International Journal of Early Childhood Special Education (INT-JECS)
DOI: 10.48047/INTJECSE/V14I7.238 ISSN: 1308-5581 Vol 14, Issue 07 2022

THE USE OF MENTAL MAPS IN TEACHING THE SUBJECT OF COMPLEMENTARY GENE INTERACTION

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Annotation: The article is based on the use of mental mapsfor consolidation in teaching and understanding the theme "Complementary gene interaction".

Keywords: Complementary, dominant, recessive,mental map

Today, in our country, it is very important to use pedagogical technologies that guarantee the effectiveness of the educational process that increases the educational and creative activities of students.
Maps , the right and left hemispheres of the brain work well. Mind map, mental map, mind map, associative map, associative diagram, thinking scheme are all just a few names of the way we organize our personal thoughts. We think from the center to the side with associations. There will be a single central idea, through which connecting threads lead to other associations, and from them to others. In some ways, it reminds of a tree. Its body is the central idea, and its branches are the ideas that come from it. A mental map is created in this way. There is no single rule about how it should be. The main task is to define the main idea, many links can be created using associations. With the help of mental maps, it can be used to learn a new topic, to consolidate the previously learned topic.

So, there are several stages of creating a mental map. The first is to create the main idea and idea, the second is to create first-level topics, the third is to develop the second level of topics, and the fourth is to clarify the topic. For example, we want to study complementary inheritance from genetics. As a basis, we take complementary inheritance. Then we divide it into groups depending on the type of heredity ratio. Then you determine the genotypic and phenotypic ratios of these items. You can give a complete description of the new topic through the created mental map. (Figure 1)

A mental map can be used to reinforce this topic. For this purpose, the genotypic and phenotypic ratios are lost and the students are asked to clarify. (Figure 2)
The subject of the lesson: Complementary inheritance
The scientific purpose of the training: to acquire the competence of the students in Complementary heredity and to teach them to think independently, analyze, come to conclusions and express them.
Educational importance of the training : introducing knowledge about the subject and forming a scientific worldview.
Developmental goal of the training: development of skills of independent work, analysis and creative thinking on complementary heredity training.
Training equipment :Complementary heredity exhibitions, computer, projector , handouts.
Technology used in training : Technologies of mental maps
Basic concepts and basic knowledge: Complementary, dominant ,recessive , mental map
The course of the training .
1. Organizational part : Greets, attendance is taken, news is introduced.
2. Pupils are introduced to the topic, purpose, course of the training.
3. Learning a new topic : Based on the teacher's statement and mental map slides
Complementary effect of nonallelic genes Complementary effect of **nonallelic** genes **The English word "** complementary " means to fill. Nonallelic gene interaction is a distinctive feature of the type of complementarity in that the F_1 hybrid develops a new trait, not the trait of the father or mother that participated in the crossing. Due to the non-allelic value of genes influencing the development of the character, the development of the characters in the F_2 generation is manifested in different ways .
9:3:3:1 ratio of characters in F_2. There are 4 types of feathers of Holdor parrots: orange, yellow, green and white.
We assume that the genotype of yellow-feathered parrots will be aaBB, the genotype of brown-feathered parrots will be AAbb, the white-feathered parrots will be aabb, and the green-feathered parrots will be in the state AaBb. In order to clarify how correct our assumption is, we need to crossbreed male and female parrots with orange and yellow feathers and determine the genotype and phenotype of the first and second generation hybrids.

A → air color
> → green
B → yellow
aabb → white

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In the development of a certain trait, each dominant gene determines a separate phenotype, a common phenotype, and recessive genes another phenotype. An example of this is the inheritance of parrot feathers. Air color of the feather depends on the A gene, yellowness on the B gene, greenness on the complementary effect of A and B genes, and whiteness on the sum of recessive alleles of these genes. When yellow-feathered parrots are crossed with yellow-feathered parrots, only green-feathered parrots develop in the F1. Parrots belonging to 4 phenotypic classes are obtained in F2.

pale yellow
P $^{F}{}_{G}$ AAbb x aaBB
gam Ab aB
green green
F $_{1}{}^{F}{}_{G}$ AaBb x AaBb

The data presented in the table show that our assumption about the genotypes of the birds is correct. So, regardless of the sex, A and B gene alleles in the homozygous or heterozygous condition ensure green feather color, Ab alleles brown, aB alleles yellow, and recessive ab genes ensure white color in the homozygous condition .

F2 _

Genotypic class	Genotype	Genotypic ratio	Phenotypic ratio
1	AABB	-1	9ta green patli
2	AABb	-2	
3	AaBB	-2	
4	AaBb	-4	
5	AAbb	-1	3ta havorangpatli
6	Aabb	-2	
7	aaBB	-1	3ta sariqpatli
8	aaBb	-2	
9	aabb	-1	1ta oqpatli

Thus, in the example of the inheritance of feather color characteristics of holly parrots, we can see: 1) the development of green and white feather characteristics absent in the parent birds in the $_{F1}$ and F2 generation of $_{birds\ ;}$ 2) we can conclude that the color of the parrot's feathers is related to two non-allelic gene alleles, not one gene allele, as in the first experiment. 3) The ratio of 9:3:3:1 according to the known phenotype was obtained in the F $_{2\ generation}$ of hybrids according to complete inheritance. But if it was crossbred with two characters, i.e. yellow straight and green curly peas, and each character was developed under the influence of 1 gene allele. And if the parrots that participated in breeding (yellow and yellow) differ only by one character, i.e., feather color, then F $_{2}$ shows diversity in the above-mentioned ratio in terms of phenotype. This result suggests that two nonallelic genes contribute to the development of feather color in parrots. The same type of inheritance can be observed between the flower-crowned breed and the pea-crowned breed of chickens, or the forms with brown and pale red eyes in the fruit fly Drosophila . can also be seen when crossing.

9:7 character ratio in F $_{2}$. At the beginning of the 20th century, when Betson and Pennett crossed silky white chickens with white Dorchinroosters , the F $_{1}$ chickens and roosters had colored feathers. When they were crossed, 9/16 of the F $_{2}$ chickens and roosters had colored feathers and 7/16 had white feathers. A similar result was obtained when crossing phenotypically similar but genotypic varieties of sweet pea. This can be explained as follows:

A → white fragrant peas
> → red
B → white
aabb → white

In the dominant case of 2 non-allelic genes involved in the development of a certain trait, both allelic genes determine the same phenotype, in the case of complementary effects, a new phenotype, and the sum of the second dominant gene and recessive alleles determine a different phenotype. an example of this is the inheritance of sweet pea flower color.

white white
P $^{F}{}_{G}$ AAbb x aaBB

gam Ab aB
tqtq
$_{F1}{}^{F}{}_{G}$ AaBb x AaBb

F $_{2}$

Genotipiksinif	Genotype	Genotipiknisbat	Fenotipiknisbat
1	AABB	-1	
2	AABb	-2	9ta qizil
3	AaaBB	-2	

DOI: 10.48047/INTJECSE/V14I7.238 ISSN: 1308-5581 Vol 14, Issue 07 2022

4	AaBb	-4		
5	AAbb	-1		
6	Aabb	-2		
7	aaaBB	-1		7ta oq
8	aaBb	-2		
9	aabb	-1		

9:3:4 ratio of characters in F_2. In some cases, one dominant allele gene of the individuals involved in breeding may be active and affect the trait, and the second non-allelic dominant gene, together with the recessive allele, may not affect the trait.

A → air color rabbit
> → black
B →
aabb → white

One of the two pairs of non-allelic genes involved in the development of a certain trait can determine a particular phenotype in the dominant case, and the second dominant gene can determine another phenotype. Together, they can define a new phenotype. The latter of non-allelic genes and recessive alleles can determine the same phenotype separately. An example of this is the inheritance of wool color in rabbits .

An example of this is the inheritance of fur color in rabbits and mice. Mice come in white, black, and mottled fur . In agouti -colored mice, yellow rings are visible along each wool fiber . There is a black pigment at the base and tip of wool . Such zonation of pigments in wool fibers is also observed in rabbits. Studies have shown that in agouti mice, the distribution of color depends on one gene, and the distribution of pigment along the wool fiber depends on another nonallelic gene. Black wool mice do not have pigment zonal distribution. The pigment is uniformly distributed along the length of the fiber . There is no pigment in the wool of white mice .

Thus, when black-furred mice are crossed with white-furred mice, the $F_{1\ \text{generation of mice}}$ will have fur- furred mice . When the male and female forms of $F_{1\ \text{agouti mice}}$ are crossbred, 9/16 of F 2 $_{\text{mice}}$ have agouti fur, 3/16 mice have black fur, and 4/16 mice have white fur.

The genotype of the black mice obtained for breeding is AAbb, that of the white mice is aaBB, and the genotype of the F_1 generation hybrids is AaBb (Fig. 4). If the genotype of $F_{2\ \text{generation mice obtained from crossing}}$ F_1 generation male and female agouti mice contained AB genes, they were woolly agouti type (9/16), the genotype of 3/16 black mice was A-bb, and the genotype of 4/16 white mice will be in aaB- or aabb position.

Black White
P $^F{}_G$ AAbb x aaBB

gam Ab aB
GrayGray
F_1 $^F{}_G$ AaBb x AaBb
F_2

Geotypic class	Genotype	Genotypic ratio		Phenotypic ratio
1	AABB	-1		9ta gray
2	AABb	-2		
3	AaaBB	-2		
4	AaBb	-4		
5	AAbb	-1		3 Black
6	Aabb	-2		
7	aaaBB	-1		4 white
8	aaaaaaaaaaaaaa aaaaaaaaaaaaaa aaaaaaa	-2		
9	aabb	-1		

9:6:1 character ratio in F_2. Complementary genes can independently produce one or another trait without complementary genes. For example, in pumpkins (Sucurbita), the fruit shape is round, flange-like and elongated .

A or B → spherical fruit
→ flanged
aavv → long

In the dominant case of 2 non-allelic genes participating in the development of a certain trait, both allelic genes determine the same phenotype, in the case of complementary effects, a new phenotype, and the sum of recessive alleles determines a different phenotype . An example of this is the inheritance of the shape of the fruit of the pumpkin plant.

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Each dominant nonallelic gene develops round shaped pods without the recessive allelic gene. If two types of round caps with different genotypes are crossed , flanged caps are formed in F_1 under the influence of dominant complementary genes AB. If F_1 hybrid pumpkin is crossed, F_2 produces 9/16 flanged, 6/16 round, 1/16 elongated fruits.
the interaction of AB genes , pumpkins with A-bb, aaB- genotypes have round fruits, and pumpkins with aabb genotype have long fruits.
SphericalSpherical
P $^F{}_G$ AAbb x aaBB
gam Ab aB
Flanged
F $_1{}^F{}_G$ AaBb x AaBb
F2 _

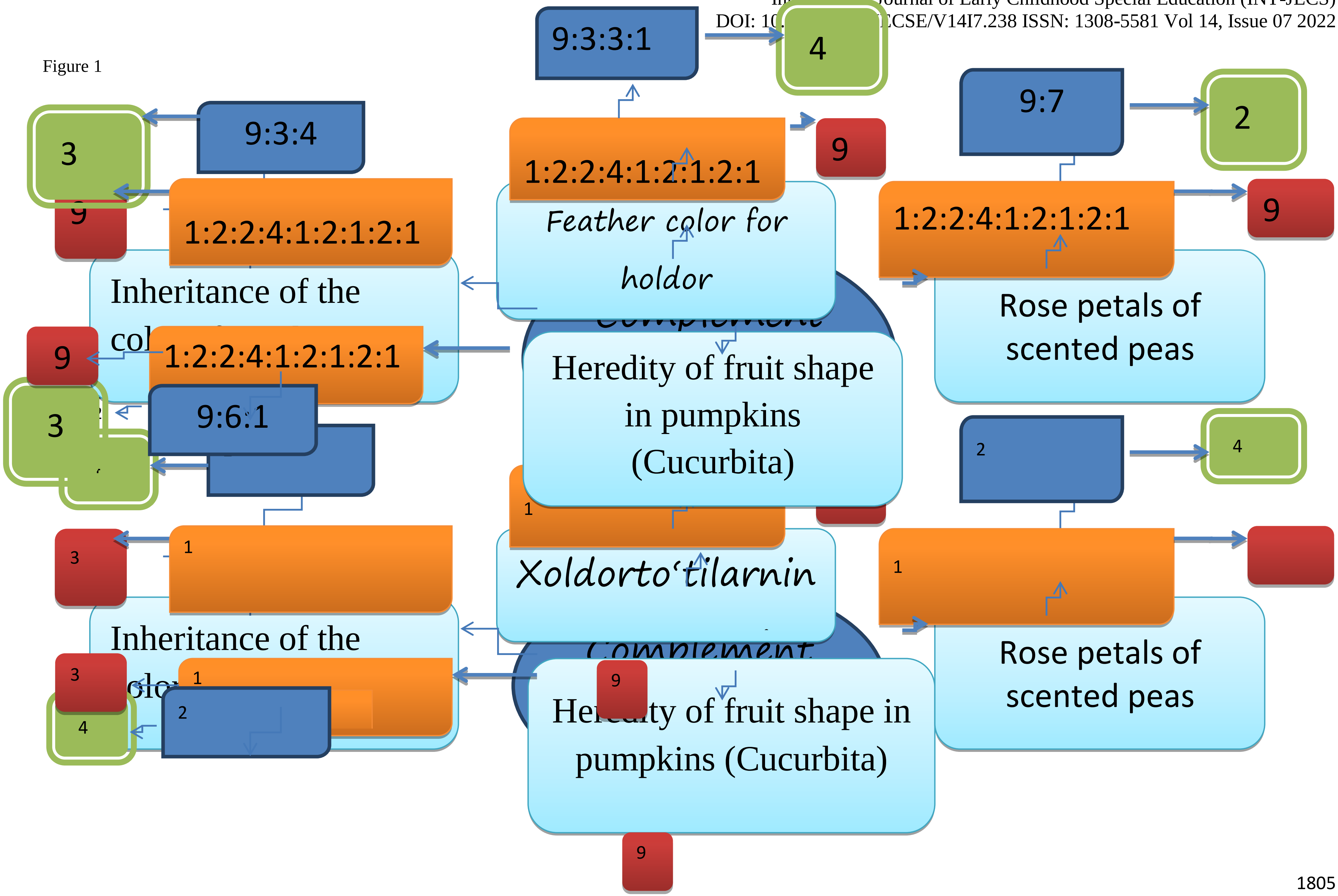
Genotypic class	Genotype	Genotypic ratio	Phenotypic ratio
1	AAB B	-1	9 flanges
2	AABb	-2	
3	AaBB	-2	
4	AaBb	-4	
5	AAbb	-1	6 spherical
6	Aabb	-2	
7	aaBB	-1	
8	aaBb	-2	
9	aabb	-1	1pcs long

complementary effect of nonallelic genes , firstly, in the F_1 and F_2 generations, new traits that were not observed in the parental individuals develop. Secondly, due to the interaction of dominant and recessive alleles of non-allelic genes , phenotypic classes F_2 are fundamentally diverse.

<table>
<tr><td rowspan="2">The interaction of nonallelic genes is different</td><td colspan="4">Phenotypic classes in F_2</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>A- B</td><td>9</td><td>9</td><td>9</td><td>9</td></tr>
<tr><td>A-bb</td><td>3</td><td>3</td><td rowspan="3">7</td><td rowspan="2">6</td></tr>
<tr><td>aaB-</td><td>3</td><td rowspan="2">4</td></tr>
<tr><td>aabb</td><td>1</td><td>1</td></tr>
</table>

4. Consolidation of a new topic: with the help of a mental map
End of lesson: The teacher summarizes the topic. Students' grades will be announced.
Homework: Learning a new topic.
Thus, if we explain and reinforce the topic with the help of mental maps, we will make students think logically, develop their acquired knowledge, skills and abilities, and increase their interest in the lesson.

Figure 1


9:3:3:1
4
9:3:4
3
1:2:2:4:1:2:1:2:1
9
Feather color for holdor
9:7
2
1:2:2:4:1:2:1:2:1
9
1:2:2:4:1:2:1:2:1
Inheritance of the
Rose petals of scented peas
9
1:2:2:4:1:2:1:2:1
Heredity of fruit shape in pumpkins (Cucurbita)
3
9:6:1
2
4
1
3
1
Xoldorto'tilarnin
1
Inheritance of the
Rose petals of scented peas
3
1
9
2
4
Heredity of fruit shape in pumpkins (Cucurbita)
9

DOI: 10.48047/INTJECSE/V14I7.238 ISSN: 1308-5581 Vol 14, Issue 07 2022

1. What is the genotypic ratio of my organism?
2. What is the phenotypic ratio of my organism?
3. How many genotypic classes does my organism form?
4. How many phenotypic classes does my organism form?

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