2005-2007 LITRE Grant Proposal

1. Project Title:

Virtual Microscopy: incorporation of innovative, cutting-edge technology in two veterinary science courses to facilitate interactive student learning

2. Project Coordinator:

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3. Other Participants:

2d Project Coordinator:
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Other Participants:
Dr. Carol Grindem, Dr. David Bristol
Three of the participants (Drs. Grindem, Neel and Pallatto) have completed the Summer Institute for Teaching with Technology and will be incorporating this technology (virtual microscopy) into two courses using WebCT VISTA.

4. College or Unit:

College of Veterinary Medicine

5. Department:

Population Health and Pathobiology (Clinical Pathology Division)

6. Project Description:

Implement the revolutionary technology of virtual microscopy in two veterinary clinical pathology courses (VMP 942 and VMP 978) to enhance and supplement student learning which traditionally used glass slides and microscopes as instructional instruments.

Virtual microscopy is a unique and specialized method of digitizing a glass microscope slide. Once the microscope slide has been scanned

(photographically digitized), a computer now becomes the microscope to view the slide. Students can use any personal computer and control the virtual slide by changing magnification and focusing through tissue sections, just as if they were viewing the slide with a microscope. Virtual microscope slides have outstanding quality and resolution, resulting in an amazing educational tool.

A. Advantages of virtual microscope slides:

·Student access to viewing the virtual slides anywhere, anytime. They can use a home computer, or any computer in the university laboratories at any time of day or night. Students will no longer have to sign out cumbersome slide boxes, nor will they have to go to a microscope lab at night to study tissue sections because they can study from their home computer.

·Students will have the ability to create a personal library of study images by selecting a diagnostic area of the virtual slide and saving the image to a folder, which they can keep for life.

·Uniformity of slide specimens. In a traditional microscope lab, it is difficult to accumulate enough slides of the same tissue specimen so that a class of 80 students can all see a specimen of the same diagnostic quality. This is a significant problem with hematology and cytology samples. Virtual microscopy eliminates this problem because ALL students will have access to the same virtual slide.

·Protection of unique specimens. When 80 students are viewing glass slides in a traditional microscope setting there are always slides that are broken. This problem will be eliminated with virtual microscopy and precious slide specimens that are few in number will be safe.

·Lifelong slide image. Over time, the color, stain quality and mounting media of tissue specimens on glass slides deteriorate. Once the slide is digitized and becomes a virtual slide, the image quality is preserved for life in a virtual slide image.

·Expansion of virtual slide teaching sets between veterinary colleges. An advantage of implementing virtual microscopy is that all veterinary colleges that participate will have access to virtual slides from other participating veterinary colleges. This is a phenomenal advantage to our veterinary students who may plan on moving to another part of the country to practice veterinary medicine because they will have access to viewing tissue specimens of regionally specific diseases.

B. Advantages of virtual microscope software, consultation features and teaching options:

·Extensive annotation options including text, numbers, arrows, lines and hyperlinks. A unique feature of virtual microscopy is that virtual slides can be annotated to bring attention to specific areas of a tissue specimen so that students are guaranteed to see and identify the diagnostic features of a specimen. In a traditional laboratory setting with glass slides and microscopes,

it is impossible to guarantee that all 80 students will see all of the important features of a slide. The hyperlinks option allows direct links from the virtual slide to course notes, websites, other digital images, journal articles or library materials.

·Consultation mode feature: This feature allows students to view the same virtual slide from different remote locations. One student can control the virtual slide and all other students will see the movements directed by the student in control of the slide and they can have an on-line (chat) discussion about the slide features. This feature will greatly enhance and facilitate networking of students and independent small group learning.

·Quantitation and morphometrics. Using the computer as a microscope allows easy measurement of structures on tissue specimens. With traditional microscopy this requires special equipment not usually supplied with the microscope.

·Use of virtual slides in classroom Powerpoint presentations. Virtual slides can be embedded into Powerpoint presentations which can be accessed in a large classroom setting for group instruction without additional equipment other than server access, computer and a projector.

·Source of high quality still images of unknown virtual slides for testing purposes. Once the virtual slides are created, they are an excellent source for practical exam testing, which eliminates the need to have enough glass slides in a traditional microscope lab to test 80 students. It also eliminates the extreme amount of time involved in setting up and breaking down a practical exam for a large class of students.

·In the event that the college decides not to renew the contract with Bacus laboratories, the virtual slides are the property of NC State University for life and will still have use in teaching.

·The college currently is updating the student microscope lab to include additions of plasma screens, lecture podium, and restructuring for enhanced acoustics. These additions will greatly facilitate the use of virtual microscopy in tandem with traditional microscopy.

·Virtual microscopy has the potential for use in many other veterinary and university courses including: histology, ophthalmology, pathology, dermatology, anatomy, plant biology, animal science, parasitology, microbiology, and exotic animal medicine.

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7. Project Objectives:

A. Objectives in implementing virtual microscopy in two clinical pathology courses:

·Digitize a bank of hematology and cytology slides through the use of hardware created by Bacus Laboratories Incorporated. This company developed a digital microscope allowing high resolution photographs of entire slide specimens to be assembled into a montage for interactive, real-time viewing of

specimens on-line without the aid of a microscope.

·Create an organized course website that includes the following: virtual microscopy instructional video link, help tips, course notes, library access, virtual slide box, and virtual slide quizzes.

·Create an on-line instructional video on how to use virtual microscopy.

·Create a bank of virtual slides with specific annotations of key features for interactive student instruction.

·Create an on-line practical quiz/exam using virtual microscopy for both courses in hematology and cytology.

B. Long-term impact of the project:

·Encourage other departments to implement the use of virtual microscopy to enhance student learning. Departments that may benefit include any that use microscopy (anatomic pathology, histology, parasitology, animal science, botany, and entomology).

·Eventually decrease the cost of microscope maintenance. (Cost is approximately $120.00 per hour for cleaning; parts not included).

·This could save thousands of dollars because we are at a breaking point to replace 40 microscopes that are now obsolete in our teaching lab. A microscope costs $6000.00 to $8000.00 each. Virtual microscopy literally could save the university $320,000.00.

·This technology is now being used in medical schools in lieu of microscopy with great success. Students are happy with this new technology and utilize it to a greater degree than traditional microscopy because they have access to the technology from any computer with server access.

·This state of the art technology will bring faculty members and students in tune with the future of microscopy.

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8. Estimated number of students affected:

A. Short term impact: This technology will have an initial impact affecting approximately 160 students in two courses.

B. Long term impact: Virtual microscopy could be implemented in 6 different courses at the college of veterinary medicine having an impact on a total of 320 students per year, and could potentially be implemented by several courses taught in other colleges at NC State University. Graduate students and veterinary residents preparing for board certification could also reap the benefits of virtual microscopy. This technology is the future of microscopy; just as computers replaced typewriters, virtual microscopy will eventually replace microscopes in the teaching setting.

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9. Outcomes of the Project:

A. Students will learn how to effectively evaluate hematology and cytology tissue samples and will spend more time viewing virtual slides than they would in a microscopy lab. This is because students will have ease of access to the technology and will not have to be physically present in lab to review glass slides.

B. Uniformity of virtual slides for student learning: All students will have access to the best tissue examples via virtual microscopy. This will eliminate using some glass slides in a traditional microscope setting that are not as good as others in an attempt to meet the demand of a large class size.

C. Students will receive immediate feedback in virtual microscopy for specimen diagnosis because the slides can be annotated pointing out the important features of the slide. This would be impossible to achieve in a microscope laboratory setting given the low instructor to student ratio.

D. Increased ability to challenge students on a cognitive level: Students can be required to capture images from the virtual microscope slides that are supportive for a specific diagnosis for a slide. This image library can then be emailed to the instructor for grading. This would be impossible to achieve with 80 students in a single laboratory session.

E. Students can create a personal library of study images from the virtual microscopy slides that they can save and access for life.

F. An outcome other than student learning is that these courses will serve as a model of virtual microscopy technology for NC State as well as for other veterinary colleges. Currently 3 veterinary schools and many medical schools are successfully using this technology. We have an opportunity to join the ranks of these other veterinary schools in bringing our teaching methods into the future.

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10. Project impact on NCSU:

A. As a pilot project for student use of virtual microscopy, it serves as a test bed for many other courses that rely heavily on the use of microscopy including other departments within the college of veterinary medicine and other colleges within the university.

B. Students will spend more time viewing and learning with virtual slides than they will with traditional glass slides and a microscope.

C. The contract with Bacus laboratories also allows student and faculty access to a bank of slides from other participating universities allowing viewing of unique specimens, which we may not have in our slide bank.

D. Implementing this technology now will save the university thousands of dollars now as well as in the future.

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11. Project Assessment Plan:

A. On-line quizzes: Students will be required to take an on-line microscopy quiz. Scores from these students can be compared to scores from past classes that used traditional microscopy.

B. Student survey: This will be required from every student in each course. Questions will survey student satisfaction with the technology compared with traditional microscopy and how much time students spent reviewing slides using virtual microscopy verses traditional microscopy.

C. Faculty surveys: Survey several faculty members that use microscopy on a regular basis after they have viewed the website and used virtual microscopy. The survey will assess ease of use and whether they would consider integrating this technology in their course.

D. Student surveys for those who have received additional microscopy training by working in the clinical pathology lab.

E. Resident surveys: Those residents that participate in an elective clinical pathology rotation will be required to complete a survey comparing virtual microscopy with traditional microscopy.

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12. Staffing and Support:

1. Bacus Laboratories:$6000.00/ 1 year contract
·Slide digitization
·virtual microscopy viewer software
·Software, website and technology hardware consultation

2. NC State Learning and Technology Service/ Developmental Support
·Initial website set-up
·Create links for 20 slides 40 hours* x $40.00= $1600.00
·Website graphical design 10 hours* x $40.00= $400.00
·Student training and consultation for website management
·Instructional design consultation for integrating quizzes into WebCT Vista 5 hours* x $200.00

3. Enterprise Technology Service and Support $4080.00/ 1 year contract
·Host the server
·Server technical support/ daily back-up
·Back-up battery/ generator for server
·Training for server user ID and password management

4. Biomedical communications $1200.00 estimate for all
·Videotaping on-line instructional video (video taping, editing, dubbing, and text integration for the hearing impaired)

5. Student
·Website updates/ additions $864.00 ($12.00/ hour at 3 hours/ week for 24 weeks)

* Services provided by the Learning and Technology Service is approximately $40.00/ hour: 55 hours x $40.00 = $2200.00

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13. Financial Support Requested:

EPA salary total: 0.00
SPA salary total: 7480.00
Other salary: 864.00
Equipment: 0.00
Cost associated with assessment: 0.00
Other financial support requested: 6000.00
Total Funds requested: 14,344.00
Additional Explanation of how funds will be used:

This project requires that we purchase a server with specific recommendations to support virtual microscopy.

An estimate for the server has been provided by the NCSU Enterprise Technology Services and Support Division:
HP Proliant DL380 G4 Server- $4978.00
Software (Windows Server Enterprise 2003)- $316.00
Total: $5294.00

This amount was not requested in the budget for this grant because, the Associate Dean's Office (Dr. David Bristol) agreed to provide the funds for purchase of this server and software in support of this project.

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14. Funding Breakdown:

Total funding requested for fiscal year 2005-2006: $14,344.00
Total funding requested for fiscal year 2006-2007: N/A

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15. Staff Support and/or Technical Support Requested:

All personnel and funds are listed in items 12 and 13.

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16. Timetable for Implementation:

December 20, 2005: Slides submitted to Bacus laboratories for digitizing.
February 1, 2006- Instructional video complete, including editing/ closed caption (ready for addition to website).
February 15, 2006: Five hematology slides and five cytology slides annotated and ready to add to website for student interactive instruction
March 1, 2006: Two hematology and two cytology student self quizzes available for students; one hematology and cytology test for grading available to students.
April 1, 2006: Website complete
June 1, 2006: Compile faculty and student surveys from the VMP 978 course
June 30, 2006: VMP 942 website complete; will not be evaluated until Spring 2007 when the course is offered.

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17. Human Subjects Protection:

If your proposal project involves research using human subjects, you will need approval from the Institutional Review Board for the Protection of Human Subjects in Research (IRB) prior to final approval. IRB information is available at http://www.ncsu.edu/sparcs/irb

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18. Proposal Release:

By submitting this proposal the applicant grants the LITRE Advisory Board permission to make this proposal available as an example for future grant applicants. All personal information will be removed if this proposal is used as an example.