American Association of Physics Teachers



**Application for the Bauder Fund Endowment for the**

**Support of Physics Teaching**

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**Project Description: Inquiry Circuit Boards**

I am the lead teacher for an annual workshop held at Johns Hopkins University, intended for high school physics teachers, and overseen by an NSF program called QuarkNet.

One of the things we like to do at our meetings is to build devices for students and teachers to use in their classrooms, either as a demonstration device or as a piece of student lab equipment. This summer, a colleague and member of the JHU QuarkNet group came up with a prototype for a relatively inexpensive circuit board, and after some tinkering and discussion we think that it could be an excellent addition to the classroom.

Our primary focus, after building and testing the boards, will be helping the workshop teachers to learn and understand the different levels of **inquiry-based lab investigations**, which is a style that has become increasingly popular; and is indeed hardwired into the NGSS standards being adopted in many states including Maryland. We have written some sample inquiry tasks for the teachers to complete, starting as low as “level 1” (task and procedure provided), progressing through levels 2/3 (topic question provided; learner must create procedure) and even including level 4 (only topic is provided; learner must develop both question and procedure). We feel that these circuit boards will provide a fantastic opportunity for the teachers – and eventually their students – to really delve into circuit ideas in a clear and simple way,

We are going to pay out-of-pocket for the teachers to each build a prototype board of their own, because the workshop runs 23-27 July and therefore occurs before this summer’s AAPT meeting. The budget request, therefore, is intended to pay for the materials for an additional 10 boards for each of the 16 teachers, meaning a total of 160 boards. We have come up with a parts list that costs approximately $14 per board, making these much less expensive than an analogous device for sale in a science educational supply catalog.

**My Expertise**

I have been leading the JHU QuarkNet group for the last 5 years and have also run a different QuarkNet workshop at Fermilab for the same 5-year interval. This project is intended for introductory-level students and so there is nothing conceptually outside my abilities as a physics teacher.

**Dissemination**

Many of the teachers in our workshop group are members of AAPT. Following successful implementation of the circuit boards in their classes, we plan to share our design in a few ways. If permitted, we would give a talk at the annual AAPT summer meeting as well as the Chesapeake regional meeting, to share the design of the board and how we’ve used it. Further, the board design and a description of how it can be used in inquiry-based lab investigations would make for a nice article in *The Physics Teacher* and we would therefore submit an article to same. I frequently participate in presentations in my local district’s science meetings, and would love to share the results of this project with my fellow physics teachers in the district. We would also share the board design with other members of QuarkNet at several dozen centers across the country, who could then distribute the design and lesson plans to their own schools and local meetings.

**Time Line**

* 23-24 July, 1-5 pm: Assemble and test boards
* 25-26 July, 1-5 pm: Conduct inquiry tasks and comment/reflect on successes and failures
* 27 July, 1-3 pm: Teachers design their own set of inquiry tasks for use with their own students, and share resulting ideas with rest of workshop at the end
* Ongoing, 2018-19 school year: teachers build the rest of their circuit boards and implement their lesson ideas with students

**Itemized Budget**

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| --- | --- | --- | --- | --- |
| Item | Qty | Price | Subtotal | Supplier |
| Plywood, 11/32", 4' x 8' | 5 | $22.53 | $112.65 | Home Depot |
| 6-32 1 1/2" Oval head Phillips machine screw, 1000 | 5 | $40.16 | $200.80 | Amazon |
| 6-32 Washer, 1000 | 5 | $16.99 | $84.95 | Amazon |
| 6-32 hex nut, pack of 100 | 42 | $8.00 | $336.00 | Amazon |
| Capacitor, 1000 uF, set of 5 | 32 | $5.99 | $191.68 | Amazon |
| Resistors, Variety Pack | 16 | $9.99 | $159.84 | Amazon |
| Photoresistor, pack of 100 | 2 | $7.99 | $15.98 | Amazon |
| LED, 120 degree viewing angle, 100 | 4 | $5.50 | $22.00 | TBD |
| 2x C battery holder w leads | 160 | $1.00 | $160.00 | eBay |
| SPDT Knife Switch | 160 | $3.00 | $480.00 | eBay |
| DC Piezo Active Buzzer w leads, 6 | 27 | $9.89 | $267.03 | Amazon |
| Solder, 0.6 mm lead-free | 2 | $10.99 | $21.98 | Amazon |
| Jumper Wire, 6" 100 pcs | 16 | $7.29 | $116.64 | Amazon |
|   |   |   |   |   |
| Estimated Tax | 1 |   | $120.00 |   |
| Estimated Shipping | 1 |   | $50.00 |   |

**Total estimated budget: $2339.55**

Send completed application to: programs@aapt.org

