Computing Outreach Literature Review

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Abstract—The lack of diversity in computing has existed for decades. It has garnered the attention of computing educators and private companies who have implemented a host of outreach and retention programs to draw more diverse students into the field and the workforce. A question that stands out is whether or not these programs are effective in the long term in helping to mitigate the lack of diversity in the field. To determine an answer to this question, the authors undertook a systematic literature review of reported computing outreach activities in relevant journals and conference proceedings for the years 2009-2014 inclusive. Upon consideration of all relevant articles, 73 articles were coded for information about the type of outreach, target audience, and reported results. Summaries of the findings of the literature review are presented in this poster.

Keywords—outreach; after school programs; gender issues in computing; diversity issues in computing, broadening participation

I. INTRODUCTION (Heading 1)

In an effort to address the lack of diversity in computing programs at universities as well as within the workforce, a good deal of outreach and retention programs have been started by various organizations. A question that lingers is what impact do these programs have on the participants in the long term? In order to begin to answer this question and in preparation for a study on the long-term impact of computing outreach discussed in [2], we undertook a systematic literature review following the structure outlined in Khan, Kunz, Kleijnen, and Antes [1]. Their systematic review framework includes five important steps: frame the question (step 1), identify relevant work (step 2), assess the quality of the studies (step 3), summarize the evidence (step 4), and interpret the findings (step 5).

II. FRAMING THE QUESTION

The free-form question (step 1) we sought to answer with this review was “Is there a long-term impact on participants in computing outreach activities?” To answer this question, we established the following four overarching characteristics:

- The populations studied—Students enrolled in computing outreach programs
- The interventions—Programs that exposed students to computing concepts that were outside of their normal required school work
- The outcomes analyzed—Interest in pursuing a degree in a computing field and/or actual enrollment and completion of a degree in a computing field
- The study designs—Quantitative, qualitative, or mixed methods studies that tracked the participants in computing outreach programs over a period of time that extended beyond the length of the intervention itself.

III. IDENTIFYING RELEVANT WORK AND CODING THE STUDIES

We identified relevant work of quality (steps 2 and 3) by considering Association of Computing Machinery (ACM) and Institute of Electrical and Electronics Engineers (IEEE) journal and conference publications, which both have a long history of publishing quality papers related to computing education. We further refined that to venues within these organizations that emphasize education, namely the following peer-reviewed journals and conference proceedings in electronic form:

- ACM SIGCSE Technical Symposium on Computer Science Education (SIGCSE)
- IEEE Frontiers in Education (FIE)
- Innovation and Technology in Computer Science Education (ITiCSE)
- International Computing Education Research Workshop (ICER)
- Taylor & Francis’ Computer Science Education
- Transactions on Computing Education

Publications from the years 2009 to 2014 inclusive were considered. This effort resulted in 3,672 citations from which applicable studies were reviewed for relevance. Their potential relevance was examined using the following key words: outreach, K-12, elementary school, high school, secondary school, after school clubs, summer camp. An article was determined to be relevant if it had a title and abstract associated with outreach because it contained one or more of the actual or related keywords. After reviewing all 3,672 paper title and abstracts, 3,571 papers did not fit the criteria. 

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and were deemed irrelevant. This resulted in 101 articles left for a more thorough review.

These articles were then examined in detail and the following information was recorded:

- Target audience of the outreach
- Country in which the target audience lived
- Whether or not the intervention was designed to increase gender diversity
- Whether or not the intervention was designed to increase ethnic diversity
- If data was collected from participants
- Whether the study was quantitative or qualitative
- The number of participants in the study
- The gender of the participants in the study
- The ethnicity of the participants in the study
- What was assessed in the study
- Whether there was a longitudinal component to the study
- The number of years for the study (if longitudinal)
- The summary of the findings (if longitudinal)

During this careful read stage, it was discovered that 28 of the 101 articles did not quantitatively or qualitatively evaluate the impact of associated outreach activities. For example, many of these simply described an activity, gave advice for running an activity, gave example curriculum for activities, or were work in progress papers that did not include reporting of any results.

IV. SUMMARIZING THE EVIDENCE

This left 73 papers in the analysis to be summarized (step 4). We will present summarized data about the geographic location of the interventions, the target audience (level in school) of the interventions, the intent of the intervention with regard to diversity of gender or ethnicity, the types of studies done with participants, participant gender and ethnic makeup, and what types of assessments were used by the various programs.

We will leave as a point of discussion around the poster for observers to interpret and discuss the findings (step 5).

REFERENCES
