

2009 Student Technology Fee Proposal Form

Title of Project: KINESIOLOGY LAB ENHANCMENT

Department/Organization: **PHYSICAL EDUCATION, HEALTH, AND RECREATION**

Name(s) of Project Applicant(s)

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Amount Requested for project: **\$70651 (\$63176 + \$2000 shipping + \$5475 Tax)**
(Net required =\$55651)

Contribution by Requesting Organization: **\$15,000**

Important note: Before completing this form, please read the Proposal Form Instructions located on the STF website:

<http://www.wvu.edu/stf/>

I. Project Abstract

Give an overview of existing environment, and summarize the items being requested. Include a brief explanation as to how the requested technology will improve student *access* to technological resources and/or enhance the *quality* of the student academic experiences through the use of technology and/or increase the *integration* of technology into the curriculum.

The proposed project will replace a force platform system that has been in operation for over 20 years, it will create more versatility in force measurement by adding a portable force platform system, and it will add a body composition measurement technique that is more current, convenient and comfortable, so it provides a much easier and safer testing environment than other currently used methods. All of these technology enhancements will increase the quality of the educational experience in our kinesiology classes by providing students with state of the art tools for measurement of various anthropometric or movement parameters. The equipment will be used in multiple classes (biomechanics, physiology of exercise, fitness assessment and exercise prescription, kinesiology/functional anatomy, functional assessment of older adults, nutrition and physical activity) for different types of applications (class assignments and projects, research opportunities, measurements of personal fitness for the general campus during a week of students' health and fitness testing conducted in a capstone course), providing students with an integrative experience.

BACKGROUND:

Force platform system. A force platform is a three dimensional multi-component system that measures forces and moments acting on the top surface of the platform. This technology has been used in kinesiology course work and laboratories to document the effects of ground reaction forces on human movement. This allows students to compare forces generated across different movement conditions and to examine the net result of a force application on the body. Because forces cannot be seen and only the effects of forces can be observed, the direct measurement of ground reaction forces becomes an important validation of the predicted movement result. Ground reaction forces are also used to determine joint kinetics (loads on the joints) when coupled with accurate motion data from high speed cameras.

a) **Permanent force platform.** We have been using a force platform system in the biomechanics/kinesiology lab for many years. Purchased initially in 1985, we have upgraded various components of the force platform system including the amplifiers, analog to digital converter, and computer. The reason we are requesting a replacement of the current system is due a consistent system error that we are observing in the initial phase of ground reaction force data collection. We have talked to the company and had WWU's scientific instrument center staff examine all components of the system. This ongoing troubleshooting has led us to the conclusion that we need to replace the system. Additionally, students are working on projects where the force applications are much higher than the capacity of the current system (ex. landings and sport applications). This force system is permanently installed in a specific space in our lab that has a mounting system built into concrete and into the room structure.

b) **Addition of the portable force platform system.** We have great need for a portable ground reaction force platform system to create more measurement opportunities for us in spaces other than the permanent mount location of the present force platform system. Specifically, we have installed a 7 camera motion analysis system that because of the room configuration could not be installed around the current force platform system. Until we get a new lab or can obtain some minor capital improvement funds to reconstruct a motion/force measurement space, we could use the portable force platform system to collect simultaneous ground reaction forces and three dimensional kinematic data. This takes our measurement capabilities to a much higher level of analysis and provides students with access to a system capable of measuring joint and total body kinetics and kinematics in combination. Additionally, students are very interested in other areas of ground reaction force usage involving posture and balance measures. Many students have worked with our older adult Mature Adult Training Program participants and having current technology to measure various stability measures with this group can be accomplished with the portable force platform system. This is an important area of investigation, given the increased likelihood that our students will work with older adults in their careers because of the shifting demographics of the country.

Body composition. An important area of measurement in kinesiology is body composition. Determining the accurate amount of lean and fat mass in the body is the most appropriate measure of body composition and provides much more valuable information than body weight measures. Because many of our students will be working in the prevention area, understanding the basis for measures of body fatness and obesity are important. Utilizing body weight or just body mass index (BMI) is not sufficient if one is attempting to provide subjects with meaningful wellness interventions, as it cannot differentiate between the amount of muscle and fat making up the overall body weight. The BOD POD purchase would provide students with the opportunity to work with state-of-the-art technology for measurement of body tissue. This device also allows for the measurement of resting metabolic rate and total energy expenditure and is equipment commonly used now in clinics and fitness settings.

In the past, students have been exposed to a variety of body composition measurement techniques including hydrostatic weighing, bioelectric impedance, skinfold calipers, and BMI. Each of these techniques has its own shortcomings. Hydrostatic weighing, while the most reliable of these measures, presents a major inconvenience to subjects who have to be immersed in a water tank. Additionally, hydrostatic weight tanks are not common in many health clubs or clinical settings where students will work after graduation. Skinfold caliper readings can be reliable with experience but there is still considerable variability especially with obese subjects. Bioimpedance has been shown to be very unreliable except under very controlled settings. Finally, BMI is a measurement of the ratio of weight relative to height and can overestimate body fat in lean and muscular athletes.

The Bod Pod measurement system has been shown to be one of the most reliable body composition measurement techniques available. It is used in many settings including health clubs, clinical settings, laboratories, and even the WWU Wade King Student Recreation Center, and therefore, students would be learning techniques that are directly transferable to their future employment settings. It is essential for our students to have training on the use of this equipment in order for them to be competitive for employment in the fitness industry.

II. Relationship to STF Objectives and Impact upon existing Academic Programs

Describe your proposed project in detail. Tell us how it will provide positive benefits to specific courses or instructional programs.

1. From a **student perspective:**

- a. How would this project provide additional student access to technological resources?

Students have been very interested in the force platform and the information that it provides on the biomechanics of human movement. Lab activities that examine the ground reaction forces produced during a variety of human movements have become an important experience that complements the course content in our kinesiology classes. By replacing our old platform system, students will be able to continue to have access to these lab experiences and to new ones. The proposed force platform system will increase access to students who want to explore human movement that

reaches higher force limits such as seen in athletic performances, which is a common area of interest for students when learning biomechanical principles. The portable force platform system will open up a major area of investigation which will allow students to take the force platform into different environments and will allow for ground reaction force data to be coupled with our motion analysis system.

In the body composition area, students currently do not have access to the BodPod technology. The addition of this instrument to our current technology applications in the labs will provide exposure to equipment that has become standard in the field.

- b. How would this project broaden or enhance the quality of the student's academic experience through the proposed technology?

Students will be able to broaden their knowledge and their technological skills in two important areas (force and body composition). By providing students access to current technology used in the field, they gain both expertise using the equipment and they are exposed to an important quantitative tool for exploring questions about human movement and structure. The availability of this equipment provides a much higher level of exploration of topics through labs and class projects.

The current emphasis in the United States and across the world on improving health and preventing disease by increasing fitness and reducing obesity is an important theme that is addressed in all of our classes in the Exercise Science curriculum. The measurement of body fatness is critical in order to demonstrate improvements in the reduction of overweight and obese levels and the effectiveness of personal and community oriented disease prevention programs. The state of the art equipment for this in clinical and fitness settings is the BodPod, and with training on the BodPod equipment in our courses, our students will be prepared to contribute to this health initiative in their future careers.

- c. How would this project integrate technology into coursework?

Both of these technologies will be integrated into courses through lab activities, course research projects, individual student research projects, and special projects. Every student majoring in the BS in Kinesiology and the BAEd in Physical Education will be exposed to these technologies through the required courses in our exercise science foundations. All students majoring in Community Health will also be exposed to the BodPod, as these students are required to take the Physiology of Exercise class. The technology will be used in a range of assignments and class projects and will utilize the technology to explore a diverse range of hypotheses.

2. From a **faculty perspective**, explain how this project will enhance your ability to help students meet their educational goals.

The human body is complex and, for this reason, it is challenging to explore the many aspects of the body without good technology. It is not sufficient to just guess whether a person is applying a large force or not

and we need tools like the force platform to provide us with a quantitative measure. Likewise, we cannot open up the body to explore structural components but it is very important that we do have an accurate representation of body tissue (i.e. fat, muscle) ratios. Technology has greatly enhanced our ability to study the human and without it we are severely limited. To provide students with the means to examine invisible forces (force platform) and to accurately determine human structural parameters (body composition) enhances our abilities as teachers significantly. We can illustrate more complex human problems and can measure them directly using this equipment. By providing students with lab experiences where they use this equipment, we are also providing them with skills that they can apply in the workforce. Body composition measures are common in both fitness and clinical settings where our students are employed after graduation. It is essential that our students are trained on the use of the equipment they will see in these clinical and fitness arenas. Another area of recent employment of our students is exercise equipment design (shoes, machines) and force measurement is a predominant technology used in that setting. Finally, we want to prepare students who value the use of technology to provide quantitative data on human parameters. Qualitative assessment still has its place, but the availability of this type of technology has greatly enhanced the accuracy and thoroughness by which we can explore and measure the human.

3. Will other departments be involved with this project? If so, please describe.
No, however, there is a possibility that other departments may have a use for the equipment and could arrange for its use. For example, students taking Biology 349 (Human Physiology) routinely make use of equipment in our Biomechanics and Physiology of Exercise laboratories as they carry out their class projects.
4. Has any part of this project previously been funded by STF?
- No Yes (Please describe):

III. Utilization

1. Please list the anticipated number of times and duration per each use, per quarter, that the proposed technology will be used by students.

This equipment will be housed in the biomechanics lab which is open to all students for 20 hours per week. This is a supervised open lab where students can use the equipment in the lab. In addition, students will use the equipment during scheduled lab hours associated with their class. After hour use can also be arranged by special permission allowing students access to the equipment after hours. There are approximately 440 students who are annually enrolled in biomechanics (120 students/yr), kinesiology (120 students/yr), exercise physiology (140 students/yr), nutrition and physical activity (40 students/yr), exercise prescription (40 students/yr; plus the generally university population during a week of free fitness evaluations conducted by the students in this class), and older adult assessment (20 students/yr) who will use this equipment. In addition, the faculty in our department are active in research, and involve students in the research projects on a regular basis.

Table 1. Summary of Activity in Kinesiology Courses

Course	# of students/yr	Force Platform Use	BodPod Use	Student hours/year
PE 311	120	One formal lab activity for 2 hours plus 6 hours of informal activity by arrangement. 50% of class will use the instrument in their class research project for an additional 6 hours during open lab.	One lab demonstration for 2 hours.	1560
PE 312	120		One lab activity for 4 hours.	480
PE 413	140		One lab activity for 6 hours plus 6 hours of informal activity by arrangement.	1440
PE 414	40		One metabolic analysis project	40
PE 415	40		One lab activity for 4 hours plus 6 hours of informal activity by arrangement. 30 hours of testing general university population via FitSteps.	1600
PE 409 (currently listed as 497)	20	One formal lab activity for 2 hours plus 4 hours of older adult testing of balance.	One formal lab activity for 2 hours plus 4 hours of older adult testing.	240
			TOTAL	5360 hours/yr.

Special Student Projects:

Undergraduate research projects (PE 493) have typically examined hypotheses incorporating principles from kinesiology, biomechanics, and exercise physiology. The force platform has been used in these research projects and the addition of the BodPod body composition measure will open up another area of investigation.

IV. Project Budget

This section of the proposal details the estimated cost of the project. Please include costs that will be covered by your department or another source, for ongoing costs such as personnel or operating expenses.

To assist you in preparing your budget, please consult with relevant campus support departments (ATUS, Purchasing, Space Administration, etc.) For more information, see this page on our website: <http://www.wvu.edu/stf/instructions.shtml>

ATUS has developed standard configurations for desktop and laptop PCs and Macs. Your project is not limited by these standards, but these figures may be helpful. Standard configurations can be found on the Student Technology Fee website: <http://www.wvu.edu/stf/instructions.shtml>

Please complete all of the following sections (attach Excel spreadsheet for any additional details).

Item	Quantity	Item Cost	Total
OR6-6-1000 Biomechanics Force Platform MSA-6 6 Channel Mini Amp Signal Conditioner/Amplifier Smf-1R Mounting fixture for force platform 7615-030-2-2 Force platform to amp cable	1	14291	14291
ACG-B-5740 AcuGait Portable Force Platform with Balance Clinic software	1	9300	9300
Educational Discount (15%)	1	-3539	-3539
1 BodPod Gold Standard Body Composition Tracking System	1	43124	43124
Shipping (taxable)		\$2000	
Subtotal			65176
Tax (8.4%)			5475
TOTAL			70651

We recognize your proposed budget as an estimate. Final funding for successful projects will be established after through technical review; some costs may need adjusting due to price changes. The STF Committee may impose special conditions may upon a project. See Sections B.7 & B.9 of the STF Mission Statement <http://www.wvu.edu/cms/WWU.STF/mission.html>

1. What funding is available from your department or other sources?
We will be able to contribute \$15,000 toward the purchase of this equipment. These funds will come from:
 1. \$3600 from course fees (PE 311, PE 312, PE 413, PE 415)
 2. \$1750 from PEHR operating budget lab allocations to biomechanics and exercise physiology
 3. \$2000 from Adult Fitness (WWU Foundation account)
 4. \$7650 from the Exercise Science Lab (WWU Foundation account)

2. Could this project be divided into discrete elements that could be funded separately?

No Yes Please summarize and prioritize project segments with cost estimate for each segment.

It could be funded in three segments:

1. **Permanent force platform replacement system = \$14291**
2. **Portable force platform system = \$9300**
3. **BodPod = \$43124**

3. Are lab fees charged for any of the courses that will use this equipment?

No Yes If yes, please note: the total funding requested from the STF must reflect the amount collected from course fees for equipment replacement and/or equipment acquisition. All proposals asking for course fees will be reviewed by the Academic Budget Office.

Yes, course fees are collected for PE 311, PE 312, PE 413, and PE 415. All of the funds in these course fee accounts are being applied to this purchase (see #1 above).

V. Impact on Existing Resources

The proposal should address your project's potential impact on existing resources. Special attention should be given to impact on data transmission networks (e.g. sources accessed, networking equipment, etc.), and personnel (e.g. staffing, administrative support, faculty support, etc.).

Any proposal that includes the replacement of computers should specifically address the feasibility and cost effectiveness of upgrading the computers rather than replacing the computers.

1. Describe how existing equipment is used. Contrast this to projected use if your project was funded.

Existing equipment is used for course laboratories, course term projects, individual student/faculty research, and for special projects. The use occurs through structured lab sessions and through access via supervised open lab hours. This new technology will be used in the same way.

2. Is similar equipment or technology available elsewhere on campus—such as the Student Technology Center, Classroom Services, Video Services, Western Libraries, a college lab? If so, please describe why the existing equipment doesn't meet the needs outlined in this proposal.

The force platform technology is not available elsewhere on campus. The Wade King Recreation Center does have a BodPod and they provide students with access to a fee-based body composition measurement common to health clubs. This is not accessible for our use on a regular basis and our students are not allowed hands on use of this equipment in that facility.

3. If this project involves the replacement of equipment:
 a. Describe the 'before and after' configuration changes. A spreadsheet reflecting these changes can be attached.

The permanent force platform system is the only replacement equipment:

BEFORE	AFTER
Platform, cable, amps/conditioner, mounting frame, computer, analog-to-digital converter	Replace platform, cable, amps/conditioner, mounting frame

- b. Describe the costs and benefits of replacing vs. upgrading (if applicable).
We have had this system for 20 years and have upgraded multiple components along the way. At this time, we are asking to replace the original platform and cable where we believe we have a system break down.

4. Will this equipment be available to students outside your department?

No Yes

5. If the proposed technology will be used by students outside your department, please describe how they would gain access, how the availability of the equipment will be publicized, the hours/week when the equipment will be available, and any costs that would apply.

Yes, students could use the equipment by permission and under supervision of a graduate student or faculty. The biomechanics lab is open for student use 20 hours/week. We regularly provide access to the equipment in the labs to students in the Bio 349 (Human Physiology) class.

6. Does this project involve the check-out of equipment to students?

No Yes If yes, please discuss whether or not the Student Technology Center could be assigned this task.

6. Does the department have adequate operating funds to provide on-going maintenance and support?

No Yes Please describe.

a) Course fees from biomechanics, exercise physiology, kinesiology, and exercise prescription can contribute to ongoing supplies and basic maintenance.

b) Other grant and foundation support has consistently been used in the past to support ongoing maintenance of the lab equipment.

c) There is also \$1500 in operating budget allocated for lab support for biomechanics and exercise physiology.

7. Does the department have adequate personnel funds to provide on-going staff support for this project?

No Yes Please describe,

Staffing consists of graduate teaching assistantships, faculty support, some equipment manager 2 support, and work-study student support.

VI. Space and Site Information

This section addresses any space alteration or site preparation necessary for the proposed project. Site alterations include painting, holes in walls, security systems, carpeting, construction, lighting changes, or conversion of a lab or office

Special Note: If this project requires any site preparation, or if this project uses any space not currently under control of the department, a draft proposal must be submitted to Space Administration by **Friday, November 14, 2008**. Space Administration and Facilities Management will conduct a site survey and respond back to you with information concerning project feasibility, cost, and schedule. This information must be included in the final project proposal.

Proposals for projects that involve any site preparation will be considered only after the required site survey by Space Administration and Facilities Management has been completed.

1. Location for installation of equipment or technology.

Carver 146 – Biomechanics Lab

2. Is site modification required?

No Yes Please describe. (Electrical, air, painting, lighting, security, network access, etc.)

3. Will this project use space not currently assigned to your department or area?

No Yes Please describe.

VII. Project Schedule

This section describes your overall implementation schedule. Project awards will be announced by the end of spring quarter. It is anticipated that projects would be substantially completed by the end of the calendar year. If there is any site preparation involved, please align your project schedule with the schedule provided by Space Administration and Facilities Management.

This equipment would be installed over the summer and requires no specific site preparation.

VIII. Constraints

This section should list any external or internal factors that could affect your project schedule, project objectives, or the project budget (e.g. if external approval is required for curricular changes, or if funding must be received by a certain date).

1. Please describe any constraints to this project.

There are no constraints to this project other than the price quotes for the equipment will expire after 30 or 90 days.

IX. External Funding

This section must be completed for any **projects over \$100,000**. For project budgets of this scale, the applicant should investigate opportunities for obtaining external funding for all or part of the proposed project.

1. Describe the external organization(s) able to provide funding in support of this project.

Not Applicable

2. Describe the funding cycle for these requests (submission dates, projected award dates).

Not Applicable

3. Indicate the amount of external funding that would be requested.

Not Applicable

4. In cases where joint funding is requested, what will happen if the STF award is made and the external grant is not awarded?

Not Applicable

5. Has a grant proposal already been submitted for all or part of the proposed STF project?

Not Applicable