K-12 Teachers Experiences with Computing: A Case Study

Steve Cooper*
University Nebraska Lincoln
Lincoln, NE 68588, United States
stephen.cooper@unl.edu

Susan H. Rodger
Duke University
Durham, NC 27708, United States
rodger@cs.duke.edu

Kathy Isbister
SF Unified School District
San Francisco, CA 94110 United States
isbisterk@sfusd.edu

Madeleine Schep
Columbia College
Columbia, SC 29203, United States
mschep@columbiasc.edu

RoxAnn Stalvey
College of Charleston
Charleston, SC 29424, United States
StalveyR@cofc.edu

Lance Perez
University Nebraska Lincoln
Lincoln, NE 68588, United States
lcperez@unl.edu

ABSTRACT

We offered professional development to in-service K-12 teachers. Teachers learned programming, and how to teach programming. During the subsequent academic year, they taught programming in their schools. We interviewed the teachers to better understand their experiences. This poster describes case studies of K-12 teachers as they teach programming for the first time. As this study is qualitative, it does not attempt to measure findings. Rather, in exploring individual teachers' experiences, we hope to benefit both future teachers who will need to teach computing as well as those who will be helping those teachers.

KEYWORDS

Alice; Teacher professional development; K-12; case study

ACM Reference format:

Steve Cooper, Susan H. Rodger, Kathy Isbister, Madeleine Schep, RoxAnn Stalvey, and Lance Perez. 2017. K-12 Teachers Experiences with Computing: A Case Study. In *Proceedings of ITiCSE'17, July 03-05, 2017, Bologna, Italy.*, 2 pages.

DOI: <http://dx.doi.org/10.1145/3059009.3072989>

1 BACKGROUND

We have been working with several hundred K-12 teachers in the United States, helping to provide them with sufficient pedagogic and content knowledge to enable them to teach programming to their students. Most of the teachers teach in public schools, where information technology (IT) resources are fewer and administrative support lower than in private schools. The majority of these teachers teach at the middle (grades 6-8, student ages 11-14) or high (grades 9-12, student ages 14-18) school level. Some teachers are primarily STEM teachers teaching required courses and meeting state-specified student learning standards. Others teach elective courses, typically as part of career and technical education (CTE)

*For the first five authors, this material is based upon work supported by the National Science Foundation under Grants NSF ITEST 1031351, 1031029, and 1031356.

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the owner/author(s).

ITiCSE'17, July 03-05, 2017, Bologna, Italy.

© 2017 Copyright held by the owner/author(s). ACM ISBN 978-1-4503-4704-4/17/07...\$15.00

DOI: <http://dx.doi.org/10.1145/3059009.3072989>

programs. We have also worked with several individuals who were employed by their schools in other capacities, most commonly as librarians and technology coordinators.

We typically spend a couple of weeks working with the teachers in the summer, as part of one or two workshops. We spend a week teaching the teachers to program in Alice, as most teachers have little to no previous programming experience. We then spend a week focusing on how to teach programming. Using selections from our curricular materials together with their own materials (as appropriate), teachers are expected to develop and deliver curricular modules for their class(es) the subsequent academic year. During the academic year, we support the teachers with their teaching. Our website containing information about our program, our curriculum materials, and teacher lesson plans are at www.cs.duke.edu/csed/alice/aliceInSchools.

Our poster presents interviews of seven of the teachers detailing their experiences with their attempts in teaching computing.

2 OBSERVATIONS AND RECOMMENDATIONS

We list several observations and recommendations from our experiences and the interviews with the select teachers. It is important to note that nearly all of these teachers introduced computing to students who would not otherwise had gotten this experience.

- 1) Incorporating computing into a non-programming course (whether a core or elective) can be challenging.
- 2) The administration can be supportive, indifferent or obstructive to a teacher.
- 3) IT can be challenging for teachers.
- 4) In the US, in many states, there is a tension between CTE and STEM education (particularly at the secondary level).
- 5) A professional development workshop provides teachers with the confidence to teach computing.
- 6) It is very important for teachers to develop a sense of a community.
- 7) There are significant differences between private and public schools.
- 8) Getting K-12 teachers involved in teaching computing offers them amazing leadership opportunities.
- 9) Teachers need ideas for advertising courses.
- 10) There is an opportunity to get the technology coordinator involved as a teacher of computing.
- 11) State standards can be challenging for teachers wishing to get computing introduced as modules into other courses.
- 12) Replacing teachers who can teach computing can be very challenging.
- 13) It can be challenging for workshop presenters to keep their teaching support materials up to date.
- 14) It is important for professional development to provide materials "in a box" at the lesson-plan level.
- 15) It is very important to select the "right" teachers for a workshop.