Request for Proposals for Innovative and Creative Undergraduate Teaching
Weber State University

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College: Dumke College of Health Professions
Department: Radiologic Sciences
Proposal: Funds for video capture and instructional videos for three-dimensional anatomy instruction.

Rationale
The department of Radiologic Sciences currently has multiple licenses for the use of three-dimensional imaging software (Voxar). This software provides the student with additional ways to reconstruct digital images in order to understand anatomical structures. The software is not web-based (thin-client) and therefore has to be loaded on a PC and remain on that PC (thick-client) for the student to use. Outreach students and students in advanced courses have limited instruction on campus due to geographic distances and course structure. Instructional videos that the student can view at their home and designed on how to use the three-dimensional software provides the student with more productive interaction on the software while they are on campus for a limited amount of time.

Depth of Impact:
Teaching sectional anatomy and two-dimensional x-ray imaging to radiography and dental hygiene students can be a complex task. Most of these courses involve memorizing key anatomical structures slice by slice or by using two x-ray views 90 degrees from each other. Sectional imaging (CT and MRI) slices can be reconstructed into different planes (axial, coronal, and sagittal) to aid the student in understanding the orientation of the anatomy (anterior, posterior, superior, and inferior). Rather than memorizing anatomy in a two-dimensional plane, three-dimensional interactive software helps the student see these anatomical structures in a different way and provides the student with a greater understanding of anatomy in multiple orientations. This new teaching method combines a new innovative way to teach anatomical structures and gives the student a more “hands on” learning experience.

Breadth of Impact:
The use of three-dimensional software can be implemented into the Radiologic Sciences Associates of Applied Science (AAS) and the Baccalaureate programs. This entails about 300 students per year in the Radiologic Sciences program. The software can also be used in the department of Dental Hygiene AAS program. This entails about 80 students per year.
Measurement:

Measurement would be based on quizzes, assignments, and exam scores. These scores can be compared with previous courses taught without three-dimensional instruction to validate improvement of student scores with three-dimensional instruction.

Accountability:

Video capture and instructional videos would be developed to start Fall semester 2014. The estimated costs of the software and manpower are included in the detailed budget section.

**Description of the innovation**

The instructor or teaching assistant will create an instructional video demonstrating the use of the three-dimensional imaging software. These videos will provide the student with instructions on how to create 3D images of all areas of the body. The anatomical structures will include specific organ systems, vascular structures, and skeletal anatomy. The instructional videos will prepare the student for using the 3D software in the computer lab in the Radiologic Science department.

**Preliminary evidence**

Nicola ward Petty in a paper entitled: “Creating YouTube Videos that Engage Students and Enhance Learning in Statistics and Excel (2010) stated the following:

“Short video clips can help teach difficult concepts effectively. A series of videos of three to seven minutes each was developed to teach and reinforce elementary but challenging principles in a first year Quantitative Methods for Business course. The response was very positive from students in the course, and from the worldwide audience who viewed the videos on Youtube.”

There is considerable research regarding the effectiveness of multimedia instruction.

In a 2003 paper by Richard E. Mayer entitled: “The Promise of Multimedia Learning: Using the Same Instructional Design Methods Across Different Media.” (Learning and Instruction 13(2), 125-139). He defines a “multimedia instructional message” as “a presentation consisting of words and pictures that is designed to foster meaningful learning.” Mayer shows that “students learn more deeply from a multimedia explanation presented in words and pictures than in words alone”, which he calls “the multimedia effect.” He develops a framework, based on aspects of cognitive science, which helps to explain this multimedia effect. The framework assumes that humans process pictures and words using different parts of working memory, both of which are limited. However, the total amount of information that can be taken in is increased by using both input channels (pictures and words), which appear to have independent capacities. The framework also suggests that better learning occurs when the learner is actively involved in the process.

Another aspect that appears important to learning is that of control. In some discussions on effective teaching, video is perceived as a passive medium, even less interactive than the traditional lecture.
However video clips that the student can pause, back-track and repeat, provide a different medium to a video that is delivered to an audience of more than one. Students can control the speed, sometimes pause the video to perform the same tasks themselves in parallel, and view the video more than once. In this respect the short self-paced video clip has more in common with a session with an individual tutor than with a lecture. The controllable nature of the clip also adds to the student’s sense of control over the learning process. Unlike a human tutor, the clip will (and does) repeat endlessly and patiently.

**Implementation**

Development of the instructional videos would occur during the Spring and summer semesters. Implementation of the three-dimensional instruction would begin Fall semester 2014.

Current courses that would include the three-dimensional instruction:

Radiologic Sciences:
- RADTEC 1502 Radiographic Anatomy & Positioning I (2)
- RADTEC 1512 Radiographic Anatomy & Positioning II (2)
- RADTEC 2272 Basic Sectional Anatomy (2)
- RADTEC 1522 Radiographic Anatomy & Positioning III (2)
- RADTEC 1532 Radiographic Anatomy & Positioning IV (2)
- RADT 3123 Sectional Anatomy (3)

Dental Hygiene:
- DenSci 2205 Head/Neck and Dental Anatomy (2)
- DenSci 2206 Clinical Dental Hygiene/Radiology (4)

**Detailed assessment plan**

Assessment of student knowledge would be based on quizzes, assignments, and exams. Comparison of assessment scores prior to the implementation of the three-dimensional component in current courses would also be evaluated and measured to ensure that desired outcomes are being achieved.

**Sustainability**

Implementing three-dimension instruction into the department of Radiologic Sciences and Dental Hygiene programs would entail the following steps:

Step one - designing instructional videos to help the student learn how to use the three-dimensional software and identifying anatomical structures.

Step two – add three-dimensional instruction into existing courses that teach anatomy and positioning and sectional anatomy.
Step three - develop a course specifically for three-dimensional imaging for the Radiologic Science and Dental Hygiene programs that are presented and approved by the University curriculum committee.

Detailed budget

Video capture software (2).................................................................................................................. $1400.00
  • Example: Camtasia

Laptop (2)................................................................................................................................................. $3,700.00
  • Example: Macbook Pro

Development of educational videos........................................................................................................ $7,616.00
  • Employee (imaging professional)
    working 16 hrs per week x 28 weeks @ $17.00 per hour

Total...................................................................................................................................................... $12,716.00