

FY2008 Learning Technologies Grants Proposal

(COVER PAGE)

Project Information

Development of a 3-D animated virtual eye model for teaching anatomical and clinical ocular concepts to veterinary students

Project Title

Dr. Ursula Dietrich, DVM, DACVO, DECVO, Associate Professor

Project Director

Small Animal Medicine and Surgery

Requesting Department

\$ 7,402.50

Amount Requested Year 1

Amount Requested Year 2

Project Director's Signature

Proposal Endorsement Signatures

Department Head

Dean

Proposal Abstract (100-word maximum)

A team of veterinary ophthalmologists, medical illustrators and animators will embark on the creation of a 3-D animated virtual animal eye model that can be manipulated in space through Quick Time Virtual Reality. The model will detail anatomical and histological layers within the eye and will illustrate species differences. This project will engage professional veterinary students in the use of innovative, computer-animated technology in classroom teaching, but can also be utilized for review and self-study. The capability for 3-D visualization of complex ocular structures will enhance student learning and understanding of complex spatial relationships within the eye.

Section I. Project Description

Nature of innovation

The objective of this project is to develop a computer-animated, interactive virtual 3-D model of an animal eye to enhance and improve the education and learning experience of students in veterinary ophthalmology. Similar to other successfully used 3-D models in veterinary education, such as the award-winning Glass Horse (www.3dglasshorse.com), this computer-animated eye model will be developed through the collaboration with the Department of Educational Resources at the College of Veterinary Medicine. Detailed and anatomically realistic illustrations of the dog eye have already been created by UGA chief medical illustrator (Mr. Kip Carter) and will serve as the base for building the animated model (Fig 1). The animated eye model can be incorporated as an additional teaching aid into the existing clinical ophthalmology courses and will also be available as a CD and from a web server. The server will allow the students to access the eye model from any computer connected to the Internet and will thus encourage and allow independent self- study. Through Quick time virtual reality (QTVR) technology the students will be able to rotate the eye and thus be able to view the eye from different angles. The model will systematically detail the tunics of the eye so the students can virtually remove the superficial layers to reveal underlying structures, magnify specific areas to study anatomical details and species differences. An animated video will embark the students on a virtual tour through the inside of the eye (by “flying” through the pupil) and will allow a 3-D panoramic view of 360 degree ocular structures, such as vitreous cavity, ciliary body and retina.

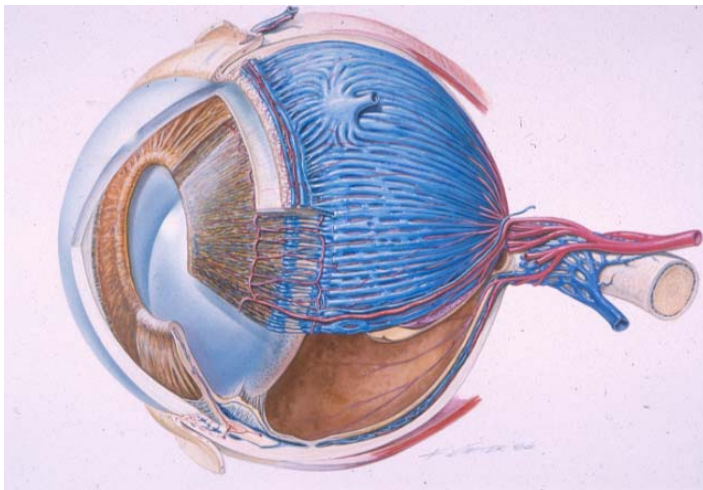


Fig.1 Vascular Anatomy of the canine eye (Kip Carter)

Need/rationale

Veterinary ophthalmology is one of the core courses for all 97 students currently enrolled in the sophomore year of the veterinary curriculum. In this course the students are taught ocular diseases in different animal species, and learn how to diagnose and treat those diseases. This requires a fundamental understanding of the gross and microscopic anatomy of the eye.

Ophthalmology is an extremely visually oriented discipline and heavily depends on visual aids to deliver course material. Three-dimensional thinking is fundamental for the students to understand the anatomical and clinical concepts. However, in the traditional lecture format digitalized pictures and simplistic two-dimensional drawings of the eye are used, which do not demonstrate spatial relationships of this complex sensory organ. Therefore, veterinary students consistently experience difficulty when studying the eye because the information available is presented in a 2-D format. They do not learn to think three dimensionally which results in misconceptions of gross anatomical details. This leads to major problems in understanding ocular diseases and pathological concepts of the eye, especially during the 4th year clinical rotation and later in veterinary practice. Plastic models of the human eye are commercially available and somewhat helpful for student learning; however, they reflect human anatomy and do not demonstrate species differences. Also, they are extremely simplistic models and do not provide a realistic view of ocular structures. In addition, those plastic models can only be utilized for teaching in small groups (such as senior students during their clinical rotation) but are not suitable for classroom teaching. Computer animated models of the human eye are now available and can be purchased online, but again they have only limited use in veterinary ophthalmology because of species differences and lack of gross anatomical detail.

Relevance of the project to unit and University priorities

The use of an animated eye model for instruction will not only benefit the Small Animal Medicine & Surgery Department and the Large Animal Department, but also other departments at the College of Veterinary Medicine that teach ocular basic science such as Anatomy/Histology and Pathology. Future developments of the interactive model could also illustrate dynamic physiological processes within the eye, including the pupillary function, production and flow of aqueous humor, and light stimulation of the sensory retina. Implementation of a 3-D animated eye model will thus enhance the students' understanding of basic anatomical, pathological, physiological and clinical concepts in comparative ophthalmology. The opportunity for faculty and instructors to incorporate 3-D virtual reality technology into their lectures will have a great impact on the delivery of their course materials. It is expected that the students will benefit from this innovative technology through enhanced understanding of complex ocular structures and improved 3-dimensional thinking. This will also improve their performance during the 4th year clinical rotation in ophthalmology and later in veterinary practice. The engagement of innovative technology into the traditional lecture format adds another up-to-date dimension to the students' classroom experience. This will likely stimulate their interest in the subject and will motivate their self-study and overall learning experience.

Specific courses or student groups benefiting from the project-Number of students served

The 3-D animated virtual eye model will be available on a web server on the internet and as a CD. Therefore, it can be made accessible for a large number of students and can be used as an instructional aid in a wide variety of courses within the College of Veterinary Medicine.

Core courses and elective courses of the veterinary curriculum:

1st year

- VARB 5150 Principles of Veterinary Anatomy and Embryology (core, 96 students)
- VARB 5130 Laboratory in Anatomy of Horse and Food Animal (core, 96 students)
- VARB 5160 Laboratory in Anatomy of Dog and Cat (core, 96 students)
- VARB 5180, 5180L Microscopic Anatomy of Domestic Animals (core, 96 students)
- VARB 5105/5105L Clinical Anatomy of Large Animals (elective, 40 students)
- VPAT 5200/5200L General Animal Pathology (core, 96 students)

2nd year

- SAMS 5200 Veterinary Ophthalmology (core, 96 students)

3rd year

- SAMS 5335 Advanced Ophthalmology (elective, 45 students)

4th year (clinical rotation)

- SAMS 5475 Small Animal Community Practice (core, 96 students)
- LAMS 5415 Large Animal Internal Medicine (large animal track students)
- LAMS 5425 Large Animal Farm Practice (large and mixed animal track students)
- SAMS 5460 Small Animal Ophthalmology (small animal track students)

A total of 384 students in all 4 years of the veterinary curriculum would benefit from this project. Based on the success of the Glass Horse, this animated eye model could also be used by other groups, such as practicing veterinarians or other Veterinary Schools in the country.

Section II. Budget

All of the technology and facilities are available to us at the College of Veterinary Medicine, mainly through collaboration with Educational Resources in the College. Educational Resources has a dual processor Dell Precision computer for running the 3-D animation software (either Maya or Cinema 4D). The 3-D animator dedicated to this project is a part-time employee and will work on an hourly basis. The project is overseen by Mr. Kip Carter, the Chief of Medical Illustration at Educational Resources, who will also oversee the storyboarding aspect of the project. Educational Resources has the software and experience for producing integrated Quick Time and Quick Time Virtual Reality movies, which will be the final product, and a Media Form CD-3702 Standalone CD-R Duplication System that permits fast and easy replication of the CD-ROMs.

ITEM	Quantity	Total Cost	Requested from LTG	Provided by other sources
Planning and research, storyboard animation, preliminary sketches	400 hrs @ \$3.25/hr	\$1,300.00	\$1,300.00	\$0

Modeling, Animating & Rendering in a 3D program (Maya or Cinema 4D)	750 hrs @ 5.65/hr	\$4,232.50	\$4,232.50	\$0
3D software upgrade	One time	\$1,200.00	\$1,200.00	\$0
Creating Quick Time, Flash, QTVR or other needed formats for designated modes of delivery	100 hrs @ 5.65/hr	\$565.00	\$565.00	\$0
Material & expense for CD, copies, notebook, DVD		\$100.00	\$100.00	
TOTALS		\$7,402.50	\$7,402.50	\$0

Project timeline

The expected completion time of the animated 3-D eye model is 12 months. Work on this project will start upon receipt of funding.

Date	Objective	Person responsible
December 2007-March 2008	Planning and research, storyboard animation, preliminary sketches	Ursula Dietrich, Kip Carter, Brad Gilleland, Thel Melton
April-November 2008	Modeling, Animating & Rendering in a 3D program (Maya or Cinema 4D)	Brad Gilleland, Thel Melton
December 2008-January 2009	Creating Quick Time, Flash, QTVR or other needed formats for designated modes of delivery	Thel Melton
March 2009	Implement teaching with model in	Ursula Dietrich, Anthony Moore

Section III. Learning Outcomes

It is anticipated that implementing the animated virtual eye model in basic science and clinical courses will enhance the students' understanding of basic concepts in ocular anatomy, pathology, physiology and clinical ophthalmology. The majority of students will have a better understanding of the spatial relationships of the ocular tissues. Presenting the course material in a multidimensional way is likely to lead to a greater level of assimilation which will improve the students' performance in the 4th year clinical rotation in veterinary ophthalmology. It is expected that their thinking behavior will be stimulated in such that they learn to apply the acquired basic knowledge to clinical problems instead of just memorizing and regurgitating the learned textual and 2-D material. By having continued access to the model through CD ROM or internet access, the students will profit from this technology throughout their curriculum and especially as they enter the fourth year and veterinary practice after graduation.

The impact of the 3-D animated eye model will be evaluated using a traditional method statistically comparing the student grades of a test group with a control group. Two classes will be utilized from two different enrollment years. The model will not be used in Year A (control group) but will be introduced in Year B (test group). In year A the students utilize books, and the lectures made available on WebCT to review the course material. Students in Year B will be taught in the same fashion, except that the animated 3-D eye model will be introduced and made available for the students on the internet and as a CD ROM. The differences in examination scores between Year A and Year B will be compared. In addition the students will fill out a questionnaire surveying their experience, satisfaction and dissatisfaction with the model.

Section IV. Support Plan

Staff and resources of the Department of Small Animal Medicine & Surgery and Educational Resources at the College of Veterinary Medicine will be available to provide technical assistance in the planning and conducting of the project. Staff members of the Educational Resources (Carter, Gilleland, Thelton) will embark as a team and closely work on the project. Implementation of the 3-D animated eye in the 2nd year ophthalmology lecture course, 3rd year advanced ophthalmology course and on the 4th year clinical rotation in ophthalmology will be jointly performed by Drs. Dietrich and Moore.

Collaborators

Kip Carter, CS, CMI, is the chief of Medical Illustration Services at the College of Veterinary Medicine, University of Georgia. He is an award winning, board-certified medical illustrator with over 25 years experience in veterinary anatomy. Kip will oversee the illustration and storyboarding aspect of the project.

Brad Gilleland, MS is an experienced 3-D animator in Educational Resources at the College of Veterinary Medicine. He will be responsible for animating the project, rendering the images in digital color and sequencing the images with software available in the Department of Educational Resources.

Thel Melton is the senior 3-D animator for the Glass Horse with over 13 years experience in veterinary anatomy through his position in Educational Resources at the College of Veterinary Medicine and will oversee the production process. He is a 2005 Frank Netter Award winner.

Anthony Moore, DVM, MS, DACVO is an associate professor in Veterinary Ophthalmology in the Department of Small Animal Medicine & Surgery at the College of Veterinary Medicine. Dr. Moore is co-teaching the Veterinary Ophthalmology lecture course in the 2nd year.