

LESSON PLAN 6.1

COURSE TITLE: ANIMAL SCIENCE
UNIT #: 6 **UNIT TITLE:** Growth and Development
LESSON: Cell Growth, Development and Differentiation

PROBLEM STATEMENT:

How do cells grow, develop and differentiate to form various organs within the body?

LEARNING OBJECTIVES:

Students will:

- Identify characteristics of 24, 48 and 72 hour old embryo
- Identify body structures of developing embryo
- Develop a chronological order of embryonic development

SCIENCE CONCEPTS:

Differentiation
Growth
Organs
Systems

AGRICULTURAL SCIENCE PRACTICES:

Growth of an embryo

REFERENCES, LEARNING RESOURCES, MATERIALS, EQUIPMENT:

Science of Animal Agriculture, Herren, Delmar Publishers
Scientific Farm Animal Products, Taylor and Bogart, McMillan Publishers

TEACHING PROCEDURE: (Attention Focusing, Anticipatory Set, Interest Approach)

Activity: Show class a chick or fish

Leading Questions: When this chick/fish started as an egg, how did one cell become this individual chick/fish? In cooperative groups, have students come up with their theory of how this occurs (collect theories for further discussion)

LESSON SEQUENCE (demonstration, direct instruction, key questions, activity description, learning activities, procedure, discussion outline)

PROBLEM SOLUTION

Layout of the plan...

COMPLETE ACTIVITY 6.1.A - Examining a Chick Embryo

KQ#1. What did you observe in each of the incubated embryo stages?

Based on observation as recorded on third and fourth pages of lab exercise.

KQ#2. Based on the information, what are the three phases of prenatal life and explain what occurs in each phase? (This can be done individually or in cooperative groups)

KQ#3. Why did features observed in each of the embryo stages develop in that order? (Use student information sheet and chronological student activity 6.2.B and

TM 6.1.1)

PROBLEM CONCLUSION AND/OR SUMMARY:

1. Review Key Questions.
2. Review Exercise.
3. Students, based on activities which is handed back by instructor, will compare original theories with actual development. Students will write a paragraph on how lab exercises changed their concept of cell growth and differentiation.

EVALUATION OF THE TEACHING/LEARNING PROCESS:

In this problem we have practiced...

HIGHER ORDER THINKING LEVEL (Identify levels with students)

Cognitive	Psychomotor	Affective
6. Evaluation	5. Naturalize	5. Characterize
5. Synthesis	4. Articulate	4. Organize
4. Analysis	3. Precision	3. Value
3. Application	2. Manipulate	2. Respond
2. Comprehension	1. Imitate	1. Receive
1. Knowledge		

MAJOR CHANGES IN WEIGHT, FORM & FUNCTION OF THE CHICK EMBRYO (WHITE LEGHORN) DURING INCUBATION

Day	Weight (g)	Developmental Changes
1	00.0002	Head and backbone are formed; central nervous system begins
2	00.0030	Heart forms and starts beating; eyes begin formation
	00.0200	Limb buds form
4	00.0500	Allantois starts functioning
5	00.1300	Formation of reproductive organs
6	00.2900	Main division of legs and wings; first movements noted
7	00.5700	
8	01.1500	Feather germs appear
9	01.5300	Beak begins to form; embryo begins to look bird-like
10	02.2600	Beak starts to harden; digits completely separated
11	03.6800	
12	05.0700	Toes fully formed
13	07.3700	Down appears on body; scales and nails appear
14	09.7400	Embryo turns its head toward blunt end of egg
15	12.0000	Small intestines taken into body
16	15.9800	Scales and nails on legs and feet are hard; albumen is near gone; yolk is main food
17	18.5900	Amniotic fluid decreases
18	21.8300	
19	25.6200	Yolk sac enters body through umbilicus
20	30.2100	Embryo becomes a chick; it breaks amnion, then breathes air in air cell
21	36.3000	Chick breaks shell and hatches

Source: Arizona Cooperative Extension Publication 8427.

LESSON PLAN 6.2

COURSE TITLE: ANIMAL SCIENCE

UNIT #: 6 **UNIT TITLE:** Growth and Development

LESSON: Comparison of Growth and Development Between Species

PROBLEM STATEMENT:

How does water and feed intake influence the production of animal products? i.e. milk, meat, eggs, etc.

LEARNING OBJECTIVES:

Students will:

- Compare amount of water consumed between species
- Contrast amount of feedstuff consumed between species
- Evaluate amount of feedstuff consumed with amount of product produced.

SCIENCE CONCEPTS:

Growth
Metabolism
Nutrition
Tissues

AGRICULTURAL SCIENCE

PRACTICES:

Daily feedstuff consumption
Daily water consumption

REFERENCES, LEARNING RESOURCES, MATERIALS, EQUIPMENT:

Science of Animal Agriculture, Herren, Delmar, pages 230-232

Scientific Farm Animal production, Taylor/Bogart, MacMillian, pages 284-293

Animal Science and Industry, Acker/Cunningham, Prentice hall, pages 9, 147-158

Animal Science, Ensmenger, Interstate

TEACHING PROCEDURE: (Attention Focusing, Anticipatory Set, Interest Approach)

Activity: Could use egg of mature hen or fish fry to growing fish, etc.

Leading Questions: Once the fetus has been born, what nutritional factors are needed to keep the newborn alive and growing?

LESSON SEQUENCE (demonstration, direct instruction, key questions, activity description, learning activities, procedure, discussion outline)

PROBLEM SOLUTION

Layout of the plan...

Predictions:

1. Have students, based on groups for lab exercise, predict the amount of water and feed each species requires daily.
2. Have students also predict how much milk a cow produces/day, how much meat is produced/day, how many eggs, etc. based on species available in lab exercise.
3. Pass out lab exercise and have students conduct as given.

4. After lab exercise have students share their initial predictions and actual results with class. (TM 6.2.1)
5. Write paragraph on how your results compared to your predictions.
6. Write a paragraph on why your predictions were the same as or different from actual results.

PROBLEM CONCLUSION AND/OR SUMMARY:

1. Review Key Questions.
2. Review Exercise.

EVALUATION OF THE TEACHING/LEARNING PROCESS:

In this problem we have practiced...

HIGHER ORDER THINKING LEVEL (Identify levels with students)

Cognitive	Psychomotor	Affective
6. Evaluation	5. Naturalize	5. Characterize
5. Synthesis	4. Articulate	4. Organize
4. Analysis	3. Precision	3. Value
3. Application	2. Manipulate	2. Respond
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TABLE 1-7
FEED TO FOOD EFFICIENCY RATING BY SPECIES OF ANIMALS, RANKED BY PROTEIN CONVERSION EFFICIENCY
(Based on Energy as TDN or DE and Crude Protein in Feed Eaten by Various Kinds of Animals Converted into Calories and Protein Content of Ready-to-Eat Human Food)

Species	Feed Required to Produce One Production Unit			Dressing Yield		Ready-to-Eat; Yield of Edible Product (meat & fish deboned & after cooking)			Food Efficiency*		Efficiency Rating						
	Unit of Production (on feet)	Pounds	TDN ¹ (lb)	DE ² (kcal)	Protein (lb)	Percent (%)	Net Left (lb)	As % of Raw Product (carcass) (%)	Amount Remaining from One Unit of Production (lb)	Calorie ³ (kcal)	Protein ⁴ (lb)	(lb feed to produce one lb product)					
												Efficiency ⁵ (%)	Protein Efficiency ⁶ (%)				
Breeder	1 lb chicken	2.1 ¹	1.7 ¹	3,400	0.21 ¹	72 ¹¹	0.72	54 ¹¹	0.39	274	0.11	47.6	2.1:1	8.1	12.4:1	52.4	1.9:1
Fish	1 lb fish	1.6 ¹	0.98	1,980	0.57	65 ¹¹	0.65	57 ¹¹	0.37	285	0.27	62.5	1.6:1	14.5	6.9:1	47.6	2.1:1
Dairy cow	1 lb milk	1.11 ¹	0.9 ¹	1,800	0.1 ¹	100	1.0	100	1.0	309	0.037	90.0	1.1:1	17.2	5.6:1	37.0	2.7:1
Turkey	1 lb turkey	5.2 ¹	4.21 ¹	8,420	0.46 ¹	79.7 ¹¹	0.797	57 ¹¹	0.45	446	0.146	19.2	5.2:1	5.3	18.9:1	31.7	3.2:1
Layer	1 lb eggs (8 eggs)	4.6 ¹	3.73 ¹	7,460	0.41 ¹	100	1.0	100 ¹¹	1.0 ¹¹	616	0.106	21.8	4.6:1	8.3	12.1:1	25.9	3.9:1
Hog (birth to market weight)	1 lb pork	4.0 ¹¹	3.2	8,400	0.36	70 ¹¹	0.70	44 ¹¹	0.31	341	0.088	0.25	4.0:1	5.3	16.8:1	24.4	4.1:1
Rabbit	1 lb fryer	3.0 ¹¹	2.20	4,400	0.48	55 ¹¹	0.55	79 ¹¹	0.43	301	0.08	35.7	2.8:1	6.8	14.6:1	16.7	6.0:1
Beef steer (yearling finishing period in feedlot)	1 lb beef	9.0 ¹¹	5.65	11,700	0.90	58 ¹¹	0.58	49 ¹¹	0.28	342	0.085	11.1	9.0:1	2.9	34.2:1	9.4	10.6:1
Lamb (finishing period in feedlot)	1 lb lamb	8.0 ¹¹	4.96	9,920	0.88	47 ¹¹	0.47	40 ¹¹	0.18	225	0.052	12.5	8.0:1	2.3	44.1:1	6.0	16.5:1

¹TDN pounds computed by multiplying pounds feed (column to left) times percent TDN in normal rations. Normal ration percent TDN taken from M. E. Erminger's books and rations, except for the following: dairy cow, layer, broiler, and turkey from *Agricultural Statistics 1974*, p. 358, Table 518. Fish based on averages recommended by Michigan and Minnesota Stations and U.S. Fish and Wildlife Service.

²Digestible Energy (DE) in this column given in kcal, which is 1 Calorie (written with a capital C), or 1,000 calories (written with a small c). Kilocalories computed from TDN values in column to immediate left as follows: 1 lb TDN = 2,000 kcal from *Lessons on Meat*, National Live Stock and Meat Board, 1965.

³Feed efficiency as used herein is based on pounds of feed required to produce 1 lb of product. Given in both percent and ratio.

⁴Kilocalories in ready-to-eat food = kilocalories in feed consumed, converted to percentage loss = kcal in feed ÷ kcal in product.

⁵Protein in ready-to-eat food = protein in feed consumed, converted to percentage loss = pounds protein in feed ÷ pounds protein in product.

⁶*Agricultural Statistics 1974*, p. 358, Table 518. Pounds feed per unit of production is expressed in equivalent feeding value of corn.

⁷Pounds feed (column No. 2) per unit of production (column No. 1) is expressed in equivalent feeding value of corn. Therefore, the values for corn were used in arriving at these computations. No. 2 corn values are TDN, 81%; protein, 8.9%. Hence, for the dairy cow 81% × 1.11 = 0.9 lb TDN, and 8.9% × 1.11 = 0.1 lb protein.

⁸Data from report by Dr. Philip J. Schubbe, Michigan State University, *Feedstuffs*, April 15, 1967.

⁹*Industrial Fishery Technology*, edited by Maurice E. Soreby, Reinhold Pub. Corp., 1963, Ch. 28, Table 28-1.

¹⁰And reports that "Dressed fish averages about 73% flesh, 21% bone, and 6% skin." In limited experiments conducted by A. Erminger, it was found that there was a 22% cooking loss on fillet of sole. Hence, these values—73% flesh from dressed fish, minus 22% cooking losses—give 57% yield of edible fish after cooking as a percent of the raw, dressed product.

¹¹Calories and protein computed basis per egg hence, the values herein are 100% and 1.0 lb, respectively.

¹²*Marketing Poultry Products*, 6th Ed., by E. W. Benjamin et al., John Wiley & Sons, 1960, p. 147.

¹³*Factors Affecting Poultry Meat Yield*, University of Minnesota Sta. Bull. 478, 1964, p. 29, Table 11 (incassal).

¹⁴*Ibid.*, Page 28, Table 10.

¹⁵Erminger, M. E., *The Stockman's Handbook*, 6th Ed., Sec. XII.

¹⁶Allowance made for both cutting and cooking losses following dressing. Thus, values are on a cooked, ready-to-eat basis of lean and mealbed meat, exclusive of bone, gristle, and fat. Values provided by National Live Stock and Meat Board (personal communication of June 5, 1967), from Dr. Wm. C. Sherman, Director, Nutrition Research, to the author, and based on data from *The Nutritive Value of Cooked Meat*, by Ruth M. Lewerton and George V. Odell, Mac. Pub. MP-49, A. Jendis C., March 1958.

¹⁷Estimates by the author.

¹⁸Based on information in *Commercial Rabbit Raising*, Ag. Hobb. No. 308, USDA, 1966, and *A Handbook on Rabbit Raising*, by H. M. Butler field, Washington State University Ext. Bull. No. 411.

STUDENT EXERCISES/EXPERIMENTS/ACTIVITIES

NAME _____

TITLE: Growth and Development - Feed Materials**FOCUS QUESTION:**

How do feed materials affect animals' growth and development?

OBJECTIVES:

You will:

- Weigh and study the feed materials various livestock species consume.
- Define terms related to feeding animals for growth and development.

STUDENT PREDICTION:

How much feed do animals require to be productive?

INTRODUCTION:

In this activity you will study the feed materials various agricultural animals eat for their growth, for producing milk and to keep their offspring or babies alive and growing. Your job in this activity will be to figure out the amount of feed each kind of animal eats to develop the amount of milk or meat they produce in their bodies each 24 hour period.

SCIENCE CONCEPT(S):

Measurements
Growth
Nutrients

MATERIALS NEEDED:

Feed materials for dairy, swine, sheep
Scale (spring)

LEARNING ACTIVITIES/PROCEDURE(S):

In this activity, you will spend time in three stations.

1. At each station you will be expected to:
 - a. weigh feed materials
 - b. calculate the total pounds in each section (please show your work)
2. Complete the observation sheet.
3. Complete summary sheet.

STUDENT OBSERVATIONS/EVIDENCE ANALYSIS
(Data analysis, findings, questions)

Station #1 - Dairy Cows

1. How many gallons/pounds of water does a cow consume each day? (water weight 8 pounds/gal)

$$\begin{array}{r} \text{_____} \text{ gallons} \\ \times \text{ _____} \text{ pounds/gallon} \end{array}$$

Total pounds = _____

2. Please weight the various feed ingredients and record the amount of consumed each day by a cow:

Feed Material	Pounds
Hay	_____ #
Silage (corn)	_____ #
Corn	_____ #
Protein supp.	_____ #
Other	_____ #
Add the above pounds:	
Total pounds per day =	_____

3. How much milk does an average cow produce each day? (1 gallon milk weights about 8.6 pounds)

$$\begin{array}{r} \text{_____} \text{ pounds/gallon} \\ \times \text{ _____} \text{ gallons} \end{array}$$

Total pounds = _____

Milk is 86-87% water
Milk is 13-15% solids

Station #2 - Sheep

1. How many gallons/pounds of water does a feeder lamb consume each day?

_____ gallons
/ _____ pounds/gallon

Gallons = _____

2. Please weigh the various feed ingredients and record the amount consumed each day.

Feed Material	Pounds	
_____	_____	#
_____	_____	#
_____	_____	#
_____	_____	#

Add the above pounds:
Total pounds per day = _____

3. Weigh the lamb chops. The total weight equals the amount of weight a market lamb gains each day.

Station #3 - Market Hogs

1. How many gallons/pounds of water does a market hog consume each day?

_____ total pounds
/ _____ pounds/gallon

Gallons = _____

2. Please weight the various feed ingredients and record the amount consumed each day.

Feed Material	Pounds	
_____	_____	#
_____	_____	#
_____	_____	#
_____	_____	#

Add the above pounds:
Total pounds per day = _____

3. Weight the pork products. The total weight of the ham, bacon and chops equals the amount of weight a market hog gains each day.

STUDENT SUMMARY/CONCLUSIONS/RECOMMENDATIONS/REFLECTIONS:

Thinking about this activity, what have you learned about livestock growth and development?