

# **Discussion of Claremont Graduate University Experimental Program Proposal April 2013**

## **Introduction**

This agenda item presents a concept paper submitted by Claremont Graduate University (CGU) describing an experimental Career Technical Education credential preparation program focusing on Science, Technology, Engineering, and Mathematics (STEM) that the institution proposes to submit to the COA. If the COA agrees that the concept paper meets the goals and objectives for Experimental Programs as defined by the Experimental Program Standards document, it may provide feedback to the institution and signal its interest in receiving and considering a full experimental program standards proposal.

## **Background**

The Experimental Program Standards have existed for a number of years, but have been updated or revised several times. The current standards were approved by the Commission on Teacher Credentialing in 2008. The current Experimental Program Standards are available at: <http://www.ctc.ca.gov/educator-prep/standards/Experimental-Program.pdf>.

The experimental program option is designed to encourage innovations in educator preparation and investigation of those innovations, with the aim of increasing the profession's understanding of professional learning and improving professional practice for the benefit of all students in California. Experimental programs were provided for in Education Code 44273(a) as a way for programs of "merit and the potential of improving the quality of service authorized by the credential" to be developed. The goals for experimental programs include the following:

1. As with all other Commission program completers, experimental program completers have the necessary knowledge, skills, and abilities as identified by the Commission's candidate competence standards to teach and support student learning for all children in California public schools.
2. Program completers can, through their practice, meet the needs of populations that have been underserved and contribute to the success of all students (including meeting the needs of English language learners and/or helping to close the achievement gap).
3. Experimental programs contribute to the construction of new knowledge and scholarship on educator preparation to improve student learning.

The proposed sponsor program submits a concept paper for presentation to the COA. This brief document is reviewed and discussed by COA members for its potential in contributing to the knowledge base of educator preparation literature and experience and whether it meets the overall objectives for Experimental Programs. The COA may ask the potential sponsor to continue to develop the program and the research project around the project. The research portion of the proposal must identify the key, current literature leading to the program idea, identify research questions to be answered by the experimental program, describe the program's implementation, and evaluate the outcome of the program by answering the original research questions.

After the Commission receives the full proposal, reviewers are selected who have familiarity with the subject area and who have experience developing and completing research programs. These trained reviewers read and discuss the proposal for its alignment with the experimental program standards. Generally, the proposal needs to be returned at least once to the proposed sponsor because reviewers adhere to the standards carefully.

Once the reviewers are satisfied that the proposal is aligned with the standards, staff brings the item before the COA for consideration and action. If the COA approves the proposal, the experimental program may begin to operate. The current experimental program standards require the program to participate in all of the routine accreditation activities but cannot run as an experimental program for more than seven years.

### **Questions for COA Discussion**

Appendix A presents the concept paper from Claremont Graduate University to offer STEM as a trans-disciplinary subject for current mathematics and science teachers and for current STEM professionals who want to become educators via the CTE option. COA will discuss this paper and determine whether it would advise the proposing institution to continue to develop the project into the full proposal for submission to the Commission as an Experimental Standards program. In making that determination, COA may want to consider the following questions:

1. Does the appended (Appendix A) concept paper describe an experimental or novel preparation program? Does the concept paper describe the project as a “next step” for extending current knowledge being discussed in educator preparation professional literature?
2. Would the program, if approved, add to the current educator preparation knowledge base?
3. Does the project, as described in the concept paper, seem plausible and likely to be successful in preparing educators?
4. Is the concept generally aligned with the objectives for Experimental Programs as articulated in the Experimental Programs Standards?

## Appendix A

STEM/CTE Credential Experimental Program Proposal Brief:  
Claremont Graduate University  
Teacher Education Program

## **Problem**

The vision and priorities for K-12 education in the 21<sup>st</sup> Century are now established and changes in how and what is taught in K-12 classrooms are well under way. Nowhere is this more evident than in the Common Core State Standards (CCSS) which have been adopted by an overwhelming majority of States; a clear indication that there is widespread consensus around the idea that a baseline education must ensure all American students are college **and** career ready and that they are able to compete in the global arena (Kendal, 2011). Concurrently, a similar effort is underway to develop the Next Generation Science Standards (NGSS). Although the NGSS have not been finalized recent drafts indicate that they will represent a conceptual shift in science education that mirror the CCSS—that is they will focus on deeper understanding and application of content, practice and core ideas. Specifically, the NGSS place particular emphasis on the integration of Engineering and Technology into the structure of science education as recommended in *A Framework for K–12 Science Education* (NRC 2011). Together these shifts underscore the urgent call to enhance integrated Science, Technology, Engineering and Mathematics (STEM) education in the United States (Committee on Prospering in the Global Economy of the 21st Century, 2007), (PCAST 2010). PCAST (2010) made recommendations to educate 100,000 highly skilled STEM teachers and create a national corps of Master STEM teachers who can lead the way in a new kind of STEM education. Yet we have no common definition of what a “highly skilled STEM teacher” should be able to do or exactly what STEM education should look like. Some have defined STEM as a “meta-discipline” or an interdisciplinary approach to teaching that bridges the discrete disciplines of science, technology, engineering and mathematics. This approach allows students to make sense of the world holistically instead of in disconnected bits and chunks (Morrison, 2006). Some specifically include the coupling of rigorous academics and real-world application in contexts that assist students in making connections between school, community, and work (Tsupros, Kohler & Hallinen, 2009). Lantz Jr. (2009) states that STEM is more than an interdisciplinary approach and is in fact trans-disciplinary; an approach that drives innovation in the naturally overlapping boundaries of the sciences. Clearly we cannot charge our teachers to teach what they do not know – and for the most part, they do not know how their discrete disciplines are integrated in the workplace if don’t have that experience or training. To date, this need has been met through Career and Technical Education credentials that are given to skilled workers so they can enter the educational system to teach students a variety of vocational education paths. But we do not have sufficient numbers of STEM professionals willing to get additional training to get this credential and leave their profession to meet the call for 100,000 more STEM teachers. Moreover, as defined by the National Science Teachers Association (NSTA), STEM Education attempts to transform the typical teacher-centered classroom by encouraging a curriculum that is driven by problem-solving, discovery, and exploratory learning. It requires students to actively engage a situation in order to find its solution (NSTA, 2012). We will state further that for the purposes of this proposal STEM Education also includes pedagogy that promotes and develops the transferable skills students need to successfully engage in this type of problem solving, namely; critical thinking, collaboration, communication and creativity in the real world. Thus, as described above, STEM Education is a way of teaching and learning that more closely reflects and prepares students for the demands of future STEM careers whose precise form and shape we cannot know. As such, there is no existing credential in California that fully prepares teachers to meet this unique need. There are several challenges that exist within the context of the current credential system that teacher preparation programs face in preparing this new “breed” of

teacher:

1. There is currently no credential that defines the content knowledge, and pedagogical skills and experience that teachers must have in order to prepare students for college and careers in STEM in the 21<sup>st</sup> century.
2. Career and college readiness have historically been considered two separate “tracks” with career preparation falling under the purview of the CTE credential and college readiness falling under the traditional subjects credential. Each with its own set of content standards as well as credential criteria/requirements for teacher preparation.
3. Despite the existence of alternative teacher certification programs aimed at training individuals experienced in industry to become CTE teachers, there is still a shortage of CTE teachers in the STEM fields.
4. While alternative teacher certification in California allows skilled workers to earn a CTE credential, there are no such paths for current teachers (those that do not have 3 years of specific pathway work experience) to earn a CTE credential.

These challenges form basis of the central question in this proposal, namely; how can the literature on STEM/CTE Education, CCSS, NGSS, and Effective Teacher Education help guide the development of an experimental STEM/CTE Credential that 1) ensures teachers have the content knowledge, pedagogical skills and real world experience necessary to best prepare their students for college and careers in STEM as described above, and 2) addresses the STEM/CTE teacher shortage by providing current science and math teachers pathways for earning this experimental STEM/CTE credential.

### **Proposal**

Our proposal is to address this problem by designing and implementing an experimental STEM/CTE credential program that provides a pathway for current and prospective teachers to earn this credential through a combination of academic coursework and work based field experience. Our rationale for creating this experimental STEM/CTE credential is twofold: 1) the authors of the NGSS are very clear that the goal is not for schools to develop separate STEM courses but rather to include core concepts related to careers in engineering and technology into existing curriculum. The STEM/CTE credential would thus provide current math and science teachers with the knowledge, skills, and work-based experience necessary to accomplish this goal 2) given the difficulty in recruiting new science and math teachers, those math teachers who are currently in the classroom have the foundational skills, pedagogy and content knowledge and are best positioned to obtain this integrated STEM/CTE credential. 3) While the design of the program would target current teachers, professionals with experience in STEM fields (non-teachers) would still be able to earn a STEM/CTE credential just as they would in any other designated subject. Our approach would involve designing and implementing a new STEM/CTE credential in collaboration with STEM and Education professors from the Claremont Colleges with input from our community college partners. Upon completion of the STEM/CTE preliminary program current math, science and technology teachers in California will have the knowledge, experience and pedagogical skills to teach STEM subjects in a trans disciplinary, problem-based, and career-centered way to educate and inspire their students towards advanced study and/or career paths in STEM fields. For professionals that are not teachers, it would provide them with the foundational knowledge, skills, and pedagogy necessary to teach an integrated STEM/CTE course at the secondary level.

## **General Program Description**

Teacher Pathway: The experimental STEM/CTE preliminary credential we are proposing would consist of 9 semester units specifically designed to help teachers build trans-disciplinary academic skills in context, with an emphasis on real world problem solving, critical thinking and career readiness through the integration the state adopted CTE 7-12 curriculum standards with the K-12 academic standards. Of the 9 units, 3 would be a work-based externship consisting of a minimum of 135 hours of approved relevant work experience in a STEM related industry. As such this credential would build on current teacher's content knowledge; pedagogical skills and classroom experience by providing them the practical experience in a STEM field. Each course will introduce a highly adaptable set of approaches/methodologies/skills that teachers will then be able to extend and modify to a variety of situations well beyond the specific content of that course. It is expected that candidates in this program will meet some of the foundational requirements including the early orientation items related to teaching and learning in the k-12 classroom outlined in the CTE Program Standards by being concurrently enrolled in a General Education Credential program or by having a preliminary general education credential. All other program requirements will be met through 2 specifically designed 3 unit courses.

Professional Pathway: The STEM/CTE professional pathway will be designed for skilled professionals who have a minimum of 3 years work experience in a designated STEM field and are interested in teaching an integrated STEM/CTE course aligned with the 7-12 CTE curriculum standards and K-12 academic content standards. This pathway will consist of 12 units. The first 3 units will meet the early orientation requirements as well as foundational skills related to curriculum, learning and instruction and assessment. Two additional 3 unit classes will be designed to meet the remaining STEM/CTE program standards. Finally, STEM/CTE candidates will complete a 3 unit supervised clinical experience in a k-12 classroom of no less than 135 instructional hours.

Each pathway will lead to an individual earning a preliminary STEM/CTE credential that will authorize him/her to teach a standalone STEM/CTE course at the secondary level however, current teachers who earn their STEM/CTE credential would have the added benefit and be in the unique position to integrate their STEM/CTE curriculum into their content classes—a key aspect of this proposal that we feel has the potential to make a tremendous impact on how science and math are taught in the secondary classroom. As such schools and districts can help address their STEM teacher shortages from within in addition to seeking out highly skilled professional.

## **Intellectual Merit**

The intellectual merit of this proposal is two-pronged. First, we will design, implement and test an experimental STEM/CTE credential for teachers who already possess a teaching credential or are currently working towards a single subject teaching credential in a discrete science, mathematics or technology discipline. The experimental program standards that we intend to develop will be based in large part to the current CTE Designated Program Standards varying only in the 3 year minimum work experience required and the manner in which they demonstrate CTE designated subject specific content competencies. These experimental program standards will allow us to study which features are key to effective STEM teacher preparation, induction,

and development including the models and characteristics of teacher preparation, induction, and development that produce quality STEM teachers in the secondary setting. Secondly, creating this experimental STEM/CTE credential will allow us to examine the feasibility of addressing the STEM/CTE teacher shortage by recruiting from within k-12 rather than relying solely on the alternative CTE certification model currently in place. It is important to note that CTE Designated Subject Credentials are essential and play a critical role in meeting the educational goals of preparing California's students for college and careers and this proposal should in no way be interpreted as being inconsistent with the goals laid out in the *2008-2012 California State Plan for Career Technical Education* (California Department of Education, 2008). In fact, we feel this proposal is in close alignment with the goal of ensuring that CTE is woven into the fabric of education in California, preparing all students for their future endeavors, rather than being seen as a separate system of education.

### **Summary**

The lines between how we prepare students for college and career have been blurred and what have traditionally been seen as two distinct pathways are now one in the same. This along with a growing sense of urgency to improve how we prepare students for college and careers in STEM requires us to think of how best to prepare teachers to meet this difficult task. While K-12 math and science teachers have the expertise and training to help their students meet high academic standards, they may not have the direct work related experience and expertise that CTE teachers bring to the table. This is especially true in the STEM fields where careers are highly technical and specialized. Compounding the issue is the shortage of experienced professionals willing to leave industry and become teachers leaving us with the question of who will prepare our students for college and careers in Science, Technology, Engineering and Math. This proposal outlines a plan to tap into an untapped resource—the teachers currently in the classroom and those individuals already pursuing math and science teaching credentials. Our proposal creates an experimental STEM/CTE credential that provides credentialed teachers or those currently seeking single subject credentials in math or science a pathway for gaining the practical work-related experience necessary to obtain a STEM/CTE credential. This pathway not only helps address the fundamental need to increase the number of STEM teachers in the secondary classroom, it has the potential to dramatically change how science and math teachers approach their content; bridging the historical divide between college and career readiness by creating a new breed of teacher—a STEM/CTE professional, highly qualified to teach his or her discipline within the context of CTE Designated Subject Standards.

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