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The STEM Guitar Project
Year One Evaluation Report
Executive Summary

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Prepared for:

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Project Summary and Background

This is the Year One external evaluation report for The STEM (Science, Technology, Engineering, Math) Guitar Project funded by the National Science Foundation Advanced Technological Education (NSF ATE Award #1700531). The project has been supported by the NSF ATE for the past eight years (NSF ATE awards DUE #1304405_2013 through 2017; DUE # 0903336_2009 through 2013). The STEM Guitar Project helps faculty Institute participants and their students acquire knowledge, skills, and attitudes (KSAs) that are transferable to life and industry situations. The project has shown promising results related to faculty and student KSA achievements in STEM.

This report is prepared for Sinclair Community College (SCC), in Dayton, Ohio to fulfil the external evaluator's yearly program evaluation deliverable commitment. It is meant to support SCC (as the project's lead institution) with its grant reporting requirements. It covers the project period from August 2017 through April 2018, hereby referred to as the project's Year One.

The Context for Evaluation is described to provide the background for review of the formative results. This includes: (1) the program evaluation overview [with the evaluation design/approaches and methods; the project goals and objectives; the project logic model; and the evaluation goals and questions], (2) the continuing project effects from the previous grant [with descriptive report about the previous project media exposure and increasing guitar kit sales], and the Project Team structure. There are five evaluation questions raised to guide the program's formative and summative evaluation. Given this inclusive period in Year One, this report focuses on the formative results framed within the five program evaluation questions related to: (1) diversity of Institute participants, (2) preparation for Institute participants' program implementation, (3) moving toward project outcomes, (4) the STEM Guitar applied learning community, and (5) project partnerships and sustainability. Most of the data reported in this project's Formative Results Section were based on the Project Team's sharing and documentations, as well as the external evaluator's professional interactions with the Project Team, using developmental evaluation and capacity building approaches. Because the Project Team members are well-versed in the guitar building project-based learning, it was easy for the external evaluator to lead them in program evaluation and hone their evaluative thinking. Below are the project performance highlights, conclusions, and recommendations for the project.

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Project Performance Highlights

Project Team Process

        The STEM Guitar Project's established plans, communication and team processes, structures, guidelines, and documentations are all contributing to efficient project operation. Additionally, in this current grant, the Project Team's capacity increased by six additional members (from five original members in the first grant, 16 members in the second grant, 22 members in the current grant). The six new members came from among the previous grants' faculty "champions" (two young faculty members, two experienced faculty in Computer Numerical Control (CNC) machining, and two support staff). Contributing to the project's efficient operations are:

- The team members' commitment and dedication, which primed them for project implementation beyond the Institute training;
- Honed team members' evaluative thinking as they continue to experience developmental evaluation and capacity building; Project Team's leadership development as they continue to assume responsibility and authority to complete agreed upon tasks and activities; Project Team members' own professional development;
- The development (face-to-face) meeting held at San Diego State University in November 2018 with all Project Team members that provided opportunities to get to know new team members and learn about the strengths and experiences that each member brings to the team; also, this meeting that allowed for the team to plan out the project, get started with specific tasks, and attend meetings with Taylor Guitar Company regarding the new Acoustic Guitar Building (AGB) program track (which will be offered in 2019);
- The AGB Sub-team members' research, planning, and continuing efforts about the new AGB program track [construction of acoustic kits manageable for assembly and processing within a week-long Institute, developing educational modules corresponding to advanced level of instruction];
- The wisdom of the Electric Guitar Building (EGB) Sub-team in harnessing lessons learned from the two previous grants in preparing for the implementation of the Electric Guitar Building Institutes (EGBI);
- The team's development of a new 2018 Institute offering - the CNC machining in guitar program track where CNC technology behind the guitar is focused upon to expand the direct workforce technician skill training the project provides;
- The all-team involvement in the ongoing planning, management, and coordination of the project's 2018 Summer Institutes [six Electric Guitar Building Institutes (EGBI) and two new CNC Institutes (CNCI)] - the largest in the history of the project;
- The ongoing documentations and creation of guidelines to explore and improve program implementation; and
- The seamless communication among the team members via different avenues – telephone, email, text, and face-to-face interactions in professional meetings and conferences.

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Diversity of Faculty Institute Participants

The Project Team expanded its definition of "persons with disabilities" beyond 'physical disabilities' to include 'economic disabilities' (as determined by recipients of free and reduced lunch). Additionally, information about military service personnel (on active duty and veterans) was included among the demographic information requested in the applicant solicitation survey. Several strategies were initiated to ensure the project's reach to underrepresented populations. Among these were:

- A concerted effort and focus on underrepresented populations in recruitment and selection of Institute participants and host sites; host sites applications were evaluated based on geographic location, project growth opportunities, and potential for participation of diverse groups;
- Project Team members' aggressive email communication strategies to intended participants; and
- Tapping of previous Institute participants in recruitment campaigns geared toward underrepresented groups.

Preparation for Institute Participants' Implementation

In the course of preparing the Institute participants for the week-long agenda and eventual program implementation in their institutions, the Project Team members are involved in the following:

- Continuing reviews of the alignment of the project's emerging Knowledge (K), Skills (S), and Attitudes (A) learning outcomes mapped with technical skills and soft skills identified in the Guitar Building Competencies and the MatEdU publication of the Materials, Technology, and Manufacturing Core Competencies funded by NSF;
- Continuing reviews and improvements in the development of Modular Learning Activities (MLAs) over the previous grant's process - developing new course MLAs; affirming alignment of MLAs with NGSS, Common Core, and School Districts' requirements; mapping the project-developed and participant-developed MLAs to avoid significant overlaps of material presentations, systematically linking the project's KSA Map in the MLA development;
- Developing instructional videos for new software tools of instruction;
- Conducting a preparatory Institute webinar for the participants;
- Conducting peer reviews and development of the Summer Institute agenda for better flow of instruction;
- Acknowledging the need for fidelity of Institute implementation within program tracks, modelling implementation for Institute participants in varying scenarios, context, and ways of implementation.

Moving Toward Project Outcomes

Pivotal project activities and development of guidelines for structures and practices have started anticipating robust data gathering to provide evidence toward project

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outcomes. These include:

- Using Guskey's levels of evaluation for professional development to prepare structures and practices for faculty follow-up evaluation, helping determine the quality of faculty program implementation and change of Institute participants' instructional practices;
- Conducting more research and deliberations about the proposed assessment framework; considering applications in exploring and developing the novel idea of high-tech, high-touch assessments for students that can be used across the US states;
- Framing the case study and longitudinal study for a high school in Washington state for a more robust data gathering of student outcomes.

The STEM Guitar Project Applied Learning Community

Part of the STEM Guitar Project goals is the replicability and scalability of its Community of Practice (CoP). The Project Team's processes and experiences in interacting and learning with and among themselves, as well as with the Institute participants, led them to a serious review of what defines the STEM Guitar Community and the project's practices - thus, the ongoing project search for the definition of its "applied learning community". The Project Team recognizes that the "community of practice" phraseology in the STEM Guitar Project proposal is changing as the team's consensus about the project's current and emerging project's interactions, learning, and collaboration practices mature. Currently, the project's ongoing search and discussions include:

- Reconciling and making sense of the Project Team's project learning, collaboration, and interaction experiences with literature reviews defining communities of practice and applied learning community;
- Reviewing already established project practices [such as the project's use of its website forum and social media, yearly Project Summit, etc.] involving the Project Team and the Institute participants; and
- Examining the usability, practicality, and feasibility of sustaining the emerging STEM Guitar applied learning community.

Project Partnerships and Sustainability

The Project Team members continue to develop, maintain, and enhance their academic, business, and community partnership. Sustainability efforts also continue. Examples of these include:

- Enhancing partnership with academic institutions – plans are underway for the Administrators Institute, which may be implemented in Year Two;
- Continuing efforts in developing and maintaining its business/industry and community partnerships [e.g. harnessing the newly established partnership with Taylor Guitar Company for the technical and supply chain support, new members to the Project Advisory Group; continuing linkages with and soliciting support from guitar and music celebrities];
- Increasing the number of schools participating in the supply chain;
- Conducting program outreach and other program activities without the use of the NSF

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grant fund:

- o Holding the 2nd international STEM Guitar outreach at the University of Medellin in Colombia, through the initiatives of one of the original project Trainers in collaboration with his University;
- o Conducting a STEM Guitar Building outreach with wounded veterans through the Phoenix Patriot Foundation;
- o Continuing operation of the STEM guitar manufacturing (a self-sustaining support component of the grant) at Sinclair College, producing over 1650 guitar kits in Year One that were shipped to educational institutions around the US;
- Continuous project dissemination through conference, publications, and media exposure:
  - o Management of the yearly STEM Guitar Summit held in conjunction with the M-STEM conference; the Summit serves as venue for Institute faculty participants around the nation to share their guitar program implementation and program impact on their students, among others;
  - o Project Team members' continuing dissemination activities in professional conferences and journals; starting July 2017 through March 2018, Project Team members have had eight conference presentations and one journal publication about the STEM Guitar Project featuring problem-based learning implementation of the guitar building program and the effects of this program on faculty and students;
  - o Pursuing strategies for media release regarding the 2018 Summer Institutes and national media coverage;
- Project Team efforts toward creating a foundation and exploring other grants and funding sources.

Conclusions

Fruitful and positive results came about during the inclusive period for this Year One evaluation report from the Project Team Process to the five area foci for the formative results (diversity of Institute faculty participants, preparation for Institute participants' program implementation, moving toward project outcomes, the STEM Guitar Project Applied Learning Community, and project partnerships and sustainability).

Much as there were productive project formative results, there are also potential areas of opportunities for the project. Among the things where the project is emerging are:

- Creation of tools that could help in seamless orientation of the new team members and Institute participants into the project's practices and program implementation;
- Improvement in the sequence and progression of prior work needed in completing some project aspects (e.g. KSA mapping and assessment framework before MLA development);
- Development of documentation for clarity of project oriented concepts and project "musts";
- More research and exploration about, as well as eventual development of, the high-

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tech, high-touch assessment app for students;

- Systematic ways of interaction and follow-up of participants involved in the emerging STEM Guitar applied learning community;
- Shared dissemination strategies and mentoring practices to enhance dissemination opportunities for all Project Team members;
- Team feedback and support for the Marketing Sub-team's efforts in promoting national media coverage.

Recommendations

The STEM Guitar Project has been very open to changes, emerging developments, and ideas. One may say that continuous program improvement is one of the trademarks of the STEM Guitar Project. Some of the things that the project is already doing and are recommended for vital actions are continuous improvement/development of the:

- Project Team's involvement in developmental evaluation and capacity building to further hone its evaluative thinking skills needed in critical program implementation;
- Solidified definition of the project "musts" and guidelines for program implementation;
- Project's processes, structures, and documentations of the different aspects of the project for replicability and scalability;
- MLA process [adopting/adapting; implementation in different contexts, use of KSAs and assessment framework];
- Monitoring process for fidelity of implementation;
- Definition and setting of the STEM Guitar "Brand of COP" [structural set-up, practices needed such as follow-up and implementation]; and
- Venues for in-depth data collection and longitudinal study commitment.

Explicit actions are recommended for areas where the project is "emerging":

- Develop management tools that continue to enhance members' productivity;
- Promote the consensus and opportunity for Project Team members to be involved in improving the KSA map and priorities prior to further MLA development;
- Continue the research and efforts to explore and develop the high-tech, high-touch assessment app for students, possibly making, at least one proto-type, available for participant testing during the Summer Institute;
- Determine the best and most feasible ways (e.g. surveys, focus group, interviews, could also use a social network analysis) to systematically interact and follow up with Institute participants;
- Promote and support Project Team members to set project dissemination goals and do conference presentations and/or professional publications; less experienced Project Team members may be paired with more professionally experienced Team members as mentors;
- Encourage other Project Team members to communicate their input to the head of the Marketing Sub-team in setting and implementing a more systematic strategy for national media coverage.

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