Scaling Up an Innovative Approach for Attracting Students to Computing

Workshop and Follow-up Survey and Assessment: Evaluation Report

2013

by

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PROGRAM BACKGROUND

Scaling Up an Innovative Approach for Attracting Students to Computing is a pilot ITEST project that incorporates Alice instruction into K-12 teachers’ classes. A major focus of this project is conducting professional development workshops to enable high school and middle school teachers to develop skills and expertise necessary to teach object-oriented programming concepts with Alice software and materials. The workshops are hosted by local college/university faculty members and students, and attended by teachers from all over the states of North Carolina and South Carolina, and, in the summer of 2014, Oakland, California. Notably, faculty members in the local colleges have prior teaching experience with Alice and have successfully run similar workshops as part of the original ITEST project. The summer workshop experience includes two consecutive weeklong workshops. The first weeklong workshop presents instruction on topics unique to Alice, providing teachers with fundamental learning about the concepts of objects and object-oriented programming. The second weeklong workshop focuses on curricular materials development. During this week, teachers work with the faculty and students from the local college to modify the workshop curricular materials (as needed) and develop new materials for teachers to integrate the approach into a course at their own school.

The program began in the summer of 2011 with two-week-long workshops. One workshop was offered in North Carolina at Duke University. Two workshops were offered in South Carolina, with one held at Columbia College in Columbia and the other at College of Charleston in Charleston. Originally, the University of Mississippi was scheduled to implement the program; however, the Principal Investigator of the Mississippi site had to withdraw from the program due to unavoidable personal reasons. Instead, the program will host several middle and high school teacher professional development workshops in Oakland, California in the years of 2014 and 2015, as the third site. Professional development workshops targeting California enable the program to reach a similar number of teachers as originally planned when Mississippi was included as one of the workshop sites. The program will recruit teachers from California areas serving economically disadvantaged students in Watsonville, San Jose, and Oakland.

In summer 2011, the project contracted with the Collaborative for Evaluation and Assessment Capacity (CEAC), within the School of Education at the University of Pittsburgh, to assist in evaluating the impact of summer workshops on teacher participants’ content knowledge and skills in Alice, teacher participants’ feedback of Alice instructors and their fellow participants, Alice instructors/leadership team’s feedback of teacher participants’ lessons, and teacher utilization of Alice in their classroom after their participation in the workshops.
EVALUATION ACTIVITY

The evaluation activity consists of several instruments administered to teachers at the summer workshops, during the academic school year, and the follow-up institute in the following summer. In the report, teachers who participated in 2012 summer workshops are addressed as Year Two Cohort, and those who participated in 2013 summer workshops are addressed as Year Three Cohort.

At the beginning of the Alice summer workshops, a Demographic Survey and a Pre-Workshop Content Assessment were administered to beginner teacher attendees. At the end of the workshop, a Post-Workshop Content Assessment was administered. Starting in summer 2012, three additional surveys, Instruction Feedback Survey, and Internal Peer Evaluation Survey, and External Peer Evaluation Survey, were administered during the workshops. In the follow-up institute held in the following summer, teachers were asked to take the End of Program Content Assessment, the End of Program Survey, and Teacher Use of Alice Survey. Teachers were also asked to participate in Teacher Classroom Log during the academic school year. For more information on the evaluation instruments described above, please see Appendix 1.

Data drawn from each of the above-mentioned assessments were analyzed across all respondents. Demographic data were disaggregated by site. Data on pre- and post-workshop content assessment were disaggregated by site and respondent characteristics. Findings from this report will be used to inform the program and future decisions, to inform the evaluation plan developed by CEAC and the Scale-up ITEST team to meet NSF funding requirements, and to refine the instrument for use in the next summer and school year.
SUMMARY OF FINDINGS

This section presents a summary of findings across all three years of the program. It is organized to answer four evaluation questions by drawing on data from relevant evaluation activities.

The demographics for all three populations across the three years of workshops are generally similar. In Cohort One (n=55), the majority of the respondents (60.0%) had more than ten years of teaching experience, with 79.1% teaching in the computer/technology field, and 69.8% teaching at the high school level. Many of the respondents had previous teaching experience with programming, such as using HTML and Basic, and the majority felt uncomfortable or very uncomfortable using Alice (72.8%) and teaching with Alice (80.0%) prior to the workshop.

In Cohort Two (n=49), the majority of respondents (54.2%) have more than ten years of teaching experience, with 61.2% teaching in the computer/technology field, and 69.4% teaching at the high school level. About half of the respondents had previous teaching experience with HTML, while a little more than half of the respondents felt uncomfortable or very uncomfortable using Alice (51.2%) and teaching with Alice (58.6%) prior to the workshop.

Finally, in Cohort Three (n=54), slightly less than half of the respondents (48.1%) have more than ten years of teaching experience, with 59.3% teaching in the computer/technology field, and 57.4% teaching at the high school level. Only a quarter of the respondents had previous teaching experience with computer programming, with 24.1% citing experience with HTML and less than 10.0% citing experience with any other programming. In addition, the majority felt uncomfortable or very uncomfortable using Alice (60.0%) and teaching with Alice (79.2%) prior to the workshop.

Question one: To what extent did the summer workshops impact teachers’ content knowledge and skills in Alice?

The summer workshops significantly increased teachers’ content knowledge and skills in Alice. This is evident in findings drawn from the summer workshop content pre- and post-assessments, and end of program content assessments.

Summer Workshop Content Pre- and Post-Assessments

For Cohort One, fifty-four respondents completed both the 2011 summer workshop pre- and post-assessments. Respondents’ mean percentage scores increased from 32.56 on the pre-test to 49.37 on the post-test. This increase was statistically significant.

The mean percentage correct scores of thirteen matched respondents at the College of Charleston workshop increased from 38.24 on the pre-assessment to 56.56 on the post-assessment, and this increase was statistically significant. The mean percentage scores of fifteen matched respondents at the Columbia College workshop increased from 29.41 on the pre to 44.29 on the post and this increase was statistically significant. The mean percentage
correct scores of twenty-six matched respondents at the Duke University workshop increased from 31.37 on the pre-assessment to 49.10 on the post-assessment, and this increase was statistically significant.

The pre-post mean score differences by respondent characteristics were statistically significant within the following subgroups:

- Years of teaching experience: less than 3 years of teaching experience, 5 to 10 years of teaching experience, and more than 10 years of teaching experience
- Subject respondents teach: science, computer/technology, and math
- Type of institution respondents teach: middle school and high school

For Cohort Two, forty-seven respondents completed both the 2012 summer workshop pre- and post-assessments. Thirty-seven respondents demonstrated an increase in their mean percentage score from the pre-assessment to the post-assessment. Respondents’ mean percentage scores increased from 26.60 on the pre-assessment to 42.38 on the post-assessment. This increase was statistically significant. The majority of forty-seven respondents (89.4%) indicated no experience with Alice prior to the workshop. Notably, the overwhelming majority of the respondents indicated that they increased their knowledge of Alice (97.9%) and ability to teach with Alice (90.7%) at some degree or at a high degree.

Notable disaggregated findings show that nineteen of twenty-three matched respondents at the Duke University workshop demonstrated an increase in their mean percentage score from the pre-assessment to the post-assessment, while eighteen of twenty-two matched respondents at the College of Charleston workshop demonstrated an increase.

The mean percentage correct scores of respondents at the Duke University workshop increased from 26.33 on the pre-assessment to 41.30 on the post-assessment, and this increase was statistically significant. The mean percentage scores of respondents at the College of Charleston workshop increased from 26.89 on the pre to 43.40 on the post and this increase was statistically significant.

The pre-post mean score differences by respondent characteristics were statistically significant within the following subgroups:

- Years of teaching experience: less than 3 years of teaching experience, 6 to 10 years of teaching experience, and more than 10 years of teaching experience
- Subject respondents teach: science, computer/technology, and non-stem
- Type of institution respondents teach: middle school and high school
- Comfort level in using Alice: uncomfortable in using Alice, and comfortable in using Alice
- Comfort level in teaching with Alice: very uncomfortable in teaching with Alice, uncomfortable in teaching with Alice, and comfortable in teaching with Alice

For Cohort Three, forty-eight respondents completed both the 2013 summer workshop pre- and post-assessments. Thirty-two respondents demonstrated an increase in their mean
percentage score from the pre-assessment to the post-assessment. Respondents’ mean percentage scores increased from 34.55 on the pre-assessment to 46.53 on the post-assessment. This increase was statistically significant. Notably, the overwhelming majority of the respondents indicated that they increased their knowledge of Alice (100.0%) and ability to teach with Alice (97.9%) to some degree or to a high degree.

Notable disaggregated findings show that seventeen of twenty-eight matched respondents at the Duke University workshop demonstrated an increase in their mean percentage score from the pre-assessment to the post-assessment. Respondents’ mean percentage scores increased from 36.90 on the pre-assessment to 47.32 on the post-assessment. This increase was statistically significant. In addition, fifteen of twenty matched respondents at the Columbia College workshop demonstrated an increase. Respondents’ mean percentage scores increased from 31.25 on the pre to 45.42 on the post-assessment. This increase was statistically significant.

The mean percentage correct scores of respondents at the Duke University workshop increased from 26.33 on the pre-assessment to 41.30 on the post-assessment, and this increase was statistically significant. The mean percentage scores of respondents at the College of Charleston workshop increased from 26.89 on the pre to 43.40 on the post and this increase was statistically significant.

The pre-post mean score differences by respondent characteristics are statistically significant within the following subgroups:

- Years of teaching experience: 3 to five years of teaching experience, 6 to 10 years of teaching experience, and more than 10 years of teaching experience
- Subject respondents teach: science and computer/technology
- Type of institution respondents teach: middle school and high school
- Comfort level in using Alice: very uncomfortable in using Alice, uncomfortable in using Alice, and comfortable in using Alice
- Comfort level in teaching with Alice: very uncomfortable in teaching with Alice and uncomfortable in teaching with Alice

End of Program Content Assessment

For Cohort One, eighteen respondents who participated in the End of Program Content Assessment, administered in summer 2012, were matched with those who participated in the 2011 summer pre- and post-workshop content assessments. Respondents’ mean percentage scores consistently increased from 36.08 on the pre-assessment to 49.48 on the post-assessment, and 50.00 on the end-of-program assessment. Notable disaggregated findings by workshop site show that the mean percentage scores on the part of College of Charleston respondents demonstrated a consistent increase from 42.65 on the pre-assessment to 52.94 on the post--assessment, and 64.71 on the end of program assessment.
For Cohort Two, ten respondents who participated in the End of Program Content Assessment, administered in summer 2013, were matched with those who participated in the 2012 summer pre- and post-workshop content assessments. Respondents’ mean percentage scores consistently increased from 30.08 on the pre-assessment to 44.17 on the post-assessment, and 45.00 on the end-of-program assessment.

**Question two: What was teacher participants’ feedback of Alice instructors and their fellow participants?**

Instruction feedback survey and Internal Peer Evaluation Survey generate information on teacher participants’ feedback of Alice instructors and their fellow participants presenting lessons. Respondents were satisfied with the instruction they received in the workshop. Many respondents provided positive comments on the lessons of their fellow participants.

*Instruction Feedback Survey*

Across years, respondents praised the instructors’ knowledge of Alice and materials presented, clarity of presentation and presentation materials, and instructors’ awareness of time and flow of the materials.

For Cohort Two, fifty-seven teachers participated in the workshop Instruction Feedback Survey and generated one hundred and forty submitted evaluations. The vast majority of submitted evaluations revealed instructors’ knowledge of Alice and materials presented (97.9%), clarity of presentation and presentation materials (91.4%), and instructors’ awareness of time and flow of the materials (95.7%), as very good or excellent.

Many respondents praised the helpful nature of the instruction they received in the workshop. They addressed hands-on activities, handouts, student helpers, tutorials, and step-by-step instructions as most helpful aspects of instruction in adding their understanding of how to use the Alice software materials.

For Cohort Three, the vast majority of submitted evaluations indicated the instructors; knowledge of Alice and materials presented (n=105 of 108, 97.2%), clarity of presentation and presentation materials (n=93 of 107, 86.9%), and instructors’ awareness of time and flow of the materials (n=100 of 106, 94.3%), as very good or excellent.

Respondents commented on the hands-on and one-on-one attention they received as being most helpful to their understanding. Additionally, respondents highlighted the importance of tutorials, handouts, and student helpers as being critical to the successful workshops.

*Internal Peer Evaluation Survey*

Across years, many respondents provided positive comments on the lessons. Respondents indicated Alice concepts such as billboards, objects, methods, storyboards, and worlds to be most critical for students to have studied before the lessons. Many respondents also focused on the necessity of having a basic understanding of Alice prior to this lesson. Respondents
reported some notable pedagogic advantages to using the Alice approach over conventional techniques, which include the visual presentation, hands-on learning, and the more engaging/interactive and fun nature of Alice.

**Question three: What was Alice instructors/leadership team members’ feedback of teacher presenters?**

Across years, respondents indicated Alice concepts such as the use of sound, methods, objects, looping/loops, storyboarding, and functions as most critical for students to prepare for the lesson. They also indicated that basic knowledge of the program and basic computing skills were necessary for students. The visual aspects and interactive and engaging nature of Alice continued to be the major pedagogic advantage to using the Alice approach from the lesson over conventional techniques.

**Question four: How did teachers implement Alice in their classroom after their participation in the workshops?**

Teachers implemented Alice in their class(es) after their participation in the workshops. Data from the Teacher Use of Alice Survey and Teacher Classroom Logs inform how teachers implemented Alice in the classroom.

*Teacher Use of Alice Survey*

For Cohort One, twenty teachers participated in the Teacher Use of Alice Survey. A majority of seventeen respondents indicated they used summer workshop materials and more than half used online materials from the Adventures in Alice Programming Duke University site (Prof. Susan Rodger’s site). Half of twenty respondents indicated they used Alice in one class/subject over the last academic year (Fall 2011 – Spring 2012), while a handful of them indicated they used Alice in more than one classes/subjects.

For Cohort Two, Fourteen teachers participated in the Teacher Use of Alice Survey. The majority of fourteen respondents used online materials from the Adventures in Alice Programming Duke University site (Prof. Susan Rodger’s site) (n=12, 85.7) and summer workshop materials (n=10, 71.4%) as resources for their classroom. Half of respondents used chapters of the book (Learning to Program with Alice) (n=7, 50.0%), while fewer than half used online materials from www.aliceprogramming.net (n=6, 42.9%), exercises from the book (n=5, 35.7%), and their own activities (n=4, 28.6%).

Five of the fourteen respondents indicated they used Alice in one class/subject over the last academic year (Fall 2012 – Spring 2013), while two respondents indicated they used Alice in either two or three classes/subjects, and four respondents used Alice in four classes/subjects. One respondent did not use Alice in any classes.
Teacher Classroom Logs

For Cohort Two, ten respondents completed eleven teacher classroom logs, and all attended the Alice workshop at Duke University in the summer of 2012. Respondents indicated the class/subject area topic of the lesson in which Alice was used. Six of the eleven (54.5%) classes were computer science related (intro to programming, computer skills, etc.), while three (27.3%) were math related, the remaining responses were reading and after-school club.

When asked to briefly summarize the Alice-based lesson, all (54.5%, n=6) of the computer science related classes used lessons that taught programming concepts through Alice. In particular, one lesson focused on “drag and drop object based programming,” while another “used the tutorials provided by the Duke Alice web site to cover the functions of Alice.” In addition, the math related classes used Alice to visualize math concepts and as an introduction to math concepts in algebra and ratios. All of the ten respondents indicated that their students were interested and engaged with Alice throughout the lesson. Further, nearly all of the respondents (n=8 of 10, 80.0%) stated that their students’ interest in programming increased because of their exposure to Alice and that they are eager to continue to use their new skills.

STRUCTURE OF REPORT

The analysis section of this report is divided into two sections, presenting findings drawn from the Year Two and Year Three Cohorts, respectively. Findings regarding 2012 summer pre-and post-workshops were included in a separate report completed in February 2013. Therefore, Section I describes findings generated from the 2012 follow-up surveys: the End of Program Content Assessment, the End of Program Survey, Teacher Use of Alice Survey, and Teacher Classroom Log. Section II focuses findings on the 2013 summer workshop surveys: the Demographic Survey, the Pre-and Post-Workshop Content Assessment, Instruction Feedback Survey, and Internal and External Peer Evaluation Survey. Each of two sections is divided into subsections, for the aforementioned individual instruments.
ANALYSIS I: YEAR TWO COHORT FOLLOW-UP SURVEYS

END OF PROGRAM CONTENT ASSESSMENT ANALYSIS

Thirteen teachers participated in the End of Program Content Assessment. Ten respondents were matched with those who participated in the 2012 summer pre- and post-workshop content assessments. For the purpose of comparison, this section presents changes in mean percentage scores from pre- and post-assessments to the end of program assessment. Respondents’ mean percentage scores consistently increased from 30.00 on the pre-assessment to 44.17 on the post-assessment, and 45.00 on the end-of-program assessment. (Table 1).

Table 1: Descriptive Statistics

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<th>Group</th>
<th>Percentage Correct</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Pre- Mean</td>
<td>Post- Mean</td>
<td>End-of-Program</td>
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<td></td>
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<td>SD</td>
<td>SD</td>
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</tr>
<tr>
<td>All Respondents (n=10)</td>
<td>30.00</td>
<td>0.07</td>
<td>44.17</td>
<td>0.15</td>
</tr>
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END OF PROGRAM SURVEY ANALYSIS

Four teachers participated in the End of Program Survey, of which three respondents participated in the workshop at Duke University and one at College of Charleston. The section is organized to provide findings to each of the open-ended questions.

When asked to comment on any topics or instructional methods that they felt were not adequately covered by the workshop that would have aided them in teaching programming concepts to their students, three of the four respondents indicated “No”. They felt the workshop covered sufficient topics and they were well prepared for classroom teaching. The remaining respondent suggested more exploration of the Alice 3.1 environment, especially with functions and event listeners would have been beneficial.

Regarding the relationship and interaction they had with local college faculty during the academic school year, all respondents indicated that they have interacted with college faculty in some way during the school year. In addition, two of the respondents made a point of communicating how helpful the faculty members were.

When asked for any additional comments or advice regarding the workshop, two respondents cited that the experience and the use of Alice have helped them in the classroom and that it was beneficial. Finally, all of the respondents indicated an interest in remaining current in their knowledge of Alice and how to incorporate it into the classroom.
TEACHER USE OF ALICE SURVEY ANALYSIS

Fourteen teachers participated in the Teacher Use of Alice Survey, of which ten respondents participated in the workshop at Duke University and four at College of Charleston. Teachers responded to questions regarding the impact of Alice workshops, the participants’ use of Alice materials, and specific information on the classes in which they used Alice.

The Impact of Alice Workshops

- **The Way in Which Alice Changed Respondents’ View of Programming.** When asked to provide comments on how Alice changed the way they view programming, five respondents felt Alice helped to make programming easier and more accessible to teach, while five others cited how Alice provided them with new resources that were fun and engaging in the teaching of programming. One teacher responded, “It made programming seem accessible. It also opens a world of educational possibilities.” Finally, two teachers responded that Alice helped them to relate to their students and feel empowered when teaching programming to students who have a great deal of experience with computers. One teacher, in particular, wrote, “It allowed me to relate more to my students who know so much about computers.”

- **The Way in Which Alice Changed Students’ View of Programming.** When asked to provide comments on how Alice changed the way their students view programming, over half of the fourteen respondents indicated that after using Alice, students found programming to be easier and more fun. One responded wrote, “I think with Alice, they see programming as something they can accomplish. Most of them look forward to the Alice unit and think it is a lot of fun.” In addition, three teachers responded that students found programming to be more visual, and less formula-based, after working with Alice. One teacher responded, “Students were able to visually explore programming concepts. Students could easily design programs based on high level concepts without be [sic] hindered by the syntax of a specific programming language.”

- **The Benefits of Using Alice in the Classroom.** Responding to the benefits of using Alice in the classroom, nine of the fourteen respondents indicated that the greatest benefit of Alice is how it improves student skills, such as critical thinking, logic, 21st century skills, problem solving, higher-level thinking, and organization. Additionally, three teachers responded that the increased interest and engagement in programming was a major benefit, while two others praised Alice’s benefit for different types of learners, specifically stating that Alice is, “Perfect for the visual learner” and with Alice, “Kids can progress at their own speed – great for differentiating learners.”

- **Use of Alice in Future Classes.** In response to whether they will use Alice in future classes, all fourteen respondents indicated positive answers, stating that they planned to use Alice in the future, in a variety of settings. Some respondents suggested specific areas where they will use Alice, including, “For story illustrations,” “I would like to use Alice to support the students’ work in their core classes. I have an idea to use Alice in conjunction with a science
assignment”, “As a development tool for middle schoolers,” as well as “With special needs students who needed a quiet activity and it also provided them a way to be successful.”

Participants Use of Alice Materials

When asked to indicate Alice materials they used in their classes, and they can provide multiple answers. The majority of fourteen respondents used online materials from the Adventures in Alice Programming Duke University site (Prof. Susan Rodger’s site) (n=12, 85.7) and summer workshop materials (n=10, 71.4%). Half of respondents used chapters of the book (Learning to Program with Alice) (n=7, 50.0%), while fewer than half used online materials from www.aliceprogramming.net (n=6, 42.9%), exercises from the book (n=5, 35.7%), and their own activities (n=4, 28.6%).

Class/Classes in Which Respondents Used Alice

Five of the fourteen respondents indicated they used Alice in one class/subject over the last academic year (Fall 2012 – Spring 2013), while two respondents indicated they used Alice in either two or three classes/subjects, and four respondents used Alice in four classes/subjects. One respondent did not use Alice in any classes. The following section reports the detailed demographic information about the classes/subjects.

While many respondents indicated that they used Alice in multiple classes/subjects, not all respondents provided information on each of the classes/subjects. Overall, respondents provided detailed information on twenty-four classes/subjects. Based on these responses, respondents used Alice in classes/subjects such as introduction to programming (n=5), computer skills (n=3), computer applications (n=2), tech ed (n=2), and various foundation courses (Java, Visual Basic, Animation, Multimedia and Webdesign). In addition, two respondents indicated that they used Alice during intervention time or during an after-school computer science club. Respondents indicated that these classes/subjects were split evenly with twelve taught at the grades 6-8 level and twelve taught at the grades 9-12 level.

Respondents indicated the demographic breakdown of each of their classes/subjects. Classes/subjects had an average of twenty-eight students and a gender breakdown of 66.8% male to 33.2% female. Respondents provided racial/ethnic demographic information, as well. On average, students in these classes/subjects were 63.2% white, 20.3% African American, 6.0% Hispanic, 3.6% multi-ethnic, 3.1% Asian, 2.9% Native Hawaiian/Pacific Islander, and 0.9% American Indian.

TEACHER CLASSROOM LOG ANALYSIS

Teachers had the opportunity to describe their lessons that used Alice throughout the 2012-2013 school year. In total, ten respondents completed eleven teacher classroom logs, and all attended the Alice workshop at Duke University in the summer of 2012. When asked to specify the discipline in which Alice was taught for the lesson, three of the eleven (27.3%) lessons were within computing, two (18.2%) were within media/technology, and one (9.1%) each within
math, social studies or history, an after-school club, and social skills. The remaining two disciplines were not specified. Additionally, respondents indicated the class/subject area topic of the lesson in which Alice was used. Six of the eleven (54.5%) classes were computer science related (intro to programming, computer skills, etc.), while three (27.3%) were math related, the remaining responses were reading and after-school club.

Respondents indicated, by selecting all that applied, at what grade level(s) the lessons were taught. Overall, respondents taught six (54.5%) lessons at the sixth grade level, six (54.5%) at the seventh grade level, five (45.5%) at the eighth grade level, four (36.4%) at the eleventh grade level, four (36.4%) at the twelfth grade level, three (27.3%) at the ninth grade level, and three (27.3%) at the tenth grade level.

When asked to briefly summarize the Alice-based lesson, all (54.5%, n=6) of the computer science related classes used lessons that taught programming concepts through Alice. In particular, one lesson focused on “drag and drop object based programming,” while another “used the tutorials provided by the Duke Alice web site to cover the functions of Alice.” In addition, the math related classes used Alice to visualize math concepts and as an introduction to math concepts in algebra and ratios. All of the ten respondents indicated that their students were interested and engaged with Alice throughout the lesson. Further, nearly all of the respondents (n=8 of 10, 80.0%) stated that their students’ interest in programming increased because of their exposure to Alice and that they are eager to continue to use their new skills.
ANALYSIS II: YEAR THREE COHORT SUMMER WORKSHOPS SURVEYS

DEMOGRAPHICS SURVEY ANALYSIS

The demographic survey analysis includes participant characteristics and their teaching contexts, comfort level in using and teaching with Alice, desired outcomes from the workshop, ways to learn about the workshop, and motivation for attending the workshop. In addition to findings across all respondents, disaggregated findings by workshop site are presented.

All Respondents

Fifty-five teachers participated in the demographic survey. Among them, thirty respondents participated in the workshop at Duke University, and twenty-four respondents at Columbia College. In an effort to thoroughly represent respondent answers, frequencies (n=#) and percentages were reported at item level. However, due to rounding, percentages cited do not always equal 100% of respondents who answered a question. In addition, for questions that respondents were able to choose more than one answer, percentages are always more than 100%.

Respondent Characteristics and Teaching Contexts

- Years of teaching experience (54 respondents) (Figure 2)
  - 48.1% (n=26) have more than 10 years of teaching experience
  - 31.5% (n=17) have 6 to 10 years of teaching experience
  - 14.8% (n=8) have 3 to 5 years of teaching experience
  - 5.6% (n=3) have less than 3 years of teaching experience

Figure 2: Years of Teaching Experience
• Degree respondent has earned, check all that apply (54 respondents)
  o 70.4% (n=38) have earned a master degree
  o 59.3% (n=32) have earned a bachelor degree
  o Respondents were asked to specify the subject(s) of the degree they hold. Over a third (36.7%, n=18) of forty-nine respondents identified business-related subjects. These subjects are varied, including business education, business administration, economics, marketing, and accounting. Others indicated education (14.3%, n=7) and science (14.3%, n=7) degrees most often.

• Subject(s) taught, check all that apply (54 respondents)
  o 59.3% (n=32) teach computer/technology
  o 22.2% (n=12) teach science
  o 18.5% (n=10) teach business
  o 16.7% (n=9) teach math
  o 14.8% (n=8) teach social studies or History
  o 13.0% (n=7) teach language arts or English
  o 7.4% (n=4) chose “other”
  o 3.7% (n=2) teach music or art
  o 1.9% (n=1) teach foreign language

• Type of institution(s) respondents teach, check all that apply (49 respondents)
  o 57.4% (n=31) teach at the high school
  o 40.7% (n=22) teach at the middle school
  o 7.4% (n=4) teach at the elementary school
  o 3.8% (n=2) chose “other”: Career/Vocational School and College/University

• Previous teaching experience, check all that apply (54 respondents)
  o 24.1% (n=13) have previous teaching experience with HTML
  o 7.4% (n=4) have previous teaching experience with BASIC
  o 7.4% (n=4) have previous teaching experience with Alice
  o 5.6% (n=3) chose “other”: Scratch Programming, Pivot, and Gizmos
  o 5.6% (n=3) have previous teaching experience with Java
  o 5.6% (n=3) have previous teaching experience with C++
  o 3.7% (n=2) have previous teaching experience with Pascal

• Computer-related classes offered at the respondent’s school (54 respondents)
  o 96.3% (n=52) indicated “yes”
  o 3.7% (n=2) indicated “no”

• Computer-related clubs or activities offered at the respondent’s school (54 respondents)
  o 55.6% (n=30) indicated “yes”
  o 44.4% (n=24) indicated “no”
• Flexibility in introducing new materials (40 respondents) (Figure 3)
  o 30.0% (n=12) indicated integrating Alice into their class curriculum as not challenging
  o 30.0% (n=12) indicated integrating Alice into their class curriculum as a little challenging
  o 25.0% (n=10) indicated integrating Alice into their class curriculum as moderately challenging
  o 15.0% (n=6) indicated integrating Alice into their class curriculum as very challenging
  o Respondents were further asked to provide a brief explanation of their answers. Of those who responded further, 75% (n=30) of the forty respondents indicated that they are yet to integrate Alice and anticipate their newness to Alice as a challenge to integrating it into their class curriculum. An additional 12.5% (n=5) of the respondents cited time and resources as challenges to integrating Alice into the class curriculum.

**Figure 3: The Level of Challenge in Integrating Alice into Respondents’ Curriculum**

![Bar chart showing the level of challenge in integrating Alice into respondents' curriculum: 30.0% not challenging, 30.0% a little challenging, 25.0% moderately challenging, 15.0% very challenging.]

**Level of Comfort in Using and Teaching with Alice**

Respondents were asked to rate their own levels of comfort in using and teaching with Alice on a 4-point scale. Notable findings included that over half of fifty respondents feel uncomfortable or very uncomfortable using Alice (n=30, 60.0%) and over three-quarters of forty-eight respondents feel uncomfortable or very uncomfortable teaching with Alice (n=38, 79.2%) (Table 2).
Table 2: The Level of Comfort in Using and Teaching with Alice

<table>
<thead>
<tr>
<th></th>
<th>Very Comfortable</th>
<th>Comfortable</th>
<th>Uncomfortable</th>
<th>Very Uncomfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Using Alice</td>
<td>1</td>
<td>2.0%</td>
<td>19</td>
<td>38.0%</td>
</tr>
<tr>
<td>Teaching with Alice</td>
<td>1</td>
<td>2.1%</td>
<td>9</td>
<td>18.8%</td>
</tr>
</tbody>
</table>

Table 3 shows that the majority of fifty-four respondents feel comfortable or very comfortable encouraging students to use computers in and out of class (n=51, 94.4%), integrating computing into the existing curriculum (n=28, 88.9%), and implementing instructional activities designed to develop students advanced computer skills (programming, etc.) (n=36, 66.7%).

Table 3: The Level of Comfort with the Following Teaching Practices

<table>
<thead>
<tr>
<th></th>
<th>Very Comfortable</th>
<th>Comfortable</th>
<th>Uncomfortable</th>
<th>Very Uncomfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Encouraging students to use computers in and out of class</td>
<td>37</td>
<td>68.5%</td>
<td>14</td>
<td>25.9%</td>
</tr>
<tr>
<td>Integrating computing into the existing curriculum</td>
<td>31</td>
<td>57.4%</td>
<td>17</td>
<td>31.5%</td>
</tr>
<tr>
<td>Implementing instructional activities designed to develop students advanced computer skills (programming, etc.)</td>
<td>15</td>
<td>27.8%</td>
<td>21</td>
<td>38.9%</td>
</tr>
</tbody>
</table>

Desired Outcomes from the Workshop

When asked to describe their desired outcomes from this workshop, two-thirds of the fifty-four respondents would like to learn Alice to integrate it into a class, curriculum, or instructional practice. For example, one respondent wrote that his/her goals were to, “Obtain the knowledge/ability to implement an ALICE course next fall; develop enough skill in ALICE to problem solve and teach effectively with ALICE; obtain resources to help teach effectively with ALICE.” Another respondent interested in learning how to integrate Alice into the classroom wrote, “I would like students to see how computers can enhance presentations and allow for creative work which is both exciting and entertaining to the people who are watching and learning. I would like to show this to the students by using ALICE to enhance my lesson plan specifically in work place safety.”
In addition, nearly a quarter of respondents (n=13, 24.1%) were interested in growing more comfortable and knowledgeable with programming through learning Alice. In particular, a respondent wrote, “I wish to learn Alice well enough to support student learners who are taking Alice in the computer apps class.” Finally, the remaining five respondents (9.3%) indicated that they were interested in promoting computer science through the use of Alice.

Ways Learned About the Workshop

When asked to provide information on where they learned about the workshop, slightly greater than half of the fifty-five respondents indicated they learned about the workshop from an email list (not the AP CS list) (n=18, 32.7%) or another teacher (n=10, 18.2%). In addition, six respondents, each, indicated that they learned about the workshop from a school administrator or department chair (10.9%) or from an internet search (10.9%). Additional answers included from an AP mailing list email (n=4, 7.3%) and from the State Department of Education (n=3, 5.5%).

Motivation for Attending the Workshop

Responding to the question about their motivation for attending the workshop, a third of the fifty-four respondents (n=18) indicated they were interested in learning something new. Specifically, one respondent stated, “I have always loved computing and did some C++ in the military and managed 7 computer systems... so I wanted to learn more about this programming.” An additional quarter of the respondents indicated that their motivation for attending the workshop was to help in their teaching (n=14, 25.9%) or to help their students (n=13, 24.1%). In particular, a respondent stated, “I really wanted to integrate technology in my lessons more frequently that I wanted to. I love learning new stuff that will help me become a more effective teacher,” and another stated, “My motivation also comes from trying to help our students (mostly minority and from low socioeconomic backgrounds) try new and interesting things to help spark their interests for future careers in STEM.” Finally, four of the fifty-four respondents (11.1%) are interested in promoting computer science in their schools, either directly to students are by starting a club.

Duke University

Respondent Characteristics and Teaching Contexts

• Years of teaching experience (30 respondents)
  o 46.7% (n=14) have more than 10 years of teaching experience
  o 30.0% (n=9) have 6 to 10 years of teaching experience
  o 16.7% (n=5) have 3 to 5 years of teaching experience
  o 6.7% (n=2) have less than 3 years of teaching experience

• Degree respondent has earned, check all that apply (30 respondents)
  o 50.0% (n=15) have earned a master degree
  o 77.3% (n=22) have earned a bachelor degree
Subject(s) taught, check all that apply (30 respondents)
- 50.0% (n=15) teach computer/technology
- 30.0% (n=9) teach science
- 26.7% (n=8) teach math
- 26.7% (n=8) teach social studies or History
- 23.3% (n=7) teach language arts or English
- 23.3% (n=7) chose “other”
- 6.7% (n=2) teach music or art
- 3.3% (n=1) teach foreign language

Type of institution(s) respondents teach, check all that apply (30 respondents)
- 53.3% (n=16) teach at the middle school
- 43.3% (n=13) teach at the high school
- 13.3% (n=4) teach at the elementary school

Previous teaching experience, check all that apply (30 respondents)
- 13.3% (n=4) have previous teaching experience with HTML
- 6.7% (n=2) have previous teaching experience with BASIC
- 3.3% (n=1) have previous teaching experience with Alice
- 3.3% (n=1) have previous teaching experience with Pascal
- 3.3% (n=1) chose “other”

Computer-related classes offered at the respondent’s school (30 respondents)
- 93.3% (n=28) indicated “yes”
- 6.7% (n=2) indicated “no”

Computer-related clubs or activities offered at the respondent’s school (30 respondents)
- 53.3% (n=16) indicated “yes”
- 46.7% (n=14) indicated “no”

Flexibility in introducing new materials (22 respondents)
- 36.4% (n=8) indicated integrating Alice into their class curriculum as moderately challenging
- 31.8% (n=7) indicated integrating Alice into their class curriculum as not challenging
- 22.7% (n=5) indicated integrating Alice into their class curriculum as a little challenging
- 9.1% (n=2) indicated integrating Alice into their class curriculum as very challenging

Level of Comfort in Using and Teaching with Alice

Notable findings included that more than half of twenty-seven respondents feel comfortable or very comfortable in using Alice (n=17, 62.9%), and teaching with Alice (n=21, 77.8%) (Table 4).
Table 4: The Level of Comfort in Using and Teaching with Alice

<table>
<thead>
<tr>
<th></th>
<th>Very Comfortable</th>
<th>Comfortable</th>
<th>Uncomfortable</th>
<th>Very Uncomfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Using Alice</td>
<td>1</td>
<td>3.7%</td>
<td>9</td>
<td>33.3%</td>
</tr>
<tr>
<td>Teaching with Alice</td>
<td>1</td>
<td>3.7%</td>
<td>5</td>
<td>18.5%</td>
</tr>
</tbody>
</table>

Table 5 shows the vast majority of thirty respondents feel comfortable or very comfortable in encouraging students to use computers in and out of class (n=29, 96.6%) and integrating computing into the existing curriculum (n=26, 86.7%), but fewer feel comfortable or very comfortable implementing instructional activities designed to develop students advanced computer skills (programming, etc.) (n=16, 52.4%).

Table 5: The Level of Comfort with the Following Teaching Practices

<table>
<thead>
<tr>
<th></th>
<th>Very Comfortable</th>
<th>Comfortable</th>
<th>Uncomfortable</th>
<th>Very Uncomfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Encouraging students to use computers in and out of class</td>
<td>19</td>
<td>63.3%</td>
<td>10</td>
<td>33.3%</td>
</tr>
<tr>
<td>Integrating computing into the existing curriculum</td>
<td>15</td>
<td>50.0%</td>
<td>11</td>
<td>36.7%</td>
</tr>
<tr>
<td>Implementing instructional activities designed to develop students advanced computer skills (programming, etc.)</td>
<td>8</td>
<td>26.7%</td>
<td>8</td>
<td>26.7%</td>
</tr>
</tbody>
</table>

Columbia College

Respondent Characteristics and Teaching Contexts

- Years of teaching experience (24 respondents)
  - 50.0% (n=12) have more than 10 years of teaching experience
  - 33.3% (n=8) have 6 to 10 years of teaching experience
  - 12.5% (n=3) have 3 to 5 years of teaching experience
  - 4.2% (n=1) have less than 3 years of teaching experience

- Degree respondent has earned, check all that apply (24 respondents)
  - 95.8% (n=23) have earned a master’s degree
  - 41.7% (n=11) have earned a bachelor’s degree
• Subject(s) taught, check all that apply (24 respondents)
  o 70.8% (n=17) teach computer/technology
  o 29.2% (n=7) chose “other”
  o 12.5% (n=3) teach science
  o 4.2% (n=1) teach math

• Type of institution(s) respondents teach, check all that apply (24 respondents)
  o 75.0% (n=18) teach at the high school level
  o 25.0% (n=6) teach at the middle school level

• Previous teaching experience, check all that apply (24 respondents)
  o 37.5% (n=9) have previous teaching experience with HTML
  o 12.5% (n=3) have previous teaching experience with Java
  o 12.5% (n=3) have previous teaching experience with Alice
  o 12.5% (n=3) have previous teaching experience with C++
  o 8.3% (n=2) have previous teaching experience with BASIC
  o 8.3% (n=2) chose “other”
  o 4.2% (n=1) have previous teaching experience with Pascal

• Computer-related classes offered at the respondent’s school (24 respondents)
  o 100.0% (n=24) indicated “yes”

• Computer-related clubs or activities offered at the respondent’s school (24 respondents)
  o 58.3% (n=14) indicated “yes”
  o 41.7% (n=10) indicated “no”

• Flexibility in introducing new materials (18 respondents)
  o 38.9% (n=7) indicated integrating Alice into their class curriculum as a little challenging
  o 27.8% (n=5) indicated integrating Alice into their class curriculum as not challenging
  o 22.2% (n=4) indicated integrating Alice into their class curriculum as very challenging
  o 11.1% (n=2) indicated integrating Alice into their class curriculum as moderately challenging

*Level of Comfort in Using and Teaching with Alice*

Notable findings included that over half of twenty-three respondents feel uncomfortable or very uncomfortable in using Alice (n=13, 56.5%) and over half of twenty-one respondents feel uncomfortable or very uncomfortable teaching with Alice (n=17, 81.0%) (Table 6).
Table 6: The Level of Comfort in Using and Teaching with Alice

<table>
<thead>
<tr>
<th></th>
<th>Very Comfortable</th>
<th>Comfortable</th>
<th>Uncomfortable</th>
<th>Very Uncomfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Using Alice</td>
<td>0</td>
<td>0.0%</td>
<td>10</td>
<td>43.5%</td>
</tr>
<tr>
<td>Teaching with Alice</td>
<td>0</td>
<td>0.0%</td>
<td>4</td>
<td>19.0%</td>
</tr>
</tbody>
</table>

Table 7 shows that the vast majority of twenty-four respondents feel comfortable or very comfortable in encouraging students to use computers in and out of class (n=22, 91.7%), integrating computing into the existing curriculum (n=22, 91.7%), and implementing instructional activities designed to develop students advanced computer skills (programming, etc.) (n=20, 83.4%).

Table 7: The Level of Comfort with the Following Teaching Practices

<table>
<thead>
<tr>
<th></th>
<th>Very Comfortable</th>
<th>Comfortable</th>
<th>Uncomfortable</th>
<th>Very Uncomfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Encouraging students to use computers in and out of class</td>
<td>18</td>
<td>75.0%</td>
<td>4</td>
<td>16.7%</td>
</tr>
<tr>
<td>Integrating computing into the existing curriculum</td>
<td>16</td>
<td>66.7%</td>
<td>6</td>
<td>25.0%</td>
</tr>
<tr>
<td>Implementing instructional activities designed to develop students advanced computer skills (programming, etc.)</td>
<td>7</td>
<td>29.2%</td>
<td>13</td>
<td>54.2%</td>
</tr>
</tbody>
</table>

SUMMER WORKSHOP CONTENT PRE-POST ASSESSMENT ANALYSIS

The pre- and post-workshop content assessments generate findings from analyses for reliability, in addition to descriptive statistics for mean percentage scores. For each disaggregated site, Duke University and Columbia College, findings are focused on descriptive statistics for mean percentage scores. Disaggregated findings on significant differences in respondents’ mean percentage scores between pre and post assessment are also presented. This disaggregation was based on respondents’ characteristics, including years of teaching.
experience, subject respondents teach, type of institution respondents teach, comfortable level in using Alice, and comfort level in teaching with Alice.

All Respondents

Participants were tested at the beginning and end of the Alice teacher workshop. Fifty-seven respondents completed the pre-assessment and fifty-four respondents completed the post-assessment. Among forty-eight matched respondents, thirty-two respondents demonstrated an increase in their mean percentage score from the pre-assessment to the post-assessment.

Content Pre-Post Assessment

Respondents’ mean percentage scores increased from 34.55 on the pre-assessment to 46.53 on the post-assessment (Table 8). This increase was statistically significant ($t(47) = -5.01, \rho < .001$).

<table>
<thead>
<tr>
<th>Table 8: Descriptive Statistics for Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage Correct</td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>34.55</td>
</tr>
</tbody>
</table>

Only ten respondents provided an answer to a question asking pre-workshop knowledge of Alice and nine responded to the question of ability to teach with Alice. Of those ten respondents, 70.0% (n=7) indicated that they had minimal knowledge of Alice while the remaining 30.0% (n=3) indicated some knowledge of Alice. Additionally, 66.7% (n=6) of nine total respondents, indicated that they had no or minimal ability to teach with Alice, and 33.3 (n=3) had some ability to teach with Alice.

Upon finishing the workshop and considering their experience in the workshop, the participants were asked to rate their knowledge of Alice and ability to teach with Alice again. Results showed that all of the forty-eight respondents indicated that they increased their knowledge of Alice and nearly all increased their ability to teach with Alice (n=47, 97.9%) to some degree or to a high degree.

Pre-Post Reliability Summary

Analyses for reliability were conducted on both pre- and post-assessments. The pre had a Cronbach’s Alpha score of .560 (n=12) and the post had a score of .670 (n=12). The alpha scores indicate moderate reliability across the assessments, suggesting the identification of individual test items that need to be revised. To determine the impact of the problematic questions on the overall assessment performance, alpha scores were calculated after removing the item of concern (Appendix 2). In each case the alpha score did not change drastically leading us to conclude that each assessment is a reliable measure.
Comparing item difficulty (p) on the pre- and post-assessments, the post had a higher average item difficulty index (.465, SD=.068) than the pre (.345, SD=.033) (Table 9 and 10). Item difficulty index is the number of people answering the item correctly divided by the total number of people answering item.

Discrimination coefficients were calculated for each item using point biserial correlation. This is the correlation between the right/wrong scores that students receive on a given item and the total scores that the students receive when summing up their scores across the remaining items. Five questions on the pre and four on the post had correlations less than .25, which is the point at which items should be investigated as potentially flawed (Table 11 and 12). For more information on the reliability tests used in this evaluation, please see Appendix 3.

**Table 9: Pre-Test Item Difficulty (p)**

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
<th>Q11</th>
<th>Q12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.38</td>
<td>.27</td>
<td>.52</td>
<td>.50</td>
<td>.38</td>
<td>.31</td>
<td>.42</td>
<td>.06</td>
<td>.10</td>
<td>.42</td>
<td>.13</td>
<td>.67</td>
</tr>
</tbody>
</table>

**Table 10: Post-Test Item Difficulty (p)**

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
<th>Q11</th>
<th>Q12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.71</td>
<td>.35</td>
<td>.75</td>
<td>.60</td>
<td>.65</td>
<td>.27</td>
<td>.71</td>
<td>.23</td>
<td>.17</td>
<td>.23</td>
<td>.10</td>
<td>.81</td>
</tr>
</tbody>
</table>

**Table 11: Pre-Test Discrimination Coefficient - Point Biserial Correlation (r_bis)**

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
<th>Q11</th>
<th>Q12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.281</td>
<td>.367</td>
<td>.149*</td>
<td>-.141**</td>
<td>.389</td>
<td>.424</td>
<td>.328</td>
<td>.459</td>
<td>.089*</td>
<td>.173*</td>
<td>-.004*</td>
<td>.497</td>
</tr>
</tbody>
</table>

**Table 12: Post-Test Discrimination Coefficient - Point Biserial Correlation (r_bis)**

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
<th>Q11</th>
<th>Q12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.336</td>
<td>.403</td>
<td>.347</td>
<td>.220*</td>
<td>.293</td>
<td>.314</td>
<td>.359</td>
<td>.506</td>
<td>.556</td>
<td>.131*</td>
<td>.046*</td>
<td>.184*</td>
</tr>
</tbody>
</table>

* Items with r_bis < .25 should be investigated.

** Items with r_bis < .00 show questions that had a reverse discriminant effect; individuals who scored lower on the test were most likely to answer these questions correctly.

**Duke University**

In total, thirty-one participants completed the pre-assessment, and twenty-nine participants completed the post-assessment. Among twenty-eight matched respondents, seventeen respondents demonstrated an increase in their mean percentage score from the pre-assessment to the post-assessment.

Respondents’ mean percentage correct scores increased from 36.90 on the pre-assessment to 47.32 on the post-assessment (Table 13). This increase was statistically significant (t(27) = -3.23, p < .05).
Table 13: Descriptive Statistics for Respondents

<table>
<thead>
<tr>
<th></th>
<th>Percentage Correct</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-</td>
<td>Post-</td>
</tr>
<tr>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>36.90</td>
<td>0.22</td>
<td>47.32</td>
</tr>
</tbody>
</table>

All of the five respondents indicated that they had minimal or some knowledge of Alice and three (60.0%) indicated no ability to teach with Alice.

Results showed that all of the twenty-eight respondents indicated that they increased their knowledge of Alice and twenty-seven of twenty-eight (96.4%) increased their ability to teach with Alice to some degree or to a high degree.

Columbia College

In total, twenty-six participants completed the pre-assessment and twenty-five participants completed the post-assessment. Among twenty matched respondents, fifteen respondents demonstrated an increase in their mean percentage score from the pre-test to the post-test.

Respondents’ mean percentage scores increased from 31.25 on the pre-assessment to 45.42 on the post-assessment (Table 14). This increase was statistically significant ($t(19) = -3.96$, $p < .001$).

Table 14: Descriptive Statistics for Respondents

<table>
<thead>
<tr>
<th></th>
<th>Percentage Correct</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-</td>
<td>Post-</td>
</tr>
<tr>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>31.25</td>
<td>0.12</td>
<td>45.42</td>
</tr>
</tbody>
</table>

All of the five respondents indicated that they had minimal or some knowledge of Alice and ability to teach with Alice.

Results showed that all of the twenty respondents indicated that they increased their knowledge of Alice and their ability to teach with Alice to some degree or to a high degree.

Disaggregation of Pre-Post Mean Score Difference by Respondent Characteristics

This section focuses on findings from the pre-post workshop content assessments disaggregated by respondent characteristic data gathered on the demographic survey. It should be noted that there are no statistically significant differences in pre- and post-tests between groups; however, there are statistically significant increases within groups ($p \leq .10$).
Years of teaching experience

- Teachers with 3-5 years of teaching experience (pre=32.14, post=57.14; t(6) = -5.61, ρ < .001)
- Teachers with 6-10 years of teaching experience (pre=35.78, post=48.53; t(16) = -3.43, ρ < .05)
- Teachers with more than 10 years of teaching experience (pre=32.95, post=42.42; t(21) = -2.69, ρ < .05)

Subject respondents teach

- Science teachers (pre=41.67, post=62.12; t(18) = -3.77, ρ < .001)
- Computer/Technology teachers (pre=32.14, post=43.45; t(27) = -3.62, ρ < .001)

Type of institution respondents teach

- Middle School teachers (pre=32.02, post=46.05; t(15) = -3.80, ρ < .05)
- High School teachers (pre=33.65, post=45.19; t(25) = -3.76, ρ < .001)

Comfort level in using Alice

- Teachers with very uncomfortable level in using Alice (pre=32.14, post=44.05; t(6) = -2.34, ρ < .10)
- Teachers with uncomfortable level in using Alice (pre=37.28, post=53.07; t(18) = -4.53, ρ < .001)
- Teachers with comfortable level in using Alice (pre=30.39, post=40.69; t(16) = -2.45, ρ < .05)

Comfort level in teaching with Alice

- Teachers with very uncomfortable level in teaching with Alice (pre=33.33, post=46.21; t(10) = -3.75, ρ < .05)
- Teachers with uncomfortable level in teaching with Alice (pre=35.71, post=48.81; t(20) = -3.58, ρ < .05)

INSTRUCTION FEEDBACK SURVEY ANALYSIS

Sixty-six teachers participated in the workshop instruction feedback survey. Among them, thirty-six teachers participated in the Duke University workshop, and thirty in the Columbia College workshop. In total, there are one hundred-nine submitted evaluations.

Results in Table 15 showed that the vast majority of submitted evaluations indicated the instructor’s knowledge of Alice and materials presented (n=105 of 108, 97.2%), clarity of presentation and presentation materials (n=93 of 107, 86.9%), and instructor’s awareness of time and flow of the materials (n=100 of 106, 94.3%), as very good or excellent.
Table 15: Workshop Instruction Feedback

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<tr>
<th></th>
<th>Fair</th>
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<td></td>
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<td>39.4%</td>
<td>50</td>
<td>46.7%</td>
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<tr>
<td>Instructor’s awareness of time and flow of the materials</td>
<td>4</td>
<td>3.8%</td>
<td>2</td>
<td>1.9%</td>
<td>26</td>
<td>24.5%</td>
<td>74</td>
<td>69.8%</td>
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</table>

The Most Helpful Aspect of Instruction

In answering the question, “What aspects of instruction have you found most helpful in aiding your understanding of how to use the Alice software materials?”, 25% of respondents mentioned hands-on activities and one-on-one attention. An additional 25% of responses related mentioned the teaching style and format of the lessons. Respondents also highlighted tutorials, handouts, student helpers, and specific aspects of Alice.

Selected responses focusing on hands-on activities and one-on-one attention:

- *Hands on activities were most helpful. This would be hard to learn in a lecture format.*
- *I like the fact that instruction is hands on. The only way to learn this is by doing. There was time to experiment with things on your own.*
- *The varied examples and hands-on experiences helped me to understand the presented concepts. The student interns were extremely helpful and patient. This aided me in feeling comfortable with trying new areas in Alice. Thank you very much to the entire team who aided in support and instruction.*
- *The part where we have to work on our own really made me think about and enhance my knowledge of Alice*
- *The one-on-one with the instructor*
Selected responses focusing on teaching style and lesson format:

- I appreciate the 'why' being answered. I can comprehend an action better when I understand why it's done, as in "We do this for a placeholder."
- Clear and concise. Instructions repeated and explained when requested.
- I enjoyed the format of instruction: preview with PowerPoint, demonstration by facilitator with hands-on step by step, and then an independent assignment
- The way the information has been broken in segments.
- Chunking the material and having us practice using this material on our own. Tutorials are fine, and the printouts are wonderful, but having us actually practice small chunks on our own before moving on is most helpful to me.
- The focused tutorials, guest speakers who've taught Alice in a school setting, and experienced undergrad assistants who can help problem-solve when codes go awry

Selected responses focusing on the tutorials:

- The tutorial sheets. Although I may work through the activities, I still need the sheets to review
- Hands on tutorials. Scenario descriptions to visualize an Alice world are good before jumping into the coding/skill
- Doing the tutorials at the same time with the teachers and student aids helping as we have issues or questions.
- The tutorials and handouts helped provided review of recent-learned skills in Alice while adding a new skill in a format that simulates what I might experience with my students in the classroom. Each activity includes review, instruction, and practice that provide enough new or challenging material to keep me engaged without feeling overwhelmed. The handouts give me a way to self-check my work during the assignment and a reference material I could use or adapt for my students.

Selected responses focusing on the student assistants:

- Assistance by the students, especially Daniel, on camera placements
- There are student assistants who are available to assist us in case we are not able to catch up with the materials?
- The student helpers were invaluable. I didn't feel I was taking time away from the instructor and the rest of the class.
- Tutorial handouts and the student helpers. Without the students it would have not been good
Selected responses focusing on the handouts:

- Having the printed handouts has been great.
- The handouts are very helpful while following along with the instructor. I must have. It is also good having at least 3 student helpers in the room.
- In the beginning following the instructor, but when I understood enough I followed the handouts and finished way before the instructor.

Selected responses focusing on specific aspects of Alice:

- Creating variables, methods to create games and lists
- Learning better ways to combine code to save time.
- Use of shapes and textures and building decision trees

The Not Helpful Aspect of Instruction

In response to the question, “What aspects of instruction did you find were not helpful in aiding your understanding of how to use the Alice software materials?”, 48% submitted evaluations indicated the instruction as very helpful in every aspect and therefore respondents indicated nothing to report. Among the rest of comments, instruction pace, to much talking and noise in the classroom and the instructor’s accent were the most frequently cited themes.

Selected responses focusing on the pacing:

- The demonstrations were sometimes kind of draggy.
- At the beginning, I was sort of lost in starting to understand methods, etc. It did come to me, but since I’m not as experienced in computers as others, it took longer for me to absorb - I didn’t feel I was keeping up with the material, but didn’t want to hold up the others.
- Sometimes the instructions were given too fast!

Selected responses focusing on talking and noise in the classroom:

- Sometimes other attendees would be talking and it made it a little difficult to hear the instruction.
- Very noisy and hard to hear or concentrate sometimes
- I have found all aspects of instruction helpful. What I do find unhelpful is the excessive talking that happens with the instructors are trying to teach and the class gets out of control. Teachers are notorious for exemplifying the same bad traits of students while in workshops. When the instructors are showing us what to do on the big screen people are not always looking or listening to following what is going on.

Selected responses focusing on the instructor accent:
• Instructor’s accent is difficulty to follow at times. But she is very knowledgeable in the subject
• I cannot understand her accent. I cannot read the smart board - too small. I am completely frustrated

Changes That Could Make to Better Facilitate Learning

In responses to the question “What changes could the instructors make to better facilitate your learning?” 33% of respondents indicated that they though nothing should be changed. Additionally respondents most frequently suggested changes in the Smartboard set up, changing the pacing, controlling the noisy classroom and more student assistants.

Selected responses suggesting changes for the smart board set up:

• Get what’s on the Smartboard onto the screens on our desks.
• Get the monitors working at our table so we can follow along while she is providing instruction. We are not able to see the screen in the front.
• Have a lab with a easier viewing screen or a computer software that would broadcast the instructors screen.

Selected responses suggesting changing the pacing:

• The instructor needs to slow down. Explain what Alice is and why you use what you use in order to create your program.
• Slow down some, but not too slow.
• Break the information down into smaller chunks.

Selected responses focusing on talking and noise in the classroom:

• A few ground rules the first day- keep voices low, aides too. When providing 1:1 instruction, be mindful of others who are trying to concentrate and keep your voice low. It's very distracting to be in the middle of something, and to have to contend with loud conversations around the room.
• Wait time for class to quiet down before beginning instruction again
• Keeping people at tables quiet during instruction. Having the teacher's screen displayed at the base computers at each table.

Selected responses suggesting more student assistants:

• More classroom assistance to rotate around the room during class.
• Have maybe 2-3 assistants if possible or offer the class to a smaller group
THE INTERNAL AND EXTERNAL PEER EVALUATION SURVEY ANALYSIS

Internal and external peer evaluation surveys include the same questions but target different groups. The internal peer evaluation survey was designed to enable teachers to provide feedback to their fellow participants presenting lessons, while the external peer evaluation survey targeted Alice instructors/leadership team members.

Seventy-five teachers participated in the Internal evaluation of lessons, of which forty-five teachers were from the Duke University workshop and thirty teachers were from the Columbia College workshop. Fifty-four lessons were evaluated, of which thirty-one lessons were evaluated at the Duke University workshop, and thirteen lessons were evaluated at the Columbia College workshop. In total, there were nine hundred seventy-five submitted evaluations.

Five Alice instructors/leadership team members submitted external evaluations of lessons, of which four participated in the Duke University workshop and one in the Columbia College workshop. They evaluated fifty-eight lessons, of which thirty-five lessons were evaluated at the Duke University workshop, and thirteen lessons were evaluated at the Columbia College. In total, there are one hundred and ninety-five submitted evaluations.

Internal Program Evaluation

Programming Concepts Critical for Students

In answering the question, “After observing the lesson/presentation, which programming concepts do you feel would be most critical for students to have studied prior to this lesson/presentation?,” most responses were focused on specific concepts in Alice such as billboards, worlds, objects, and storyboarding. Many responses also focused on the necessity of having a basic understanding of Alice prior to this lesson. Fifteen percent of responses indicated that no prior programming knowledge was necessary. An additional 10% of responses mentioned the necessity of content knowledge that was not programming related. Some of these responses indicated that the responder viewed Alice as an instructional tool meant to reinforce classroom instruction rather than to educate the students in programming.

Selected responses focusing on specific aspects of Alice:

- Must know how to add sounds, billboards, objects, methods, 3D text, changing scenes, using wait, if/else features, must know vehicle feature
- How to create lists and how to create arrays and how to add elements to the arrays. In Alice, how to make your arrays into classes. Do in order
- Storyboard, explicit instruction, methods, variables, functions, parameters - need to know how to program with Alice
Selected responses focusing on a basic knowledge of the program:

- They'll need to know the basics of Alice (from your instructions or Duke's tutorials) to recreate this world.
- Basic Alice programming concepts
- They'll need to know how to program in Alice in order to build their own worlds.

Selected responses focusing on knowledge that is not programming related:

- They need to know stoichiometry and follow the Alice world. The students don't do any programming
- Content knowledge about biomes would be necessary but she only used Alice to demonstrate the concept.
- Knowledge of wage and tax information
- Alice presentation used to practice/reinforce science content area/social studies concepts. Students would need some prior knowledge to gain maximum benefit.

Unclear Aspects of the Presentation

When asked “What aspects of the lesson/presentation might still seem unclear to students that meet the conditions you described in the previous question?,” many respondents (35%) answered that there were no aspects that were unclear. An additional 25% did not respond to the question or said that the question was not applicable. Specific aspects of the Alice program such as objects, methods, worlds, etc. were listed as the most common areas lacking clarity. The remaining responses varied greatly. Some mentioned that more familiarity and basic knowledge of the program was needed, and others mentioned concepts that were related to the subject matter of the worlds rather than programming or Alice itself.

Selected responses focusing on specific aspects of Alice:

- Maintaining continuity between object and camera view throughout the running of the world. integrating movement of multiple objects
- Types of sorting, bubble, selection, insertion. Bubblesort, is a different type of concept for sorting.
- How to set up new events

Several responses mentioned that any lack of clarity could be due to the large amount of information that was presented in a short period of time. Others mentioned that although there were no issues with the presentation itself, students may experience a lack of understanding when they actually try to do the project on their own. Finally, several respondents showed that they were unclear as to what the purpose of the lesson was and that they did not understand what the students were supposed to do with the Alice knowledge. For example, one respondent replied, “Instruction was presented well... I still was not clear on what the presentation was for or about.” Another, when asked what aspects of the lesson were
unclear, responded, “The purpose of the lesson; not sure what the lesson was supposed to make the students do...”

**Major Pedagogical Advantage**

When asked what a major pedagogical advantage was to using Alice rather than more conventional techniques, most respondents replied that Alice was more engaging and interactive. Many others also replied that a major advantage to Alice was its visual aspects. Other common responses were that Alice was more fun and entertaining, and that Alice could be used to reinforce other classroom concepts.

Selected responses focused on engagement:

- *Students using Alice will be more engaged than those who don’t.*
- *Students are more actively engaged and thereby would learn and retain the concept*
- *Students getting to see their projects in action as they do them helps them become less frustrated and more interested.*

Selected responses focused on the visual aspects:

- *Great for visualizing the concepts in programming*
- *Very impressive visual organization. Love the sound effects.*
- *It is good for visual learners.*
- *Visually stimulating*

Selected responses focused on Alice’s entertaining and fun nature:

- *Alice makes learning more fun.*
- *The "game" aspect makes it more fun than a standard test. The shark attack could only happen in a world like Alice.*
- *Humorous example world...will probably make for more enthusiasm about projects*

Selected responses focused on classroom reinforcement:

- *This is a great way to use Alice to help reinforce keyboard skills.*
- *More helpful way to learn accounting*
- *Better way of learning the periodic table*
- *Students will learn subject better if they get to use it in a meaningful way like with Alice.*

The remaining responses were quite varied. Many mentioned the program’s hands on approach, as well as encouragement of student creativity and critical thinking skills. Others mentioned the integration of technology with other school subjects, as well as the program’s ability to spark an interest in programming. Ten percent of survey respondents did not answer this question.
Additional Comments

A majority of respondents provided praise for the presenters and positive comments about the program. The remainder of respondents provided comments and suggestions. For example:

- Great job!! Once the lighting gets fixed, everything will be perfect.
- Would like to see the coding on how the world was created. Text on animation could be larger. Text time on screen needs to slow down a little.
- Would have like to see the instructions on what the students would be doing with Alice.
- Good effort! I thought the PowerPoint was very lengthy.

Twenty-six percent of survey respondents chose not to answer this question.
External Program Evaluation

Programming Concepts Critical for Students

In answering the question, “...which programming concepts do you feel would be most critical for students to have studied prior to this lesson/presentation?,” most respondents provided answers relating to specific concepts within Alice. For example, “Recording and including sound, how to use billboards, moving and manipulating objects in a world, loops” and “Loops, do together, do in order, for all together, using sounds, using textures.” Other responses were related to basic knowledge of the program and basic computing skills. A few responses indicated that no prior knowledge was necessary.

Unclear Aspects of the Presentation

When asked what aspects of the presentation may still be unclear to students, most respondents mention specific concepts in Alice. Responses included:

• How to manipulate object properties to make them look like what they had in mind
• It might be a little unclear on how to set up different camera views.
• How to move between scenes

A few respondents replied that no areas were unclear. Others mentioned that it was unclear what concepts the students were expected to learn, for example, “I wasn’t clear exactly what sorts of animation instructions were to be part of this unit. I also wasn’t clear whether students would be expected to learn in Alice about how to write their own methods, use loops, etc.” Almost half of the survey respondents did not respond to this question.

Major Pedagogical Advantage

When asked what the major pedagogical advantage was to using Alice rather than other conventional techniques, the most commonly mentioned advantage was Alice’s engaging and interactive features. Several others mentioned the appeal of the visual aspects of Alice, which was helpful both for engaging the student and aiding in understanding of the concepts. Other responses mentioned that Alice was fun and exciting for students, and that it was a good tool to reinforce concepts from class. The remaining responses were miscellaneous.

Additional Comments

Slightly more than half of the respondents provided positive comments and praise of the program or presenters. The remaining responses either provided suggestions or chose not to respond.

Selected positive responses:

• Great concepts! The second one is great! I love the idea of giving the kids a partial world to start with
• Nice use of animation.
• Love it! Very easy to follow

Selected comments and suggestions:

• Ok, a bit on the boring side...consider adding sounds
• Try making the text move slower and the penguin move faster
• It could be nice to expand it to allow students to add to the quiz at the end - would involve them more and allow them to learn in an active way.

CONCLUSION

The purpose of the evaluation is to assess the impact of the summer workshops on teachers’ content knowledge and skills in Alice, teacher participants’ feedback of Alice instructors and their fellow participants, Alice instructors/leadership team’s feedback of teacher participants’ lessons, and teacher utilization of Alice in their classroom after their participation in the workshops.

Overall, findings indicate positive and productive workshops at Duke University and Columbia College during the summer of 2013. Participants responded that the workshops helped them to increase their knowledge, skills, and abilities with Alice, as well as learn valuable instructional strategies for translating the information to their classes. Across the sites, participants increased their content knowledge using Alice, as evidence by significant gains on content assessments. In addition to gains in knowledge, respondents provided praise for the instructors and sessions, rating them as meaningful and helpful in preparing them to use Alice in their own lessons.

Moving forward, efforts should be made to increase participation on follow-up survey instruments, including the End of Program Survey and the Teacher Classroom Logs in order to gain an understanding of the sustained impact of the workshops on the teacher participants.
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APPENDIX 1: EVALUATION INSTRUMENTS

The Demographic Survey was designed to gather information on participant characteristics and their teaching contexts, comfort level in using and teaching with Alice, desired outcomes from the workshop, ways to learn about the workshop, and motivation for attending the workshop.

The Pre- and Post-Workshop Content Assessments consisted of twelve items, focusing on assessing teacher participants’ ability to perform Alice. The pre-workshop content assessment contained two additional questions related to participants’ prior experience with Alice. The post-workshop content assessment contained one additional scaled question that asked participants to rate the extent to which the summer workshop increased their knowledge and skills of Alice.

The Instruction Feedback Survey aimed to gain participants’ assessment of instruction they received in the workshop, and the helpfulness of the instruction in aiding their understanding of how to use the Alice software. The purpose of the survey is to help the instructors improve their instruction during the curriculum week.

The Internal Peer Evaluation Surveys served to assess teacher participants’ feedback of their fellow participants presenting lessons. The participants were able to use the feedback data to modify their lesson plans prior to external reviews. The External Peer Evaluation Surveys was designed for Alice instructors/leadership team members. The participants were able to use the feedback data to modify their lesson plans prior to teaching the lessons with students. The internal and external peer evaluation surveys used the same questions that are composed of the following questions:

- After observing the lesson/presentation, which programming concepts do you feel would be most critical for students to have studied prior to this lesson/presentation?
- What tasks must students be able to accomplish in Alice prior to attempting this lesson/presentation?
- What aspects of the lesson/presentation might still seem unclear to students that meet the conditions you described in the previous two questions?
- List a major pedagogic advantage to using the Alice approach from this lesson/presentation over conventional techniques.
- Please provide any other comments you have regarding the lesson/presentation.

Teacher Classroom Log was lesson specific, meaning that teachers should fill out one log for each lesson. The online survey allowed for the completion of three logs, after which teachers would be required to follow the original link to the survey to complete additional logs. The log asked teachers to summarize their Alice-based lessons, and assess students’ performance in using Alice.

The End of Program Content Assessment consisted of seventeen items, assessing teacher participants’ ability to perform Alice at the end of the academic school year.
The End of Program Survey consisted of eight open-ended questions, asking respondents’ perception of the 2011 summer workshop, their interaction with local college faculty, the role of the graduate or undergraduate student(s) served in their classroom, additional comments on the workshop, and suggestions for future workshops.

Teacher Use of Alice Survey was designed to gain information on (1) the impact of Alice workshop on workshop participants and students, (2) participants’ use of Alice materials, and (3) demographic information of the class/subject areas in which participants used Alice.
APPENDIX 2: RELIABILITY STATISTICS

Table 1: Reliability Statistics

(Overall pre-test alpha=.560, overall post-test alpha=.670)

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<tr>
<th>Question</th>
<th>Cronbach's Alpha if Item Deleted</th>
<th>Question</th>
<th>Cronbach's Alpha if Item Deleted</th>
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* Bolded values show an increase in overall alpha score if the problematic question was deleted
APPENDIX 3: EXPLANATION OF POINT-BISERIAL CORRELATIONS


“A low point-biserial implies that students who got the item incorrect also scored high on the test overall while students who got the item correct scored low on the test overall. Therefore, items with low point-biserial values need further examination. Something in the wording, presentation or content of such items may explain the low point-biserial correlation. However, even if nothing appears visibly faulty with such items, it is recommended that they be removed from scoring and future testing. When evaluating items it is helpful to use a minimum threshold value for the point-biserial correlation. A point-biserial value of at least 0.15 is recommended, though our experience has shown that “good” items have point-biserials above 0.25.”

“When faced with statistics such as we see here for Item 3 (high p-value, low point-biserial), it is recommended that the item be qualitatively reviewed for content and wording.”

“A point-biserial value of at least 0.15 is recommended, though our experience has shown that ‘good’ items have point-biserials above 0.25.”