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### Foundation of the Leaders, by the Leaders, and for the Leaders

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#### Abstract

Funding Peer-Led Team Learning (PLTL) initiatives after the grants run out has been a long-standing and often devastating issue within the greater PLTL world. We propose consideration of local independent nonprofit organizations (Local Foundations) or possibly Local Chapters within PLTLIS to advance Science, Technology, Engineering, and, Mathematics (STEM) education through the PLTL model. The proposed Foundations are envisioned as collaborations of:

- Academics;
- Industry leaders;
- University Students;
- Members of the local education district; and
- High School teachers

to be run and funded locally from the ground up rather than from top down. This will give the Leaders and those directly interacting with them more opportunity to govern their own path without university encumbrances, such as Development Office, Administration, or System/University/College politics, restrictions and fees. The purpose of the Foundations is to provide K – 16 pupils with the requisite skills to enter and succeed in higher education STEM (or any other) disciplines. The function includes aiding instructors in the K – 12 realm to enable students toward successful transition to higher education. Independent foundations organized and overseen by the Leaders can promote PLTL using outstanding students from Universities/Colleges, High Schools and Community Colleges. Foundations can seek funding from local and federal government entities, individuals and most importantly businesses/industries and other philanthropic organizations.

#### Introduction

Great need exists for sustainable solutions to improve STEM education and to increase the number of STEM graduates. Instructors in higher education are increasingly faced with a decline in capability of entering freshmen in their ability to grapple with the tasks of learning. They do not have the skills in numeracy (or literacy) required nor have they acquired the ability to study. As a result a significant difficulty in freshmen courses, in particular in the STEM disciplines, the more able students become complacent and one of two scenarios occur, namely:

- a) The instructor maintains the requisite standard and many students are unable to keep up. Thus these students become disenfranchised with the course content, fail, and sometimes drop out of STEM disciplines or higher education altogether.
- b) The instructor "waters down" the course content, in which case, able students become complacent; this triggers an avalanche of inadequate foundations for content understanding in subsequent courses.

There is a real threat to the future of STEM education in this country. In the absence of sustainable long-term solutions capturing the interests of the able and improving the status quo of the weak in STEM education, a catastrophe of monumental proportions is just around the corner and we are just riding out the eye of the storm.

### Solution

Peer-led team learning (PLTL) (Gosser and Roth, 1998; Gosser et al, 2001) provides a proven method for improving the quality and increasing the number of STEM students (Gosser, 2011) and graduates (Becvar, 2012; Becvar et al 2008). It is not the intention of PLTL to replace traditional lectures but to complement them in delving into complex ideas within settings more conducive to learning and by promoting active learning discussions among students. Peer leaders, who have taken the specific course in the past and who have demonstrated outstanding abilities in its subject matter understanding guide the learning in a small group, team-based environment.

As a product of the British system of education, the first author has noticed that a fundamental issue in El Paso and probably much of the US (and the UK for that matter) is the weakness of students not necessarily just in understanding the science and math, but rather applying the fundamentals to solving problems. This shortcoming is probably a result of Standardized Testing and results from poor educational preparation received in high school that trickles down to the university. The authors propose that the non-profit established be strongly encouraged to work with the local high schools, educational governing districts, or other relevant authorities. In particular this would entail the extension of the PLTL model to high schools (with the difference that university students be mandated to carry out part of the leading roles). The PLTL model at present largely acts to remedy the shortcomings of the students already in the pipeline rather than fundamentally to influence the learning process. Therefore preventive action at earlier stages is of great importance. Earlier and more thorough preparation may well be major issues that must be taken into consideration when assessing the impact of PLTL. Involvement of peer leaders within the program at the secondary level may also further promote teaching as a career among the students at the university level.

### Financial Issue

A fundamental problem is funding. The PLTL method is cost effective in that almost all the expenses involve paying undergraduates. Undergraduates work for essentially minimum wage. Many undergraduates pay for their education by working local jobs at minimum wage off campus. PLTL provides an on-campus work opportunity relevant to their curricular endeavors. University budgets are set up with budget lines for staff and faculty members (and high paying budget lines for administrators), but usually not for student learning facilitators like peer leaders. With time, this should change and the change should be a goal of an organization like the Peer-Led Team Learning International Society (PLTLIS). However, immediate solutions are needed for immediate needs – otherwise the demise of PLTL may result. Some institutions like Florida International University have found successful strategies to compensate leaders with letters of recommendation and accolades provided at the time of graduation. But is it ethical for an

institution of higher education to base a significant part of its learning function on the voluntary activities of some, especially if the time commitment for those voluntary activities prevents the earning of wages within the local economy?

One solution to the financial issue is establishment of local non-profit organizations. The STEM non-profit Foundation is to seek funding from local and federal government, university, individuals and most importantly businesses/industries and other philanthropic organizations such as the Gates Foundation (<http://www.gatesfoundation.org/postsecondaryeducation/Pages/default.aspx>). A foundation in Washington with a STEM focus exists ([http://washingtonstemeducation.org/about\\_wssef/](http://washingtonstemeducation.org/about_wssef/)): “Known as the STEM Foundation, we support a view that STEM literacy is a foundational skill which matters for all careers, not just the technology workforce. STEM builds critical thinking abilities because it addresses how we view and experience the world around us. Especially at a time when global challenges in water, climate, and energy require broad and comprehensive solutions across policy and technology, proficiency in English, mathematics, technology, and science, as well as literature, history, and the arts will be essential. Our future workforce must be comfortable with ideas and abstractions, analysis and synthesis. Gaining a STEM proficiency provides the foundation for these skills, and also helps build the flexibility to adapt quickly to frequent changes in the labor market that are expected as global shifts in the economy become faster.”

A key message here for any potential donor to a PLTL foundation ought to be that they are investing in the future of STEM education, not simply donating money to a foundation. Notwithstanding the benefits of PLTL its organization and logistics remains a significant challenge. Thus we have proposed the establishment of an independent non-profit organization with a structure and purpose similar to the Lead For America Corporation.

#### Lead for America Corporation

Lead For America Corporation (LFAC) was established as a non-profit organization in 2012 as a vehicle to provide funding to support PLTL activities at UTEP. The founding Directors donated intellectual property to LFAC for this benefit (Becvar et al, 2012a; Becvar et al, 2012b). The founding LFAC Directors envision the organization as a model for a local entity to support PLTL in all respects within the K-16 realm including fundraising and fund-distribution. Other kinds and forms of intellectual property could be similarly donated to The Peer-Led Team Learning International Society (PLTLIS) for a similar national purpose. Local Chapters of PLTLIS could be established and organized by the PLTLIS Board of Directors based on certain membership covenants established by PLTLIS. Each Local Chapter of PLTLIS could consist of students and academics to ensure all stakeholders are represented in the organization.

#### Income/Expense

To ensure the sustainability and survival of any foundation, a funding mechanism must be in place. Again, the LFAC model might be adopted for the financial support of Local Chapters of PLTLIS. Intellectual property specifically designed for PLTL team activities and other resources could be donated to PLTLIS in the form of Resource Books, Workbooks, Strategies and Solutions Manuals, Homework Systems, Course Assignments, Learning Activities, etc.

At the University of Texas at El Paso, learning frameworks for each of the two semesters of General Chemistry in the form of Workbooks (Becvar et al, 2012a; Becvar et al, 2012b) have been donated to the LFAC Organization. The non-profit Organization holds the copyrights to the two Workbooks and all other rights. LFAC has sold copies of the Workbooks to the University Bookstore and an off-campus bookstore. Because the Workbooks represent faculty-generated-materials, the University System has established

guidelines for the maximum dollar amount that can be generated in this case. The proceeds received by LFAC over cost of production is limited by the University of Texas System to \$5.00/Workbook copy. This is donated to a Gift Fund to support PLTL activities at UTEP. Unfortunately this amount does not cover the estimated cost of nearly \$50/student needed to pay the peer leaders facilitating the learning in the two courses for which the Workbooks are used.

The \$50/student cost is calculated in the following way. At UTEP each peer leader guides two workshops per week, each workshop with approximately 15 students. A semester is 15 weeks, with one extra week of pay for training. Each leader is paid for ten hours per week (4 hours of Workshop + 2 hours of prep/preview + 2 hours of lecture + 2 hours of preparation/ review/ office hours/ additional duties). Thus each leader works 16 weeks x 10 hours/week x \$8.50/hour = \$1360.00 for the cost of the semester. Assuming that 30 students populate the two workshops in the semester, this represents \$1360.00/30 students = \$45.33/student. The cost for a few expendables consumed by the students in workshop [e.g. household chemicals used in the Explorations (see article in these Proceedings)] makes up for the discrepancy between \$43.33 and \$50.00.

It is proposed for consideration that additional intellectual properties generated by local chapters be donated to PLTLIS for use and customization by other chapters. Peer leaders have also taken on the initiative to attempt to create a new improved textbook based on their experiences with the students. These textbooks can be edited by faculty members. The intellectual property rights associated with any product generated can be donated PLTLIS. It is anticipated that local chapters will adopt a customized version of the textbook as a standard text for each course. The proceeds of the sale of the textbook will be collected by each chapter to support peer leaders and further development of PLTL.

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