

STEM Enrichment: After School and Beyond

Primary goals and Impact Report

Center for Literacy, Education and Employment (CLEE) is undertaking a significant new outreach project entitled *STEM Enrichment: After School and Beyond*. We are requesting ORU funding to develop collections of research-based, high quality Science, Technology, Engineering, and Mathematics (STEM) curricular resources to be used in out-of-school programs for all levels (from pre-K to adult learners) and to continue pilot testing this approach with various audiences. The support of this initiative by the ORU grant will ensure that all the elements of the proposed STEM enrichment curricular materials will be fully developed and will provide the basis for future STEM education grant proposals with the goal to offer STEM resources to all teachers, parents, and community-based providers of out-of school programs for various ages (pre-K – adult). This bank of curricular resources will be appropriate for a wide variety of grant proposals, which we will be able to prepare and submit with increased frequency. The streamlined approach will enable us to “plug” appropriate curricular resources meeting the needs of each particular proposal, increasing productivity and relieving some of the stress and reluctance often accompanying proposal preparation. The University will largely benefit from this innovative approach, since the amount of proposals submitted within the next two to three years will lead to new research funding awards.

CLEE has a history of researching, conducting professional development, and advocating for lifelong learning. As part of this goal, the School and Family Support team within the Center focuses its attention on learning that takes place in the home, in schools, and in the community. Through education, workshops, websites, other resources, and research and analysis, the Center works with staff of agencies and schools, as well as with parents and community members to ensure that information and resources about what works best for learning is available to teachers, family members, and others in the community who work with children and families. The Center is envisioned as an international leader in achieving and maintaining a future where all individuals have the knowledge, skills, and opportunities needed to flourish in an increasingly complex and interconnected world. The Center’s mission and vision have directed their involvement in Tennessee’s *First to the Top* initiatives, particularly those focusing around STEM Education and Common Core State Standards. The Center has been instrumental in developing *ReadTennessee.org*, *MathTennessee.org*, and *TNCore.org* websites from the Tennessee Department of Education (TDOE), and has recently received a grant from the U.S. Department of Education (DOE) to incorporate research-based resources for out-of-school providers into the *ReadTennessee.org* website to make it available to Tennessee out-of-school programs.

Through a well-developed partnership with the UT College of Engineering (COE), the Center has gained access to many resources that improve capacity for integrating engineering into STEM elementary and middle school programs. COE graduate and undergraduate students are involved in the Alcoa Elementary pilot. With the ORU-funded project, we will continue to develop partnerships with the COE as well as other STEM departments and will be able to fund additional graduate students. We are also proposing to publish and otherwise disseminate our STEM curricular resources, with a particular emphasis on the dissemination to potential funders.

Outlook and the Funding Proposal

STEM Enrichment curricular resources will extend STEM learning beyond the regular school day for children and adults. The University of Tennessee Center for Literacy, Education & Employment has begun development of the STEM enrichment curricular resources bank as a part of their current partnership with Alcoa Foundation, Y-12, Alcoa City Schools, US DOE/WestEd, and UT College of Engineering. We are looking to expand the curricular resource bank to other grades (pre-K, high school, and adult programs). In addition to the current funding from Alcoa Foundation, WestEd, and Y-12, we have pending proposals to the UT Alliance of Women Philanthropists and New York Life Foundation.

The need for this project arose from three national initiatives that are currently being

implemented in Tennessee and nationally: emphasis of STEM at all grade levels; Common Core State Standards in Mathematics and English Language Arts, to be followed shortly by Next Generation Science Standards; personalization of learning (a priority in the current Race to the Top district-level national grant competition); and the new high school equivalency exam, which will require significant STEM preparation for adults and youth. While all these areas are being addressed in Tennessee schools, the out-of-school programs are largely left out of these initiatives or at best, are addressing only one of them. This is unfortunate because out-of-school programs provide excellent opportunities for personalization of learning because of a) a close relationship with families (whom they see practically every day, unlike regular school teachers) and b) smaller groups and capacity to provide one-of-one instruction because of higher involvement of volunteers and other mentors. However, frequently out-of-school programs are completely left out of instructional planning taking place in schools and are not informed about what is taking place during the school day. This project will be able to combine these components (Common Core, STEM, personalized learning, and commitment to the alignment of in-school and out-of-school instruction and to parent involvement) in the *STEM Enrichment* curriculum. We were very fortunate to have found a worthy partner in Alcoa Elementary School whose staff has already begun exploring these issues and where the first (elementary) STEM enrichment curriculum is currently being piloted.

At elementary level, *STEM Enrichment* increases student achievement through a combination of student enrichment activities and parent engagement activities. Twenty-two families of students in grades 3-4 have been recruited from Alcoa Elementary School and the curriculum is being implemented during the AES extended Spring break. This curriculum can subsequently be modified to be used in any out-of-school program for pre-K – 12 students and for programs serving adults and adolescents out of school. The curriculum has been aligned with Common Core Standards for Mathematics, especially the Tennessee Focus Standards that all schools will be working with in the coming year. It also includes the tools and strategies from the U.S. Department of Education's *Doing What Works* resource collection on the topic "*Increased learning time: Beyond the regular school day.*" In the future phases, the curriculum will be further refined to be aligned with the Next Generation Science Standards (to be released in several months).

Key elements and activities of the elementary *STEM Enrichment* include:

- US DOE/WestEd *Doing What Works* collections (particularly those on *Increasing Learning Times Beyond Regular School Day*, *Critical Foundations for Algebra*, *Encouraging Girls in Math & Science*);
- Resources from *MathTennessee.org* and *TNCORE.org* websites developed by the T DOE and dedicated to Common Core implementation through best research-based instructional practices;
- UT College of Engineering Office of Diversity and UT CURENT summer program activities especially designed for introducing engineering concepts to underrepresented populations;
- Science Olympiad;
- Engineering is Elementary by the Boston Museum of Science (NSF-recommended resource);
- Mechanical Engineering curriculum for girls from National Center for STEM elementary education;
- Biology in a Box developed by UT NimBios;
- Supplementing the STEM curriculum for students with parent education/parent involvement activities with STEM emphasis. The parent strategies are grounded in the research-based framework *Forty Developmental Assets* from the Search Institute as well as the Goodling Institute's Family Literacy model. One component will be PACT (Parent and Child Together) time devoted to interactive math literacy activities.

The evidence of the effectiveness of the curriculum will come from a statistically significant increase in participating students' test scores. In addition, participating students will have an increased

self-efficacy and interest in STEM subjects. Parents will understand the importance of their support and learn strategies to enhance that support. This will be measured through a survey and parent interviews. It is anticipated that general information about the project and later follow-up will be shared on Channel 3, the local cable station in Alcoa. Related press releases as approved by the sponsors will be released to the two local newspapers. In addition, after the project is completed, a report of the curriculum and the pilot results will be shared at education conferences and disseminated through United Way and UT Extension. Finally, the resulting curriculum will be linked to the *MathTennessee.org* web site, providing a concrete and useful resource in the area of STEM education.

CLEE has accumulated a rich collection of STEM elementary curricular resources for out-of-school programs through Alcoa Elementary pilot project, and through our work on *MathTennessee.org* and on the dissemination of the Increased Learning Time Doing What Works collection. We would like to continue growing our collection to reach other age groups. Through our partnership with the TDOE TNCore project staff, we have access to a variety of middle school resources, and through our *MathTennessee.org* Community Portal work we have developed relationships with many community organizations serving middle school students outside school hours. This would enable us to develop a middle grades STEM curricular resource collection, and we could partner with several local school systems and write proposals for implementing a STEM middle school enrichment curriculum very soon. As for our adult and adolescent STEM work, CLEE has a long history of proposals and partnerships with organizations serving adults and adolescents out of school. For example, we have provided adolescent literacy workshops and technical assistance in high school redesign and improvement. We are working extensively with many programs serving out-of-school youth and we constantly hear from them how great the need is for high quality STEM resources. One of these programs, WAVE, is on UT Campus, and we have partnered with them before in successful grant proposal. WAVE would be a natural site for piloting adult STEM curricular resources, which then could be included in many grant proposals to different funders.

One other audience that could immensely benefit from our ability to use our resource bank to apply for STEM grants would be individuals with disabilities. CLEE has already conducted several projects serving children and adults with disabilities and we have excellent working relationships with the Tennessee Council on Developmental Disabilities, TDOE Special Populations Division, TN Special Schools, and others. From our work with these institutions we know how great the need is for STEM resources for individuals with disabilities. This priority is recognized by many national and state funders, and our designated resource bank will enable us to react speedily to any RFP targeting these populations.

Budget

Position	Rate Yr 1	% Effort	Year 1	Rate Yr 2	% Effort	Year 2
Principal Investigator	60,408	30%	18,122	62,220	30%	18,666
Program Coordinator	50,000	30%	15,000	51,500	30%	15,450
Budget Manager	52,791	10%	5,279	54,375	10%	5,437
Admin Services Asst	38,175	10%	3,818	39,320	10%	3,932
GRA 1	27,540	50%	13,770	27,540	50%	13,770
GRA 2	27,540	50%	13,770	27,540	50%	13,770
Benefits			14,160			14,466
STEM Consultants			2,000			2,000
Printing and Supplies			1,750			1,750
Communication			500			500
Total			88,169			89,742