Revised 11/16

Franklin-Simpson Educational Excellence Foundation, Inc.

GRANT APPLICATION COVER PAGE

Application must be typed. If you experience difficulty completing, please contact our office at 270-586-8018 or email fseducationalexcellence@gmail.com. Completed applications should be submitted via email to fseducationalexcellence@gmail.com in PDF form. Application deadlines are outlined below.

Applicant Name & Position: Robin Tyler

School/Organization Involved: FSMS

Amount Requested: $2,952.26

Purpose of Funding: The purchase of 3 different measurement tools from the PocketLab company to allow our students to collect the real-world data we currently lack sufficient tools to measure in the areas of temperature, velocity, acceleration, momentum, and various weather-related quantities.

Targeted Grade Levels: PreK-K 1-3 4-5 6-8 9-12 Other: ______

Number of Students/Persons Affected by Grant: 640

Academic Area: Reading Language Arts Social Studies Math Science Fine arts Community Other: ______

Brief Summary of Project (2 - 3 Sentences):

I would like to purchase various measurement tools from the PocketLab company for the science department of Franklin-Simpson Middle School to use. These tools include a set of PocketLab Thermos to measure temperature, a set of PocketLab G-Forces to measure acceleration, force, momentum, and velocity, and a PocketLab Air to measure weather and environmental data.

Address of School/Organization: 322 S. College St, Franklin, KY 42134

Contact Person: Robin Tyler

Phone: (Day & Evening) (270) 562 - 2550 **Fax:** (270) 586-2048

E-Mail: robin.tyler@simpson.kyschools.us

Grant Cycle Submitted: Feb. April Sept. Nov.

Required Signatures

Simpson County Schools:

Principal/Supervisor ______________ **Date** 8/22/23

Superintendent ______________ **Date** ______________

A. NARRATIVE

1. At FSMS our mission is: to inspire greatness, encourage accountability, and motivate students for success. PocketLab sensors allow students to efficiently collect their own data, which they can then use to draw their own conclusions and make their own improvements to their projects. Being able to collect individual data for their own project allows for student ownership and accountability in the products they are making, and the nature of these measurement tools allows for student engagement to motivate students to continuously strive to produce their best effort.

   Currently, our school does not possess any way for students to measure many physical quantities outlined in the Kentucky Academic Standards for Science, including velocity, momentum, acceleration, or contact force. The PocketLab G-Forces outlined below would allow students to collect this data easily and engagingly. We also currently have no method at our school to measure the atmospheric and environmental properties the PocketLab Air outlined below possesses, including air quality index, particulate matter, ozone, and carbon dioxide. Finally, our school would benefit from a more sustainable method of measuring temperature that the PocketLab Thermo sensors would deliver. Our school's number of traditional thermometers has dwindled over time due to normal wear and tear, with most teachers no longer having a half class set for students to use during partner work. The PocketLab Thermo sensors detailed below would provide a more durable and shareable method for obtaining temperature data.

   2&3. Three types of PocketLab sensors are included in this grant. Each is described in the table below:

Sensor Type	Quantities the Sensor Measures	Picture	General Purpose
PocketLab Thermo	Temperature (2 separate probes)		To measure and compare temperatures during experiments.
PocketLab G-Force	Velocity, Momentum, Acceleration, Displacement, Position, Rotation, Direction, G-Force	 Attachments (These allow for weights, strings, and bumpers to be attached).   Track (compatible with HotWheels Track)	To measure the transfer of force and energy during motion and collisions (these cars are designed to be suddenly stopped, crash into each other, drag weights, and travel on HotWheels brand track).

			
PocketLab Air	Ozone, Air Particulate Matter, Carbon Dioxide, Air Quality Index, Ambient Temperature, Humidity, Dew Point, Barometric Pressure, Light Intensity, Altitude.		To measure the air properties around our school throughout the year, and compare the air properties at different points around the school.

All of these probes are integrated into a free online system that stores student data, while allowing them to analyze their data, film and photograph their experimental setup, and answer questions both in written answers and drawn diagrams.

Below is a timeline of discussed projects and activities for all three grade levels as to how they can use the PocketLab sensors to more effectively and engagingly teach their standards:

Timeline	6th Grade	7th Grade	8th Grade
August - September	(MS-ETS1-1 and MS-ETS1-3) These standards have students design a solution to a real-world problem and evaluate the success of different possible solutions. Students will experiment designing the best way to keep a "house" (small box) insulated by using the 2 temperature probes on the PocketLab Thermo to compare the changes in temperature over a class period of a house they have engineered to be best insulated, versus a control house. Students can then compare their data to their classmates to determine which possible solution best met the criteria. This would also be used for beginning of the year discussions on experimental design and	(7-PS3-1) This standard has students investigate the effect of mass and speed on the kinetic energy of an object. Students will add and remove mass (in the form of washers) from the PocketLab G-Forces to examine the effect that adding mass has on the speed of a second PocketLab hit by the first traveling down a ramp. Subsequently, students will then investigate the effect that changing the inclination of the ramp has on the speed the car travels, and then how the speed of one car hitting another affects the speed the hit cars travels at. These two experiments will demonstrate the effect both mass and speed have on total kinetic energy.	

	control groups.		
October	(06-PS1-1) This standard involves students analyzing how the properties of matter affect its uses in the real-world. Students will use the PocketLab Thermos to compare the amount of ice that melts on various surfaces vs the temperature the material maintains as the ice melts. Students will then generate possible reasons why the ice melted at different rates and why the temperature of the materials changed at different rates (insulators vs. conductors, color, reflectivity, etc.). *This standard will be taught in 7th grade this year due to KASS re-alignment this year.	(7-PS3-2) This standard has students analyze the conversion of energy from kinetic to potential. Students will construct roller coasters using the PocketLab G-Forces that include hills and dips. Students will then use the velocity and displacement of the car at various points along the track to prove that though the car slows down at different points, the total energy is conserved as the energy is transformed from potential to kinetic, and vice versa.	
November - December	(6-PS2-1) This standard has students use Newton's 3rd Law to "design a solution to a problem involving the motion of two colliding objects". The PocketLab G-Forces will be used to collect data about the distribution of forces involved in the collision of 2 cars, and then compare student engineered solutions to minimize the force of the collision that impacts those in the car.	(7-PS2-2) This standard has students investigate what factors affect the total force of a moving object. Students will use the PocketLab G-Forces on a track with differing amounts of weight attached to them. Students will then let the weights fall off of the table, dragging the car with it (end pieces of the track will stop the car from flying off of the table). This will let them examine the effect that adding mass has on the velocity the car has while traveling, as well as the acceleration, a quantity	

		that as of now we have no accurate way to measure in class.	
January - February		(7-PS3-3) This standard has students investigate thermal energy transfer. Students will use the PocketLab Thermos to demonstrate how atoms reach thermal equilibrium by using the 2 temperature probes to analyze changing temperatures when hot and cold water are mixed. Students will also Examine the rate at which thermal energy is lost from a small cup of hot water versus a large cup of hot water to see that temperature changes more quickly in the small cup of water, as there are less atoms in the cup to change motion. Students will also use the PocketLab Thermos to observe temperature changes in endothermic and exothermic reactions.	(8-ESS3-3) This standard has students analyzing human factors that affect the air and environment. Students will use the PocketLab Air to examine data from multiple points around the school including the parking lot, pond, field, and the construction site where the new auditorium is being built to compare the particulate matter in each of these spots and hypothesize how to mitigate their impact in the most heavily affected areas.
March		(07-LS1-7) This standard has students analyze factors that influence photosynthesis. Students will use data from the PocketLab Air to model how areas with considerable photosynthesis happening have less carbon dioxide, as it is used in photosynthesis.	(8-ESS3-5) This standard has students examining factors that contribute to global warming. One of the main factors is the production of greenhouse gasses that trap heat in lower levels of the atmosphere. To demonstrate this, students will place one of the PocketLab Thermo's temperature probes into a sealed empty cup, and the other into a cup that has

			carbon dioxide being funneled into it (to achieve this, Alka-Seltzer will be dissolved in water, and connected via a tube to the cup). Both sealed cups will be put under a light source to heat them up so that students can see that the temperature increases faster, and remains hotter for longer, in the gas-filled cup.
April - May	(6-ESS2-5) This standard has students analyze atmospheric patterns and their relationship to regional weather patterns. Ms. Tyler's STEM class students will monitor and record data from the PocketLab Air throughout the year, also noting major storms, snows, etc. The data from the PocketLab Air will then be compared to the timing of these weather events to have students predict which atmospheric properties precede and influence major weather events.		

4. The goal for all of these experiments is to allow students to be accountable for their own experiments, data collection, and improvement, all while learning to take accurate data and scientifically analyze it.

B. EVALUATION

1. The PocketLab sensors and probes will be used in a variety of experiments across three grade levels, with each project and experiment having its own specific rubrics and criteria for success. As a general rule, individual projects and experiments will be considered successful if the overall student grade point average on the assignment is 80% or higher. Some of the leading questions our experiments will answer include:

6th Grade

- What factors affect the rate of thermal energy transfer?
- How does the transfer of thermal energy from an object (ice cube) to its surroundings support the Law of Conservation of Energy?
- How does matter's physical properties affect the rate it is able to transfer energy?
- How are the forces acting on two objects affected when they collide?
- How can car manufacturers minimize the transfer of forces to passengers in a car during a collision?
- What atmospheric properties allow scientists to best predict weather events?
- What are the similarities and differences in atmospheric conditions across different regions and different climates?

7th Grade

- What is the effect of mass on a moving object's kinetic energy?
- What is the effect of velocity on a moving object's kinetic energy?
- How does the change in velocity and displacement of a car on a roller coaster demonstrate the law of conservation of energy?
- What is the relationship between acceleration and the force of a moving object?
- What is the relationship between mass and the force of a moving object?
- Why will two objects of differing temperatures reach thermal equilibrium when touched?
- Why do materials with less densely packed atoms change temperature more quickly than dense objects?
- How can we model the behavior of atoms in endothermic reactions and exothermic reactions?
- What impact do photosynthesis and cellular respiration have on the air properties of an area?

8th Grade

- How does human activity affect local atmospheric conditions?
- What particulates improve and impair air quality.
- What actions can citizens take to improve local air quality?
- What is the relationship between greenhouse gas production and global warming?

C. BUDGET

Below is an itemized budget with the most cost-effective price for each item provided. If funding is given for this project, **please make the check payable to Robin Tyler,** as our school is unable to order directly from the PocketLab Company.

Item / Location	Cost per Unit ($)	Quantity	Purpose	Total Cost ($)
Pocket Lab G-Force set of 5 with chargers, case, and attachments	648.00	3	These sensors are mounted in a car and can measure velocity, acceleration, momentum and	1944.00

From PocketLab			force. The attachments allow for us to examine Newton's laws in a collision, and changes in motion when dragged or pulled.	
PocketLab Thermo From Arbor Scientific	40.00	15	This device has 2 connected temperature probes to allow students to monitor and compare temperatures in physical science experiments and during chemical reactions.	600.00
PocketLab Air From PocketLab	348.00	1	This device collects data on various atmospheric conditions which can be used to complete experiments concerning weather, climate, and environment.	348.00
Hot Wheels Straight Track Set (for the PocketLab G-Forces) From Amazon	23.99	2	These are straight track pieces for the PocketLab G-Forces to travel on. Students will use these to create different experimental setups.	47.98
Power Strip From Amazon	12.28	1	This will be used to keep the PocketLab Thermos and PocketLab G-Forces continuously charged to be checked out by teachers.	12.28

Total: $2,952.26

D. APPLICATION SUMMARY—The mission of the Franklin Simpson Educational Excellence Foundation, Inc. is "to supplement existing educational opportunities through funding to educators and community organizations in order to facilitate effective learning."

Students at Franklin-Simpson Middle school experience many observation-based labs and experiments that have students observe an event or phenomena and have their teacher explain the "why" behind their observations. The addition of PocketLab sensors and probes will allow students the ability to collect their own data to discover scientific concepts and laws, rather than be told these concepts and laws, and passively observe them without hard data. The use of these measurement tools would allow our students to better construct their own claims to predict scientific principles supported by their own self-created evidence and reasoning.