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ADVISORY BOARD MEETING AGENDA  
FRIDAY, 1<sup>ST</sup> MARCH 2019  
9 am MST/10 am CST/11am EST

1. Welcome
2. Introduction of Team
  - a) Grant Team
  - b) Advisory Board
3. Project update
  - a) What have we done achieved thus far?
  - b) What do we want to achieve next?
  - c) What we hope to do together?
4. Discussion

# Spotty Rain Campaign: Enhancing the Capacity for Rural Libraries to Engage the Public in Drought Monitoring

## A. OVERVIEW AND PROJECT RATIONALE

This **Innovations in Development** project, entitled “Spotty Rain Campaign: Enhancing the Capacity for Rural Libraries to Engage the Public in Drought Monitoring” focuses on the design, development, and evaluation of informal science education (ISE) programs and educational media for use in rural libraries in drought prone areas of the Great Plains. The target audiences include public librarians (professionals) in rural communities of Oklahoma, Nebraska, and Colorado, as well as the general public (adults and children) they serve. The **project goals** are to leverage the professional skills and community knowledge of rural librarians to support local drought monitoring networks. Three objectives will serve this goal:

*Objective #1* to enhance the capacity for rural libraries to engage their communities in citizen science opportunities.

*Objective #2* to explore the social contexts for STEM learning and community participation in volunteer drought monitoring.

*Objective #3* to design and pilot educational materials that translate scientific knowledge about drought in useful and usable ways.

Our **innovative model** prepares librarians to introduce citizen science processes and practices within the context of community dialogue and deliberation about drought. The proposed Spotty Rain Campaign includes the following strategies: (1) a **professional development webinar** for rural librarians that introduces the resources necessary for training volunteer drought monitors and supporting citizen science practices and processes, (2) a **drought infographic booklet and poster series** to improve public awareness, interest, and understanding about the role of science to inform drought adaptation, and (3) **co-designed library programs** for public audiences.

**Study area.** The concentration of rural counties in the Great Plains complements the nation’s densest concentration of agricultural and other resource-based industries (Laughlin, 2016). However, all along the Great Plains, rural communities face “wicked” problems like population loss and economic decline (Cromartie, 2017; Lazarus, 2009). These problems are historically interconnected to experiences with drought and the parallel impacts on farming and ranching operations (Cooper, 2004). For example, the PI’s research in Oklahoma and New Mexico confirms that recent prolonged intense drought resulted in the large-scale selling of cattle, changes in crops planted, and decreased land in cultivation (Vadjunec et al., 2016). Drought causes widespread economic losses and land degradation, and the teleconnections between rural agricultural sectors and urban consumption can amplify those impacts (e.g. producing high beef prices nationally) (Colston et al., 2015; Munroe et al., 2014).

**Why citizen science in rural libraries?** To date, there is an unequal distribution of formal and informal STEM education opportunities to rural places. Rural populations are underserved when it comes to ISL experiences for youth due to travel distance and lack of resources (Afterschool Alliance, 2017). There are even fewer ISL experiences for adults (Dusenbery & LaConte, 2016). Libraries can serve as “third spaces”, beyond home and school/work, for ISL (Baek, 2013, 12; Wallander-Roberts & Jakubowski., 2016). In rural places particularly, libraries are important learning institutions with critical technological resources (Baek, 2013; Garmer, 2014). Prior NSF research suggests that librarians are accustomed to designing public programs and libraries are natural repositories for scientific resources (Garies et al., 2013).

## B. PROJECT DESIGN

The proposed project envisions new pathways for informal STEM learning (ISL) that can support drought planning and adaptive practices, but also serve as jumping off point for engaging rural communities in deciding future priorities and strategies. Often described as a slow onset disaster, the timescale and unpredictability of drought engenders public apathy and lack of planning (Wilhite, 2011). By tapping the social capital of local librarians as community liaisons, the project aims to foster public dialogue and to direct relevant information about drought monitoring to the surrounding community (Benton, 2012). This will broaden participation in STEM learning by underserved and underrepresented rural communities of Oklahoma, Nebraska, and Colorado, while putting to test the ability of citizen science programming to increase ‘coproductive capacity’ and effect scientifically-informed social change with locally sensitive approaches (van Kerkhoff & Lebel, 2015).

### i. Research Foci

The research plan explores the social contexts for informal STEM learning (ISL) and participatory citizen science in rural libraries. It is hypothesized that rural librarians have a unique relational capacity for translating external scientific information for new community knowledge-building and forums (Martins & Canhoto, 2016). The research aims are (a) to build new ISL knowledge about the social networks and human motives (the ‘who’ and ‘how’) that inspire public participation in citizen science programming at libraries (Contractor & DeChurch, 2014, pg. 13650), and (b) to pilot educational programs and materials that translate scientific knowledge about drought in useful and usable ways.

The primary **research questions** are:

*RQ1:* What professional development opportunities and resource materials help rural libraries to engage their communities in citizen science opportunities?

*RQ2:* How do librarians tap into the web of relationships and dense social networks in rural spaces (across generations, cultures, community sectors, etc.)?

*RQ3:* In what ways do rural communities engage with citizen science programs at the library (e.g. entry points for STEM, economy, motivations/attitudes/behaviors)?

*RQ4:* Does the Spotty Rain improve the communication of science-based knowledge about drought risks, impacts, and adaptive technologies?

### ii. Methods and Analyses

**Recruitment and Sampling.** Purposeful sampling methods will aim to include different rural community types (e.g. rural fringe, rural distant, rural remote) as defined by geography, transportation, and local identity. The recruitment of project participants will include both indirect and direct methods. Professional audiences (rural librarians) will be recruited directly at state library conferences and via email/telephone identified from publicly available library databases. Indirect recruitment will occur using presentations, organizational newsletters/listservs/social media, and flyers. Public audiences (consenting adults & children) will be recruited in-person and via email, as appropriate, following the participation in library program events.

**Data Collection and Analyses.** The research will include the collection of both qualitative and quantitative data. A mixed methods design include the following methods of data collection, lines of analysis, and expected number of research participants:

*Interviews and focus groups with rural librarians* (n=25). These will be completed at state library conferences or virtually using the Zoom web conferencing platform. A semi-structured questionnaire will explore library needs, interests, and possibilities for citizen science programming. Data will be collected in digital format (video/audio), transcribed, entered in NVivo software, and coded thematically (Richards, 2009). Anticipated codes will focus on citizen science interests, knowledge, and efficacy, as well as current STEM program

interests and partnerships, community and patron needs, and library capacity (Baek, 2013b). Opening coding is expected to yield additional themes and sub-themes (Glaser & Strauss, 1967).

*Pre/post surveys with professional development workshop participants* (n=30). Surveys will be collected electronically using Qualtrics and include assessment of each module's content, as well as overall effectiveness, usefulness, and participant learning outcomes (Garies, Lukasiewicz, & Goodman, 2013). Heat maps will also be used to capture information about usability and navigability of the website as a learning platform (Gorham et al., 2016)

*Narrative programming reports from librarians* (n=30). Narrative programming reports will be submitted by librarians at several stages of the co-design, planning, and implementation of the library drought programs. The reports will be used to synthesize implement approaches, program experiences, and community reactions. Thematic analysis of discourse will focus on the niche-finding process in establishing a participatory platform (Mollenkamp, et al 2010), the process of co-design and implementation (Gieryn, 1995), and outcomes in terms of tangible outputs and social goals (Beierle, 1998).

*Exit surveys with library program participants* (n=150). An exit survey will be distributed by the librarian or on-line to consenting participants following their participation in library drought programs. Analyses will focus on public audiences interest, motivation, citizen science practices, and STEM identity (Baek, 2013a), as well as perceptions about the value and usability of drought science resources (e.g trust, relevance, and ease of access) (Whitefield et al., 2016).

*Web and social media analytics.* A digital record of usage rates and patterns will help to characterize citizen science participation and use of project resources. Beyond page clicks, social media research will include textual analysis of volunteers' condition reports to explore the role of place-based in online communication, including dimensions of audience, dimensions of text, aspects of interactivity, and figurative understanding of social networks (Adams & Gynnild, 2013).

### iii. Project Deliverables

Citizen science offers modality to advance beyond the current modes of STEM learning in libraries (Baek, 2013a) to include opportunities to generate local reports and data visualizations, to reflect on science as a way of knowing, and to develop an identity as a science contributor and user (Bell et al., 2009). The existing Spotty Rain website serves in the proposed project as a springboard for engaging citizen scientists as drought monitors. The catalog is organized to support citizen science processes and practices, including sections to: (a) *Track*, users can find national drought reports and regional weather forecasts, as well as learn strategies to make a personalized drought report, (b) *Report*, users learn how to become drought monitors (using CoCoRaHS) and to try new digital tools for tracking drought conditions in their place, and (c) *Adapt*, users can search existing drought education resources organized by target audience (farmers, ranchers, youth educators, and rural communities). The proposed project deliverables support a fourth citizen science practices: *Communicate*.

The Spotty Rain website will serve as both a learning platform for the professional development workshops, as well as a long-term repository for the produced educational media. Currently, the Spotty Rain catalog includes extension resources, state reports, regional forecasts, and drought science resources within 5 states in the Southern High Plains area. In the first year, the project will revise the website and expand the catalogue to include similar resources for all 10 states within the Great Plains region, as well as redesign the website in WordPress. Other project deliverables include:

- (a) **Professional development workshop for librarians.** Project plans include the development and pilot of a professional development workshop for rural librarians using webinars, video tutorials, and computational thinking activities.
- (b) **Drought infographic booklet and poster series for rural libraries.** The drought infographic booklet will incorporate regional data visualizations that highlight the potential for local drought monitoring networks and introduce the range of scientific research related to drought (see mock-up in the appendices).

- (c) **Co-designed library programs for public audiences.** After participating in the webinar, rural librarians will be recruited to co-design drought-related programs, exhibits, and/or meetings. Social events in small communities have the potential to reach critical mass and overcome the limitations of rural geographies.

### **Timeline of Project Tasks and Milestones**

*Year One* milestones include Phase 1 participant recruitment, exploratory needs assessment, and educational media design.

- **Design research protocols.** Project Leadership and graduate students will design research protocols for review and comment by the external advisory board.
- **Initiate participant recruitment.** The project leadership team will develop exhibits and presentations for the annual conference of the state library association in Oklahoma (Phase 1). The goal is to raise awareness about citizen science opportunities and directly recruit project participants from rural and small libraries. At the conference, if possible and as appropriate, we will also submit/present sessions, add recruitment flyers to in conference bags, and attend related committees, special interest groups, and roundtables. Attendance and networking at the conference is expected to support further indirect recruitment measures (e.g. social media, newsletters, articles) and possible integration into existing career and professional development programs.
- **Conduct exploratory research.** We will conduct interviews and focus groups with rural librarians aimed at assessing their needs and interests related to the project, as well as the obtain feedback useful to exhibit design modifications. Transcriptions will be completed by the Center for Research in STEM Teaching and Learning.
- **Design professional development workshop & drought infographic booklet.** Project Leadership and Design Team will work with partners at CoCoRaHS and NDMC to produce the videos and library program materials to be piloted in Year Two.

*Year Two* milestones include, Phase 1 pilot and revisions product deliverables, Phase 2 recruitment, and formative reporting.

- **Pilot and revise professional development workshop.** Rural librarians in drought-prone areas of Oklahoma will participate in the initial pilot study of the professional development workshop (Phase 1). Revisions will include feedback from librarians, project partners, and the advisory panel.
- **Broaden participant recruitment.** The project leadership team will host exhibits and make presentations for annual state library association conferences in Nebraska and Colorado (Phase 2).
- **Complete formative report.** Project leadership will prepare research briefs for formative evaluation by the external advisory panel. Research briefs will include the analysis of interview/focus groups with rural libraries, survey results from pilot with professional development workshop participants, and baseline web analytics.

*Year Three* milestones include the co-design of library programs (Phase 1) and implementation of revised professional development webinar (Phase 2).

- **Modify research protocols (ass needed).** Project Leadership and graduate students will redesign research protocols based on Phase 1 research findings and with feedback from external advisory board.
- **Broader implementation of professional development workshop.** Rural librarians in drought-prone areas of Colorado and Nebraska will participate in the revised professional development workshop (Phase 2).
- **Co-design and host library programs.** Project leadership team will work with trained Oklahoma librarians to implement drought-related programs, exhibits, and/or meetings that introduce citizen science opportunities and promoting public dialogue about drought. This will include the co-design of poster series and other necessary program materials.

*Year Four* milestones include the co-design of library programs (Phase 2) and summative reporting.

- **Co-design and host library programs.** Project leadership team will work with trained Colorado and Nebraska librarians to implement drought-related programs, exhibits, and/or meetings that introduce citizen science opportunities and promoting public dialogue about drought (Phase 2).
- **Complete summative report.** Project leadership will prepare research briefs for summative evaluation by the external advisory panel. Research briefs will include survey results from Phase 2 implementation of professional development workshop participants, synthesis of narrative program reports and exit surveys with patrons, and advanced web and social media analytics.

*Year Five* milestones include research with volunteer and website users, dissemination of project findings to national library conferences and rural libraries, and final reporting.

- **Follow-up with drought monitors.** This will include surveys and interviews website users & CoCoRaHS observers.
- **Distribute project materials to rural libraries.** Information about the project, a drought infographic booklet, and posters will be distributed to 900 rural libraries in across the Great Plains.
- **Final Reporting.** Project leadership will prepare the final report including all research findings and conclusions.