the Porifera.
168 G7: It's the …
169 N7: You can't say. It's the it has a proper structure.
170 N7: Even a jelly fish has a proper structure.

171 R7: All animals have proper structure.
172 Z7: So what about Bob?
173 R7: Bilateral symmetry.
174 Z7: So what about?
175 N7: Everything just has this bilateral.
176 G7: It's like flat worms and all. Porifera stuff .
177 Z7: But also but also like …
178 N7: What we are doing the advantages?
179 Z7: But also another thing uh but also like another thing. I think if you what is cut like one part like sponge bob. Then what is it?
180 N7: That's why we say a proper structure whatever happens to the one side. Like even with humans. If this eye does not work .If you cut it it doesn't work yes. So either way the main advantage is that whatever happens to the one side the other will help out.
181 R7: But now what's the disadvantage?
5:00
182 N7: The disadvantage is …I don't know. But that's the main thing that's the main advantage for everything including everything is bilateral from worms to humans to whatever.
183 R7: Now the advantage is (Inaudible) it is like that.
184 G7: Doesn't it have like?
185 N7: We have been focusing on symmetry, guys. Let's go on to the number of tissues.
186 Z7: To go back to the symmetry uh.
187 N7: Eh, the number of tissues. It would mean .What I what what I have said is that, tissues are a group of cells. … Tissues are a small group of cells right as opposed to that's tissues.
188 G7: Yes.
189 N7: So, if so if uh so obviously I think that tissues align themselves to layers, right?
190 N7: So then if it is an animal that, so the sponges your the sponges don't have tissues, that that that they don't um put the cells together. Even if the cells are the same. That means the cells are separated that's why there are a small group of cells that are separated. That's when that's when. There's no no …
191 G7: Ok, so why is it why the sponges?
192 N7: That means they separated of the tissues. That's when it's ...
193 G7: So why is it?
194 N7: That means it only has two layers.
195 G7: So it only has two layers of tissues.
196 N7: Ja, it only has two layers of tissues.
197 G7: Developing from the embryo.
198 N7: Ja developing from the embryo.
199 G7: What is the advantages of?
200 N7: Ok the advantages of having no um tissues, at all.
201 G7: The sponges have diplo diplobalstic.
202 N7: No, no tissues at all.

203 Z7: Ja So what do we call it.
204 G7: The Porifera doesn't have.
205 N7: It has none. It has put a cavity. So it has none, no just cells.
206 G7: Ok, so the advantages of having no cells at all?
207 N7: So the advantages of having no tissues at all, um.
208 Z7: Is it?
06:00
209 N7: Think of the sponge.
210 R7: Who has any tippex?
211 N7: Just write on top of your notes.
212 Z7: There are no tissue layers. There are no tissue layers to protect you in some way.
213 G7: No tissue layers like certain. Sssh those certain cells have …
214 G7: So what's the advantage?
215 Z7: Uh you know what I am telling you now?
216 N7: Ok, what s the let's look it at it. What's the advantage? What's the advantages of having a lot of tissue layers? Like being you know. It's probably if we know what the advantage are it will help us with that..
217 R7: Ja.
218 N7: So the disadvantages?
219 G7: Ok.
220 Z7: Shouldn't we?
221 N7: Ok, what's the advantage? What's the advantage of being triploblastic?
222 G7: Um, the …
223 N7: Probably it is better protection . There's a lot of layers of cells.
224 Z7: That's the same thing what I am saying.
225 R7: Ja.
226 N7: Its better protection. A lot of layer of cells.
227 R7: Ja.
228 Z7: Those cells the tissues.
229 G7: It's probably why.
230 Z7: *Inaudible.* Take what happens when there are a lot of tissues for something. Take tissues.
231 G7: What?
232 Z7: Take tissues.
233 G7: Take tissues?
234 N7: So what the the phylas with the highest, um, layers you get is three layers.
235 Z7: Smaller tissues. Ja, don't protect you much.
236 G7: And body functions?
237 N7: But don't tissues have the uh?
238 R7: But don't …
239 N7: Don't tissues come from the mitosis not mitosis but I don't know how to put it. The development of like. Don't tissues? Don't they ? I'm just thinking. Like if you got. . Don't they help with they with shape? I think it helps with shape.

240 R7: I think this might help. I think the triploblastic what what I used. When it divides into organs. Where the organs are muscles . and the gullet and nervous systems is formed. And so if you if the layers are formed other things are formed. And then you get muscles, and you get gullet So all of …

241 G7: So you have like more organs.

242 R7: Ja.

243 N7: So the advantage of having triploblastic, um ja, I know means that you that you develop you develop a lot of a lot of organs.

244 R7: Ja.

245 G7: Don't tissues make organs?

246 R7: Ja. I think so.

247 N7: That's what I am thinking. From that thing.

248 G7: Ok from organs.

249 Z7: The disadvantage of …

250 R7: Ag.

251 G7: The disadvantage.

252 N7: And the disadvantage. Um, um animals with no tissues layers have no organs.

253 R7: Do the sponges do sponges have organs?

254 R7: You triploblastic ne.

255 N7: Sponges don't have organs.

256 R7: Ja.

257 G7: Yes, yes.

258 N7: Except for the Sponges because that's the only tissue.

259 Z7: Sponges ,uh.

260 G7: No sponges, no if they don't have cells. They don't have organs.

261 N7: We don't say Sponges sponges, disadvantages.

262 G7: So triploblastic is fine.

263 Z7: *inaudible*

264 G7: Guys like if you don't have organs how do you live?

265 N7: So that's a disadvantage.

266 R7: That's important for Porifera.

267 G7: So its to survive.

268 Z7: I want to say something. I want to say Because *inauduble*
About this …

269 G7: Maybe they don't have longer lives.

270 Z7: Ja, like I am saying. Uh Uh maybe there is extra because it is like the uh uh because there is two i*naudible* but it is. What is it too?

271 R7: What are they?

272 G7: The last one.

273 N7: So basically if you are diploblastic, the advantages would be some tissue layers are formed and some organs are formed what would that be?

8:00

274 .N7: For example, and then they the the advantage …

275 G7: What's that?

276 N7: What's the advantage? The disadvantage I've got they don't have enough organs.
277 R7: Help me out .
278 N7: …and functions? .So do you understand the layers?
279 R7: So so the the disadvantages?
280 N7: The tissue layers you can play around. Look at the. What's the trip triploblastic?
281 G7: Triploblastic is the same as …
282 Z7: The same as?
283 G7: Same as … um. …
284 N7: *inaudible*
285 G7: Um, isn't more like don't you need more to keep those those toilets happy? *Laughs*
286 R7: Are are are are tissue like from cells. So now if 1 cell is like is like something something the other cells to make tissues. Now if one cell is not well. Doesn't that affect your tissues?
287 G7: Don't you have lots of cells?
288 R7: But I mean still. Maybe half the cells are unhealthy cells. Won't it catch up with you
289 G7: Or we can say. Ja You see like the dicot. Like ne, that if you can damage one tissue.
290 R7: It's got a less lesser chance of of of of of; dying. You know what I am saying?
291 G7: So the thing is …
292 N7: So the triploblastic is …
293 N7: If anything happens to the to the group of cells the tissue is basically wrong.
294 R7: Ja.
295 G7: The tissue?
296 G7: What must we write?
297 N7: If anything happens to the group of cells.
298 G7: If anything happens to one tissue because a group of cells is a tissue. A group of tissues.
299 R7: Ja one tissue.
300 G7: the elements of other tissues.
301 N7: The coeloms ne.
302 N7: Ok finished ne? Are you finished?
303 R7: Of other tissues?
Ne?
304 G7: So now we are doing the coelom coelom, coelom.
9:00
305 R7: Ok, well if I sorry guys. What are we we looking at?
306 N7: What is the coelom?
307 R7: For all of them?
308 N7: Ja.
309 R7: Ok, the coelom isn't it like a body cavity. It is the actual body cavity. Right?
310 G7: Isn't the coelom; I thought the coelom was a hole.
311 R7: A hole! It is a body cavity.
312 N7: It's a body cavity?
313 R7: It's a body cavity. Let's talk.
314 R7: Your niger? (*Referring to the Cnidarians).*

315 G7: Isn't a cavity a hole?
316 N7: No.
317 R7: No.
318 R7: You're thinking of the *latest* one.
319 G7: Whooooo
320 R7: And any how if if organs have this coelom ja it basically gives them the opportunity it allows them to move and things like that. Ja it's actually an advantage to have …
321 N7: Even here.
322 R7: Because the body because the ja because and then the structure and there the body structure, the body structure. um and things like that. So it …
323 N7: Guys what's the mesoderm? The the mesoderm is the what you call it. The mesoderm is the is the 'middle round. It's like the middle. You know like the middle part of in your kidney. There's the cortex and middle part is the medulla. That's the mesoderm. It's the middle part of the…
324 R7: Isn't, isn't.
325 N7: So, if then uhm if uh the coelom having the right space, correct space. It goes into shape. Where by it makes space where the organs and tissues. So …
326 Z7: Guys, basically it is easy. Just to clarify somethings if you touch them you squash and…
327 R7: Ja so it doesn't have …
328 Z7: A strong?
329 R7: A strong.
330 Z7: Uh?
331 N7: What I am saying is …
332 R7: Skeleton.
333 N7: In order for you in order for you to have muscles in order for you to have muscles. And like this it is because of the coelom the space the space it makes inside.
334 G7: Guys please explain I don't understand. This ...
335 R7: Let me let me explain it. This is how I understand it. The coelom it has it is like..
10:00
Instead of having bones like this one. Ja like this liquid in you.
336 G7: Ooohhhh
337 R7: And the advantage of it is that you can do for something like for us, for yourself.. It's hard. It's hard like. You can wind yourself like the super people.
338 G7: Oooohhhh.
339 R7: And all that. And like that.
340 N7: But, but.
341 R7: And to make to make it easier anyhow.
342 G7 : So like …
343 R7: But, and the disadvantage is that you're easier to kill other than if they just run like that they just squashed. You know what I am saying?
344 G7: Oooohhhh
345 N7: But I disagree.
346 G7: Oohhh.

347 N7: Animals that are, animals that have coeloms are the ones which have your muscles.
348 G7: Yes.
349 N7: Yes please look at your tables quickly. Animals with a coelom. No, ani animals with the coelom are with a presence of a coelom are those with muscles, your annelida, your arthropoda, your chordata. Please look at your things.
350 Z7: Make sure of the time. I can see of 15
351 R7: I said, I said.
352 N7: Can you please have your tables...
353 R7: I said, I said that they animal that have uh. I said my spiders, they're not. At the end of at the end of the other day.
354 Z: This is for evolution?
355 R7: For evolution for like the spiders and your crabs it's the ones that have, that have no bones. Do you understand what I mean? So the ones that have bones. So they have this put in. So the big advantage is. Do you understand?
356 G7: Ok
357 R7: So do you understand?
358 G7: Ok. Yes so now I understand. Yes cause …
359 R7: If the animals and the other, they have it .. It's the one that don't have bones, they.
360 G7: Oh, so that's why the flat worms don't have a coelom.
361 R7: Ja, they are just flat. That, ja, but you're your it is the one that. They are the one and it's the one's that have, it's the earthworm.
362 Z7: Ok, so for example.
363 G7: Ok so why does the chordata have?
364 Z7: It's because maybe that it has.
365 N7: You see you you .
366 G7: Oh I got it wrong.
367 N7: Yours ok? Thank you.
368 N7: Yours is absent?
369 N7: The coelom is absent. Yes All the squishy squashy. No guys eish
370 G7: No no we look look under squishy plan.
11:00
371 G7: Ok what is tells us what it is?
372 R7: Ja.
373 N7: Wait. What. I'm saying is my coelom its got all my squishy squashy animals uh are absent. Yes you know. But the ones that are advanced. But with you too. Like your Porifera.
374 Z7: Ja. Let's see what we got here. See.
375 G7: Ok let's go through everything.
376 N7: You see absent there, absent there, absent.
377 Z7: Ja I. Er Chordata doesn't have. Um so …
378 R7: It does. Cos, look I said it doesn't have. It's absent. There. I said its absent in the and its not there. And with this one. It's absent. See.
379 N7: Now you are getting yourself confused. Because, you said with squishy squashy animals. Have coeloms.

380 R7: Ja. Porifera have. Um um.
381 G7: N7, maybe you can't see it?
382 N7: That's what Maám can can Maám must please tell us.
383 G7: Can we explain it to you?
384 R7: Ja.
385 G7: Ok, the coelom is a liquid that gives you structure ne. So instead of bones you have this liquid that you don't . Then what gives the shape inside?
And so the … The coeloms is .
386 N7: Then what do why do the Chordata have coeloms?
387 R7: Chordata they do . They do have it. We've done it. But just look at it. It's the animals that don't really need bones that have the hard covering outside like our crabs and oh other jellies.
388 G7: But it should, Chordata is like a frog. Like him.
389 Z7: Haai
390 R7: Haai wena. It is like a spider.
391 N7: Eish People.
392 Z7: It's like what?
393 R7: It's like what what?
394 Z7: It's like…
395 N7: Can't I eish …
396 G7: Let me show you the Chordata.
397 N7: Chordata even if it is that, guys I can tell you just want something. As you guys are copying.
12:00
398 N7: G7 got a coeloem in the.
399 R7: Because mine says down here.
400 N7: Can I tell something? Your table and your essay is not gonna to because you said here.
401 R7: No I made a mistake. I made a mistake. Fine I will write it out.
402 N7: Please just call maám. Cause it' s …
403 Z7: I've seen here the coelom.
404 N7: You See. So can you please call maám?
405 G7: Mine also says it has a coelom.
406 R7: Mine says …
407 G7: No guys, isn't the coelom like the lymph fluid.
408 N7: Please call maám.
409 R7: Ok sure . Let's call her .
410 N7: Because the coelom is going to mess us up. And I …
411 Z7: Sure, haai this is.
412 N7: Even though For this. Um Ja
eh *laughs* my tree. Guys please call ma'ám.
413 R7: She's busy. To call her we are wasting time. Ja, let's go onto the next one.
414 G7: Um Ok guys I'm done.
Um why don't we discuss what the through gut is.

415 R7: Ok, explain what it is and explain what the advantages are and functions are…

416 G7: Ok, so you get the ok you get you get the one that is absent. I want to know how the Porifera get's rid of its food.. And how does it?

417 N7: You know how some of the food. Like it has an absent some of them like they take in the food. And then then …

418 G7: How do they take in the food…?

429 N7: Listen, listen, in a through gut like it comes in and comes outside ne. So if you don't have a through gut.
Let's say . Let's say let's just make let's make our own example. Let's say there was a hydra.

430 G7: How do you eat without a mouth?

431 N7: Listen, listen that's what I am saying. If you don't have a through gut. Let's say hydra likes fish. Yes, hydra likes fish. Hydra likes fish what happens is the meat will go inside inside the hydra, but the bones.

432 G7: What the bones?

433 N7: Like they take, take it in.

434 N7: But whatever is not taken in.

435 G7: Listen, listen.
Listen, listen but then whatever is not taken in by our bodies goes out. From them what ever is.

13:00

436 N7: Not taken in by us by them and it squirts out.

437 Z7: That's right.

438 N7: Like the inside.

439 R7: I I I've like I've got I've got two kinds of guts. I've got the ja, I've got the blind one and the through gut is what I have. That is the one where food comes in the mouth and comes out elsewhere. And then with blind one you've got one hole. It goes in and whatever happens to it like that it is going to go out the same way it came in.

440 N7: That's that's what I think everything I told you. When it goes inside the body then comes out.

441 G7: Ja but then you see for um the sponges.

442 N7: Its absent.

443 G7: Its absent so they don't have a mouth or a.

444 N7: They have a mouth.

445 R7: They don't have.

446 N7: They have something like or. They have something like a 'mouth' they have the something that takes in the food.

447 R7: Think about Think about when you eat. You swallow; you chew everything, like when you digest food. What you have.

448 G7: N7. I'm not doing this again. . When you have a through gut…
Its either you have to gut it actually its three. It's either you don't have a gut. Either you have one hole, ne. And then the other one will have two holes. Do you understand?

449 R7: And the sponges don't have holes?

450 N7: So they don't have holes?
451 R7: No.
452 R7: Holes?
453 G7: So the sponges don't have a hole so they don't have nothing?
454 R7: They have nothing.
455 N7: So they don't have a mouth? How do they eat?
Cause the water or something. Get's inside.
456 G7: Maybe.
457 Z7: The water or something.
It's a sponge uh?
458 R7: The sponge is will suck the air bubbles in.
459 Z7: But that's what I am saying it is a combination of the two. A plant actually even if you go . That's what I am saying. You know that's what I am saying.is … uh.
460 G7: Ok, ok.
461 N7: What's the blind gut.? The one with one hole. The blind gut. The blind gut?
462 R7: Ja.
463 G7: Yes.
464 G7: Ok, so then I said.
465 R7: *inaudible* .And like all of use the whole digestive system. If you have one hole . It is going to come out the same way it went through.
And the through gut is for them.

APPENDIX 9: Glossary

Assessment for learning:	Assessment which is dynamic and ongoing, determining prior knowledge of a student, providing opportunities for students to receive constructive feedback, allowing students time to self correct.
Collaborative group work:	situations when students work together on a task, which results in learning gains which would not be achieved should the students work individually.
Constructivism:	a theory of learning that suggests that the student actively construct knowledge, it is not passively received.
Feedback:	refers to information a student receives regarding any action about a performance.
Feed forward:	feedback which supports current and future thinking.
Group work:	students working together in small groups consisting of 2-6 students where each individual is given an opportunity to actively participate on a task and in the process knowledge is constructed.
Learner-oriented assessment:	when the purpose of assessment is to evaluate student learning and to provide opportunities for students to learn.
'Substance' of group work:	an approach to teaching where teaching in groups promotes learning.
Zone of proximal development:	the distance between the actual level of development and the level of potential development.

APPENDIX 10: List of Acronyms

DoE	Department of Education
INSET	Inservice training
LOLT	Language of learning and teaching
NCS	National Curriculum Statement
OBE	outcomes-based education