

**Improving the Undergraduate Exercise, Sport Science and Pedagogy Learning Experience
with Computer-assisted and Video-based Motion Analysis Technology**

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Request for
2007-2008 Academic Year
Funding

Narrative

Problem/Need:

The field of Exercise, Sport Science and Pedagogy (ESSP) is very diverse with several disciplines. A common theme throughout the disciplines is the need to enhance motor skill learning and performance in a variety of populations depending on the discipline. One method to accomplish this need for enhancement is through motion analysis (i.e., Dartfish technology). The use of motion analysis is not only invaluable to the ESSP researcher, but is also becoming common place in physical education teaching and coaching professions. Additionally, several of the accreditation agencies within the ESSP field (e.g., American College of Sports Medicine [ACSM] and National Council for Accreditation of Teacher Education/National Association of Sport and Physical Education [NCATE/NASPE]) require that students are able to demonstrate appropriate discipline-based movement analysis techniques and demonstrate their ability to use technology. Therefore, the ability to document the utilization of a number of diverse and current technologies is critical to the success of students graduating from ESSP curriculums, and for meeting the requirements of accreditation agencies. Unfortunately, access to this technology for ESSP students at the University of Idaho does not exist.

Objectives/Rationale:

The Dartfish Human Movement Analysis System (Dartfish USA, Inc., Atlanta, GA) would allow our students to develop movement analysis skills, that will benefit their academic learning experience, and will also improve the movement assessment skills of future physical educators, coaches, biomechanists, motor behavior specialists, and athletic trainers. The technology will allow physical educators and coaches to improve movement and skill correction techniques, and athletic trainers will gain a better understanding of injury mechanisms and how

these injuries impact movement. Learning experiences recorded through the use of Dartfish will provide the documentation required by ACSM and NCATE/NASPE. Until recently, technology used for human motion analysis was cost prohibitive (>\$10,000 for a single system) greatly restricting student access. Today technology is available in the classroom through the use of desktop computers. Not only is access to motion analysis technology available, but the ability to work with these systems is becoming a necessity for students graduating from ESSP curriculums. The proposed grant would allow the integration of four Dartfish Human Movement Analysis systems into the laboratory curriculums for several ESSP classes at the undergraduate and graduate level.

Plan of Work:

Through the purchase of four Dartfish systems a number of activities will occur across disciplines impacting the motor skill performance and learning of our students and students in the community. By utilizing this technology in the classrooms at the University of Idaho we will begin to train educators and other professionals moving onto positions not only in the Pacific Northwest but across the country. In developing an interactive webpage (e.g., videos, guestbook's, and examples of students work) we will create a dissemination tool for our work that will be accessible to anyone interested in learning more about the project and its progression.

Over the period of the next 2 years we will incorporate this technology into numerous classes at both the undergraduate and graduate level, a few examples of the classes that will be impacted include:

- (a) Motor behavior and pedagogy classes: Multiple motion analysis systems will allow our students to work in smaller groups (there are typically 15-20 students in each lab section)

enhancing their learning and the laboratory experience. The actual laboratory assignments incorporated will vary depending upon the class learning objectives. For some classes the instructor may use the system to have students practice analyzing skill performance and providing appropriate feedback to facilitate learning. Being able to track the progression of skill acquisition/development side by side on a computer screen is a highly effective and innovative way for teachers, coaches and anyone involved in teaching motor skills to better understand motor skill performance. Currently these skills are being acquired through direct observation without the ability to track and compare the movement across time or between individuals with any level of efficiency. The software will allow students to capture images of an individual learning a new skill over the course of several practice attempts. The students will then analyze the movements and track the progression of skill acquisition, and observe and quantify how the performance changed throughout the learning process. Based on the results of the analyses, the students would then provide appropriate pedagogical cues to further enhance the learning of the motor skills.

The software will also allow ESSP students to enhance their own performance in the required ESSP skill and analysis classes. Students in these classes will be able to capture their own skill performance and compare it with that of an expert which will provide personal and authentic assessments and feedback to enhance their performance.

(b) Athletic training (AT) classes: The AT instructor may load video data of injured or pathologic populations walking or performing other movements. The students will then capture video of each other and compare their movements with those of the injured or pathologic populations. The ability to see movement, altered as a result of an injury, through video analysis, is an extremely effective and innovative way for the student to develop the

necessary skill set to identify and analyze critical features of a movement both in its injured and uninjured state and to design a more appropriate treatment strategy.

(c) Other potential areas: This software could be incorporated in any course requiring assessment of movement with the goal of understanding and improving the motor skills with benefit from the Dartfish software. Dartfish offers students the opportunity to solve problems and engage in experiential learning opportunities. Examples of such classes could include biomechanics, tests and measurement classes, and special education classes.

The principle investigators have been involved in college level teaching for a combined 30+ years, working with over 150 students per year in a variety of classes. Dr. Dickin has a master's degree in biomechanics and a PhD in motor control; both disciplines utilize motion analysis technology in teaching and in research. Dr. Goc Karp has a PhD in Sport Pedagogy, and has worked with students in the area of physical education and teacher preparation for 23 years. She consistently uses videotape analysis in her course work to critique and enhance performance and motor behavior. Consequently we are confident that the implementation of this grant will result in a successful project.

Learning Impact:

The Dartfish system not only allows movements and concepts to be visualized, but it allows live motion to be “paused” so that the students can focus on critical aspects of a movement that cannot be observed with the naked eye. It also offers other features such as StroMotion that allows students to “see” motion trajectories (i.e., projectiles, limbs moving relative to other limbs). The ability of the Dartfish software to freeze live action, and follow movement trajectories will have a dramatically impact all courses that adopt the software in the

ESSP disciplines. The student learning experience will be enhanced through the ability to visualize concepts that are often difficult for undergraduate students to grasp. Their movement analysis skills will also be improved through the opportunity to work with a motion analysis system that allows them to “dissect” movement and identify problems with motor skill movements. By identifying the problems the students will be better suited to correct movement problems before they become problematic (i.e., improper movements leading to potential injury or inadequate technique impairing a performer’s success in a skill).

Evaluation Plan:

Initial evaluation of the use and effectiveness of the software will begin in the motor behavior course. The experiences using the Dartfish Human Movement Analysis System mentioned above will be utilized in two of the 10 laboratory projects for the semester, for two of the five laboratory sections of the motor behavior laboratories during the fall 2007 semester. The remaining three sections will conduct laboratory assignments consistent with those used in previous semesters. One laboratory project will involve skill acquisition with and without feedback provided by the Dartfish software, and the second project will involve the assessment of motor skill development in a group of kindergarten children. The effectiveness of the Dartfish system integration will be evaluated via two methods. First, at the end of the semester, laboratory grades and the quality of the students’ assignments will be compared using a detailed qualitative assessment between the sections using the software and those not. Second, student comments on end of semester evaluations will be compared between the sections using personalized questions directly related to the use of this technology in the classroom. It is expected that students participating in the laboratory classes utilizing the proposed software will gain a better understanding of the concepts and the movement skills, will also be more accurate at identifying

and problem solving the movement being analyzed, and produce higher quality and more elaborate assignments overall. It is also expected that students will prefer using the Dartfish technology which will be reflected on their year end course evaluations. Additional courses will be impacted by the Dartfish software including athletic training and pedagogy in the spring and fall semesters of 2008, respectively.

Budget

Product Description/Services	Qty	Price	Total
DartTrainer ProSuite Version 4.09 Includes all critical updates for current version of software. Any major upgrades of the DartTrainer application will be offered under special conditions for the operation of the Pro-Suite software. Also included is a full set of written tutorials and two video training tutorials	4	\$1,125	4,500.00
Annual Maintenance which includes upgrades and unlimited telephone support during normal business hours			810.00
Panasonic PV-GS65 MiniDV Camera	4	500.00	2,000.00
Camcorder Tripod	4	50.00	200.00
1394 Firewire PCI I/O Card	4	40.00	160.00
IEEE1394 cables	4	30.00	120.00
MiniDV Tapes	20		60.00
WebDesign and Networked Resources			750.00
Summer Salary DCD			1,400
			10,000

Other Sources of Support:

Project Schedule:

May-June 2007:	Procure equipment and develop website for project.
July-August 2007	Pilot test equipment and software and train students to use technology.
September-Dec 2007	Utilize technology during the fall semester and collect data on student learning.
January 2008	Analyze and assess impact of systems on the teaching and learning outcomes for the project
January-April	Integrate technology into additional undergraduate and graduate classes and perform formative assessments on its impact.
April 2008	Complete final progress report on project.