Obstacles to Alice Adoption in the High School Classroom

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ABSTRACT
Surprising Possibilities Imagined and Realized through Information Technology (SPIRIT) is a three-year project, funded by the National Science Foundation. [4] It includes summer professional development programs for high school teachers to learn how to integrate Alice into their classes. This paper describes our experiences with Alice adoption in various school systems that were involved in the 2008 SPIRIT program at Purdue University. For many, this was the school system’s first exposure to Alice, and there were many obstacles to be overcome so that the teachers could use Alice effectively for instruction in their classrooms. We identify the most challenging obstacles and provide suggestions for removing or minimizing their impact.

Categories and Subject Descriptors
1.0 [Computer Applications]: General –Education, end user acceptance.

General Terms
Management, Security, Human Factors

Keywords
Alice, end-user, administration, policy.

1. INTRODUCTION
The goal of SPIRIT can be found in its full name -- Surprising Possibilities Imagined and Realized through Information Technology (IT). Over the past decade, young women have been opting to pursue non-computing fields of study, but the career opportunities that exist in Information Technology are exciting, surprising, and often limited only by the imagination. Because IT supports so many disciplines, studying IT opens up numerous career opportunities in a variety of domains, including those that make a positive impact on society. Consequently, the SPIRIT project focuses on encouraging more young women to pursue computing careers, such as in information technology, computer science, network engineering and technology support.

SPIRIT's goals are accomplished through programs for three select groups--high school teachers, high school guidance counselors, and high school students. Part of the educational experience includes instruction on how to use Alice, a computer program that can be used to create animated stories and interactive games to convey technical subject material in an engaging manner. [1]

An obvious prerequisite for achieving the goal of using Alice in the classroom is for the software to be installed on computers that are readily available to high school teachers that are involved in the SPIRIT program and their students during their regularly scheduled class periods. To address this need, before teachers accepted into the program, they were required to provide a letter of support from their principal or superintendent agreeing to the installation of Alice on computers that the teacher and students could use. SPIRIT offered technical support upon request if schools had concerns regarding the Alice installation. In the case of some schools, however, the installation did not occur before the start of the school year. Even worse, a few schools were unwilling to do the installation for quite some time despite repeated offers by SPIRIT to provide technical support.

Based on our experiences from the first year of SPIRIT, it is clear that several items are needed for a successful implementation of Alice in the high school classroom. The most basic is a sufficient number of computers that meet the minimum requirements for running Alice. These computers must also be available on a regular basis for classroom instruction. The school administration must approve and support both the installation of Alice on school-owned computers and also the teacher’s use of it as a vital part of classroom instruction. The school’s IT staff must also approve of the installation of Alice on school-owned computers. They must have sufficient notification to plan and complete the Alice installation before the start of the school year.

2. SPIRIT PROGRAM FOR TEACHERS
The SPIRIT program for teachers consists of a two-week program that includes one-week of hands-on instruction on Alice. During this week, teachers develop sample lesson plans that integrate Alice in some way. During the following week, the other two groups of participants arrive on campus to learn Alice as well as listen to IT career speakers and use interesting IT applications. The teachers practice their lessons on small groups of students to get their feedback and make improvements to their Alice worlds before the program ends. By the end of the two weeks, all teachers should have three lesson plans with accompanying Alice worlds that have been student tested. [3]

2.1.1 Alice Version
The majority of the instructional information shared with teachers during week one is about Alice 2.0. Near the middle of the week, two other versions of Alice were introduced. Because a number of the teacher participants taught English and foreign languages and
the literature suggested that Storytelling Alice was an effective tool for younger students [5], there is a short introduction to Storytelling Alice. Alice 2.2 was also shared as a way to create Alice videos that could be uploaded to YouTube.

The original intent of the SPIRIT program was to have teachers use the Alice 2.0 version upon return to their classrooms; however, many of the English and foreign language teachers felt Storytelling Alice would be a better tool for their needs. Teachers were cautioned about the greater likelihood of problems with this version. Nonetheless, the richness of the characters and methods available in Storytelling Alice helped reinforce their decision. Their goal was to have students use Alice to communicate what they learned in English or the foreign language, not programming, so they felt Storytelling Alice was a better choice for them.

The majority of teachers, 14, used Alice 2.0 in their classrooms. Six teachers used Alice 2.2 and six used Storytelling Alice. Five teachers used multiple versions of Alice over the past school year. There were two reasons reported for using multiple versions of Alice. The first was general curiosity, either from the teacher or the student, about new features in Alice 2.2 and Storytelling Alice as compared to Alice 2.0. The second reason was from teachers using either Alice 2.2 or Storytelling Alice that encountered problems and reverted back to Alice 2.0.

3. ISSUES RELATED TO FACILITIES
Some of the problems experienced by the teachers had more to do with the facilities rather than Alice itself. Some teachers had access to older computers, many used Alice in a networked environment, and some had very little to no access to computer labs. These limitations created a variety of challenges for the teachers, but all were able to find work-arounds.

3.1 Hardware Requirements
The hardware requirements for a computer to run Alice are fairly modest when compared to the computer hardware that is available today. Most schools involved in the SPIRIT program already had computers in the school system that was sufficient. However, a few did not. One school was able to use the Slow and Steady version of Alice successfully on this older hardware. Another teacher reported that even the Slow and Steady version did not run reliably enough for use by students in the classroom. Teachers who had opted to use Storytelling experienced the most problems with system crashes.

3.1.1 File server
The ability for the computers to be networked to a centralized file server that both the students and the teachers have access to is another necessity for effective classroom instruction. This is not a core requirement of Alice but one that greatly reduces the time spent managing Alice assignments in the classroom. The most effective classrooms were those that allowed students to work on their own computers or in pairs that were connected to the central file server. Some teachers placed starter Alice worlds on the server for their students. The students saved their finished Alice worlds to the file server. This allowed the teacher to have access to the students’ work for evaluation and assessment.

One teacher had a classroom of computers but they were not networked together. This teacher used a number of USB flash drives to retrieve student assignments. Unfortunately, there were fewer USB flash drives than computers. This meant that the first part of class was spent handing out the flash drives, each student copying the previous day’s work to his/her computer, and then passing it onto the next student to retrieve his/her work. Time at the end of the class period was reserved to reverse the process. This approach severely reduced the actual amount of time that could be spent using Alice.

Based on the enhancement reported on the Alice website regarding the Alice 2.2 beta version to address using Alice on a networked machine, [2] the authors expect problems related to file server issues to be minimized.

3.2 Classroom scheduling
Many schools had computers that were capable of running Alice effectively. However, only a couple schools had these computers in the teacher’s primary classroom. Most teachers were required to reserve time in a shared computer lab. The most common experience was for the teachers to be able to get approximately one class period a week in the computer lab for Alice instructions. This limits the type of projects that students could complete since they were not able to receive instruction and work on their assignments on consecutive days.

There were also several unique situations that occurred related to scheduling of computer time.

3.2.1 Multiple Alice teachers
One school system had three teachers, all from the same department, participate in SPIRIT. After some initial resistance, the school installed Alice in a single computer lab. This meant that all three teachers were competing for the same lab time in addition to the other teachers in the school system and their regular lab requests. The number of teachers planning to adopt Alice and the current computer lab utilization and availability need to be taken into account when a teacher is planning to use Alice in his/her class.

3.2.2 Corporation wide computer testing
Many school systems did computerized testing of entire grades or subject areas during the course of the school year. This would typically make no computer labs available for anywhere from a week to a month at a time. Computerized testing is generally given the highest priority when scheduling lab time. The best option for a teacher using Alice in a shared computer lab is to plan ahead at the beginning of the semester by finding out testing dates. Then plan Alice lesson length and due dates accordingly.

4. SCHOOL ADMINISTRATION
School superintendents and principals are one key to a successful adoption of Alice in the high school classroom. As mentioned earlier, teachers were required to submit a signed letter of support from their superintendent or principal. This document proved to be helpful in one school system which, during the first part of the school year, would not allow Alice to be installed on the school-owned computers. Numerous attempts were made to work through the issues with the school system, including providing free, on-site technical support. Unfortunately, they were unwilling to change their position until they were reminded of the letter of support. Fortunately, this situation was the exception, and additional measures are being employed for the second year of the program to eliminate this problem.
Overall, we have found that school administration are most willing to encourage Alice in the classroom when they are shown the ability of Alice to help the teacher 1) meet state and national educational standards, 2) teach across the curriculum, and 3) use inquiry-based learning.

4.1 Standards
A majority of the teachers in the SPIRIT program were not computer science or technology teachers. However, all of the teachers found that Alice could help them teach the standards for their respective subject area. These other subject areas included English, foreign languages, math, chemistry, and physics.

Many subject areas include standards related to students working on teams and completing projects. Alice lends itself well to a project-based curriculum. However, Alice currently lacks the ability to combine multiple worlds together, so that presents a challenge to teams which would like multiple members to produce parts of an Alice world.

4.2 Teaching Across the Curriculum
One particular benefit of Alice, when it was used in a non-computer course, was teaching across the curriculum. This is something that administrators often encourage or require of their teachers, but it is often difficult for teachers to accomplish. Often there is not time for the required subject area material, let alone additional instructional time to teach new material.

Alice allowed those non-computer teachers to teach their required subject area but also teach computer and information technology concepts at the same time. In some classes this was an explicit goal of the teacher, and for others it was more implicit. Some teachers focused on making sure that students used effective programming techniques and software development methodologies. Other teachers did not emphasize programming to their students, yet they still exposed their students to information technology in an exciting and fun way. Regardless of the approach used, all teachers reported that using Alice really engaged the interest and curiosity of their students.

4.3 Inquiry-Based Learning
Alice was presented to the teachers in the SPIRIT program in an inquiry-based format. Teachers were instructed on the basics of Alice for just a few hours. They were then told to create several lessons. The remainder of the Alice instruction was primarily based around answering the teacher’s questions as they worked on their lessons and crafting additional instructional times based on common desires of the teachers. During the SPIRIT program, the teachers were not as responsive to this inquiry-based approach, so a more regulated, formalized approach will be used in the 2009 program for teachers.

Inquiry-based learning has been shown to be very effective in the high school classroom. Not surprisingly, many teachers taught Alice to their students using inquiry. Most teachers found that students thrived even more than they did in this less formalized instructional method.

4.4 Approaches for Alice Integration
Teachers used two general approaches for incorporating Alice into their classrooms. Some teachers used Alice to facilitate or support instructional delivery while others used Alice as an assessment tool. A few teachers used Alice for both instruction and assessment.

When Alice was used as an assessment tool, teachers taught their lesson in a traditional way and then had the students create an Alice world to demonstrate their understanding of the concepts taught. For example, earth science students were taught a traditional lesson on viscosity. They were then taken to the computer and given a template Alice world. The students made changes to the Alice world to demonstrate their understanding of viscosity by changing values for different variables to affect the fall rate of a marble through a tube.

When Alice was used to support instructional delivery, teachers generally created illustrative worlds themselves. They then incorporated those worlds into their traditional lectures and other demonstrations. For example, a chemistry teacher created an Alice world to demonstrate electron orbitals to his students. The world allowed the students to see and interact with a 3-D model of the electron orbitals. The students could move in and out between the orbitals to visualize the orbit from many different perspectives. Due to limited access to computer lab facilities, this particular teacher was unable to have the students go to the computer lab to use the world individually. Therefore, he used the classroom projector to illustrate the world to his students from his computer. Individual students could go up to the computer and try it out during or after class.

5. INFORMATION TECHNOLOGY STAFF
As experience from the first year has shown, the information technology staff of the school corporation is another vital group that directly impacts the success of an Alice adoption in the high school classroom. While administration may give the official approval for Alice to be used in the classroom, the task of making computers available with Alice for teachers and their students is often left to a systems administrator or other technology staff member. In many cases, administrators sought input from their technology staff before they provided the support letter. Considering that the majority of IT support in K-12 schools is considered overworked and understaffed [5], the teachers were fortunate to receive the support letters.

The 2008 SPIRIT program did not require the teachers to have the approval of the information technology staff from their school. A majority of the obstacles that were encountered related to information technology staff resistance. This is the reason that the approval requirements for the 2009 program have changed so that both the administrator and IT staff person must provide support letters before a teacher can be admitted to the program. This change is expected to improve the adoption of Alice in the classroom during the 2009-2010 school year.

5.1 Scheduling
Most changes and additions to a school’s computers are scheduled during the spring and completed over the summer break. During the first year, most teachers did not find out about their acceptance until the end of the school year or even the start of the summer. Consequently, many teachers were unable to inform their systems administrators until after technology decisions may have been made. Nonetheless, ample time did remain for Alice to be installed before the school year began. Unfortunately, there was
no policy related to acceptance of participants and scheduling of Alice installations.

As it turned out, many teachers did not inform their systems administrators that they would be using Alice until the week before or the first week of school. In many cases, the staff had to make exceptions to their normal policy to get Alice installed so that it could be used by the teachers at all. For some of the teachers, however, this short notice created significant delays. In some cases, teachers were unable to use the original, planned Alice-based lesson by the time that Alice was available on school computers.

Demonstrating Alice on a personal computer or running it from a CD proved to be a reliable way to allow the information technology staff to understand what Alice was and how it worked since many had never heard of Alice before.

5.2 Security
Security was the single biggest concern voiced by the technology support staff members about allowing Alice on the school-owned computers. In most cases, explaining that Alice was a stand-alone executable that did not affect the registry or the file system and that it did not contain a web browser was sufficient to allow it to be included on the computers.

Some school systems expressed repeated concerns about security but could not provide specific details about their concern. It is our belief that their real concerns were likely related to an additional task being added to their already overbooked work schedule [7] and their unfamiliarity with Alice. Security should be the highest priority for these systems administrators. However, the reasons provided were inaccurate and our offers of email and on-site support were rejected. It appeared that security was being used as an excuse because school administrators would not override a systems administrator if the reason was security.

We believe better planning will actually remove most of the security concerns since the staff will have more time to research Alice and see that no legitimate security concerns exist. To encourage early research, the 2009 group of teachers will be asked to provide a support letter from both the school administrator and systems administrator.

5.3 Support
A concern expressed by one school corporation was that the software was free. This surprised the SPIRIT team because schools are typically on very tight budgets and would welcome a free addition. However, the concern was that by being a free product, they believed it was not well designed and there would be no one to help with support. We alleviated this concern by explaining that Alice has an extensive support system backed by several universities and National Science Foundation grants. We also explained how Alice has already been used in numerous educational environments. The schools participating in the SPIRIT program had the additional benefit of dedicated program staff members to assist with support issues. By assuring systems administrators that they will have assistance, if needed, we facilitated the installation of Alice on the schools’ computers.

5.4 Teachers and IT staff
None of the teachers participating in SPIRIT expected to experience any problems in deploying or using Alice in their classroom. Few considered the additional workload that testing and installing the software would place on the IT staff, and most were surprised at the resistance they faced. If deployment problems had been anticipated, most could easily have been eliminated.

In one corporation, the school superintendent first became aware of Alice when he was warned by IT personnel that it was a "security risk." At that point, he had no ideas of the benefits of the program or the time his teachers had already invested in preparing to teach with it. From his perspective, there was little clear benefit in accepting Alice--certainly not enough to offset the perceived risk.

In retrospect, all stakeholders should have been made aware of the benefits of using Alice before any requests were made to install the software. This would have allowed the superintendent and IT workers to make an informed analysis of the software, instead of dismissing it without due consideration. It might have prompted a more detailed analysis of the suspected security risks.

Finally, as already mentioned, IT should have been notified of the desire to use Alice in time to adjust regular maintenance schedules. The IT staff might not have quickly labeled Alice a security risk if allowed enough time to sufficiently test the software and schedule installation during regular summer maintenance.

6. CONCLUSIONS
We have identified many potential obstacles to the adoption of Alice in the high school classroom. We have divided those obstacles into the categories relating to facilities, school administration, and information technology staff and offered suggestions for each. Each category represents a vital part of the support system for teachers in the classroom. This is true not just in regards to Alice adoption but in many aspects of a student’s education.

Despite the many obstacles discussed in this paper, the overwhelming majority of teachers in the 2008 SPIRIT program have successfully used Alice in their classrooms. They have reported back to the SPIRIT team that they plan to continue to use Alice in their classrooms even when their participation in the program has ended. This will continue the impact of the SPIRIT program to inform students of the surprising possibilities in information technology well into the future.

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8. REFERENCES

