

Cover/Signature Page - Abbreviated Template/Abbreviated Template with Curriculum

Institution Submitting Request: *Dixie State University*

Proposed Title: *STEM Education Endorsement*

Currently Approved Title: *N/A*

School or Division or Location: *Education*

Department(s) or Area(s) Location: *Education*

Recommended Classification of Instructional Programs (CIP) Code¹ (for new programs): *13.1399*

Current Classification of Instructional Programs (CIP) Code (for existing programs): *N/A*

Proposed Beginning Date (for new programs): *08/01/2015*

Institutional Board of Trustees' Approval Date: *MM/DD/YEAR*

Proposal Type (check all that apply):

Regents' General Consent Calendar Items		
<i>R401-5 OCHE Review and Recommendation; Approval on General Consent Calendar</i>		
SECTION NO.		ITEM
5.1.1	<input type="checkbox"/>	Minor*
5.1.2	<input checked="" type="checkbox"/>	Emphasis*
5.2.1	<input type="checkbox"/>	(CER P) Certificate of Proficiency*
5.2.3	<input type="checkbox"/>	(GCR) Graduate Certificate*
5.4.1	<input type="checkbox"/>	New Administrative Unit
	<input type="checkbox"/>	Administrative Unit Transfer
	<input type="checkbox"/>	Administrative Unit Restructure
	<input type="checkbox"/>	Administrative Unit Consolidation
5.4.2	<input type="checkbox"/>	Conditional Three-Year Approval for New Centers, Institutes, or Bureaus
5.4.3	<input type="checkbox"/>	New Center
	<input type="checkbox"/>	New Institute
	<input type="checkbox"/>	New Bureau
5.5.1	<input type="checkbox"/>	Out-of-Service Area Delivery of Programs
5.5.2	<input type="checkbox"/>	Program Transfer
	<input type="checkbox"/>	Program Restructure
	<input type="checkbox"/>	Program Consolidation
5.5.3	<input type="checkbox"/>	Name Change of Existing Programs
5.5.4	<input type="checkbox"/>	Program Discontinuation
	<input type="checkbox"/>	Program Suspension
5.5.5	<input type="checkbox"/>	Reinstatement of Previously Suspended Program
	<input type="checkbox"/>	Reinstatement of Previously Suspended Administrative Unit

**Requires "Section V: Program Curriculum" of Abbreviated Template*

Chief Academic Officer (or Designee) Signature:

I certify that all required institutional approvals have been obtained prior to submitting this request to the Office of the Commissioner.

Signature

Date: *MM/DD/YEAR*

Printed Name: *Name of CAO or Designee*

¹ CIP codes must be recommended by the submitting institution. For CIP code classifications, please see <http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55>.

Program Request - Abbreviated Template
Dixie State University
STEM Education Endorsement
02/12/2015

Section I: Request

Dixie State University (DSU) Department of Education is requesting approval to offer the Science, Technology, Engineering, and Mathematics (STEM) Education Endorsement starting fall semester 2015. DSU in partnership with Washington County School District (WCSD) was awarded a \$130,000 grant from the Utah STEM Action Center in partnership with the Utah State Office of Education (USOE) to offer this six-course STEM Education Endorsement to a cohort of Kindergarten thru 8th grade in-service teachers over a 2-year initial implementation process. This grant will cover all tuition and fees for the initial cohort of 25 participants. The DSU STEM Education Endorsement will enable practicing teachers to enhance their content knowledge, practice, and pedagogy in STEM education. We are committed to developing a cohort of educators that possess the skills and abilities to provide STEM education leadership in southern Utah.

Section II: Need

Student foundational knowledge of science, technology, engineering, and mathematics is formed in their elementary education (Nadelson et al., 2013; NRC, 2007, Schachter, 2011). Paradoxically, many elementary teachers have constrained background knowledge, pedagogy, and efficacy for teaching STEM that may hamper student STEM learning (Akerson, 2005; Bolyard & Moyer-Packenham, 2008). Both within and across disciplines, elementary STEM education has struggled with teachers' capacity to deliver instructional content with both depth and breadth. Compared to their counterparts in secondary education, very few elementary school teachers possess content area degrees in the STEM subjects they teach (Bolyard & Moyer-Packenham, 2008).

There is well-defined association between teacher preparation to teach STEM and student achievement in STEM (Akerson, 2005; Nadelson et al., 2013; Schachter, 2011). Research indicates that content area knowledge and degree attainment for teachers can be linked to better learning outcomes for students (Appleton, 2003; Hill et al., 2005; NRC, 2011). Elementary teachers' typical lack of extensive backgrounds in STEM disciplines (Rowan et al., 2002) can explain the limited rigor and authenticity of elementary classroom STEM instruction (Metz, 2008). Given that elementary school teachers tend to lack STEM area knowledge or credentials in the content they need to teach, targeted teacher education and professional development in STEM content and methods is needed to enhance capacity.

The Utah State Office of Education (USOE) commissioned a group of science educators to design the Elementary STEM Endorsement and the framework for the six courses included in the endorsement. Several institutions across the state of Utah were awarded the grant to offer the STEM Education Endorsement including Dixie State University, Utah State University, Weber State University, Utah Valley University, and Southern Utah University. These institutions are preparing STEM courses to be offered starting summer or fall of 2015.

Section III: Institutional Impact

The STEM Education Endorsement will be the first of its kind at DSU in offering advanced learning 5000-level credit to in-service teachers. This program will increase enrollment at DSU and will have no negative affect on enrollment at affiliated programs. It will create a new type of enrollment option at DSU and may lead to participants who want to take further coursework in STEM disciplines or future DSU Masters of Education courses.

This new endorsement will fall under the School of Education and Department of Education at DSU. One STEM Endorsement course will be taught each semester, fall, spring, and summer. No changes in faculty, staff, administration or facilities will be required. Current faculty members have the expertise and approval for the workload needed to teach the STEM Endorsement courses. The DSU Office of STEM Education has the classroom space, equipment and technology needed to deliver the courses.

Section IV: Finances

The Utah STEM Action Center grant will cover all tuition and fee costs for the initial cohort of 25 participants for the first two years. The STEM Education Endorsement courses will be delivered on DSU's campus through a hybrid format. All courses will earn 3 semester credit hours at a 5000 advanced learning credit level. Each course will have a practicum component included, with classroom visits and observation made by the course instructors. DSU will provide 3-credits workload for each course plus 1.5-credit workload for the practicum component. We feel the practicum is a crucial component, ensuring the success and effectiveness of our STEM Education Endorsement program.

Developing an initial cohort of strong STEM educators with skills and knowledge that positively contribute to student achievement in STEM education will act as a catalyst for the rest of the district. Sustainability of this program is evident in that the funded project will build an endorsement program at DSU enabling us to continue delivery of the STEM Education Endorsement following the initial cohort. STEM Education will ultimately become a specialty strand in DSU's proposed Master's in Education degree program.

Section V: Program Curriculum

*****THIS SECTION OF THE TEMPLATE REQUIRED FOR EMPHASES, MINORS, AND CERTIFICATES ONLY*****

All Program Courses (with New Courses in Bold)

Course Prefix and Number	Title	Credit Hours
Required Courses		
STEM 5010	Data Analysis & Problem Solving in STEM	3
STEM 5020	Nature of Science & Engineering	3
STEM 5030	Energy in STEM Education	3
STEM 5040	Matter in STEM Education	3
STEM 5050	Force in STEM Education	3
STEM 5060	STEM Practices in Technology & Problem-based Learning	3
Sub-Total		18
Elective Courses		
Sub-Total		
Track/Options (if applicable)		
Sub-Total		
Total Number of Credits		18

Program Schedule

Timeline	Activities
February 2015 – June 2017	<ul style="list-style-type: none"> • Course development of all six courses following USOE STEM Endorsement course framework. • Initiate course approval process for the STEM Endorsement courses • Identify specific faculty to develop course syllabi and teach courses • Initiate recruitment and obtain individual commitments from participants
Fall Semester 2015	Course Delivery STEM 5010: Data Analysis & Problem Solving in STEM (3 cr)
Spring Semester 2016	Course Delivery STEM 5020: Nature of Science & Engineering (3 cr)
Summer Semester (June) 2016	Course Delivery STEM 5030: Energy in STEM Education (3 cr) <ul style="list-style-type: none"> • Complete Utah STEM Action Center year one grant report
Fall Semester 2016	Course Delivery STEM 5040: Matter in STEM Education (3 cr)
Spring Semester 2017	Course Delivery STEM 5050: Force in STEM Education (3 cr)
Summer Semester (June) 2017	Course Delivery STEM 5060: STEM Practices in Technology & Problem-based Learning (3 cr) <ul style="list-style-type: none"> • Complete Utah STEM Action Center year two grant report

References

- Akerson, V. L. (2005). How do elementary teachers compensate for incomplete science content knowledge? *Research in Science Education*, 35(2-3), 245-268.
- Appleton, K. (2003). How do beginning primary school teachers cope with science? Toward an understanding of science teaching practice. *Research in Science Education*, 33, 1–25.
- Baker, W. & Keller, J. (2010). Science teacher and researcher (STAR) program: Strengthening STEM education through authentic research experiences for preservice and early career teachers. *Peer Review: Association of American Colleges and Universities*. 16.2.
- Bolyard, J. J., & Moyer-Packenham, P. (2008). A review of the literature on mathematics and science teacher quality. *Peabody Journal of Education*, 83, 509-535.
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- Metz, K. E. (2008). Narrowing the gulf between the practices of science and the elementary school science classroom. *The Elementary School Journal*, 109(2), 138-161.
- Nadelson, L., Callahan, J., Pyke, P., Hay, A., Dance, M., & Pfiester, J. (2013). Teacher STEM perception and preparation: Inquiry-based STEM professional development for elementary teachers. *Journal of Educational Research*, 106 (2),157-168.
- National Research Council (2007). *Taking science to school: Learning and teaching science in grades K-8*. Committee on Science Learning, Kindergarten Through Eighth Grade. Richard A. Duschl, Heidi A. Schweingurber, and Andrew W. Shouse, Editors. Board of Science Education, Center for Education. Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academy Press.
- National Research Council. (2011). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Committee on a Conceptual Framework for New K-12 Science Education Standards. Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.
- Rowan, B., Correnti, R., & Miller, R. J. (2002). What large-scale, survey research tells us about teacher effects on student achievement: Insights from the *Prospects* study of elementary schools. *Teachers College Record*, 104, 1525–1567.
- Schachter, R. (2011). Helping STEM take root. *District Administration*, 47(4), 42-44.