ABSTRACT
We live in a technological age and many school systems are lacking in producing a technological literate workforce. The demand for computer programmers has never been greater but the decline in the number of computer science majors is well known.[8,10] A key in producing a technological literate workforce begins with the technological education of our K-12 students. The Alice program as presented to this age group can provide an entertaining way for students to become more technologically literate and also introduce these students to the field of computer science. A day-long Alice workshop for K-12 teachers was recently held at our university to meet both of these challenges – help K-12 students learn more about technology and introduce these students to the concept of computer programming. This paper describes methodologies used to conduct an effective Alice workshop.

Categories and Subject Descriptors
K.3.2[Computers and Education]: Computer and Information Science Education – computer science, curriculum

General Terms
Management, Design

Keywords
K-12 Education, computer science, Alice Workshop

1. INTRODUCTION
The first question that should be addressed in planning or delivering an Alice workshop is “Why offer an Alice workshop?” All teachers involved in an Alice Workshop need to be entirely committed to its’ delivery. We outlined several reasons the workshop should be conducted:

• We live in a technological age. The more technological exposure we can give our K-12 students, the better these students will be able to use future technological devices.
• A study of the technology requirements for K-12 students in many states indicates a need for more advanced technological education. Our state, for example, views computer literacy more related to the use of productivity and communication tools than exposure to programming.

• Today, machines are important components in everyday life. A key skill that will be increasingly necessary in the future will be the ability to make these machines do what we want them to do (program the machines). Introducing Alice to K-12 students can certainly help students understand the beginning concepts involved in programming.
• Many consider computer programming to be the new computer literacy. [2]
• The video game industry made more money than the motion picture industry last year.
• The U.S. Bureau of Labor Statistics predicted in 2005 that 65% of job openings from 2004 to 2014 will be in science and engineering will be in information technology. [1]

The use of Alice in the classroom can address each of these issues and make the learning to program process fun. In short, Alice could revolutionize the way computer programming is taught in the United States.

This paper describes our efforts in the planning and the delivery of our Alice workshop. Lastly, summary results will be shown along with special planning hints.

2. PLANNING THE WORKSHOP
Major steps in planning an effective Alice workshop include:

• Who should attend the workshop
• How to seek funding
• Publicize the workshop
• Research similar projects
• Establish goals for the workshop
• Produce an Alice Presentation and design “hands-on” activities
• Make final arrangements.

2.1 Who should attend the workshop?
We determined, first of all, that if we wanted to reach the students, we needed to make sure that their teachers were involved in the project. Therefore, we decided that our focus group would be area K-12 teachers. However, we wished to mainly focus on the middle school mathematics and science teachers. Research has shown that if we want to reach girls for computer science, for example, we need to expose them to computer science before high school. High school is too late. [7]

2.2 Obtain Funding
We realized that there are several avenues for funding sources: departmental funding, internal and external grants, textbook publishers, college bookstore, corporate donations, and other university programs. Alice has been shown to be an effective recruitment mechanism for computer science. Therefore, our
department was willing to offer financial support for the workshop for several reasons: it should aid in the recruitment of computer science majors, it should help build community relationships, it should gain good publicity for the department. We mainly focused on internal grants in the hopes that the acquisition of these internal grants will foster success in obtaining external grants in the future. We also gained funding from corporate sponsors who were will donated various materials and door prizes for use during the workshop. Many textbook publishers are also willing to donate materials.

2.3 Publicize the Workshop
Our strategy for publicizing the workshop included: creating and publishing an Alice web site, designing and printing brochures for distribution, the production of application forms, attending K-12 teacher workshops, giving presentations at teacher in-service meetings, and establishing contacts with appropriate education coordinators.

2.4 Research Similar Projects
It is relatively easy to locate Alice workshops on the web. We established contact with several universities and were able to obtain very useful information regarding the delivery of a good Alice workshop. [3,4,5]

2.5 Establish goals for the Workshop
We found it very helpful to make a list of the workshop objectives. What do we want the teachers to learn and why? We felt that it was important for the teachers to know the importance of technological literacy (programming) and to explain why and how Alice could be used to enhance technological literacy. Also, an obvious goal was to introduce the Alice software program and show how Alice could be used in all middle school classroom assignments. Our goal for the end of the workshop was that teachers would know enough about Alice that they would want to use it in their classrooms and would encourage their students to use it and enjoy “programming”.

2.6 Produce presentation and design activities
Making an appropriate Alice presentation is vital to the success of the workshop. The presentation should clearly represent the goals of the workshop and, in the process, help the participants to understand what computer science is and how Alice relates to computer programming. The presentation was divided up into several major divisions where each division ended with a “hands-on” activity. This allowed teachers to practice the skills presented in each division. The entire presentation was divided into five main components: 1) Welcome and Introduction 2) Alice Basics 3) Alice Control Structures 4) Advanced Concepts in Alice and 5) Using Alice in the K-12 Classroom. These components will be described in Section 3 – Delivery of the Workshop.

2.7 Making final arrangements
Final arrangements included collecting the applications and regularly reminding the applicants of their reservation in the workshop, making sure lab facilities were appropriate, obtaining student help during the workshop, final lab reservations, making sure lab computers were

3. DELIVERY OF THE WORKSHOP
Our workshop was held in July, 2008 which 23 teachers attending from 11 different middle schools in the school systems surrounding our university. The workshop was designed for 20 teachers but the interest was so high in this area that other teachers requested attendance if possible. We were able to accommodate all 23 teachers. The following sub sections describes the delivery of the day’s activities.

3.1 Welcome and Introduction
Teachers were shown information regarding statistical evidences in our state that indicate a need for more technological training for our K-12 students. An explanation was given to indicate how Alice could be used to improve technology literacy in K-12 schools. An explanation was also given showing how Alice could be used to educate students on what computer science is.

3.2 Alice Basics
A general introduction to Alice was given to indicate what Alice is and where it can be obtained. Secondly, details of the Alice environment was explained and the creation of a simple Alice world was demonstrated. This phase of the workshop contained three hands-on activities which were interspersed in the presentation. A brief explanation of these activities follow:

- Practice I – Open Alice, set defaults, click on an object and examine the properties, methods and functions associated with the selected object
- Practice II – Create a new world, add at least 4 objects to the world, position the objects, rename the objects and save the world.
- Practice III – Click on two different objects, drag methods for these objects to the Editor Window and play and save the animation.

After each hands-on activity, the teachers were asked to answer “test” questions. For example, the test for Practice I, included questions similar to:

- How do we select an object?
- Show names for the different area of the Alice window.
- Name a property of the ground object.
- Name a function listed for the light object.

Each question had a point value and test scores were recorded. Explanations were given to the teachers indicating that the purpose of the test questions was to give them ideas on how they could use the questions to help their students learn about Alice. The purpose of the test questions was not to grade the teachers!

Questions related to Practice II included questions regarding how to use the mouse control buttons, name classes found in the animal gallery and explain how to rename an object. The Practice III questions included questions related to choosing activities for the objects, how to see the animation and fill in the blank questions on how to create activities for the objects in their world.

3.3 Alice Control Structures
Various control structures were presented including “Do in order”, “Do together”, “Loop” and decision structures. The “hands-on” activity required the teachers to use their previously constructed world and add some type of control structure to their animation. Also, information was given indicating how to use
“Screen Grab” and teachers were asked to save their pictures on their flash drive.

3.4 Advanced Concepts in Alice
Topics included in the Advanced Concepts portion of the workshop included how to create custom methods and using event programming. The topic of custom methods was deemed important because it helps the user to understand one of the basic concepts of programming – creating user defined methods and functions. This is one of the harder aspects of programming that beginning students in computer science have trouble with. Teachers were shown why one may want to create custom methods and demonstrations were shown on how the creation of a custom method could be used to simplify large a complex method and how it could be useful in repeating the same group of statements multiple times. The hands-on activity for this session required teachers to create a new world method, name the method, and call the method. Practice questions included:
- What does it mean to “call” a method?
- How does one “call” a method?
- What method is executed first?

Event programming was also included in the presentation because of the today’s high interest in game programming. Several simple examples related to the use of event programming were demonstrated. Some easy to create event programming examples include:
- Learn to Type – Ask the user, for example, to type in the word “cat”. When the user hits the appropriate key on the keyboard, that particular letter will be displayed on the Alice screen.
- Race Video Game – 3 players race round a race course using keyboard to guide the contestants.[6]

3.5 Using Alice in the K-12 Classroom
Advice was given to instructors regarding how to present Alice in the middle school classroom. Our experience with middle school girls, for example, suggests:
- Give very short lessons on Alice
- Encourage lab time in pairs
- Use the Alice tutorials
- Begin by allowing students to change previous worlds
- Begin small – delay custom functions and event programming until early features have been mastered.

Secondly, advice was given on how Alice could be used in the classroom. Some suggestions include:
- Ask students to create an animation regarding a math/science question. Characters in the animation could either answer the questions correctly or incorrectly.
- Create conversations between objects. Example: Ask students to create a space quiz. One space creature in Alice should ask a question about space and the other space creature should answer the question
- Ask students to create a video of a famous mathematician/scientist

Some suggestions indicated by 8th graders [9] include:
- Book reports
- Use Alice as a visual in their History Day projects

- Create character education movies for younger children
- Create advertisements for school programs (fundraisers, field trips, special events)
- Use it in Art classes
- Public Service announcements

4. SURVEY RESULTS AND FOLLOW-UP ACTIVITIES
Teachers at the end of the workshop were asked to respond to numerous questions related to the effectiveness of the workshop and how/if they planned to use Alice in the classroom. Figures 1-4 indicate responses to five of the questions on the survey.
5. SUMMARY

The planning and delivery of a successful Alice workshop requires careful and intense planning. Our efforts in presenting the Alice workshops were well worth the effort if we can convince other schools and teachers the importance of introducing our young people to the world of computer science. Therefore, we feel that our efforts were a great success. Note the following email message from one of the our workshop attendees.

“I gave an in-service about Alice during the August meetings. Everyone loved it. Our language department is using it for the students to write their stories in Spanish and French. They use it and then email it to the elementary school. The English department has used it also. The students begin work during class and then finish at home. Others probably have it also. Thanks so much for allowing me to attend.”

Our final advice is to plan well and plan plenty of easy to follow steps for all attendees. We all hope that as more and more K-12 students and teachers are exposed to Alice, we will definitely see a renewed interest in computer science. We especially hope that our colleges will see better recruitment and retention rates in computer science especially for traditionally underrepresented students.

6. REFERENCES


