Full lesson transcript for Mr. Zulu of School C

Lesson 2: Genetics and inheritance on 17 March 2020

Details

- This lesson transcript represents 35 minutes of teaching time.
- A male black South African teacher was teaching the topic of meiosis to 21 male learner participants, all in grade 12.
- The lesson took place at a former model C Boys High School in Johannesburg East district in Gauteng on 17 March 2020.
- When used by the teacher, the learners' names have been changed to protect anonymity.
- The textbook utilised during the lesson is Focus Life Sciences Grade 12 learner's book by Clitheroe, Dempster, Doidge, Singleton, Marsden, and van Aarde published by Maskew Miller Longman Pty. Ltd, South Africa.
- Used overhead projector and blank transparencies.

Transcription conventions

Symbol	**Signification**
T:	A verbal contribution belonging the teacher
L:	A verbal contribution belonging to any individual learner
Ls:	A verbal contribution belonging to two or more learners
…	Noticeable pause of less than 1 second in a turn, which could be due to reformulation or hesitation
—	Sound abruptly cut off e.g false start Truncated word Formal made shorter e.g S-

/ /	Words between slashes show uncertain transcription (not clearly known or understood.
/ ? /	Inaudible utterances
[ ]	Words in brackets indicate non-linguistic information eg [pause for 1 second] Laughter, throat clearing, smile, applause, sigh happily/ werily/deeply, contently, swallowing, nodding, shaking head dance or movement towards/away
( )	Parenthesis around tone units indicate words spoken in a sotto voice under one's breath (in a very quiet voice)
,	Slight pause
?	High rising intonation
.	Falling intonation at the end of tone unit
:	Colon following a vowel, indicates elongated vowel sound or extending length of sound e.g Die:d
::	Extra colon indicates longer elongation
↑	A step up in pitch/ high pitch (high quality sound)
↓	A shift down in pitch (low quality sound)
^	A caret indicating high pitch level e.g ^weird
-	Low pitch level
——	Self-interruption or repair
Abc	Best guess transcription

ALL CAPS	Utterance is louder/said with extra stress/emphasised compared with surrounding words
/	Rise tone e.g …saying something, /
\	Fall tone
∨	Fall-rise-tone
∧	Rise-fall-tone
CAPS	Prominent syllable e.g sOn or FAthEr

EPISODE 1: TERMINOLOGY

1.	Mr. Zulu:	Phenotype… what is phenotype?
2.		Let us start with phenotype.
3.		It is the physical appearance neh…of an organism. So, it means… those are the things that you can observe, the things you can observe.
4.		So, you say it is the physical appearance of an organism right so… that is the phenotype.
5.		Then what about the genotype? Yes! [Referring to a learner]

6.	Lesedi:	Sir, the things that you cannot see.
7.	Mr. Zulu:	You cannot see...but…Yes?
8.	Siyabonga:	Genetic characteristics…
9.	Mr. Zulu:	Genetic makeup of an organism neh…so it means we are looking at it in terms of the genes…so, it is the genetic makeup of an organism.
10.		Right, we said that an allele can be dominant or recessive neh…okay ehh…if we say something is dominant or an allele is dominant what does that mean...? Yes, Ashton?
11.	Ashton:	Sir, it has more power over something / ? /
12.	Mr. Zulu:	It has more power / ? /

13. Ashton: / ? /

14. Mr. Zulu: Okay. NO!

15. Ashton: It is stronger.

16. Mr. Zulu: It is stronger, no! Yes? [Referring to learner]

17. Siyamukela: Sir, it is more jellous…you see jellous, there is more jelly in that allele.

18. Mr. Zulu: NO! Yes? [Referring to learner]

19. Alumba: Sir, it is the one that will show.

20. Mr. Zulu: Yes! It is…going to show in the phenotype, it will show in the physical appearance of the organism.

21. What about the one that is said to be recessive, what is going to happen to it? Yes!

22 Jonah: Hidden!

23. Mr. Zulu: It is hidden neh…it is hidden by the dominant allele neh… so the dominant allele will show in the phenotype and then it will hide the effect of a recessive allele.

24. So, we are done with that.

EPISODE 2: MONOHYBRID CROSSES

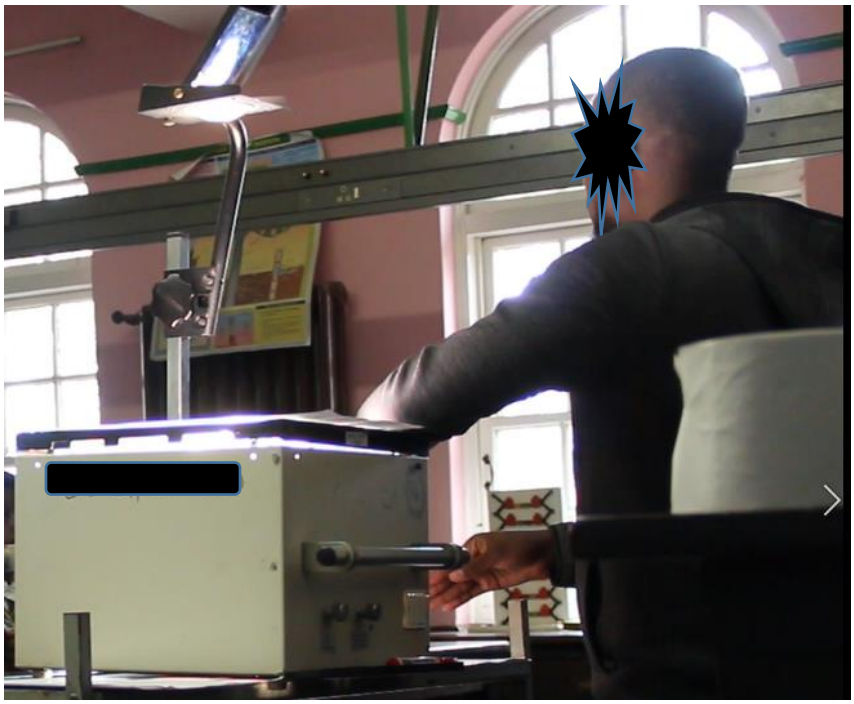
25. Now let us look at monohybrid crosses neh…okay monohybrid crosses and how to represent these ehh…monohybrid crosses. [Fixing the projector]

26. Yesterday I said that a hybrid is ehh…offspring that result of sexual reproduction will always be offspring because— I mean will always be hybrids because they come from two parents which a:re genetically different.

27. Okay, two parents that make the offspring are not the same, their genetic makeup is not the same.

28. So, they come up within offspring.

29. Okay then…with monohybrid crosses when we are talking about monohybrid crosses…



…I said we only look at one…

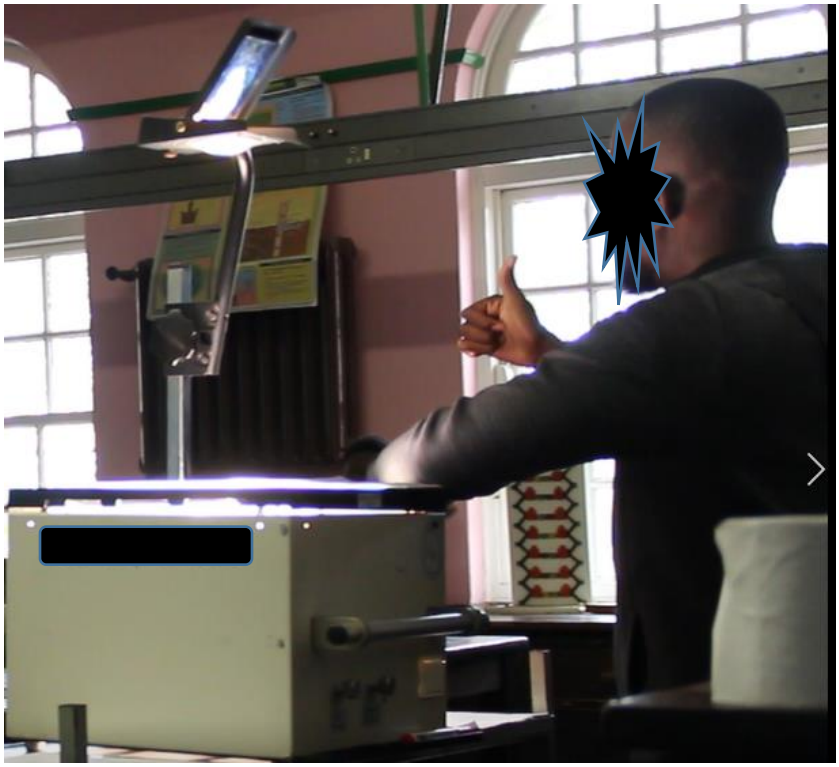
…characteristic neh…but once we say it is di-hybrid crosses then it means that we are looking more than…one characteristic or two characteristics neh.

30. For example, we can just look at the eye colour…

…of a human being.

31. If you are looking at only the eye colour…

…that will be mono- okay, but if we say we are looking at eye colour,



…and hair colour…

…for instance, those are two…

…characteristics so it cannot be monohybrid neh… are we following?

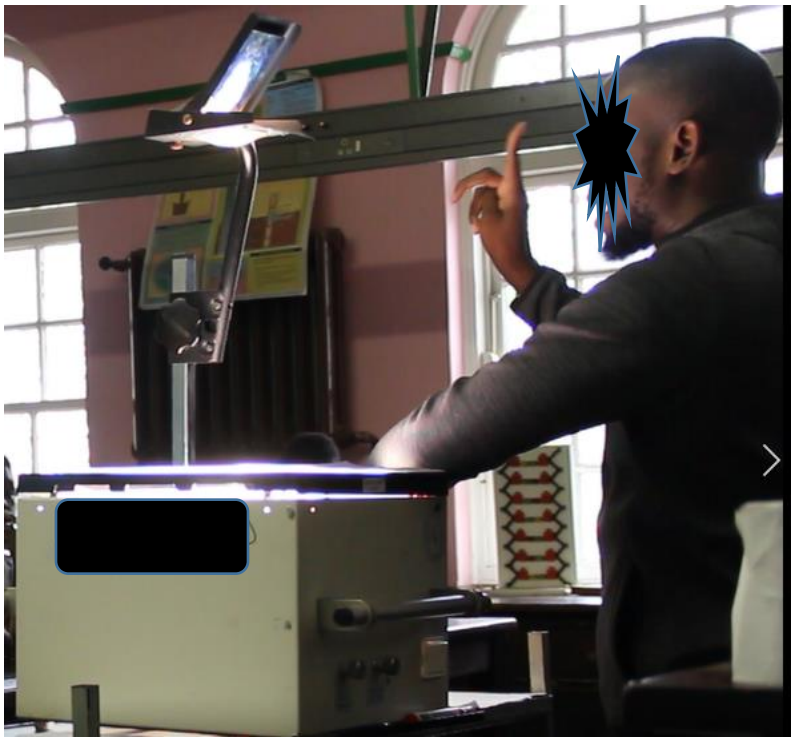
32. Right, so let us say for instance this boy--

…I say this boy is tall and dark.

33. How many characteristics am I checking on?

34. Ls: Two!

35. Mr. Zulu: Those are two characteristics neh…so it cannot be mono— but if I say that he is tall that is only one…



…characteristic that am focusing on.

36. Are you following?

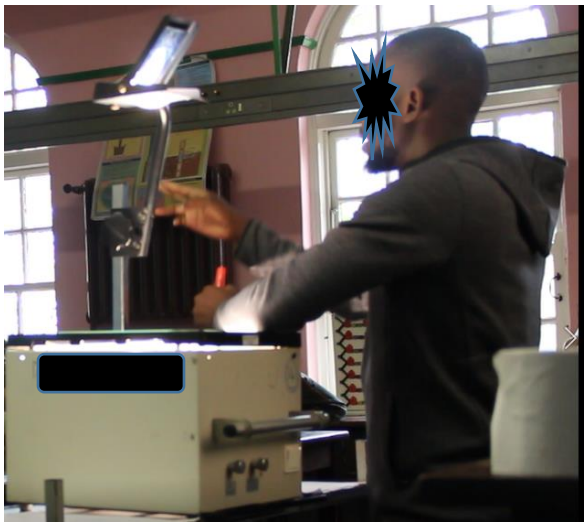
37. Right, so that is what we said yesterday.

EPISODE 3: GENETIC CROSS FORMAT

38. Right, so the format…to or for representing a genetic cross, so the genetic cross that we are representing, remember it is whereby you look at only one characteristic which is a monohybrid cross neh… [looking at the information on the transparency]

39. So, we will try to do our own because this is a bit confusing to some people neh… [removes the transparency and puts a blank one].

40. So, let us say we are using one characteristic which characteristic would you like us to look at? Yes? [Referring to a learner]



41. Lesedi: Eye colour!

42. Mr. Zulu: Eye colour, right so which letters can be used to represent eye colour?

43. Ls: E.

44. Mr. Zulu: Okay, let us use B neh… let us use B it is okay right.

45. So, we will use B to represent eye colour okay and-- [pauses as he writes on the transparency]

46. So, eye colour…what is an eye colour …is this a gene or an allele?

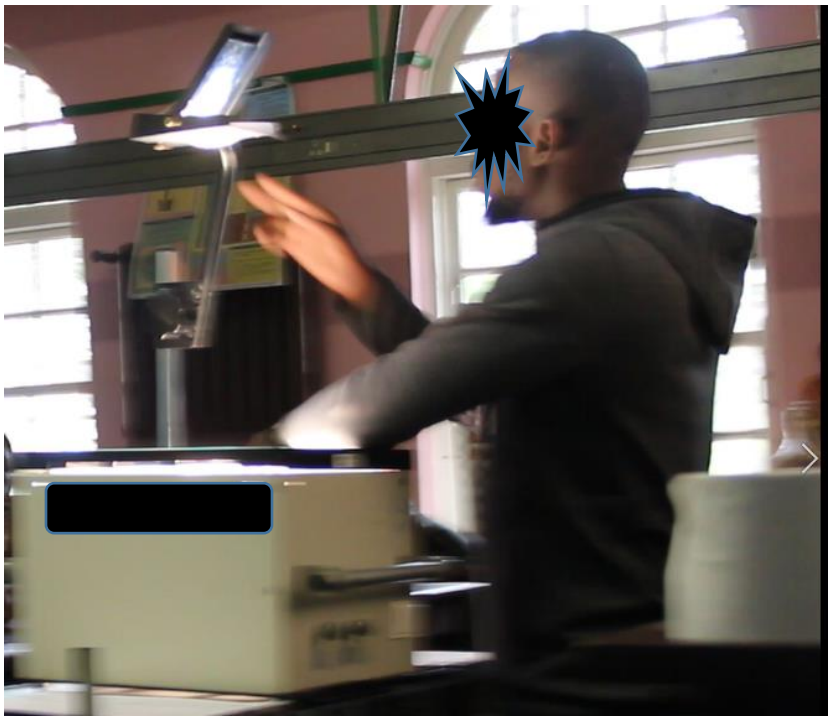
47. Ls: [Chorus]

48. Mr. Zulu: Eye colour… is it a gene or an allele?

49. Ls: It is a gene.

50. Mr. Zulu: Why is it a gene?

51. Mr. Zulu: Raise your hand. Yes? [Referring to a learner]



52. Thembekile: Sir it is a gene because / ? /

53. Mr. Zulu: Okay, so when we say for instance brown, green.

54. Yes, that is correct!

55. Or blue, red okay.

56. So, [knock on the door] those are alternative forms of this gene, the gene is eye colour. [Interruption from outside]

57. So, the eye colour neh…and we said we are going to use a B as our alleles neh…so let us say for instance the statement says in the exam.

58. Ehh… two homozygous ehh…parents for this type of gene which is eye colour…ehh which means they are crossed neh…okay.

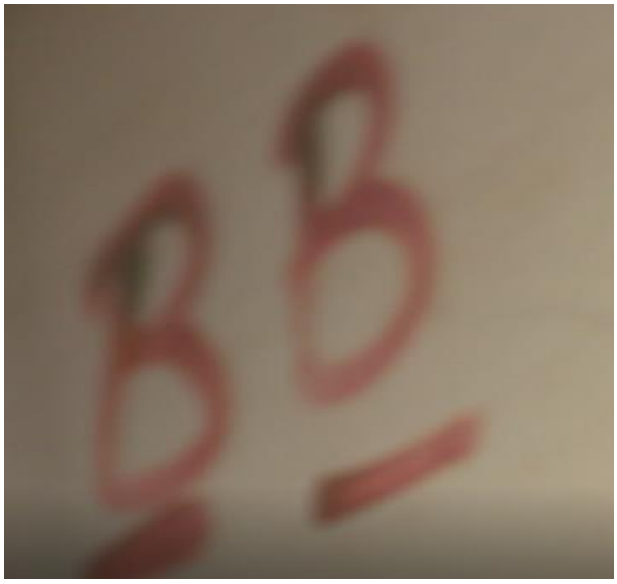
59. If they are homozygous what does that mean? Yes? [Referring to a learner]

60. Kahlego: / ? / I think they are doubles.

61. Mr. Zulu: They are doubles.

62. What do you mean? Yes, ehh…chief?

63. Lesedi: Genetically different.
64. Mr. Zulu: They are genetically different. No!
65. Thembekile: Sir, there is a structure in the genes which is genetically the same.
66. Mr. Zulu: Genetically the same.
67. No! Boys did we do homozygous and heterozygous yesterday?
68. Ls: We did not do…
69. Mr. Zulu: Sorry!
70. Jonah: We did not do homozygous.
71. Mr. Zulu: We did do homozygous yesterday chief.
72. Homozygous…yes? [Referring to a learner]
73. Kahlego: Yes, they are the same sir.
74. Mr. Zulu: They are the same, okay heterozygous meaning they are different.
75. Right so, I will give you two alleles here neh… [writing on the transparency]



…this an allele for let us say brown eye colour we said we gonna use B neh…okay so will use-- we will do brown and green right.

76. So, let us say this is ehh…brown eye colour neh…and this said to be homozygous.
77. Why is it homozygous?

78. Because this-- these are capital letters; they are the same.

79. But in this case whereby we have a capital letter and a small letter.

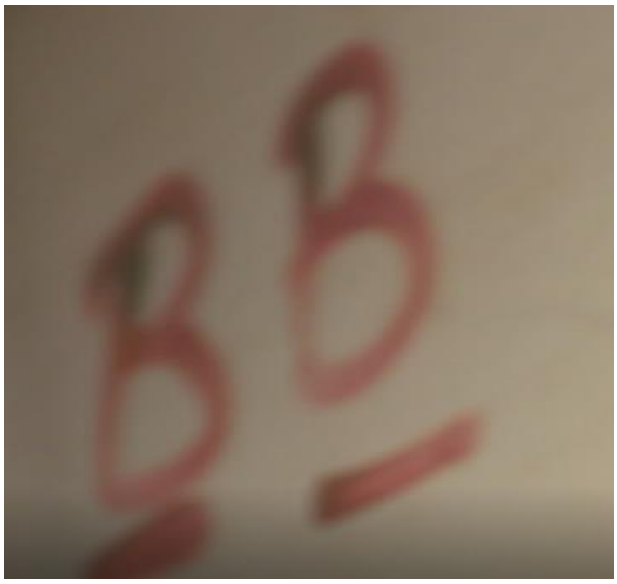
80. Then what does this mean?

81. This is ((heterozygous)) [showing letters on the board]

…because this is capital letter and a small letter and remember this is representing alleles now okay.

82. We are looking at this person, what are the alleles that make up this person's eye colour. [Knock at the door]

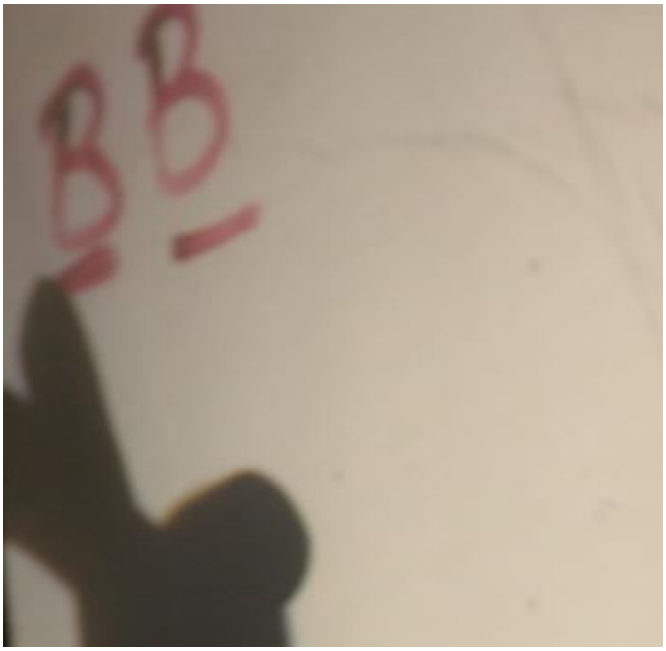
83. Okay, we were saying this is homozygous…



…and this is heterozygous [pointing to letters on the transparency]

…but the eye colour that we are going to choose here, we are going to say these two parents neh…a::re…they are bo-- dr-- they both have ehh…brown eyes neh…, they both have brown eyes ehh…okay.

84. But in this case… [pointing to letters on the transparency]



…this one is homozygous for brown eyes and this one is heterozygous for brown eyes.

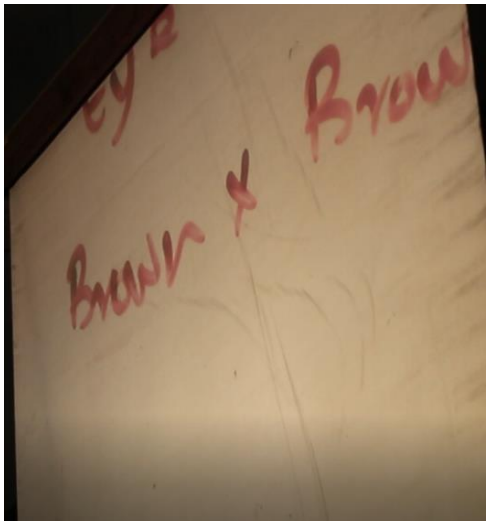
85. Remember a capital letter is said to be dominant but if it's a small letter then it i:s recessive.

86. Are we following?

87. Ls: Yes!

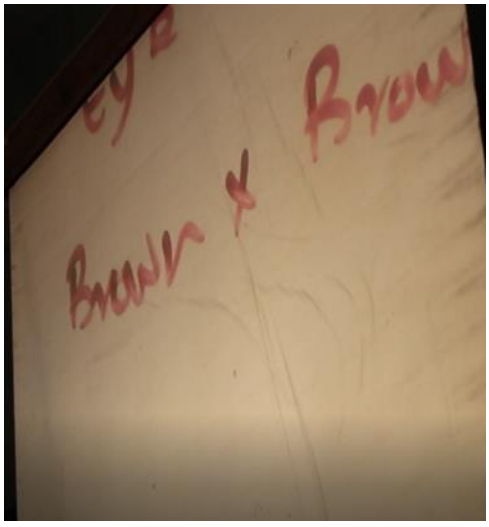
88. Mr. Zulu: Yes! Right, so let us say… [writing on the transparency]

…brown and…



…brown okay and what do we call this?

89. Mr. Zulu: Is this the genotype or phenotype?



90. Ls: [Hesitantly] Genotype.

91. Mr. Zulu: Sorry…

↓Genotype!

92. Ls: Phenotype.

93. Mr. Zulu: It is the phenotype, why is it the phenotype? Yes? [Referring to a learner]

94. Lesedi: We can see it.

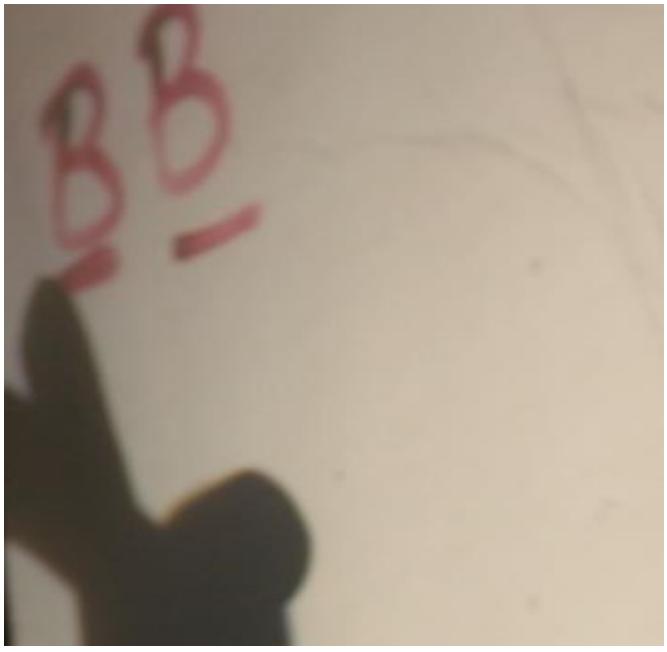
95. Mr. Zulu: Yes, we can see that characteristic neh…it is the physical appearance of an organism.

96. If we look at these two people [pointing to the letters on the transparency], we will see the brown eyes neh!

97. So, we will say this is the phenotype, I will not write it in full neh… because we do not have enough space here [fixing the projector] okay.

98. So, this will be the phenotype and then now let us represent the genotype okay.

99. So, will just put a G for genotype neh…so the genotype for this one, let us say this first [pointing to the letters on the transparency]

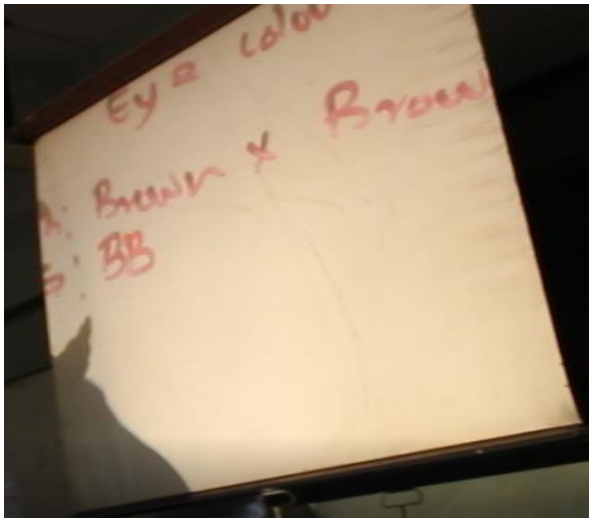


…parent is homozygous for brown eyes……and remember we said we are going to use the letter B.

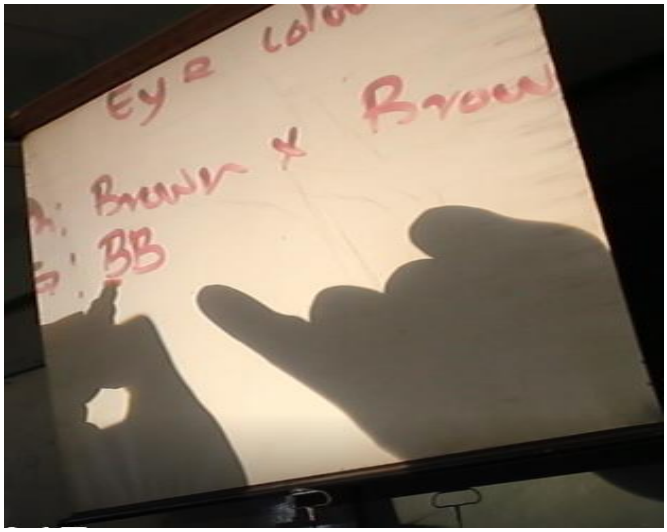
100. If this parent is homozygous for brown eyes so which letters-- how are we going to put our letters? Yes? [Referring to a learner]

101. Lesedi: Capital letters!

102. Mr. Zulu: [Writing on the transparency] Capital B a:nd ((Capital B)).

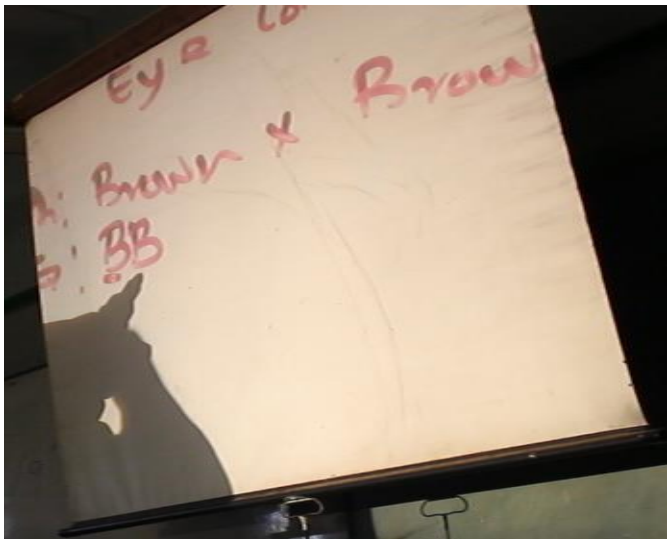


103. Yes! Remember we use two alleles neh… for each parent because this parent inherited this [pointing to one B] from…

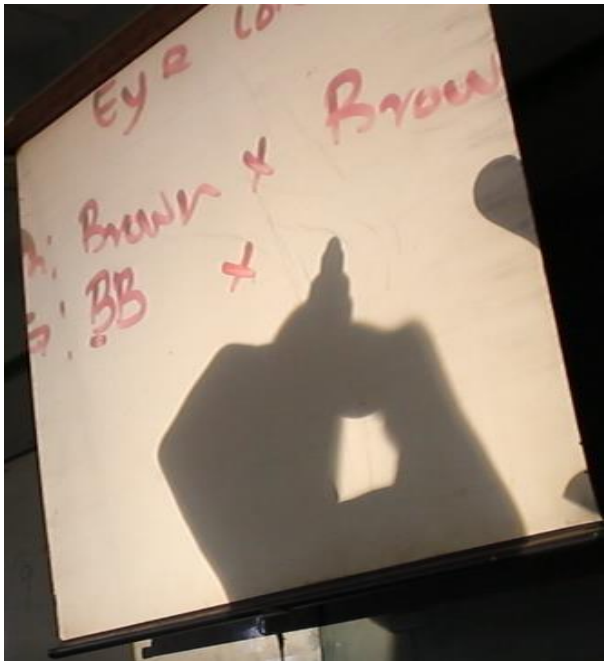


104. Lesedi: Mother

105. Mr. Zulu: Yes! [pointing to a letter on the transparency] From the mother and from their father as well. [Pointing]



106. So, for this one… [pointing to the word brown on the transparency]



…it is said to be heterozygous, heterozygous how are we going to represent the alleles? Yes, Alumba?

107. Alumba: Capital B and a small b.

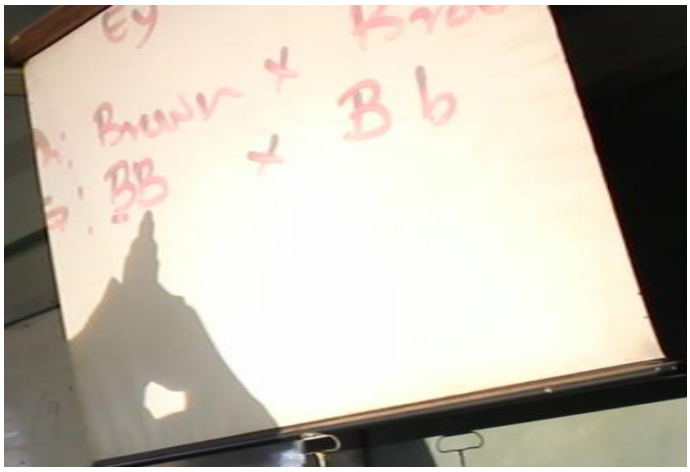
108. Mr. Zulu: It is capital B and a small letter b.

109. Okay, between the two which one is dominant here and which one is recessive? Yes? [Pointing to a learner]

110. Alumba: The capital B is dominant.

111. Mr. Zulu: [Referring to letters on the transparency] This one is dominant and this one is recessive.

112. Let us check this one… [pointing to the transparency]



…okay which one is dominant, and which one is recessive?

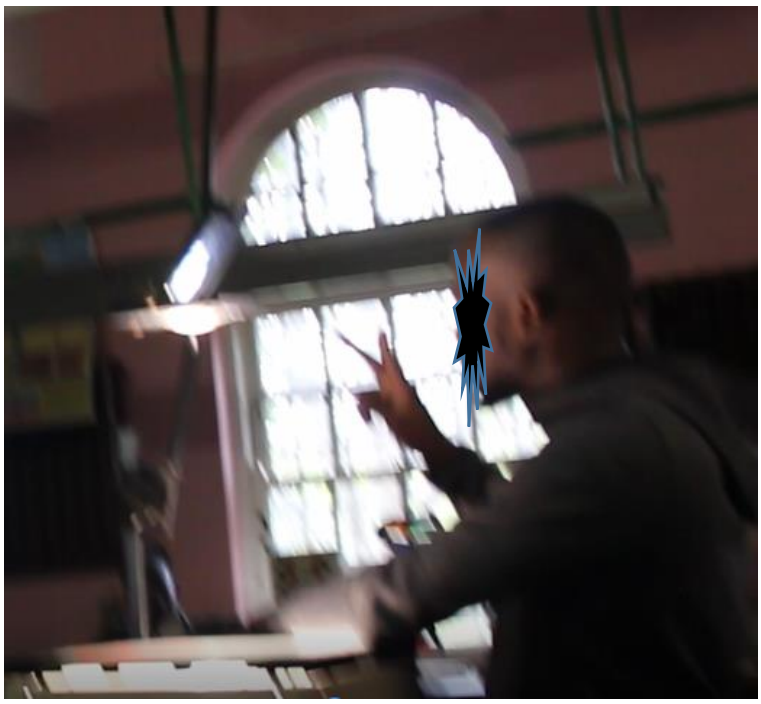
113. Ls: They are both…

114. Mr. Zulu: They are both dominant neh… okay, they are both dominant.

115. ^Now, we should start with our crossing.

116. Boys you are-- you still remember sexual reproduction…we said in sexual reproduction… the two gametes will come together.

117. It will be a sperm from the father a:nd an egg…

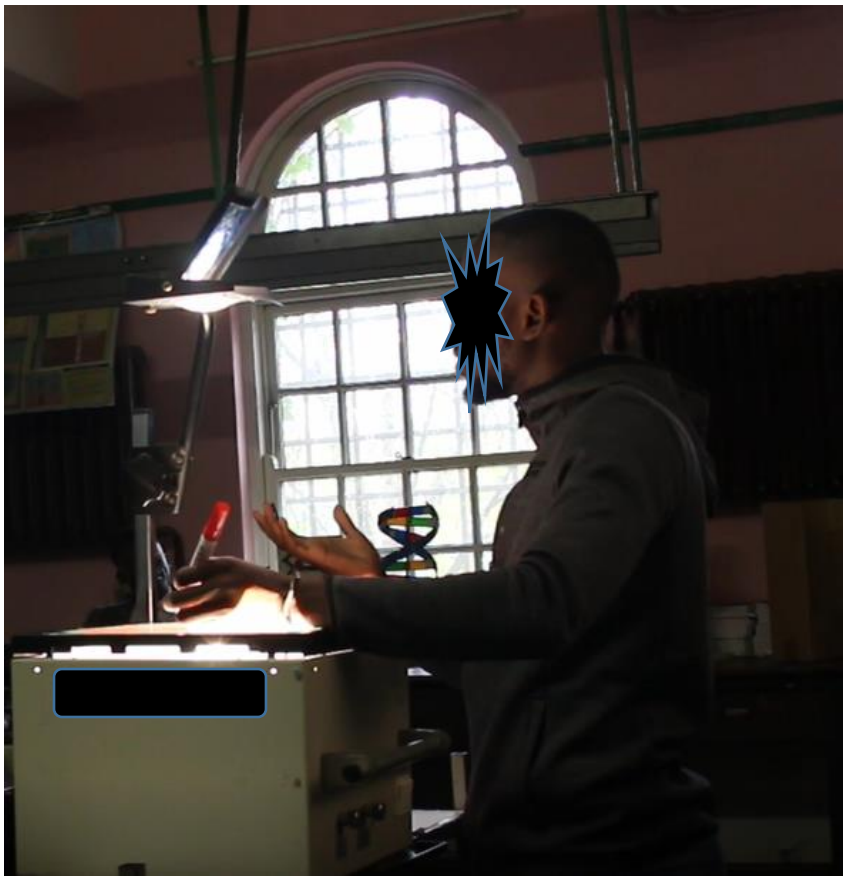


…from the mother.

118. Right, so it means that even here we must represent that neh…we must show the process meiosis.

119. We have to say that meiosis is taking place…okay meiosis is taking place.

120. After meiosis what are we going to have…



…we will have…

121. Alumba: Mitosis!

122. Mr. Zulu: ^Ahh… NO! No!

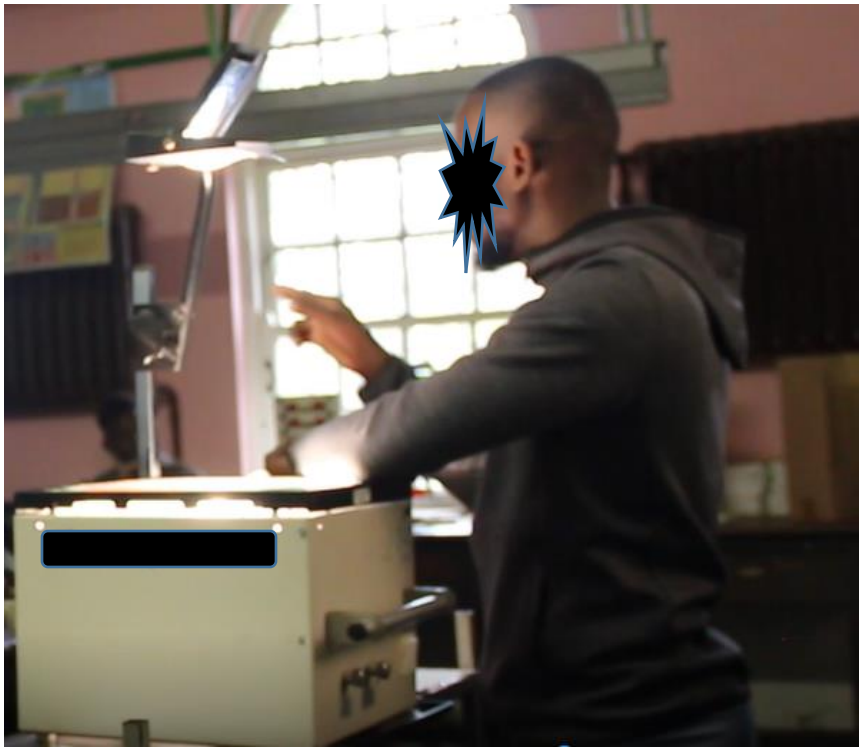
123. Not mitosis.

124. What is going to be formed?

125. Ls: Four cells!

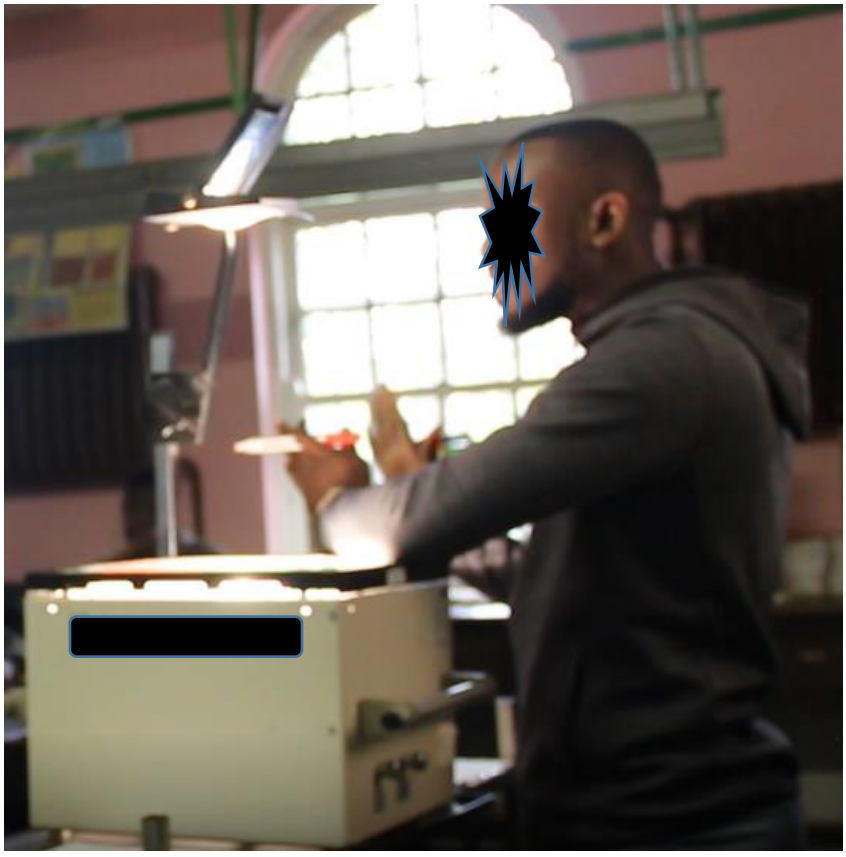
126. Mr. Zulu: Okay, it is fine but then at the end those four cells will what-- THE GAMETES!

127. Right, so what… are we going to have as our gametes here any idea? Yes? [Referring to a learner]

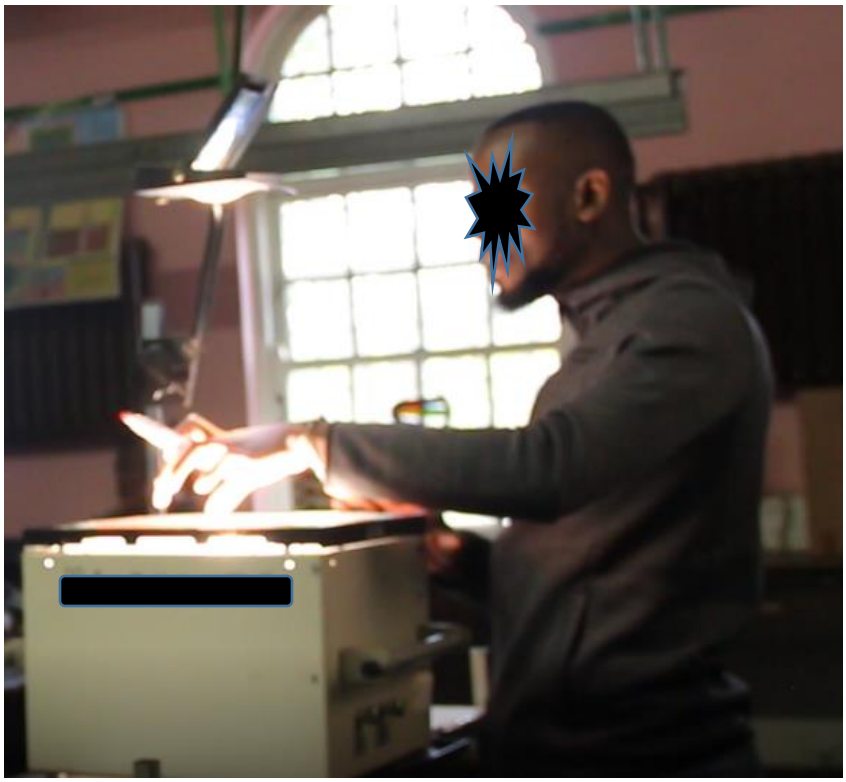


128. Mpho: Eye colour sir. [Pointing to the transparency]

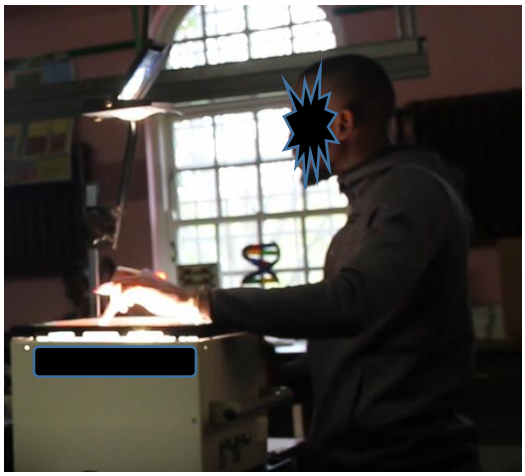
129. Mr. Zulu: [Smiling] Okay so because we are looking are at the eye colour only…



… so, it means even our gametes…

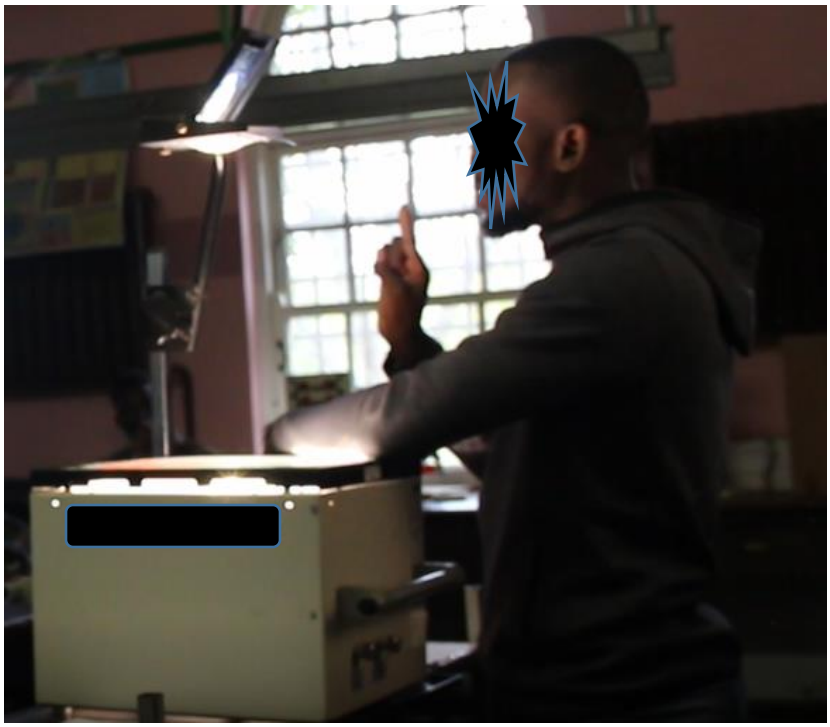


…will be representing our eye colour and the gametes…



…boys they are the same as the genotype.

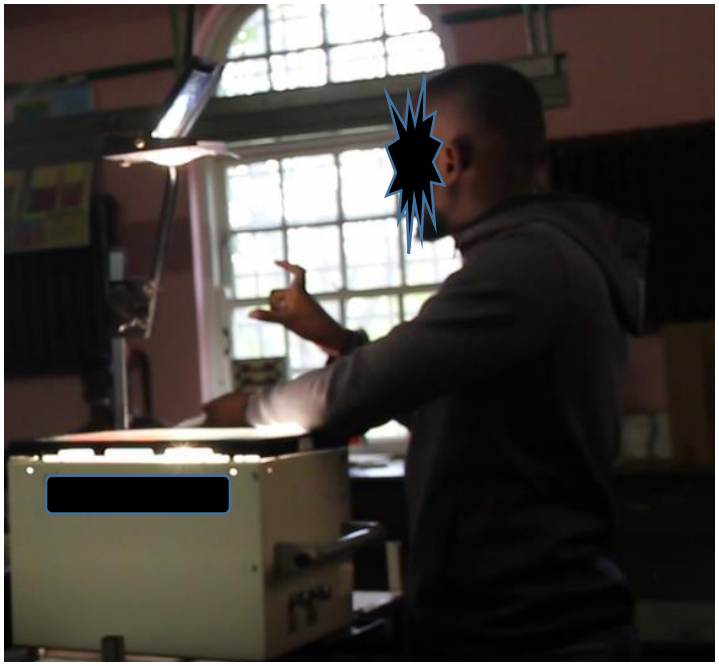
130. The only difference…



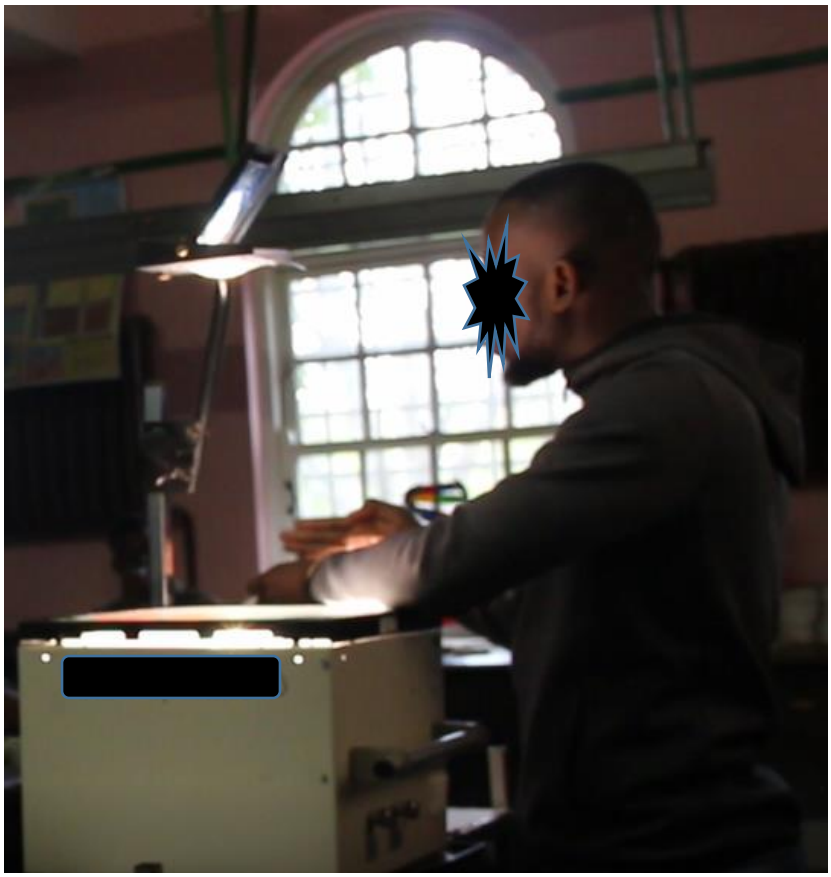
…now is that you will BE using a circle.

131. Right, so we have this B and we have another B and we put this B in a circle ^we also put this one in a circle, because they have to come together that is why we have use this sign which is like a multiplication sign.

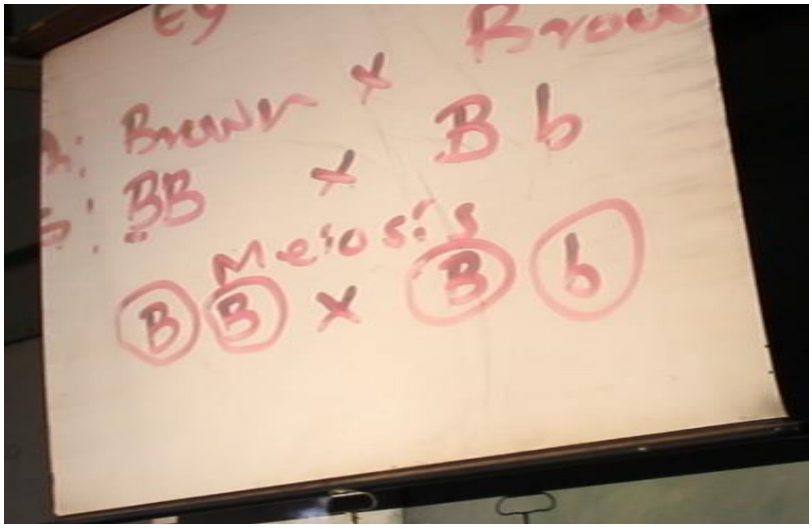
132. Then we have this one which will be capital letter B and a ^small letter right, and we put them in a circle…



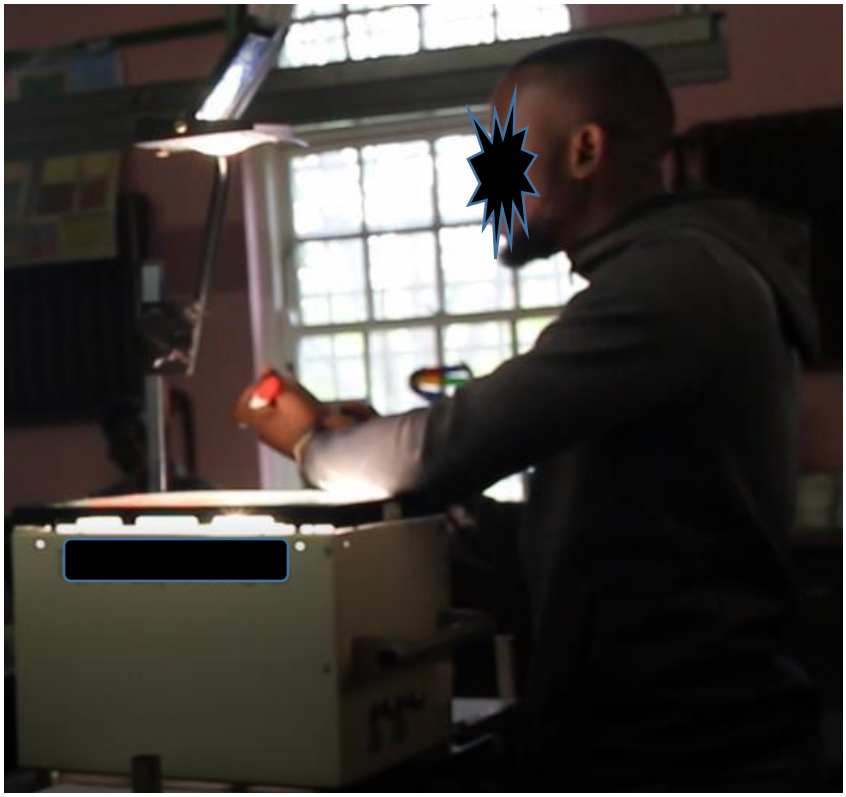
…neh… and the reason for that…



…it is because these are gametes neh…these are gametes, am I making sense?

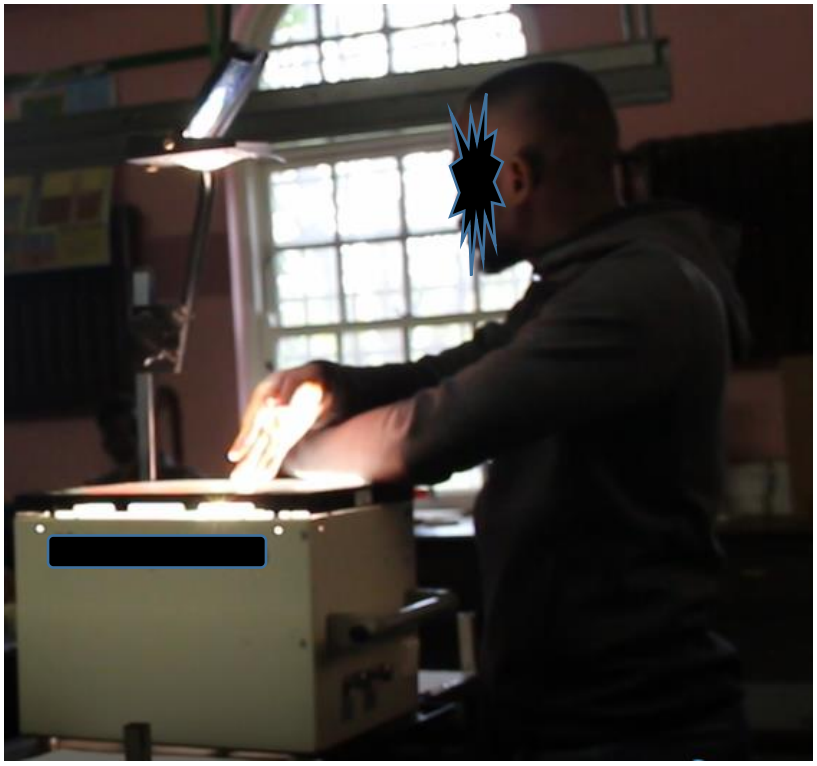


133. It is the gametes that will come together…



…to form an offspring.

134. Remember we want to see how the child is going to be in this case, right we want to see how the child…



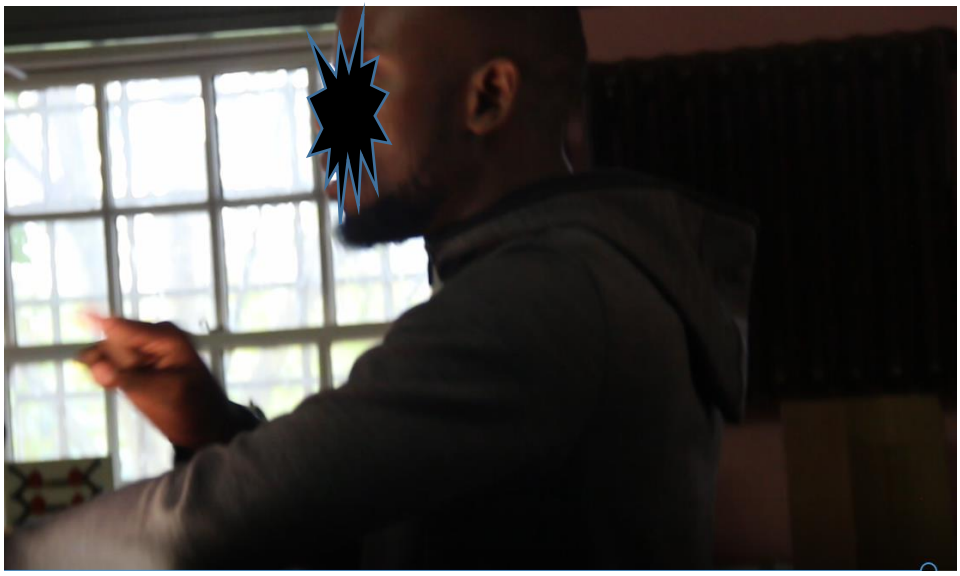
…is going to be.

135. So, it is the gametes that will come together, it not just these ehh…genotypes…

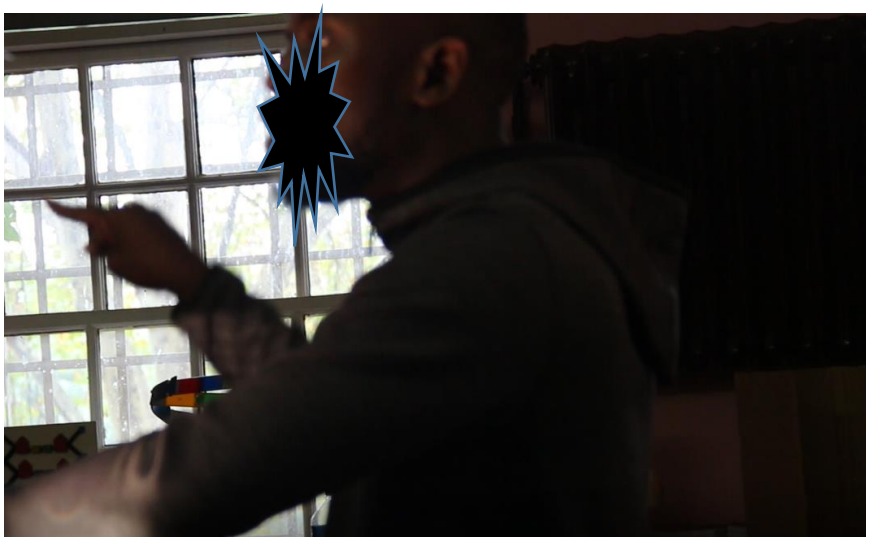
…and the phenotype.

136. You cannot like ehh…put two parents together and expect a… ehh...child to come out.

137. There must be copulation…



…and during copulation a sperm…



…will be released and then an egg will meet and then we have a process of fertilization.

138. So, by just two parents standing next to each other it does not mean that they will have an offspring.

139. There must be copulation, there must be a sperm that will ehh…fertilize an egg.

140.		So, that is why we must represent these gametes… [pointing to the transparency] neh…alright.
141.		So, in this case now we gametes… [writing on the transparency] after the process of meiosis neh… are we following?
142.	Ls:	Yes!
143.	Mr. Zulu:	Okay, right so because we know that fertilization is random neh…it can be any sperm that fertilize an egg.
144.		It will also be brown okay.
145.		Then [pointing to the transparency] what about this one?
146.	Ls:	Brown.
147.	Mr. Zulu:	It will also BE…
148.	Ls:	Brown.
149.	Mr. Zulu:	…because we say this one will mask the effects of this neh....
150.		Right, so all of them will be having brown ehh…eyes.
151.		Now the question in the exam what is the phenotypic ratio? Yes, Lindani!
152.	Lindani:	Two is to two.
153.	Mr. Zulu:	Two is to two, how come? [Pauses] Yes? [Referring to a learner]
154.	Thembekile:	Sir / ? /
155.	Mr. Zulu:	Boys how do we do or how do we get ehh…ratio? Yes? [Re$_f$erring to a learner]
156.	Jonah:	Sir, / ? /
157.	Mr. Zulu:	Okay, how?
158.	Lesedi:	/ ? /
159.	Mr. Zulu:	Fours, four as to four, okay so it means it is the same as one as to one?
160.	Lesedi:	Yes!
161.	Mr. Zulu:	Oh! Okay, it is correct.
162.		Then ehh…what about ehh…the probability [pauses] that the child will have brown ehh…eyes, probability. Yes? [Referring to a learner]
163.	Mpho:	Six is to 2.

164.	Mr. Zulu:	Right, remember the probability must be a percentage neh... or what are the chances-- what are the chances that a child from these parents will have brown ehh…eyes?
165.		What are the chances? Yes? [Referring to a learner]
166.	Delroy:	100%
167.	Mr. Zulu:	100%, so if you agree raise your hands. [Some learners raise their hands]
168.		We have one, two, ehh…four…/ ? /
169.		So, what will be your chance?
170.	Kahlego:	75% sir!
171.	Mr. Zulu:	75% how did you get your 75%?
172.	Kahlego:	Just because there is-- it is like ehh…two of the same thing.
173:	Mr. Zulu:	Right, boys when you look at the percentage it will be equal to 100% is that correct?
174.	Ls:	Yes!
175.	Mr. Zulu:	Okay, let us say this will be [writing on the transparency] 25, this will be 25, this will be 25 this will also be 25.
176.		So, we should be getting… 100 neh… / ? /
177.		So, it 100% neh…its 100 okay…this is brown, this is also brown, this brown again and this is also brown.
178.		So, that chance that a baby will BE having brown eyes in this case it will be 100%.
179.		Okay, because all of these neh… all of these offspring they have brown ehh…eyes. Maybe if one had green eyes then… [pointing to learner] 12 your 75% was going to be correct okay, are we following? [Clearing throat]
180.	Ls:	Yes!
181.		So. now we have an idea though we did not cover all the steps neh…now let us look at this… [puts another slide on the projector] let us look at this question that I have here.
182.		Do you still remember Gregor Mendel?
183.	Ls:	Yes!

184.	Mr. Zulu:	Who is he? Yes? [Referring to a learner]
185.	Lesedi:	Father of genetics.
186.	Mr. Zulu:	The father of genetics, thank you! [Reading from the transparency]
187.		"Mendel crossed a pure breed ehh…tall plant and a pure breed ehh…short plant".
188.		All the F_1 offspring were tall…so, when we say F_1 and P_1, F_1 represents the first generation [Bell rings] …right, so F_1 will be the first generation and then P_1 will be the first parents.
189.		Right if we have P_2 then P_2 will be second parent and F_2 will be the second generation are you following?
190.		Let me just / ? /. [Showing on the transparency]
191.		Okay, here is your parent, right wena [you in IsisZulu] you are an offspring are you following?
192.	Ls:	Yes!
193.	Mr. Zulu:	You should also meet with someone okay SO, let us say Y…then you have a Y after that you made your own babies, is that correct?
194.	Ls:	Yes!
195.	Mr. Zulu:	Okay, so this will be YOUR offspring let us say the offspring but the first generation of parents, these were parents, number one wena [you in IsiZulu] you were their first generation, does it make sense?
196.		But now you are a parent, so which means you are parent number what?
197.	Ls:	2.
198.	Mr. Zulu:	Number 2, Okay and then from there, you have the second generation of these parents.
199.		So, these should be F_2 so P_2 will be parents number / ? / okay they will make babies.
200.	Ls:	2.
201.	Mr. Zulu	So, /F_2/ will be parent number what?
202.	Ls:	2
203.	Mr. Zulu:	Exactly! That is how it works neh…
204.		So, we have P_1 plants as the parents / ? /

205.		This is how they look but these are the offspring [showing them on the transparency].
206.		Right, it was a tall plant and a short plant.
207.		Right, so their genetic-- their genetic makeup remember we started with… [lots of noise interrupting from outside] / ? /
208.		So, with this one the genetic makeup is said to be…they are all dominant, the alleles ar:e dominant okay.
209.		This is said to be homo-zygous.
210.		Then what about this one?
211.	Ls:	Recessive!
212.	Mr. Zulu:	Recessive… recessive what?
213.	Ls:	Heterozygous!
214.	Mr. Zulu:	…ahh-- ehm…this is homozygous… homozygous...that is a mistake [correcting what is on the transparency].
215.		Heterozygous means they are not the same.
216.		So, this homozygous tall neh...THIS IS HOMOZYGOU:S TALL, are we following?
217.	Ls:	Yes!
218.	Mr. Zulu:	Yes! Right and then these two parents because they are / ? / it means that they can produce ehh…gametes neh…but the gametes should be produced by the means of meiosis neh.
219.		This is MEIOSIS not MIOSIS [emphasisng on pronunciation] this is meiosis okay.
220.		Then your gametes will look like this [pointing to transparency] this is just a short cut.
221.		This should have heter-- and homozygous ehh…ALLELES neh—all capital letters and I said to you must use circle neh.
222.		This diagram did not show circles but it is fine you know what to do.
223.		Right, so is that a capital letter T and small letter t?

224.		All the gametes that were produced by this short plant they will have a small letter t neh…all gametes that are produced by this tall plant they will have a capital letter T… are we following?
225.		Right, and if you combine a capital letter T and a small letter t, we end up having this… [showing on the transparency]
226.		So, is this heterozygous or homozygous?
227.	Ls:	Heterozygous
228.	Mr. Zulu:	Heterozygous because the alleles are not the same neh… they are not the same.
229.		So, this should be the general of the first generation, are you following?
230.		Then their phenotype we know it remember we have four, it is just that this is a short cut we are four but here we are short with one.
231.		So, all of them…will BE tall.
232.		So now we are picking this first generation and I said that if you now make the first generation parents, they will be parents number two that is why you see there [pointing to the transparency] is P_2 parents okay.
233.		So, we have P_2 parents it will be second crossing but, in this case, they are heterozygous neh.
234.		So, we take a tall plant / ? /or it is crossed with a tall plant okay.
235.		Who can give us the genotype? Yes? [Referring to learner]
236.	Jonah:	/Dominant T and recessive t/
237.	Mr. Zulu:	It is a dominant T and…
238.	Ls:	Recessive t!
239.	Mr. Zulu:	…and a recessive t, what about this one?
240.		A dominant T and a recessive t okay.
241.		Come in… [visitor slams door]
242.		^Right so, we have dominant T and a recessive t, dominant T and a recessive t right and we said this is heterozygous here.
243.		So, which means both parents a:re heterozygous… does that make sense.
244.		Right so we said this will BE the phenotype and this will BE the genotype neh.

245.		Right so what are we going to have next? Yes? [Referring to a learner.
246.	Jonah:	/gametes/
247.	Mr. Zulu:	We need the gametes, so which process… is needed? Yes? [Referring to a learner]
248.	Lesedi:	Meiosis!
249.	Mr. Zulu:	Meiosis, right so have meiosis… which will take place.
250.		Then that meiosis will form the gametes.
251.		So, let us start with the gametes for this one-- the first one.
252.		How are they going to look like? Yes? [Referring to a learner]
253.	Mpho:	Capital T in a circle.
254.	Mr. Zulu:	Yes, in a circle obviously and…
255.	Mpho:	Recessive.
256.	Mr. Zulu:	Recessive t okay and [showing on the transparency] what about this one? Okay, it will be a dominant T and ^a…
257.	Ls:	Recessive t.
258.	Mr. Zulu:	Recessive t.
259.		↑Boys can you see that you take these as they are neh…it is just that now that you put them in circles neh… because these are gametes neh.
260.		Remember you must label them, these are gametes, this is ehh…the genotype and this is the phenotype neh.
261.		Okay, it is just that we do not have enough space and time as well.
262.		Right… so, the gametes remember are the ones that will come together neh…so that is where we can start doing our crossing neh...
263.		So, let us do our crossing… [showing on the transparency]
264.		So, we will take this one neh… we combine it with this right OR this one CAN be combined with this because you KNOW a sperm will fertilize any egg neh…you remember okay.
265.		So, we have this one and this one, so what will be ou:r genotype for this generation…? Ashton?
266.	Ashton:	Two dominant T.

267.	Mr. Zulu:	Yes, two dominant Ts okay… then we can take this one and fertilize this one neh…okay what are we going to have…? Delroy?
268.	Delroy:	One dominant T and one recessive t.
269.	Mr. Zulu:	That is correct!
270.		Right so, we are done with this okay.
271.		Let us look at the second gamete now…this small t can fertilize this neh…is that correct?
272.	Ls:	Yes!
273.	Mr. Zulu:	Okay so let us see what we have-- and a small letter t is that correct?
274.	Ls:	Yes!
275.	Mr. Zulu:	Right!
276.	Ls:	It is not correct.
277.	Mr. Zulu:	Okay if it is not correct raise your hand. [Some learners raise hands].
278.		Okay cool, why is it not—?
279.	Thembekile:	Sir, is it always a dominant letter before the recessive?
280.	Mr. Zulu:	Okay so, it means we have to do it like this [showing on the transparency].
281.	Ls:	Yes, sir!
282.	Mr. Zulu:	Okay…right, so then it means there are rules, it means there are rules okay.
283.		There are rules…we always start with a dominant one, we must always start with a dominant one…are we following?
284.	Ls:	Yes!
285.	Mr. Zulu:	Okay so, that is why… there i:s a capital T and a small letter t.
286.		So, we always start with a dominant allele okay.
287.		So, now let us look at this one [showing on the transparency] right.
288.		So, we take this, and we cross it with this one, so what is our genotype…Sir? [Referring to a learner]
289	Mpho:	/Small letter t— /
290.	Mr. Zulu:	You do not just say small LETTER you use the correct scientific terms…
291.	Thembekile:	Sir…
292.	Mr. Zulu:	Yes?

293.	Thembekile:	Two recessive tees.
294.	Mr. Zulu:	Two recessive tees like this neh… [showing them on the transparency] are WE still following?
295.	Ls:	Yes!
296.	Mr. Zulu:	Okay so, we are done with the genotype, now let us look at the phenotype okay.
297.		What will be the phenotype for this one…Reshaad?
298.	Reshaad:	Ehh…ehh…
299.	Mr. Zulu:	You see you end up sitting on the floor. Sorry!
300.	Thembekile:	Tall.
301.	Mr. Zulu:	It will be tall neh… and what about this one ehh…Arnold?
302.	Arnold:	Tall.
303.	Mr. Zulu:	It will be tall…then this one…Thulani?
304.	Thulani:	/Tall/
305.	Mr. Zulu:	^It will also be tall…then what about this one…Thulani?
306.	Thulani:	Short.
307.	Mr. Zulu:	Yes!
308.	Thulani:	/This one…short/
309.	Mr. Zulu:	It will be…do you agree?
310.	Ls:	No!
311.	Mr. Zulu:	Right, if you do not agree raise your hand [some learners raise hands] one, two, three / ? / Siyamukela?
312.	Siyamukela:	Small t represents Tall.
313.	Mr. Zulu:	No! It represents ehh…short okay.
314.		I know where the misconception is coming from neh...you see, our parents here we said they are tall.
315.		^Yes! They are tall, they look tall BUT, in their genes, or their genetic makeup there is that gene they inherited from their parents okay.
316.		Yesterday; I am not sure if it was this class, I said you find that may be… there is one parent that is very tall—
317.	Ls:	Yes!

318.	Mr. Zulu:	…and the other one is ((short)) … okay…and remember boys we inherit these genes strictly from your mother and strictly from… your father right and the baby becomes tall…how come?
319.		It does not mean that the baby only inherited the genes from the father neh…okay.
320.		Yes, maybe the baby inherited the tall— gene for tallness from the father and another— ↓in fact it is an allele not the gene.
321.		An allele for tallness from the father and an allele for shortness from…the mother.
322.		Then that baby or that offspring will look tall BUT if you look at the genetic makeup there is gene for shortness… okay.
323.		It is just that it does not show because we said that the recessive allele will BE hidden, or it will MASKED…okay.
324.		So, in this case these ones neh…they both have genes for shortness, but it does not show (if you look at them) …they look tall okay.
325.		They both look tall because [showing on the transparency] this one is marking-- is masking the effects of this okay…this one is masking the… effects of this...yes!

EPISODE 4: QUESTION ABOUT SHORT PARENTS GIVING RISE TO TALL OFFSPRING

326.	Ashley:	Sir, what if ehh…both parents are short and the offspring is tall, what happens in the genetic makeup?
327.	Ls:	[Laughter]
328.	Mr. Zulu:	Okay [laughingly] you know it is possible neh…okay it possible… you find that the parents are both short and then the… offspring is tall okay.
329.		So, boys what do you think?
330.	Ls:	[Laughter]
331.	Mpho:	Maybe they will tell-- may be your parents will tell like you inherited it from your grandfather.
332.	Mr. Zulu:	Okay, yes if we try to explain it in an African way…yes?
333.	Ls:	[Laughter]
334.	Lesedi:	/ ? /

335.	Mr. Zulu:	/ ? / …an allele okay, you still remember mutations.
336.	Ls:	Yes!
337.	Mr. Zulu:	Okay, you know mutations can be good as well we said that.
338.		So, yes in some cases they can be because of a mutation.
339.		Just a slight change in the genetic sequence okay it can cause that okay…and you can find that the two parents are dark, but the child is light in complexion.
340.		↑You are not going to say that it is not your child…
341.	Ls:	[Laughter]
342.	Mr. Zulu:	Okay, it can because of a mutation, just a slight change in the genetic makeup…right.
343.		So, it does happen…it does happen or maybe both your parents are-- they are light in complexion then wena [you in IsiZulu] you become very dark.
344.	Ls:	[Laughter]
345.	Mr. Zulu:	This can be the explanation neh…you know…this can be an explanation it can happen that yes, you could be light because maybe light was dominant over darkness but both of your parents have genes for darkness.
346.		In some cases, you can find that they do not have genes for that but then because of what we call mutations just a slight change in genes or change in genetics effects and then wena [you in IsiZulu] you become ehh…dark…it does happen neh okay.
347.		So, even with the short parents giving birth to someone who is tall okay….it is possible…okay…and also again boys, there are other conditions that can influence that, like for example the things that we eat nowadays.
348.		You find that our parents are short but thina [we in IsiZulu] we are very tall okay.
349.		It is also things that ehh…hormones from the foods that we eat…okay but we will look at hormones at a later stage…okay.

EPISODE 5: ANALYSIS OF GENETIC CROSS RESULTS

350.		Boys are we still following here?

351.	Ls:	Yes!
352.	Mr. Zulu:	Right do we all agree that it will be tall, tall, tall then short?
353.	Ls:	Yes!
354.	Mr. Zulu:	Right, then let is now look at…ehh…phenotypic ratio.
355.		What is the phenotypic ratio? Yes? [Referring to a learner]
356.	Mpho:	/Three is to four/
357.	Mr. Zulu:	Three is to four! No! Yes!
358.	Noel:	One is to three.
359.	Mr. Zulu:	One is to three…three is to one…one is to three…okay it is the same.
360.		That is correct because we have three that are tall and one that is short…so three is to one.
361.		Now let us look at the percentage-- the chance that these parents can have a-- a child or an offspring that is short okay chances…ehh…ehh… Siyabonga?
362.	Siyabonga:	Twenty-five percent.
363.	Mr. Zulu:	A short offspring?
364.	Ls:	Yes!
365.	Siyabonga:	Twenty-five percent.
366.	Mr. Zulu:	Do we agree?
367.	Ls:	Yes!
368.	Mr. Zulu:	So, it is twenty-five percent because [showing on the transparency] we said this will be twenty-five, this will be twenty-five, this will be twenty-five and this one which will give us hundred.
369.		So, which means the short one is only be one here which is only Twenty-five.
370.		↑But then what will be the chance that these parents will give ehh…birth to OFFSPRING that are tall? Yes? [Referring to learner]
371.	Noel:	Seventy-five.
372.	Mr. Zulu:	It will be seventy-five because twenty-five plus twenty-five plus twenty-five plus twenty-five will give us… seventy-five ↓yes, it is correct…okay.

373.		Also, remember with that one we said the chance was / ? / ((hundred)).
374.		Okay, which means with this one we can check…we can check…in some cases it even be zero that ehh…child will be ehh…maybe even short.
375.		Let us say for instance, all offspring were tall the chance was going to be zero for the offspring that is short okay.
376.		Then ehh…there is something that I wanted to highlight.
377.		↑Right then ehh… boys neh…it does not mean that if you combine two parents— ^NO!
378.		In reality it does not mean that they will give birth to four offspring neh…it does not mean that…BOYS these… are just ehh…chances…we do look at the chance that maybe they give birth to so someone who is short okay / ? / right THESE ARE JUST EHH…CHANCES…we are looking at the chance.
379.		We are not saying that they are going to have four babies…we are not saying that these two tall parents are definitely going to have four babies and the babies are going to be definitely like this [showing on the transparency].
380.		We are JUST looking at the chance that maybe if they give birth, what is the chance that the baby-- even if it is one baby.
381.		What will be ehh… chance that the baby can become tall…what is the chance that THAT baby will become ehh… short…and you said it Noel…you said that the chance is…seventy-five that the baby can become tall and it is twenty-five chance that the baby can become ehh…short…are we following?
382.	Ls:	Yes!
383.	Mr. Zulu:	It does not mean that they will give ehh…birth to four offspring or they will produce four offspring and then it will be exactly like this [showing on the transparency].
384.		↑YOU CAN FIND THAT…YES, THEY HAVE FOUR but all of them are short…you see…okay.

385.		So, that is why we said…fertilization is valuable…a sperm can fertilize any egg…↑but the CHANCES ARE VERY HIGH in terms of tallness…okay.
386.		You can find that maybe it is two one is tall and the other one is short, or they are both tall you see...okay.
387.		So, it does not mean that they will definitely /look like this/…we are just looking at the chances…if fertilization does happen what are the chances that the baby will become like this [showing on the transparency] right / ? /…okay.

EPISODE 6: USING A PUNNET SQUARE TO DO A CROSS

388.	Mr. Zulu:	Let me show you the last one then we look at this afterwards.
389.		We will be using…the same neh…okay but now we will be using a different format…okay to represent or TO look at the genes neh.
390.		So, we use what we call a PUNNET SQUARE [drawing on the transparency] / ? /
391.		Right, a PUNNET SQUARE it is one like this neh…and in this punnet square we are going to represent the parents neh…and you can put them anyhow…right.
392.		For example, you can say ehh…right we have the father…it or will be the male or a female neh…and then what will be the genotype for the male?
393.		This is our male and this is our female…what will be the genotypes…yes…or the allele?
394.	Noel:	For the male?
395.	Mr. Zulu:	Yes!
396.	Noel:	/Dominant/
397.	Mr. Zulu:	It will tall…how?
398.		Dominant what?
399.	Ls:	T.
400.	Mr. Zulu:	[Writing on transparency] Dominant T…okay…for the male.
401.		Dominant T and what else?
402.	Ls:	Recessive t.

403.	Mr. Zulu:	Recessive t…okay and can you see now / ? /
404.	Ls:	Yes!
405.	Mr. Zulu:	Okay, then for the female?
406.		Dominant T a:nd…so it's the same neh…okay…let use a different colour [takes a blue coloured pen and uses it to write].
407.		So, we are done representing the parents neh… okay…or the first generation…okay.
408.		So, with this one it is easy neh…if you look at the space it will be this tee and this one…so they meet here…does it make sense?
409.	Ls:	Yes!
410.	Mr. Zulu:	Right if you look at this one it will be this te::e and this one…they meet here okay …how are we going to write this now? Yes, Tshepang!
411.	Tshepang:	Dominant T…
412.	Mr. Zulu:	Dominant T [writing on the transparency] and…remember…these two are meeting here…dominant T and…and
413.	Tshepang:	Dominant T.
414.	Mr. Zulu:	…and dominant T…okay simple.
415.		Right, ↑now let us look at this one…okay they are meeting here…Ashton?
416.	Ashton:	Dominant T and recessive t.
417.	Mr. Zulu:	Dominant T a:nd recessive t…REMEMBER we start with the one that is dominant neh…and we follow with the recessive one…okay.
418.		Let us look at this [writing on the transparency] …can you see this tee and this one…they are meeting here…okay. Yes?
419.	Lindani:	Dominant T and recessive t.
420.	Mr. Zulu:	So it will be dominant T a::nd recessive t…okay.
421.		Then let us do at this one…okay the are meeting here…Samuel?
422.	Samuel:	/ ? /
423.	Ls:	[Laughter]
424.	Mr. Zulu:	Do not say that…okay. Yes?
425.	Ben:	Recessive t and recessive t.
426.	Mr. Zulu:	Recessive t a:nd recessive t neh…okay.

427.		↑Boys how many offspring do we have?
428.	Ls:	Four!
429.	Mr. Zulu:	They are four…so let us give their genotypes…↓let me just write them inside he:re neh.
430.		So, it will be this one which is both dominant, the:n ehh…dominant and recessive, dominant and recessive and both are recessive neh.
431.		So, I am just now putting in a s-- sort of a straight line neh…okay…so one two three four…done!
432.		Okay we said this will be tall or short?
433.	Ls:	Tall!
434.	Mr. Zulu:	And this one?
435.	Ls:	Tall!
436.	Mr. Zulu:	This one?
437.	Ls:	Tall!
438.	Mr. Zulu:	This one?
439.	Ls:	Short!
440.	Mr. Zulu:	Yes! Is it the same as our crossing?
441.	Ls:	Yes!
442.	Mr. Zulu:	The same neh…okay.
443.		So, it means that if they do not specify in the exam that we must do like…a genetic crossing.
444.		If they do not specify that you have to do a punnet square…you can use ehh…it will depend on which one is easier for you neh…but if they specify then you have to do a punnet then you do this… [pointing to the transparency] but if they specify that you do a genetic crossing, then you have to do the crossing…okay.
445.		So, which means you must master both… but if they do not specify then you do the one ehh…that you are comfortable with neh...yes?
446.	Thembile:	/Do we have to show the gametes/
447.	Mr. Zulu:	The gametes… ^No! You do not really have to show the gametes.

448.		The gametes are these okay these are the gametes…but then if you want to put them like this it is okay…we will not mind at all as long as it shows okay...are we following?
449.	Ls:	Yes!
450.	Mr. Zulu:	So, these are the gametes it the gametes…because it is the gametes that we have to come up with.
451.		Right ehh… boys a::ny other questions? Yes?
452.	Ashton:	/ ? /
453.	Mr. Zulu:	We are going there…we are going there…right.
454.		Yes, Thulani your hand is up?
455.	Thulani:	/Ehh…sir…is it possible for parents that are fat ehh…to give birth to ehh…a thin—
456.	Ls:	[Laughter]
457.	Mr. Zulu:	Okay…neh… yabona [you see in IsiZulu] chief…it—
458.	Ls:	[Laughter]
459.	Mr. Zulu:	…if it is something that they acquired in their lifetime…then ehh…the chances are ehh…very low that the child will inherit that but if it is part of their genetic makeup neh…and ehh…THERE ARE CHANCES that the child will inherit…it does not mean that [learner coughing] / ? /
460.		Remember that we are looking at ehh…chances because there are things that will affect this neh…things like mutations…okay and also the genetic makeup it will depend on how / ? / okay and ehh…the conditions also…yes, Archippe?
461.	Archippe:	Can a child also inherit the IQ?
462.	Mr. Zulu:	The IQ the parent…ehh…boys… is this IQ part of the genetic makeup?
463.		Ahh…that one is very difficult…ehh…chief I think…you will have to do some research for us.
464.		You will tell us tomorrow…if it is possible…okay…if it is possible to inherit it.
465.		You will tell us tomorrow, please make sure you do it…I will remind you. Yes?

466.	Thabo:	So, sir, like…does it have to be— [Learners talking]
467.	Mr. Zulu:	Ehh…remember boys we must have one discussion neh… we must have one discussion...okay. Yes?
468.	Thabo:	When you find the probabilities for the…tall gene like let us say you have ehh…eye colour a guy with brown eyes and other guy that has blue eyes.
469.		Then can they like…be brown together-- like can they have one eye that is brown and one eye that is blue.
470.	Ls:	[Laughter]
471.	Mr. Zulu:	You know there is…ehh…this other boy from the other key [another class] neh… he said they are people with ehh…two—
472.	Ls:	Yes!
473.	Mr. Zulu:	Serious?
474.	Ls:	Yes!
475.	Mr. Zulu:	Alright…then boys you know the only way I can explain that is when we get at types of dominance.
476.		Right, whereby you find that ehh…there is co-dominance, there is complete…there is incomplete whereby maybe two alleles are expressed in the phenotype neh…okay…but you get to understand that when we look-- when we start looking at the types of dominance.
477.		It is just like a cow for instance, you find that a black cow and a white cow they come together and then an offspring is black and white…okay you have seen that neh…like…even with dogs…they will have two colours right…that will be the skin colour but they are both showing.
478.		We will look at that at a later stage.
479.		Maybe— Oh!
480.		We are closing tomorrow neh…we have that whats app group and I said try to organize it so that we are not left behind.
481.		Those are the types of dominance…okay.
482.		Ehh…right boys are we fine now.
483.	Ls:	Yes!
484.	Mr. Zulu:	Okay, so let us look at the chances now.

485.		Right boys… SO, what are the chances that the offspring will be tall…yes ehh…Caleb?
486.	Caleb:	Seventy-five percent.
487.	Mr. Zulu:	It will be seventy-five because this is tall, this is tall, this also tall and it is only one that i:s short.
488.		The chances that the offspring that the offspring will be SHORT? Yes?
489.	Jonah:	Twenty-five percent.
490.	Mr. Zulu:	Twenty-five percent…okay…so we are done with ehh…genetic crossing.
491.		Now we must do at this one…↑do not take more than five minutes.
492.		No! More than two minutes.
493		So, you are going to do…parents that are…HOMOZYGOUS okay for…let us say you are looking at hair colour neh.
494.		So, hair colour… [writing on the transparency] and the letters that you are going to use.
495.		Boys remember it does not mean if for instance, you are talking about hair colour then you will tal--- you will just use…the allele like…ehh…blonde or bond maybe there is green hair colour…then you use the same letters neh…there is a case where use different letters.
496.		So, hair colour…please write this statement down neh… [writing on the transparency]. [Bell rings]
497.		Alright then in brackets we will use ehm…which letters would you like to use?
498.	Ls:	H
499.	Mr. Zulu:	H…Okay let us use H…okay so we will use H…/ ? /
500.		So, when we have two heterozygous parents you cross them to give the F_1 generation use a punnet square to show all the genotypes for F_1 generation.
501.		So, you use these letters.

THE END!