Indian Journal of Animal Sciences **81** (11): 1121–1123, November 2011

Clay modeling –A method of teaching embryology to veterinary undergraduates

LEENA CHANDRASEKHAR[1], S MAYA[2], C V RAJANI[3], T V RAJA[4] and REGHU RAVINDRAN[5]

Kerala Veterinary and Animal Sciences University, Pookot, Kerala 673576 India

Received: 21 March 2011; Accepted: 17 May 2011

ABSTRACT

Conceptualization of organogenesis is a difficult task for veterinary undergraduate students. In the present study, the traditional teaching method of veterinary embryology is subjected to a slight renovation. There is active involvement and integration of theory and practice, in which student teams prepare clay models of organogenesis under teacher supervision followed by a test during which learner's skills were verified. A survey of the differences experienced by the students taught by conventional methods and clay models was conducted and statistically analyzed. The results showed strongly positive response for teaching with the help of models.

Key words: Clay model, Education, Embryology, Teaching

Anatomy of animal bodies is among the most complex subjects to teach and the problem of students with decreasing anatomical knowledge is growing. Research in anatomy education should focus on teaching in context, vertical integration and assessment strategies (Bergman *et al*. 2011). Soley and Kramer (2001) identified organogenesis as one of the areas in Veterinary Anatomy which students feel difficult to perceive. A major reason identified was the inability to conceptualize three dimensional structures. Suitable teaching methods are essential for proper understanding of the subject. Development of models stimulates and educates the constructors while providing a teaching resource for later use in didactic teaching (Barling and Ramasamy 2011). This communication describes the use of an inexpensive and simple method of teaching veterinary embryology with the help of clay models and feedback from its end-users.

MATERIALS AND METHODS

The present study was conducted at College of Veterinary and Animal Sciences, Pookot. The teaching of the subject Veterinary Embryology (VAN-211) began with a session explaining the topics system-wise followed by hands-on practice with the clay model and finally a test during which learner's skills were verified. The students were divided into seven equal groups. A competition was announced and a certificate prize for the winning group was declared to motivate the students. One group was excluded from the workshop to form the negative control group. Each group was asked to construct a model of organogenesis. Processed clay was used to construct the base and soft modeling clay was used to construct the organs. Judging qualities included realism and fidelity to the original concept, proportionality in topological and spatial relationships, detail and resolution, absence of breaks and structural mobility. After completing this session, learners were requested to provide score for conventional teaching methods (group 1), teaching with the use of models (group 2), student understanding level without models (group 3) and student understanding level with models (group 4). The results were statistically analyzed based on posthoc LSD (Snedecor and Cochran 1994). The performance of students was also evaluated in regular written examination at the end of the semester.

RESULTS AND DISCUSSION

Various techniques to manufacture permanent models for teaching purposes like wax, wood, papier-mâché, or glass, have long been used to construct animal and plant models (Valdecasas 2009). In the present study, clay models approximately 45 cm long, 25 cm wide and 5 to 10 cm thick of the entire animal embryo or organs were constructed. A papier-mâché technique for highly fragile models was also performed (Duran *et al.* 2009). The teaching aids (Figs 1–5) so developed were preserved in the anatomy museum at College of Veterinary and Animal Sciences, Pookot to be used in future.

Present address: [1]Assistant Professor (e mail: drleenachandrasekhar@rediffmail.com), [2]Associate Professor, [3]Assistant Professor, Department of Veterinary Anatomy, [4]Assistant Professor, Department of Animal Breeding and Genetics.

[5]Assistant Professor, Department of Veterinary Parasitology, College of Veterinary and Animal Sciences, Lakkidi P O, Wayanad, Kerala.

Table 1. Statistical analysis of Learner survey results

Group	Mean	Source of variation	df	SS	MS	F
1	1.024	Between Groups	3	309.4329	103.1443	151.5062 *
2	4.439	Within Groups	160	108.9268	0.680793	
3	3.024	Total	163	418.3598		
4	4.317					

* (P<0.01) highly significant.

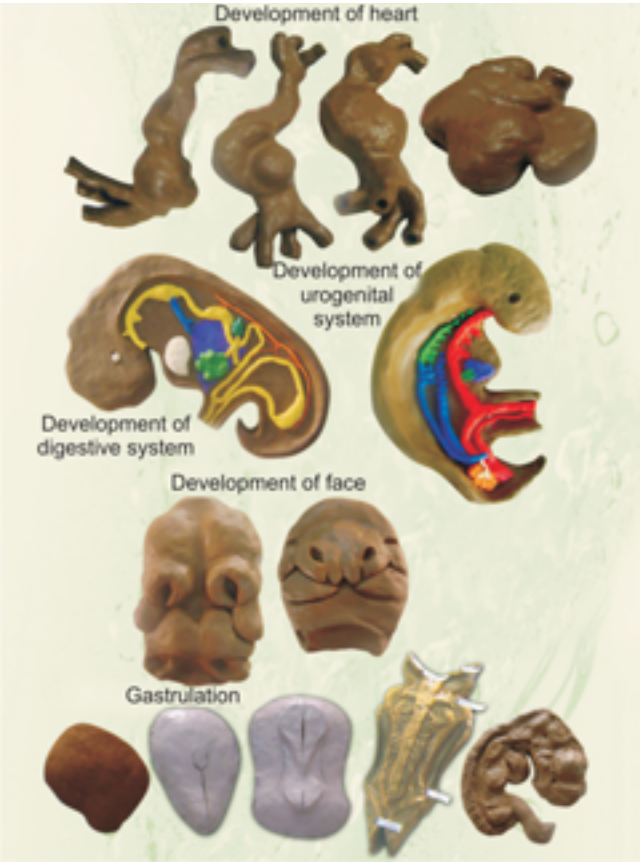
Overall learner response was strongly positive for teaching with the help of models. Statistical analysis revealed that the values of group 1 and 3 are significantly different from the other groups while that of group 2 and group 4 are similar. Analysis of variance between groups 1, 2, 3 and 4 are presented in Table 1.

Evaluation showed that that students of the learning group understood complex events of organogenesis and expressed increased confidence while learning with models. The subject of veterinary anatomy is very complex and difficult to explain with the help of two-dimensional diagrams. Teaching with hands-on practice is the way to provide students with sufficient experience and expertise and is 'a necessary component' of science (Howie 2002). However, there is difficulty in procuring embryos in various stages of organogenesis for the study of embryology.

By use of the clay embryos, complex events of organogenesis like physiological herniation, rotation of gut segments and development of the septum transversarium could be explained easily. The soft clay, used to denote the organs, allow the disassembly and repositioning of organs, which is very useful in explaining events such as involution of pronephros, mesonephros and transposition of ureteric buds. Also the development of models stimulates, informs, educates the constructors and provides a teaching resource for later use in didactic teaching (Barling and Ramasamy 2011).

There is a power in the physical interaction with the material of study that simple observation, even supported by new technologies, such as video and computer simulation cannot match (Rizzolo and Stewart 2006). In addition, interaction with the model through touching referred to as "kinesthesia" makes a large difference in learning process compared to passive visualization of pictures (Chadarevian and Hopwood 2004).

For complete teaching organogenesis of an organ system, at least 3 h were required when conventional methods of teaching such as classroom lectures, blackboard and overhead projectors were used. However, the teaching of systemic embryology using clay models took only 30 min per system. In addition, the reproduction of the studied matter by students using clay embryos was more accurate and with less effort.



The use of the clay models provided the students with practical knowledge and the faculty with a comparatively inexpensive, convenient, ready to use tool for teaching. Learners expressed increased confidence after practicing with the model and wanted it to continue to be a part of the class. Limitations are that one model is required per organ system and that a summarized model is difficult to prepare.

In the present study, the traditional teaching method of veterinary embryology was replaced by team based learning method using clay models, where students prepare clay models of organogenesis under teacher supervision followed by a test during which learner's skills were verified. Statistical survey comparing traditional teaching methods with teaching using models indicated showed strong positive response for teaching with the help of models.

ACKNOWLEDGEMENTS

The efforts of Vishnu B S, Anoopkumar T, third (2008 and 2009 admission) and seventh (2007 admission) semester students of College of Veterinary and Animal Sciences, Pookot, Wayanad, Kerala are greatfully acknowledged. The authors acknowledge the Dean of the college for permitting such an event.

REFERENCES

Barling P M and Ramasamy P. 2011. Model construction by students

within an integrated medical curriculum. *The Clinical teacher* **8**: 37–42.

Bergman E M, Van Der Vleuten C P and Scherpbier A J. 2011. Why don't they know enough about anatomy? A narrative review. *Medical Teacher* **33**: 403–09.

Chadarevian S D and Hopwood N. 2004. Models: The third dimension of science Stanford, Calif, Stanford University Press.

Duran E, Duran L B and Worch E A. 2009. Papier-mâché animals: an integrating theme for elementary classrooms. *Science Education Review* **8**: 11.

Howie D. 2002. Interpreting probability: controversies and developments in the early twentieth century. Cambridge University Press.

Rizzolo L J and Stewart W B. 2006. Should we continue teaching anatomy by dissection. *Anatomical Record* **289**: 215–18.

Snedecor G W and Cochran W G. 1989. *Statistical Methods.* 6th edn. Oxford and IBH Publishing Co., Calcutta.

Soley J T and Kramer B. 2001. Student perceptions of problem topics/concepts in a traditional veterinary anatomy course. *Journal of the South African Veterinary Association* **72**: 150–57.

Valdecasas A G, Correas A M, Guerrero C R and J Juez. 2009. Understanding complex systems: lessons from Auzoux's and von Hagens's anatomical models. *Journal of Biosciences* **34**: 835–43.