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## **Introduction and Background**

If the United States is to maintain its role as a leader in science and technology (PCAST, 2012), development of STEM faculty is crucial (American Association for the Advancement of Science, 2011). However, faculty development (FD) is not an easy process. Expectations for faculty in STEM disciplines have increased dramatically in recent years calling for faculty to become equally effective across research, teaching, and service. Those in mid and late career stages are encouraged to increase these expectations while also preserving time to act in leadership roles by mentoring and supporting early faculty (NRC, 2010). These expectations are often juxtaposed with widely accepted norms in academia that clearly value research productivity over teaching and service (particularly in R1 universities) as demonstrated in documents such as tenure and promotion guidelines or guidelines for salary or merit pay increases (Fairweather 2005, 2008; Binder et al., 2012). If we are to increase faculty recruitment and retention (in particular for faculty from traditionally underserved communities such as women, people of color, and first generation college graduates), increase research productivity, increase connections to practice and service to the STEM community, and ultimately provide the best learning experience for students, we must reconceptualize STEM FD in higher education to have a more holistic approach. That is, STEM FD requires understanding the complete responsibilities of the 21<sup>st</sup> century faculty member.

Holistic STEM FD calls for experiences that are focused on connections between research, teaching, service, and leadership that provide faculty and administration with the intentionality that is necessary to succeed in twenty first century academia. While Holistic STEM FD is a fairly new research area, we can draw some assumptions about how to frame the organization and process of conducting Holistic STEM FD from the decades of research conducted in the K-12 arena (e.g. Borko, 2004; Cobb, 2000; Loucks-Horsley, et al., 2003), which has provided a strong, fundamental understanding of and sophisticated methods for the professional development (PD) of K-12 educators. While learning from the research emerging from K-12 education can form a foundation for Holistic STEM FD, it was imperative that we as a research community formulate a national agenda for conducting Holistic STEM FD research. This research agenda was created over a two-year process with support from the National Science Foundation (EEC 1638888 Building Research Capacity for STEM Faculty Development.) and in partnership with a number of collaborators across the country.

The Holistic STEM Faculty Development Collaboratory (SFDC, Clemson University) formally gathered a working group of stakeholders from across the country (faculty and administration from 2 and 4 year institutions specializing in STEM, Education, or Research disciplines; representatives from business and industry, and representatives from higher education faculty development centers or institutes) for a two day conference in early 2017 to determine overall goals and pathways for achieving said goals for research in Holistic STEM FD. After the two-day workshop, ongoing communication through an online platform, follow-up meetings with subgroups from the working group, and member checks of findings, the Holistic STEM FD Collaboratory identified **seven overarching outcomes** for research in Holistic STEM FD:

(1) Metrics/Instrument Development for STEM FD, (2) Impact on Students, (3) Generalizable Models of Holistic STEM FD, (4) Impact on Faculty, (5) Equity, (6) Cultural and Community Context, and (7) Institutional Policy and Context

To move the needle on these outcomes, the STEM Collaboratory at Clemson University used data emerging from the two-day workshop, ongoing online platform, returning subgroups from the formal working group, and member checks to establish **four potential categories of research** (Table 1) that make up an emergent agenda of research for holistic STEM FD.

The documents provided to each group in today's session are broken down in the following ways: (1) Outcomes, (2) Research Category 1: Cultural and Contextual Considerations, (3) Research Category 2: Processes of Conducting STEM FD, (4) Research Category 3: Assessment of Models, and (5) Research Category 4: Who are the Learners? Use the guiding questions on the Individual Feedback handout as you read through the document for your group.

Table 1: *Categories of Holistic STEM FD research agenda*

Category	Themes
Cultural and Contextual considerations	<ul style="list-style-type: none"> <li>• Importance of Context</li> <li>• Institutional Value</li> <li>• External Forces</li> <li>• Who's Responsible</li> <li>• Addressing bias</li> </ul>
Processes of Conducting STEM FD	<ul style="list-style-type: none"> <li>• Delivery</li> <li>• Innovation</li> </ul>
Assessment of Models	<ul style="list-style-type: none"> <li>• Formative Assessment (Micro- inform the model/feasibility)</li> <li>• Summative Assessment (Meso- results of the model)</li> <li>• Systematic Assessment (Macro/Global- overall change/sustainability)</li> <li>• Implementing Assessment</li> </ul>
Who Are the Learners?	<ul style="list-style-type: none"> <li>• Self-Regulatory Development</li> <li>• Motivation</li> <li>• Identity</li> <li>• Student Outcomes</li> <li>• Aligning Personal and Institutional Goals</li> <li>• Aligning Goals Across Academia</li> </ul>