



AFRL-RI-RS-TR-2013-072

## **COMPUTER SCIENCE CAREER NETWORK**

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TOPCODER, INC.

*MARCH 2013*

FINAL TECHNICAL REPORT

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| <b>REPORT DOCUMENTATION PAGE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                                                 |                                             | <b>Form Approved<br/>OMB No. 0704-0188</b>                                      |                                                           |
| Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Service, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.                                                                                                                                                                                                               |                  |                                                 |                                             |                                                                                 |                                                           |
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| <b>1. REPORT DATE (DD-MM-YYYY)</b><br>MARCH 2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  | <b>2. REPORT TYPE</b><br>FINAL TECHNICAL REPORT |                                             | <b>3. DATES COVERED (From - To)</b><br>SEP 2010 – SEP 2012                      |                                                           |
| <b>4. TITLE AND SUBTITLE</b><br><br>COMPUTER SCIENCE CAREER NETWORK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                  |                                                 |                                             | <b>5a. CONTRACT NUMBER</b><br>FA8750-10-2-0167                                  |                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                                 |                                             | <b>5b. GRANT NUMBER</b><br>N/A                                                  |                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                                 |                                             | <b>5c. PROGRAM ELEMENT NUMBER</b><br>61101E                                     |                                                           |
| <b>6. AUTHOR(S)</b><br>Michael Lydon and Jessie Ford                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                  |                                                 |                                             | <b>5d. PROJECT NUMBER</b><br>BF98                                               |                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                                 |                                             | <b>5e. TASK NUMBER</b><br>00                                                    |                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                                 |                                             | <b>5f. WORK UNIT NUMBER</b><br>01                                               |                                                           |
| <b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b><br>TopCoder, Inc.<br>95 Glastonbury Blvd.<br>Glastonbury, CT 06033                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |                                                 |                                             | <b>8. PERFORMING ORGANIZATION REPORT NUMBER</b><br><br>N/A                      |                                                           |
| <b>9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b><br><br>Air Force Research Laboratory/RIG<br>525 Brooks Road<br>Rome NY 13441-4505                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                                                 |                                             | <b>10. SPONSOR/MONITOR'S ACRONYM(S)</b><br>N/A                                  |                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                                 |                                             | <b>11. SPONSORING/MONITORING AGENCY REPORT NUMBER</b><br>AFRL-RI-RS-TR-2013-072 |                                                           |
| <b>12. DISTRIBUTION AVAILABILITY STATEMENT</b><br>Approved for Public Release; Distribution Unlimited. This report is the result of contracted fundamental research deemed exempt from public affairs security and policy review in accordance with SAF/AQR memorandum dated 10 Dec 08 and AFRL/CA policy clarification memorandum dated 16 Jan 09.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                  |                                                 |                                             |                                                                                 |                                                           |
| <b>13. SUPPLEMENTARY NOTES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                                                 |                                             |                                                                                 |                                                           |
| <b>14. ABSTRACT</b><br>TopCoder built a new community for students 13-18 years of age with long-term goals to increase by thousands the number of U.S. students who pursue Computer Science (CS)-related degrees, to attract and retain tens or hundreds of thousands of community participants, to demonstrate a sustained increase in active participants' CS-related skills, and to prepare for sustainability and program growth. In the two years of the program, we successfully built a CS-related gaming web site at <i>NoNameSite.com</i> and a community with over 4,000 registered members. We completed 9 CS-related games and web site activities that include avatar design and a programming tutor. A significant number of the members who register (49%) return to participate in contests. At the conclusion of this DARPA program, we have a strong base that will allow us to grow and sustain the site. |                  |                                                 |                                             |                                                                                 |                                                           |
| <b>15. SUBJECT TERMS</b><br>Computer Science, STEM, middle school, high school, games, learning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |                                                 |                                             |                                                                                 |                                                           |
| <b>16. SECURITY CLASSIFICATION OF:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                  |                                                 | <b>17. LIMITATION OF ABSTRACT</b><br><br>UU | <b>18. NUMBER OF PAGES</b><br><br>58                                            | <b>19a. NAME OF RESPONSIBLE PERSON</b><br>ROBERT KAMINSKI |
| a. REPORT<br>U                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | b. ABSTRACT<br>U | c. THIS PAGE<br>U                               |                                             |                                                                                 | <b>19b. TELEPHONE NUMBER (Include area code)</b><br>N/A   |

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## 1.0 Overview

TopCoder proposed to build a new community for students 13-18 years of age with long-term goals to increase by thousands the number of U.S. students who pursue Computer Science-related degrees, to attract and retain tens or hundreds of thousands of community participants, to demonstrate a sustained increase in active participants' CS-related skills, and to prepare for sustainability and program growth. In the two years of the program that were funded by DARPA, we successfully built a gaming web site at *NoNameSite.com* and a community with over 4,000 registered members and 9 completed games, along with web site activities including avatar design and a programming tutor. A large number of the members who register (49%) return to participate in contests.

NoNameSite.com was built by the TopCoder community of over 450,000 developers and designers worldwide. During the two years, the development effort included:

- 438 software and graphic design development contests
- 13 projects
- 7 copilots or community project managers
- 1,031 unique competitors for those contests
- 70 countries represented
- 114 unique winners
- 23 countries represented by winners

We used the power of a software development community to build this new community of U.S. middle school and high school students who are interested in games and activities related to computer science. We engaged software developers from around the world, through the power of competition, to create ideas and code that they believed would develop skills and interest in Science, Technology, Engineering, Mathematics (STEM) generally and computer science specifically.

NoNameSite.com is now a resource for students primarily, but also teachers, and organizations who are interested in reaching out to or engaging with those students. We expect the member growth to continue with partnerships, and as participation numbers increase to build a group of sponsors to sustain the program. We have been able to create a solid foundation that will be a platform for launching challenges and for sponsorship by industry partners.

Some member quotes:

*“Once again I appreciate the reward and I love competing on your site. Thank You. “ – bluedot*

*“When I finally realized what was going on, I had a good laugh. I love the idea of an evil mummy shooting basketballs at a sarcophagus. Whoever thought up the concept for this game is either a genius or a raving lunatic.” – spinach*

*“It is so exciting to be on your website!” – clover*

*"NNS is a tremendous resource for inspiring young people to further their studies in STEM subject areas. The contests and zeapl are popular right now, and I am very excited about the SoCo [School of Code] addition to the site. Well done NNS! --Heath Woodward, Computer Teacher."*

## **2.0 Methods**

The goals of this program were:

- To generate interest in students in middle school and high school in STEM topics generally and Computer Science specifically.
- To create fun games that familiarize students with Computer Science topics.
- To use contests as marketing for the site and to motivate students to participate.
- To build and grow a community of middle school and high school students who are interested in STEM generally and Computer Science specifically.
- To create a sustainable program that will be continued after DARPA funding.

To do this, we developed a web site, NoNameSite.com using an open innovation development model. TopCoder’s development model is competition-based, meaning that TopCoder conducts competitions to develop digital assets. TopCoder engaged its world-wide development community, a community of (now) over 450,000 technologists, to generate ideas, graphics, and software targeted toward U.S. middle school and high school students. By reaching out to this community, we developed innovative ideas for the games and for web site features to meet the program goals. At a high level, the overall approach was to use the model that we used to build TopCoder.com and the TopCoder.com community to build this new community. TopCoder is a successful software social network and competition web site

primarily for college-age students and professionals that has developed and grown over the past 10 years.

We did not set out simply to build a new TopCoder, however. There are several differences between the approach we take with developing TopCoder and our approach in developing *NoNameSite.com*.

First, the new site is intended to develop interest and basic skills, rather than simply identify and promote the best-of-the-best. Competitions to find the best-of-the-best U.S. middle school and high school students would not serve the broader purpose of attracting more students to STEM generally and to Computer Science specifically. We strove to create games and competitions that would be interesting, but not intimidating, to teenagers who had perhaps latent skills and interest in this area, but had not yet taken the time or had the opportunity to develop those skills and interest. We therefore adapted some of the competitions to include participation prizes and awards for achieving certain levels.

Second, we took the approach of having a number of different types of activities, with the initial activities building skills and interest to more challenging activities, and finally having activities that feed into a self-learning activity, such as School of Code or Zero Robotics.

Third, while TopCoder is an international site with members of all ages, this site is focused on U.S. teenagers. These teenagers have many options for how they are going to spend their time, and so this site needs to be a compelling alternative. In the long term, our vision for *NoNameSite* is that it will be an after-school activity, so that it is not mandated by, or reliant upon teachers. We have had some initial success reaching teenagers and receiving feedback by working with computer science teachers, and through a partnership with EdWorks, described further below.

Fourth, the focus on *NoNameSite.com* is on games and learning. The effort that the site members spend in the activities is for them, and not for a client or customer. There is, therefore, more of a gaming emphasis, rather than on creating actual assets for customers. That is not to say that we would not engage the *NoNameSite.com* members to develop assets as an educational competition and also to receive ideas from young Americans. We have had some initial success in running a competition that had as an objective creating digital assets, and we intend to run more of them, to create assets for *NoNameSite.com*.

Finally, a goal of *NoNameSite.com* is to provide an informal learning platform that can be used to measure the progress of site visitors in playing the games and developing skills. We

have the infrastructure to do this, and as the number of site visitors increases, we can use the data that we collect to update and revise the games.

### **3.0 Assumptions**

In developing the site, we assumed:

- U.S. teenagers are interested in playing video games and online games.
- We could create games that would teach Computer Science concepts.
- We could use the TopCoder development model to build the web site and games and activities.
- We could build a web site that would attract teenagers who are using PCs and mobile devices.
- We could use competitions as marketing to attract teenagers to these games.
- We could grow the community over 3 years with games, activities, and prizes.
- That the growth would be slow and linear in the first 3 years, and then accelerate as more activities, games, contests, and interaction were available.
- That sponsorships would initially be one-off efforts, and then as there were more registered members and site activity, there would be more opportunities for multiple sponsorships.

In practice, these assumptions seemed to hold true, with the exception that DARPA funded the program for only 2 years instead of 3, and the two years of funding was reduced from the original contract amounts.

Teenagers who came to the web site were willing to play them. Players were able to learn and even master the concepts presented in the games and do well at them. The TopCoder development model successfully engaged worldwide developers to contribute ideas and code for games and activities that would interest teenagers. The site has attracted teenagers and the competitions have provided incentives for teenagers to play the games. The community has grown over the 2 years of the program. We have begun to develop sponsorship opportunities and are well-positioned for sustainability of the program.

## 4.0 Procedures

We developed a basic site and launched the “Alpha” site as soon as we were able (Feb. 2011) with the idea of getting early use and testing of the site, and adding features and games over time. We used the TopCoder competitive development methodology, which allows for a “software factory” development model.

TopCoder has a competition platform, processes, and infrastructure that enables our commercial customers and government agencies to engage a worldwide community of over 450,000 individual independent technology developers by conducting challenges and competitions that provide a full lifecycle of technology application development and support, starting from concept development through product design, requirements identification, application development, integration with back-end systems, security and information assurance, deployment, hosting, support, maintenance, and ongoing product management. TopCoder can deliver all of these tasks successfully because TopCoder has an established, enormous, diverse community and a market-based methodology that ensures that high-quality technology artifacts are built according to a measurable, predictable, and outcomes-based model.

Over the past 10 years, TopCoder has run thousands of competitions and has developed hundreds of technology applications for itself and its customers using this competition platform. Each competition can be viewed as a competitive procurement in which a specification for the desired deliverables is published along with the price to be paid for the “best” solution, and in response developers submit the actual deliverables.

Standard competition types and deliverables formats reduce the learning curve for participants. Prices are set based on the outcomes of previous competitions for those types of deliverables. For most software deliverables, submissions are peer-reviewed by three reviewers who are highly-rated in that type of competition using a rigorous scorecard, and the winner selected based on those scores. For a few types of deliverables, the winning submission is selected by TopCoder, the customer, or by community vote. Algorithm development competitions may be judged based on the performance or accuracy of the algorithm, using test data and an automated scoring method.

TopCoder’s competition-based development model is successful for a number of reasons. One reason is that it does not depend on the knowledge or availability of any particular individual. Another reason is that the contest judging process inherently includes a detailed review process for assuring the quality of work. Another reason is that the platform provides a

framework for individuals to self-select the tasks that they want to do, and for which they are motivated and believe that they have the ability to be successful. Another reason is that the site provides access to a huge pool of developers who have a diversity of skills and experience that they can bring to bear on each task at hand. Another reason is that developers are paid a fixed price for the deliverables, and are paid only if their deliverables meet minimum criteria and are delivered by the deadline. TopCoder successfully operates this platform for its enterprise and government customers, and has seen their use of it continue to grow as they come to understand the value that it brings.

Innovation projects typically are planned out in “Game Plan” schedules that show the series of competitions planned and estimated costs for each of them. The Game Plan schedules do not have particular individuals assigned to tasks, rather the competition participants decide by their participation who will deliver by the deadline. We can, however, reliably predict based on past history and the competition parameters (e.g., competition type, pricing, timing) what the likelihood of successful completion will be, and set the competition parameters accordingly. Each game or activity on the site was part of a project, which may have had one or more associated game plans.

We envisioned a model for *NoNameSite.com* that involved games and activities to teach students basic concepts and give them the background and information that would lead them to a career in STEM generally and Computer Science specifically. For each web site game or activity, we were able to use competitions to get ideas and feedback from the TopCoder development community, and to prototype ideas and concepts, and to build for production. Each stage in the development process was implemented by conducting competitions, getting input and feedback from a worldwide community of developers.

## 5.0 Results and Discussion

The best way to demonstrate the results is to review the site and the statistics that we have collected about site visits and participation. The sections that follow show the web site features and games that were developed during the program. Of course, the web site is also live and available at [www.NoNameSite.com](http://www.NoNameSite.com).<sup>1</sup>

With respect to the name of the site, we selected the name *NoNameSite* as a placeholder, intending to conduct a competition to name the site, so that we could have a name that would resonate with the target audience. Our initial naming competition did not yield results that we thought were significantly better than the placeholder name, and so we kept *NoNameSite* as the name (at least for now). It has a certain irreverence that the teenagers seem to appreciate, and we still have the option to have another naming competition as membership grows. Our naming competition did give us the name Zeepl, which is what we named the avatars.

The color scheme of the web site was selected initially by having 3 different “skins,” meaning color and formatting themes, and giving users the opportunity to select the one they preferred. After about two months of trial, it became clear that one was most preferred, and that’s the one that we continued with.

The web site has a capability for users to register using their social network (Google or Facebook) login credentials, to make it easier for them to go from social networks to NoNameSite, and to make the site more integrated with their usual online experience.

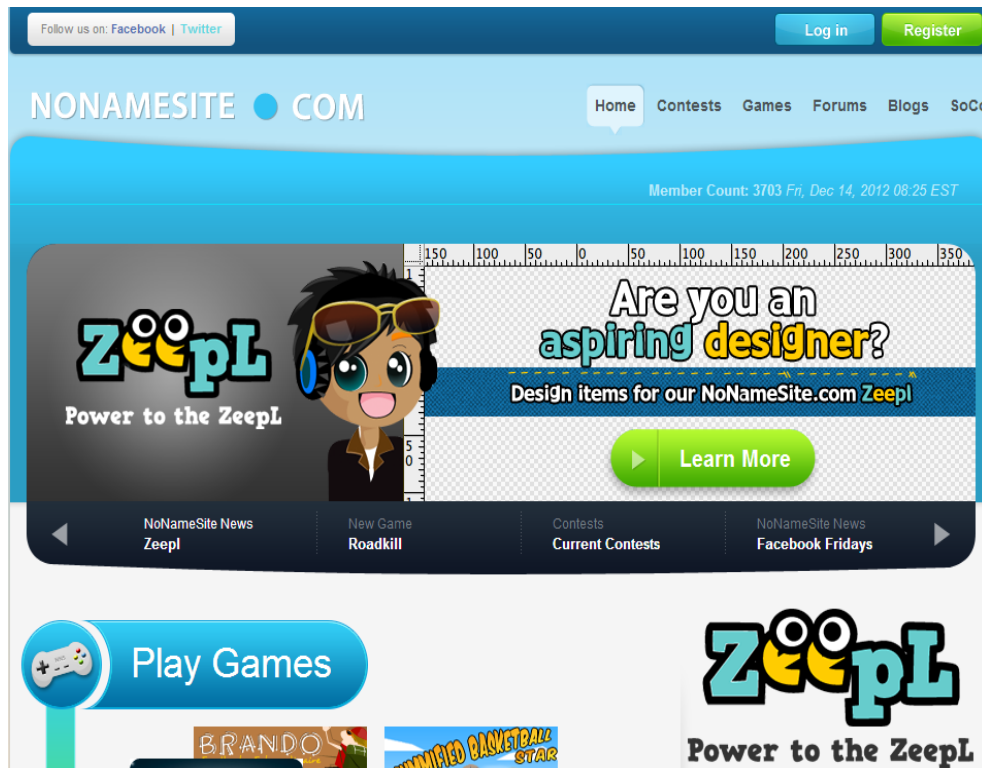
We initially assigned virtual last names to users, as a strategy to enhance privacy by discouraging users from using their real names as usernames, and to provide a sense of community, by using last names of U.S. presidents and of computer scientists. The feedback that we received was that the users didn’t like the assigned last names, they found them hard to remember, and even though they could choose from a list, they didn’t like that they couldn’t pick their own usernames. As such, after the first year we dropped the requirement of the assigned last name.

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<sup>1</sup> It is worth noting that the data on the participants that could be collected was limited by Human Subjects compliance restrictions, based on the Air Force Office of Surgeon General’s guidance to our Institutional Review Board. For example, we were not able to use the surveys that we originally intended, in order to get approval within the time frame of the program. Nevertheless, we were allowed to collect certain site statistics, and to observe the activity on the web site, and we are currently working on developing survey research protocols for review with our Institutional Review Board.

## 5.1 Web Site

The home page (Figure 1) of *NoNameSite.com* is intended to immediately present and draw interest of our target audience in the features offered by the site.

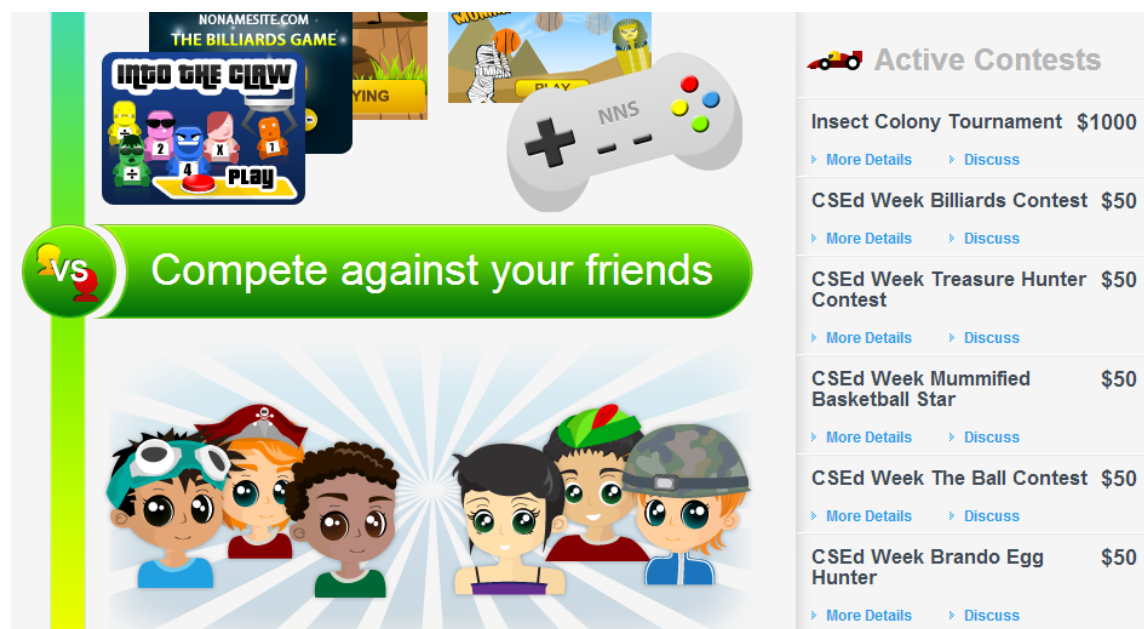


**Figure 1. Home Page**

The homepage of the web site went through several iterations. We now have a rotating carousel on the main page, featuring different games and activities at the top of the page without requiring scrolling. The carousel rotates through banners that announce news or site features, currently an announcement of the newest game (Don't become Roadkill – discussed below), Facebook Fridays (a weekly promotion on Facebook), Zeepl design (shown above), SoCo (the School of Code – also discussed below), current contests and so on. Each of the games has distinctive characters, and we are able to use those characters in the on-site promotions.

Under the carousel is the invitation to Play Games, shown in blue at the bottom of the graphic above. Clicking on that link brings the user to a list of the games that are available for play.

The next link on the page is the invitation to participate in competitions (Figure 2), shown as the green link that says “Compete against your friends” in the screen shot below. Clicking on that link brings users to the list of contests. It should be noted that the characters shown under the green link in the graphic are examples of Zeepl avatars.



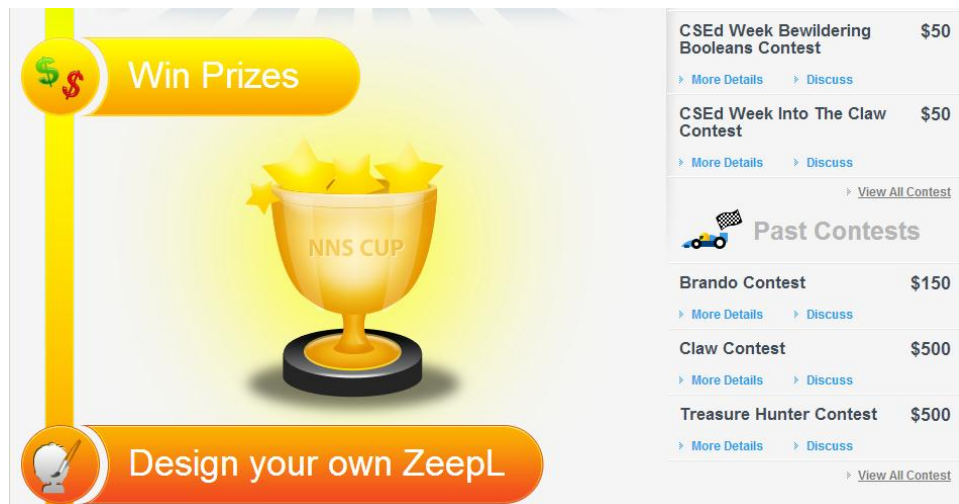
**Figure 2. Competitions**

Our goal is to have at least one competition active on the site at any time, so that there is always something for a site visitor to do. We also show the active contests and the past contests on the main page and on the contest page, so that the users can see the types of competitions that are offered on the site.

The main page also includes an invitation to “Win Prizes,” shown in Yellow in the graphic below (Figure 3). Clicking this link brings the user to a page that explains how the prizes work on the site, and the information that we need to collect to award prizes to contest winners.

The main page also includes an invitation to design Zeepl, which are the avatars that can be designed on the site. The Zeepl, discussed further below, provide an opportunity to learn to

use computers for design, another important STEM skill, and again a step towards learning more about technology and becoming familiar with the process of designing software and technology.



**Figure 3. Win Prizes**

The ZeepL also create an opportunity for users to customize their appearance on the site and create community without revealing photographs of themselves. This was intended to help protect the privacy of the users and support their creativity.

The home page also includes a description and invitation to visit SoCo, the School of Code (Figure 4). This is the Coding School that has online lessons in programming.



**Figure 4. School of Code**

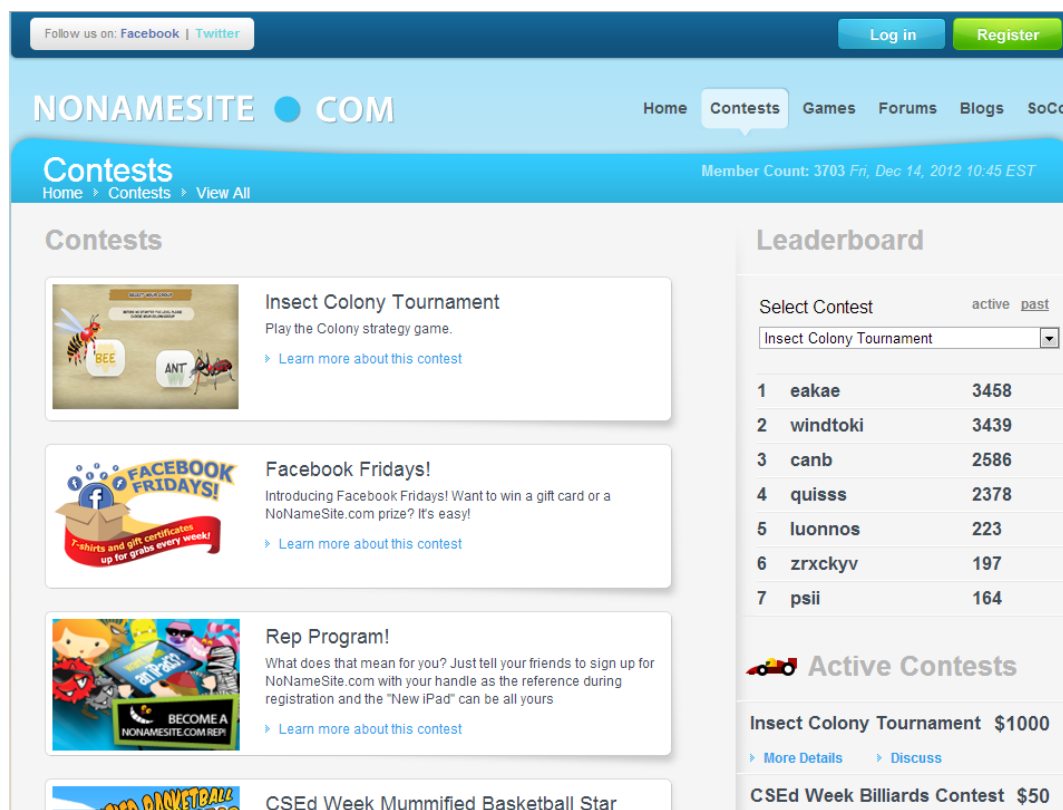
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Other features on the main page include STEM trivia, and feeds from the blogs and forums.

## 5.2 NoNameSite.com Contests

Every month on NoNameSite we post contests (Figure 5) and give prizes away to the winners. Since we launched NoNameSite, we have held 92 contests, and awarded \$27,105 in gift cards, t-shirts, cash prizes and merchandise. This includes social media contests, contests will all our games, special referral contests, and a couple NASA sponsored contests. For each of these contests, we developed rules and scoring mechanisms, and monitored the contests to assure that the prizes were awarded fairly according to the rules.

Our intention was to ramp up the amount of prizes offered in the third year, in order to drive increased traffic. With the early ending of the program, we are now working on sponsorships to provide funding for those contests.



The screenshot shows the NoNameSite.com website. The header includes social media links for Facebook and Twitter, and buttons for Log in and Register. The navigation bar has links for Home, Contests, Games, Forums, Blogs, and SoCo. The main content area is titled "Contests" and includes a "Member Count: 3703 Fri, Dec 14, 2012 10:45 EST" status. The "Contests" section lists three active contests: "Insect Colony Tournament" (a strategy game), "Facebook Fridays!" (a contest for gift cards and prizes), and "Rep Program!" (a contest for iPad prizes). The "Leaderboard" section shows a table of top performers for the "Insect Colony Tournament" contest.

| Select Contest           | active | past |
|--------------------------|--------|------|
| Insect Colony Tournament |        |      |
| 1 eakae                  | 3458   |      |
| 2 windtoki               | 3439   |      |
| 3 canb                   | 2586   |      |
| 4 quiss                  | 2378   |      |
| 5 luonnos                | 223    |      |
| 6 zrxckv                 | 197    |      |
| 7 psii                   | 164    |      |

The "Active Contests" section lists two contests: "Insect Colony Tournament" with a prize of \$1000 and "CSEd Week Billiards Contest" with a prize of \$50.

**Figure 5. Contests**

At the program kickoff, we received advice from educators and direction from the program manager that the sizes of the competition prizes we had contemplated (\$200 - \$20,000) were too high, and that we should use smaller prize amounts. Our contest prizes were therefore typically in the tens or hundreds of dollars, with only an occasional larger contest with prizes in the thousands. We did find that we were able to attract participation with these lower prize amounts.

In the future, with sponsored competitions we may consider occasional higher prize amounts for the marketing value, but only in connection with a larger marketing campaign.

### **5.3 NoNameSite.com Games**

Over the two years of the program, we developed 9 games (Figure 6) for NoNameSite.com. They are listed here and are each described further below. In each case, the games were developed to be fun, and also to provide, or to be able to be expanded to involve computer science skills, for example scripting or coding. Our plan is to monitor the game play and to see which games are popular, and to develop those more fully. Also, we have a level editor for most of the games that allows the students to develop their own game levels.

- Alice in Booleanland (a.k.a. Bewildering Booleans)
- Billiards
- Into the Claw
- Revenge of the Mummified Basketball Star
- Brando the Egghunter Extraordinaire
- Treasure Hunter
- The Ball
- Don't Become Roadkill
- Insect Colony

We currently have rudimentary “tutor” functionality in the games now, in the sense that the levels are structured to build on skills gained in previous levels, and many of the games offer hints when the users encounter problems.

Our intent is to expand the tutor functionality in the future so that we can provide better help in helping the users learn the skills more quickly.

Follow us on: [Facebook](#) | [Twitter](#)
[Log in](#)
[Register](#)

NONAMESITE ● COM
Home Contests **Games** Forums Blogs SoCo

Games
Home > Games > View All
Member Count: 3703 Fri, Dec 14, 2012 10:46 EST

### Games

All Activities
Member Created Activities



**Bewildering Booleans**  
Just how hard can it be to turn on a light?

Alice lives in a seemingly simple land of "true" and "false." Yet, she cannot quite seem to say what she means! Can you help her correct the sentence? Plumb the secrets of a 0 and 1 world by playing this Boolean game. Click the title to learn more!

[Click here to begin](#)



**Billiards**  
Show off your cool aim with a game of pool!

Billiards: a game of style and finesse for players with a steady hand and a sharp eye. Our game has all that, and a little more besides - you can control the game with math! Use our laser protractors to find the angles, and enter the exact angle and force to use on the cue ball. The player that uses the fewest strokes to finish the level scores highest. Try both your sharp eye AND your sharp mind!

[Click here to begin](#)

### Active Contests

|                                            |                         |
|--------------------------------------------|-------------------------|
| <b>Insect Colony Tournament</b>            | <b>\$1000</b>           |
| <a href="#">More Details</a>               | <a href="#">Discuss</a> |
| <b>CSEd Week Billiards Contest</b>         | <b>\$50</b>             |
| <a href="#">More Details</a>               | <a href="#">Discuss</a> |
| <b>CSEd Week Treasure Hunter Contest</b>   | <b>\$50</b>             |
| <a href="#">More Details</a>               | <a href="#">Discuss</a> |
| <b>CSEd Week Mummified Basketball Star</b> | <b>\$50</b>             |
| <a href="#">More Details</a>               | <a href="#">Discuss</a> |
| <b>CSEd Week The Ball Contest</b>          | <b>\$50</b>             |
| <a href="#">More Details</a>               | <a href="#">Discuss</a> |
| <b>CSEd Week Brando Egg Hunter</b>         | <b>\$50</b>             |
| <a href="#">More Details</a>               | <a href="#">Discuss</a> |
| <b>CSEd Week Bewildering</b>               | <b>\$50</b>             |

**Figure 6. Games**

### 5.3.1 Alice in Booleanland (Figure 7)

This game was built to help explain Boolean Logic. Alice represents a “1” and the Cheshire Cat represents a “0.” By clicking on either Alice or the Cheshire cat, the player is able to satisfy the boolean logic equation. The faster the player solves it and the less clicks it takes, the higher their score will be.



**Figure 7. Alice in Booleanland**

The concept of Alice in Booleanland thus is pretty simple but the levels get harder fast. It teaches the basics of boolean algebra. Currently there are 10 level sets (groups of levels) for the game.

In the future we plan to develop more level sets for the game, and to expand the tutorials and in-game help. Also, we can add additional themes to help engage more students.

### 5.3.2 Billiards (Figure 8)

The NoNameSite.com Billiards game is similar to the table game. The user has a cue that is used to hit the balls with the goal of the colored balls ending up in the pockets at the side of the table. There are features in the presentation of this billiards game that visually and mathematically demonstrate the physics and that allow the player to perfect their aim. The player can set specific angles, control the force of the cue stick, and even add a spin to the cue ball. These features (Figure 9) provide a simulation of the physics aspects inherent in the game.

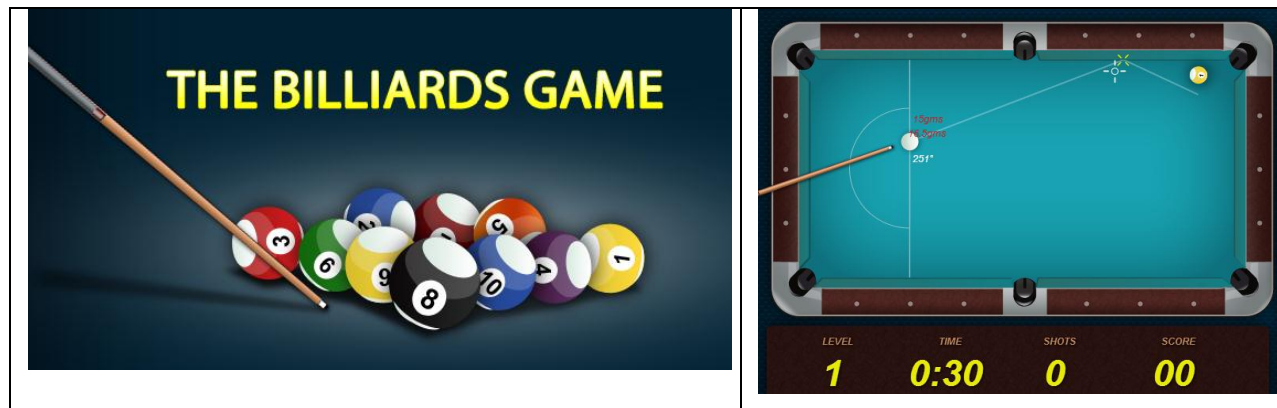


Figure 8. Billiards



Figure 9. Billiards Features

There are currently 6 level sets of play in the billiards game. In the future we plan to develop more level sets for the game, and to expand the tutorials and in-game help. Additional future plans include making this game a two-person game, and adding programming/scripting features, so that the player can develop an algorithm to hit the ball into the pocket.

### 5.3.3 Into the Claw (Figure 10)

The Into the Claw is a modification of the traditional arcade game where the player puts in coins and tries to pick up a doll or toy with the giant claw. This initial version of the game requires the player to pick up the dolls in order to reach the goal number that they are given.



**Figure 10. Into the Claw**

The claw moves up and down until the player hits the red button (Figure 11). The claw then stops in that position and moves along the other axis until the player hits the red button again. Then the claw drops and picks up the object that is under it (if any).

The objects (Figure 12) currently have numbers and mathematical operations (addition, subtraction, multiplication, division). In the future, we plan to expand the mathematical operations to use other types of operations such as patterns, computer logic operations, and lines of code. This game can be used with any type of ordered operations.

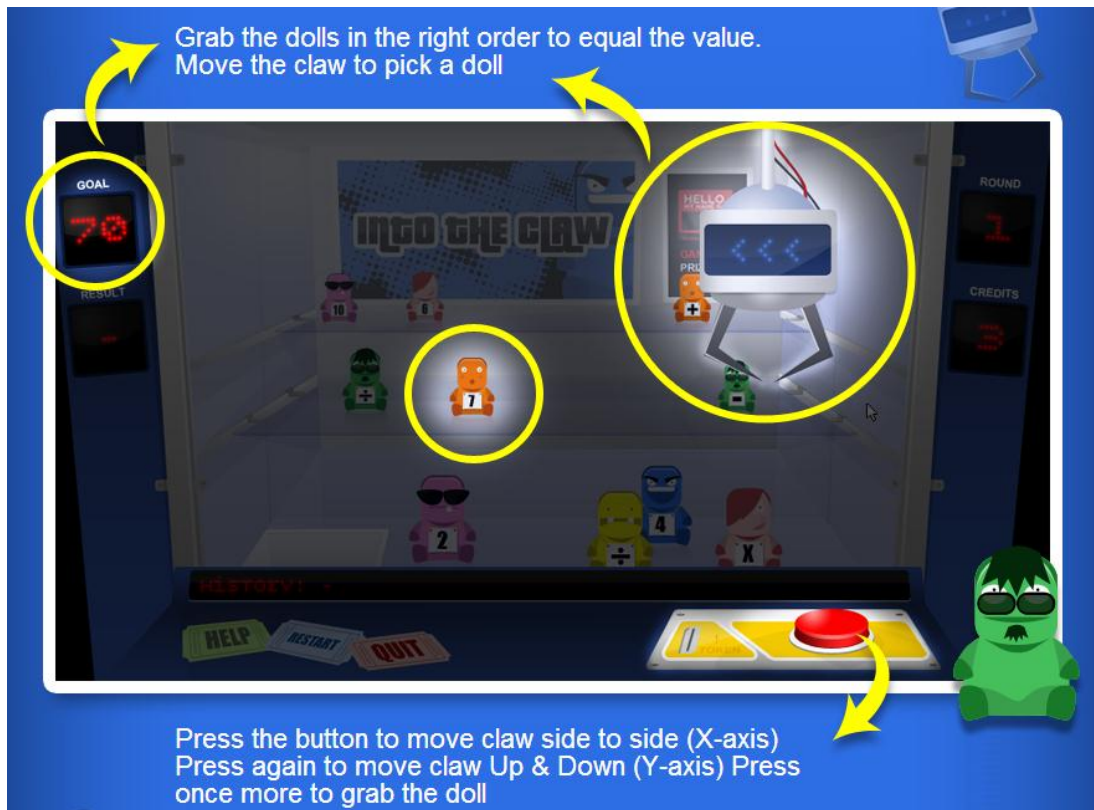


Figure 11. Claw Movement



Figure 12. Claw Objects

We also plan to add more level sets for the game, and to expand the tutorials and in-game help.

### 5.3.4 Revenge of the Mummified Basketball Star (Figure 13)

In this physics game, the player builds a fort around their treasure so the mummy does not destroy it by throwing basketballs at it. The player is given a certain amount of materials based on the level that include metal pipes, stones, and wooden beams. The stronger the fort is the better chance the player has in advancing to the next round.



Figure 13. Revenge



Figure 14. Revenge Tools

The player uses logic and understanding of the tools that are available to figure out which types of materials can be used to protect from the basketball attack (Figure 14).

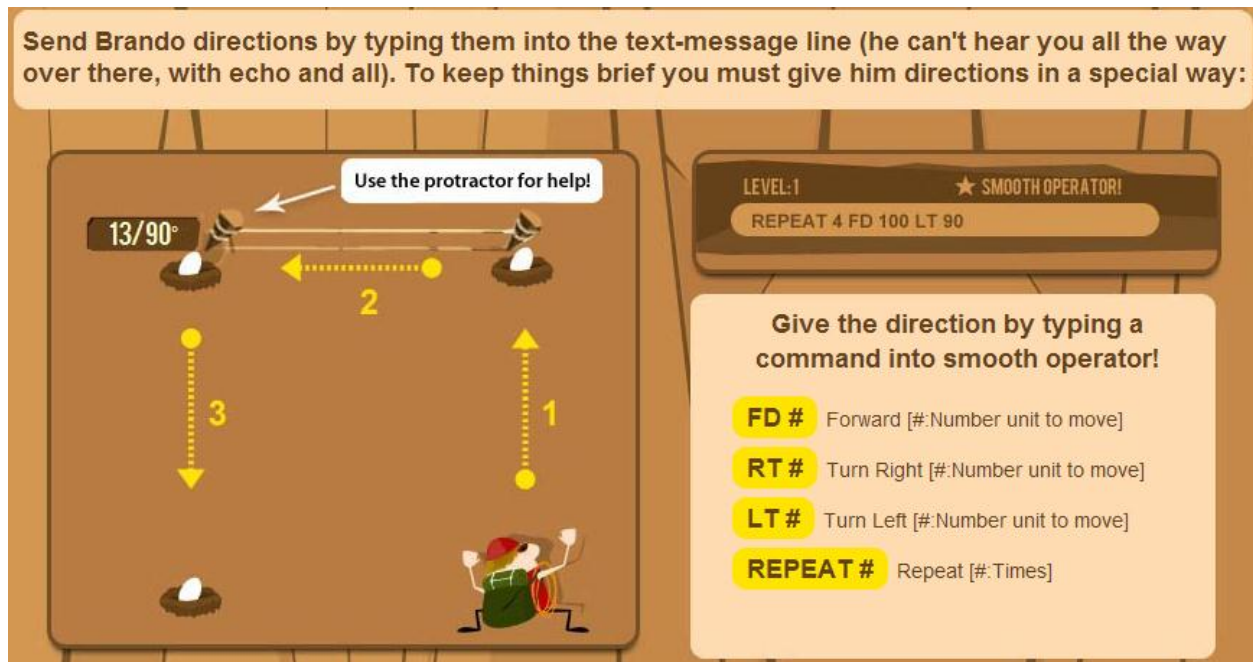


**Figure 15. Revenge Level 1**

In the future we plan to develop more level sets (Figure 15) for the game, and to expand the tutorials and in-game help. We also see possibilities for adding additional materials, and for allowing a player to control the basketball-throwing mummy, which would also allow it to be a two-player game. Ultimately, both sides could be controlled by programming or scripting.

### 5.3.5 Brando the Egghunter Extraordinaire

In the Brando game (Figure 16), the player is tasked with helping the rock climbing character Brando to collect all the eggs on a cliff by giving him instructions as to what angles and how many steps he needs to take. If the angles are too difficult the protractor can help.



**Figure 16. Brando**

The player develops a script that allows them to collect all of the eggs. The player has to think about the most efficient path to cover the egg locations. In the initial level sets (Figure 17), the egg locations are set on corners of regular geometric shapes, thereby including geometry in the activity.



**Figure 17. Brando Initial Level**

In the future we plan to develop more level sets for the game, and to expand the tutorials and in-game help.

### 5.3.6 Treasure Hunter (Figure 18)

In this game the player needs to direct their pirate to the treasure by laying out a path and getting past obstacles.



**Figure 18. Treasure Hunter**

This is a different scripting game, that is more sophisticated than Brando in that there are actions that must be included, such as swimming or jumping. Also, the focus is not on getting to all of the points most efficiently (which is the goal of Brando) but rather to get to the end goal through a set of obstacles (Figure 19). This is intended to be more analogous to basic robot programming.



**Figure 19. Treasure Hunter End Goal**

Approved for Public Release; Distribution Unlimited.

When the pirate gets to the goal, the key unlocks the treasure chest.

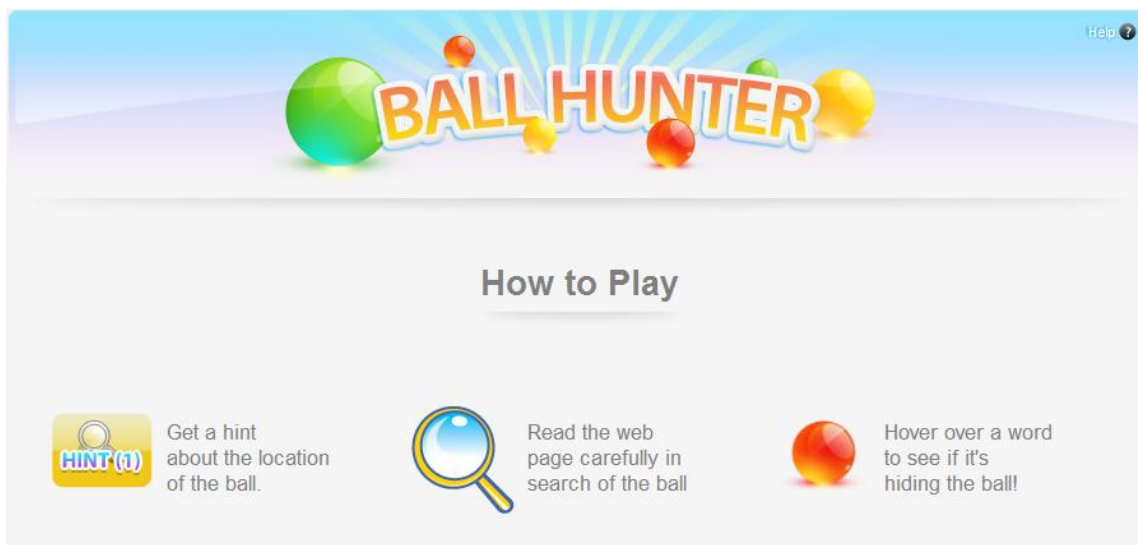


**Figure 20. Treasure Hunter Level 1**

In the future we plan to develop more level sets (Figure 20) for the game, and to expand the tutorials and in-game help. We also can add more complicated landscapes and additional activities that can be required, such as getting the key from one location and then using it in another location to open the treasure chest. The use of subroutines can be expanded to allow for reuse of code.

### 5.3.7 The Ball (Figure 21)

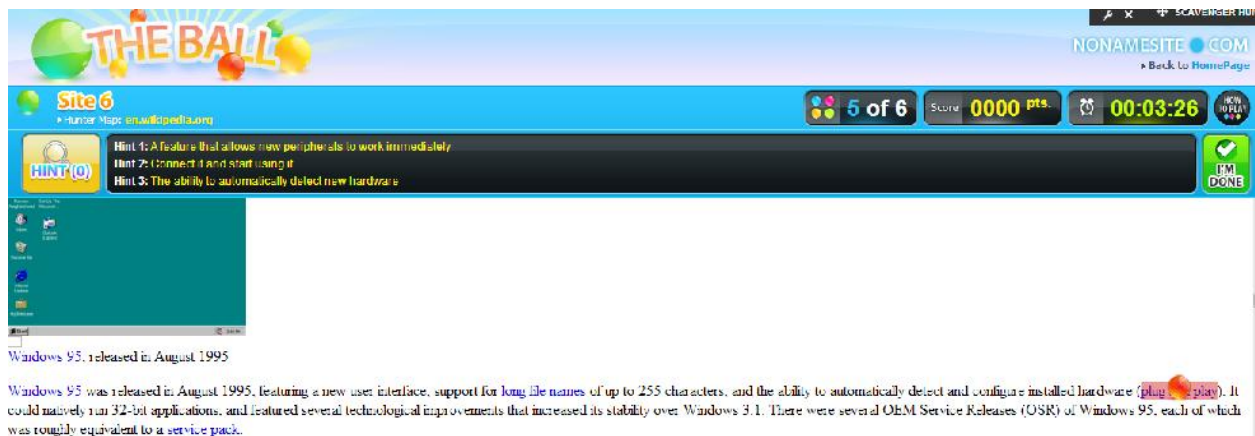
The Ball is an online scavenger hunt that is played with a web browser. After reading the hints, the user combs the given website page(s) to find the hidden ball and to move on to the next site.



**Figure 21. The Ball**

When the game is launched, a game bar appears at the top of the web page to provide the hint and also to communicate when the Ball on that page has been found. The game is intended to motivate players to read the web pages that are part of the hunt, and specifically to find the lines of text that are part of the hunt. The bar at the top of the page (Figure 22) also shows progress of this user and potentially other users.

This is a very exciting game, because it can bring visitors to web sites that are desired by the contest sponsor(s). We developed a variety of hunts for use in contests with a variety of topics, including computer science web sites and other STEM sites.



**Figure 22. The Ball Status**

In the future we plan to develop more hunts for the game, and to combine the hunts with web pages specific to particular topics of interest. We also will conduct contests to motivate *NoNameSite* members to come up with hunts to post and share with friends.

### 5.3.8 Insect Colony (Figure 23)

Insect Colony is strategy game in which users build and defend a colony base. In the game, they control characters (bees or ants) to perform tasks, interact with other characters via artificial intelligence (AI) and physics engines, earn points, make decisions, and advance to enhanced levels.



**Figure 23. Insect Colony**

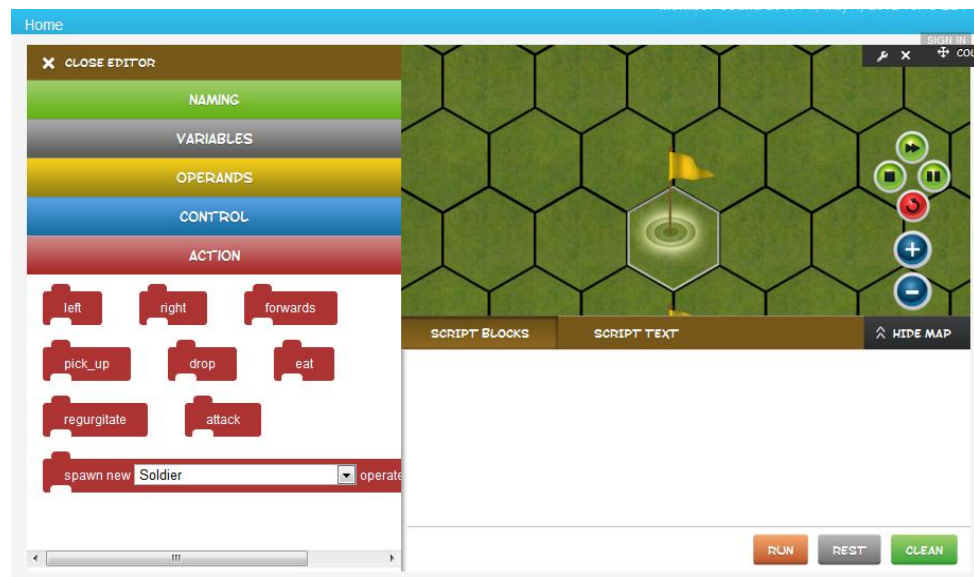
There are a variety of missions (Figure 24) that each require different tasks to be completed, for example to gather stacks of wood and move them to the other side of a field.



**Figure 24. Insect Colony Missions**

Approved for Public Release; Distribution Unlimited.

The players write scripts that perform the tasks in an automated fashion using a drag-and-drop code editor (Figure 25).



**Figure 25. Insect Colony Editor**

In the future we plan to develop more level sets for the game, and to expand the tutorials and in-game help. We can make this a two player game and also make it possible for users to design game levels.

### 5.3.9 Don't Become Roadkill (Beta)

In this game (Figure 26), the player needs to safely bring critters across the road. In this initial version, the player clicks where the critter should go, and if it is possible to go there, given the obstacles such as trees and signs, the critters will move to that location. The critters need to avoid being hit by the vehicles travelling across the road.



**Figure 26. Don't Become Roadkill**

In this initial version, there are 5 types of creatures, each has their own speed and sensing capabilities. In some cases, a creature will need to bring other creatures across the road with them, making travel more difficult.

For example, in the level shown below (Figure 27), the group of raccoons in the top center (at approximately 12:00) need to get across to the flag on the left (at approximately 9:00).



**Figure 27. Don't Become Roadkill Level 3**

This game is in Beta, and we are making changes based on user feedback. Our long-term goal with this game is to make it a programming game similar to Insect Colony, where the player provides drag-and-drop programs to direct the critters across the road based on information from sensors and their understanding of the critter capabilities.

In the future we also plan to develop more level sets for the game, and to expand the tutorials and in-game help.

## 5.4 NoNameSite.com Forums:

NoNameSite.com has forums for discussion with the community (Figure 28). There is a forum dedicated to every activity and game giving our members a place to ask questions and get help. They are monitored daily and responses returned promptly, which helps to build community.

Follow us on: [Facebook](#) | [Twitter](#) [Log in](#) [Register](#)

NONAMESITE • COM Home Contests Games **Forums** Blogs SoCo

**Forums** Member Count: 3703 Fri, Dec 14, 2012 10:48 EST  
Home > Forums

**Forum** Search

[Board Index](#)

**Anything Under The Sun**

|                                                                                                           | Topics | Replies | Last Poster                                                                                                  |
|-----------------------------------------------------------------------------------------------------------|--------|---------|--------------------------------------------------------------------------------------------------------------|
| <b>Anything and Everything</b><br>Ask questions or comment on any topic here.                             | 41     | 82      | Fri, Oct 19, 2012 09:14 EST<br><a href="#">Rep Program Winners Announced!!</a><br>by <a href="#">jdamato</a> |
| <b>Prizes Discussion</b><br>Discuss the prizes on NoNameSite.com and what you'd like to see when you win. | 2      | 1       | Tue, Apr 17, 2012 11:59 EST<br><a href="#">Prizes Evaluation</a><br>by <a href="#">stirfryLee</a>            |

**Features Activities and Contests**

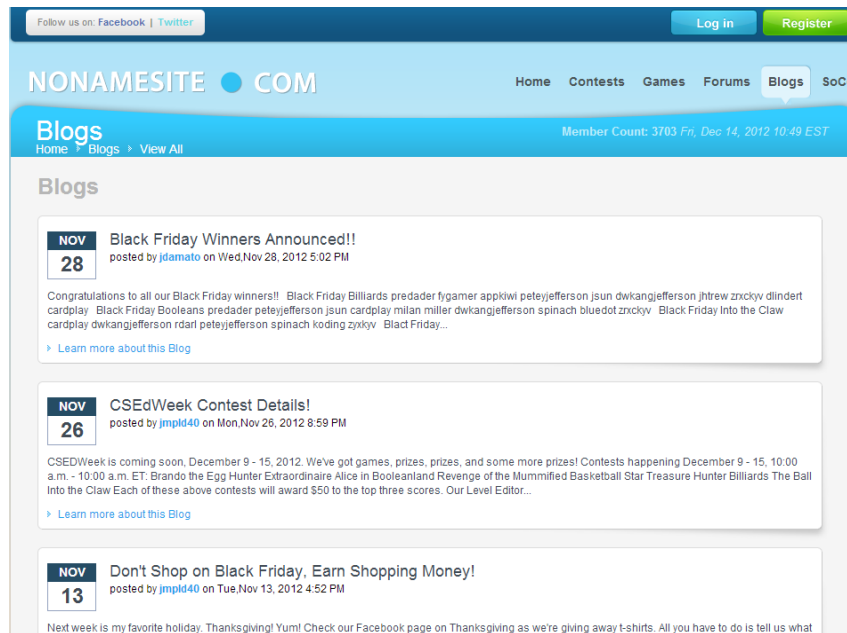
|                                                                                | Topics | Replies | Last Poster                                                                                      |
|--------------------------------------------------------------------------------|--------|---------|--------------------------------------------------------------------------------------------------|
| <b>Alice in BooleanLand</b><br>Discuss the Alice in BooleanLand activity here. | 11     | 13      | Fri, Nov 23, 2012 13:16 EST<br><a href="#">order of operations</a><br>by <a href="#">spinach</a> |

**Figure 28. Community Forums**

These forums have been useful for communicating with members and receiving feedback, but they have not been as active as we would have expected. In part, we think that this is because the target audience is more used to using Facebook and other tools for these types of community interaction. We are currently considering ways to integrate this communication with social media.

## 5.5 NoNameSite.com Blog:

On the *NoNameSite* blog (Figure 29), we give the members updates on contests, winners, and upcoming promotions. This is a place for site announcements, and is also reflected on the front page.



**Figure 29. Blog**

## 5.6 NoNameSite.com SoCo

SoCo (Figure 30), the NoNameSite.com School of Code, was built to teach and encourage students to learn how to code and to achieve this in a fun, creative way. By using a system that makes a game out of learning to code with scores, badges, and achievements, students with no programming experience can be motivated to complete lessons and master the basics.



**Figure 30. SOCO**

Lessons start off with very basic coding and logic so even members with no programming experience can participate. A simple, drag and drop interface (Figure 31) makes the lesson easy to follow. Tasks and projects will increase in difficulty as the students move deeper into the process of learning how to program.



**Figure 31. SOCO Lesson**

The SoCo activity currently features:

- 76 beginner lessons
- A scoreboard to show top members
- Profile page to show personal statistics, badges, and achievements
- Sharing mechanisms for posting your scores or our lessons to social media
- Forums for questions and community feedback

Coming soon:

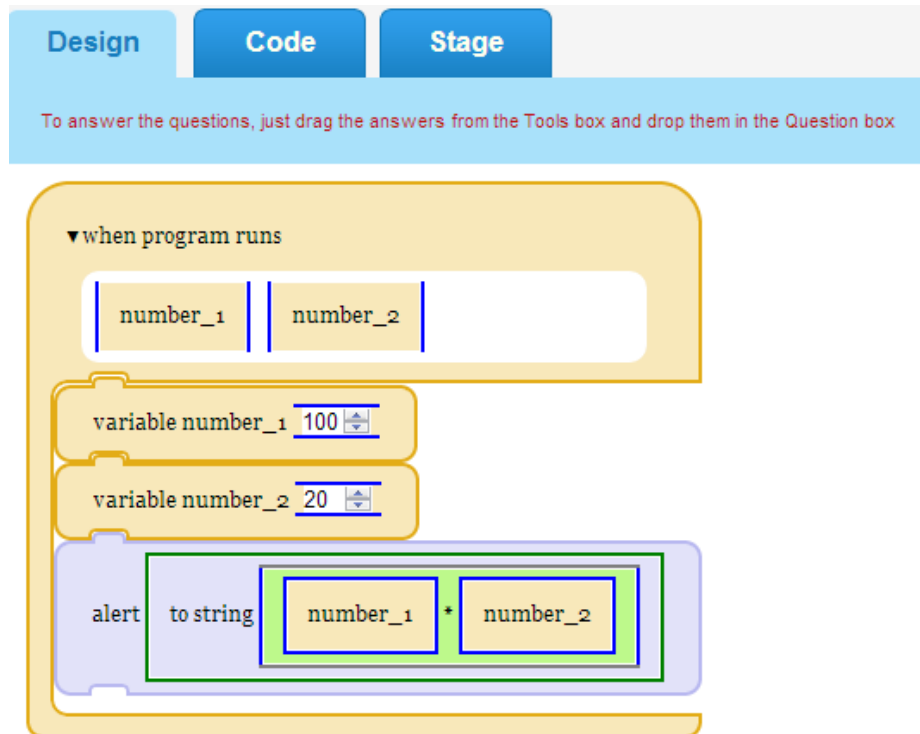
- More instructions and information about the code
- More content for learning
- More lessons
- The option to get other professionals involved with creating lessons and providing support

Example lesson:

The screenshot shows a lesson titled "Basic Arithmetic Operations" in a light blue header. Below the title, it says "This lesson shows usage of basic arithmetic operations in Javascript." A horizontal bar below the header contains three items: a document icon labeled "Javascript", a clock icon labeled "30 minutes", and a folder icon labeled "0 Related Project(s)". The main content area has a light gray background and is titled "Step-by-Step Instructions". The first instruction is "1. Drag the 'when program runs' block from the Control section and drop it to the canvas." Below this instruction is a yellow block with a dropdown arrow and the text "when program runs". At the bottom left of the instruction area is a "Next »" link.

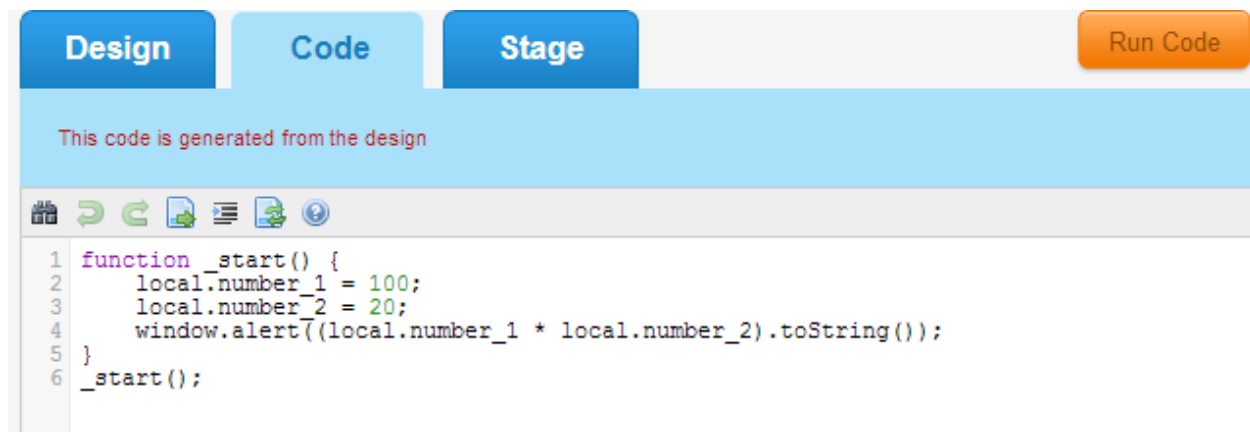
**Figure 32. SOCO Basic Arithmetic**

You're given step by step instructions (Figure 32) asking you to drag the coding blocks to the coding box.



**Figure 33. SOCO Design**

After you drag any blocks in (Figure 33) you can click on the coding tab (Figure 34) to see the code generated and the results (Figure 35).



**Figure 34. SOCO Code**

NEW

All Lessons

All lessons are shown here

Add New Lesson

All Lessons are shown here

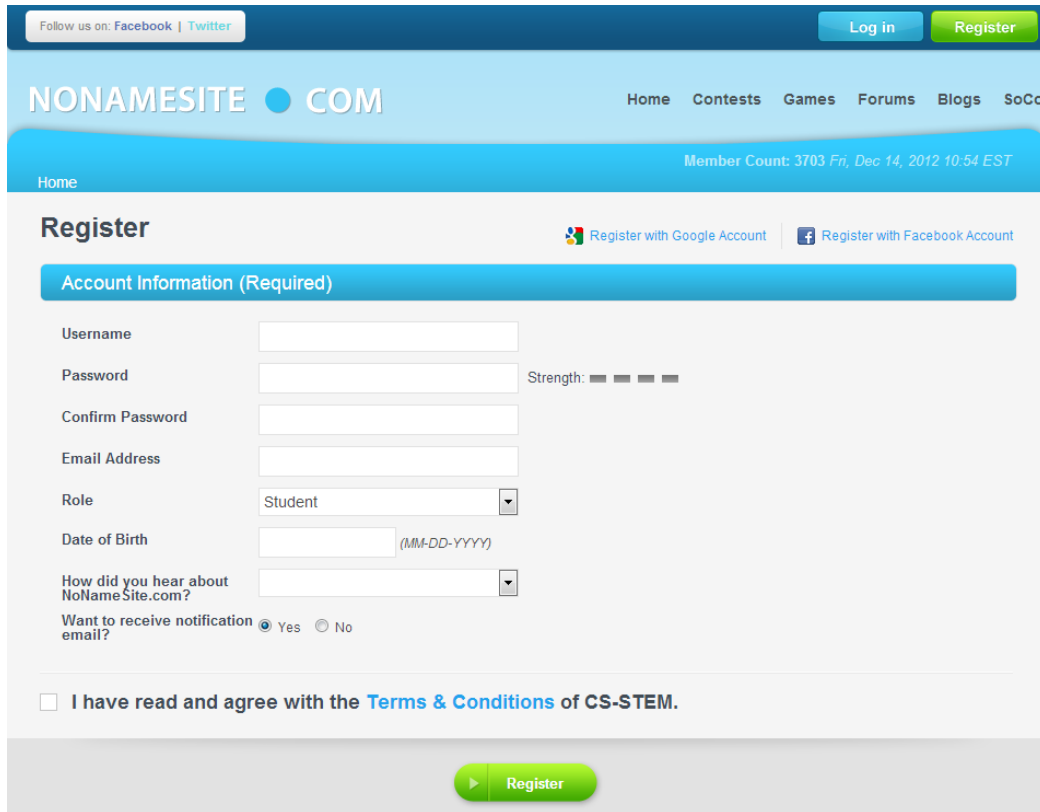
Filter By Difficulty: ☒ Beginner ☒ Regular

| Mode & Lesson Name | Lesson Details                              | Points & Badges | Operations                            |
|--------------------|---------------------------------------------|-----------------|---------------------------------------|
|                    | <div><div></div></div>                      | 0 pts           | DRAFT                                 |
|                    | <div><div></div>0 minutes</div>             | 0 badge(s)      |                                       |
|                    | <div><div></div>0 Related Project(s)</div>  |                 |                                       |
| BEGINNER           | <div><div></div> Javascript</div>           | 100 pts         | <div><div></div> Edit Lesson</div>    |
|                    | <div><div></div> 30 minutes</div>           | 2 badge(s)      | <div><div></div> Preview Lesson</div> |
|                    | <div><div></div> 0 Related Project(s)</div> |                 | <div><div></div> Delete Lesson</div>  |
|                    | <div><div></div> Javascript</div>           | 100 pts         | <div><div></div> Edit Lesson</div>    |

**Figure 35. Results**

## 5.7 NoNameSite.com Registration:

The *NoNameSite* registration page (Figure 36) follows the research protocol that was reviewed by our IRB and the Air Force. The registration page is simple and includes only minimal information.



The screenshot shows the registration page for NoNameSite.com. At the top, there is a dark blue header with social media links for Facebook and Twitter, and buttons for 'Log in' and 'Register'. Below this is a light blue navigation bar with the site name 'NONAMESITE.COM' and links for 'Home', 'Contests', 'Games', 'Forums', 'Blogs', and 'SoCo'. A banner below the navigation bar displays 'Member Count: 3703 Fri, Dec 14, 2012 10:54 EST'. The main content area is titled 'Register' and includes options to 'Register with Google Account' or 'Register with Facebook Account'. A blue bar highlights the 'Account Information (Required)' section. The form contains fields for Username, Password (with a strength indicator), Confirm Password, Email Address, Role (a dropdown menu currently showing 'Student'), Date of Birth (with a '(MM-DD-YYYY)' format hint), and How did you hear about NoNameSite.com? (a dropdown menu). There is also a checkbox for 'Want to receive notification email?' with 'Yes' selected. At the bottom of the form is a checkbox for 'I have read and agree with the Terms & Conditions of CS-STEM.' and a large green 'Register' button.

**Figure 36. Registration Page**

## 5.8 NoNameSite.com Profile Page

A user's public profile (Figure 37) on *NoNameSite* includes information about their performance on different activities and their avatar, if they have associated their account with one. The user's real name is not included in their public profile.

The screenshot shows the public profile page for a user named 'supergrl' on the website 'NONAMESITE.COM'. The page has a blue header with social media links for Facebook and Twitter, and a welcome message for 'supergrl' with a 'Logout' link. The main navigation bar includes links for Home, Contests, Games, Forums, Blogs, My Account, and SoCo. The profile section is titled 'Public Profile' and shows the member count as 3704, with a timestamp of 'Fri, Dec 14, 2012 11:07 EST'. Below this, the 'Achievements & Standings in Activities' section lists three activities: 'Alice in the Booleanland' with a rank of 408, 'Brando Egg Hunter' with a rank of 168, and 'Into the Claw' with a rank of 22. To the right of the achievements is the user's avatar, which is a cartoon character with purple skin, yellow hair, and a red flower, wearing a blue superhero costume with a yellow 'S' on the chest. Below the avatar, the profile statistics are listed: 'Member since: December 14, 2012', 'Total # of Posts: N/A', 'Daily Average: N/A', and 'Latest Post: N/A'.

| Achievements & Standings in Activities |                          |
|----------------------------------------|--------------------------|
| Alice in the Booleanland               | User's Current Rank: 408 |
| Brando Egg Hunter                      | User's Current Rank: 168 |
| Into the Claw                          | User's Current Rank: 22  |

**supergrl**

Member since: December 14, 2012  
Total # of Posts: N/A  
Daily Average: N/A  
Latest Post: N/A

**Figure 37. Public Profile**

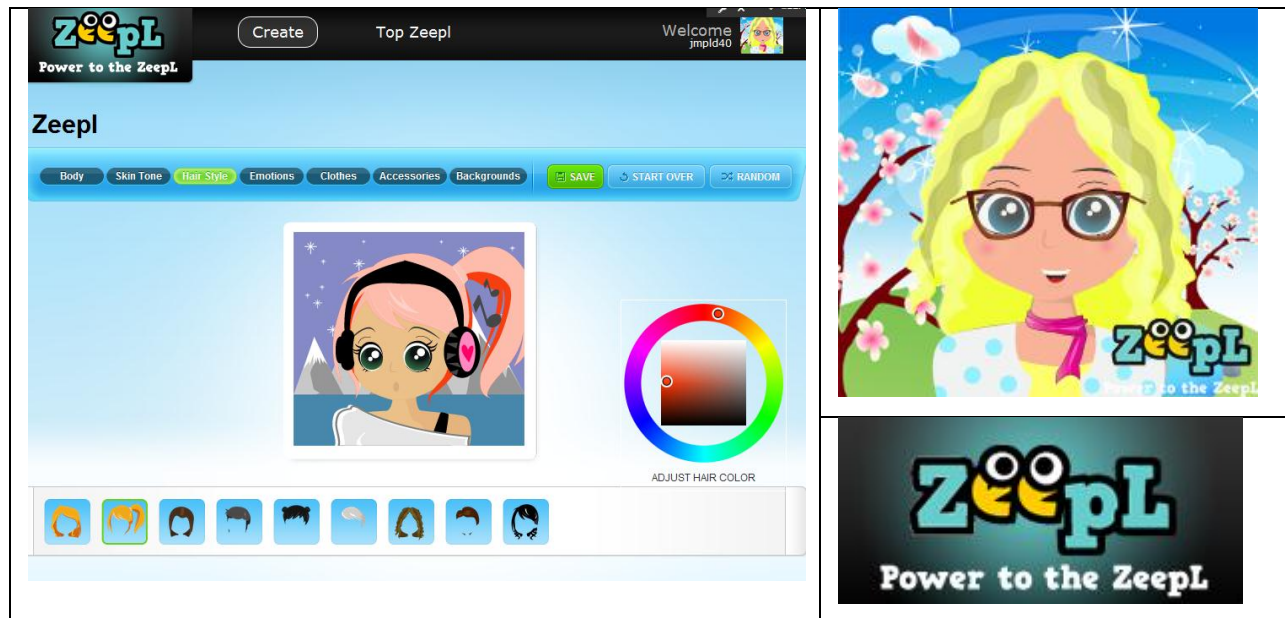
## 5.9 Zeepl

Zeepl (Figure 38) are the *NoNameSite* avatars. We built this feature to allow the members to personalize their profile page, and also to introduce members who are interested to digital design. Members can custom-build their Zeepl and even design items to give to their Zeepl.



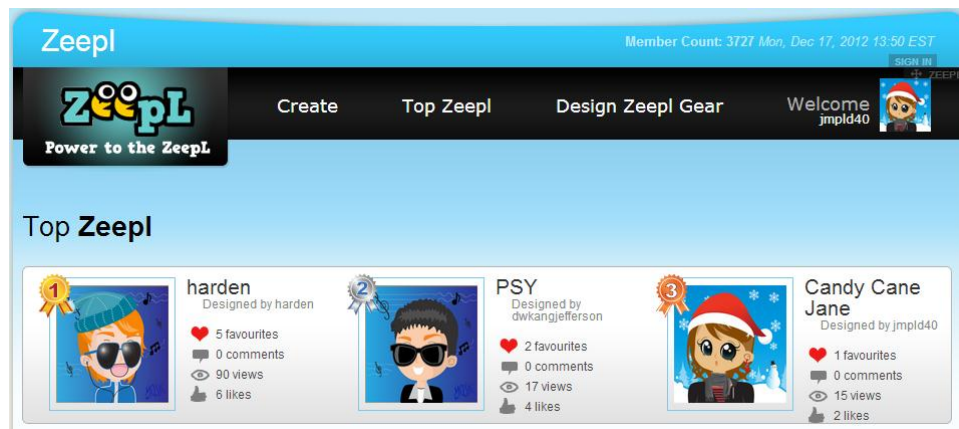
**Figure 38. Zeepl**

A Zeepl design tool (Figure 39) allows the members to customizer their Avatar. The Avatar can be downloaded and used in other social networks as well.



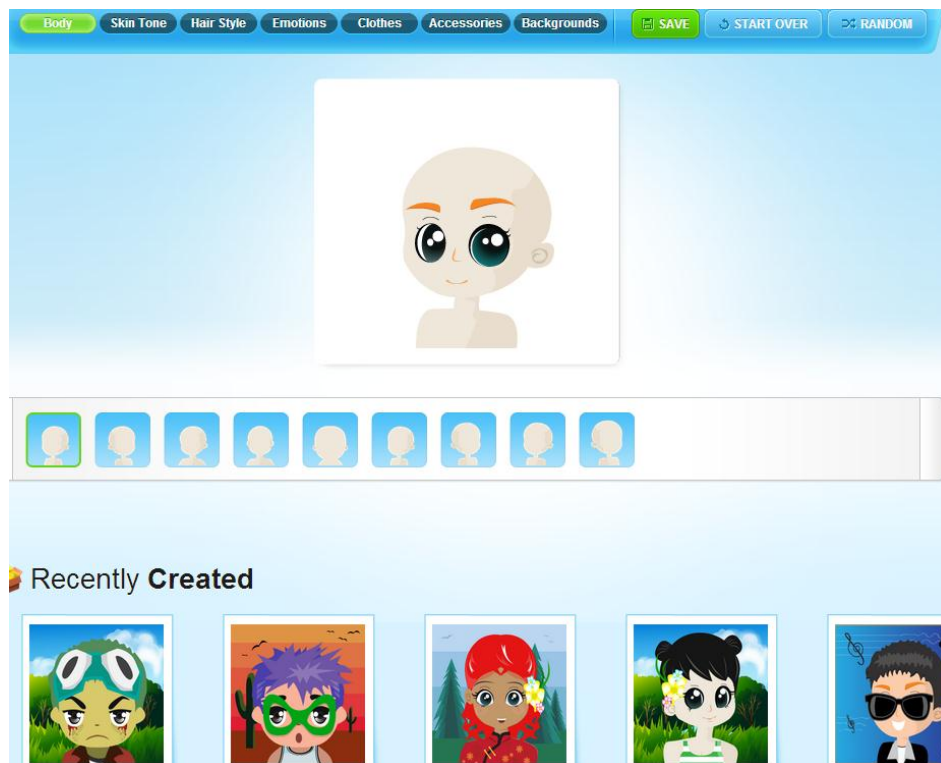
**Figure 39. Zeepl Design Tool**

Recently designed Zeepl, and Zeepl that have been liked by the most other members are shown on the Zeepl page (Figure 40).



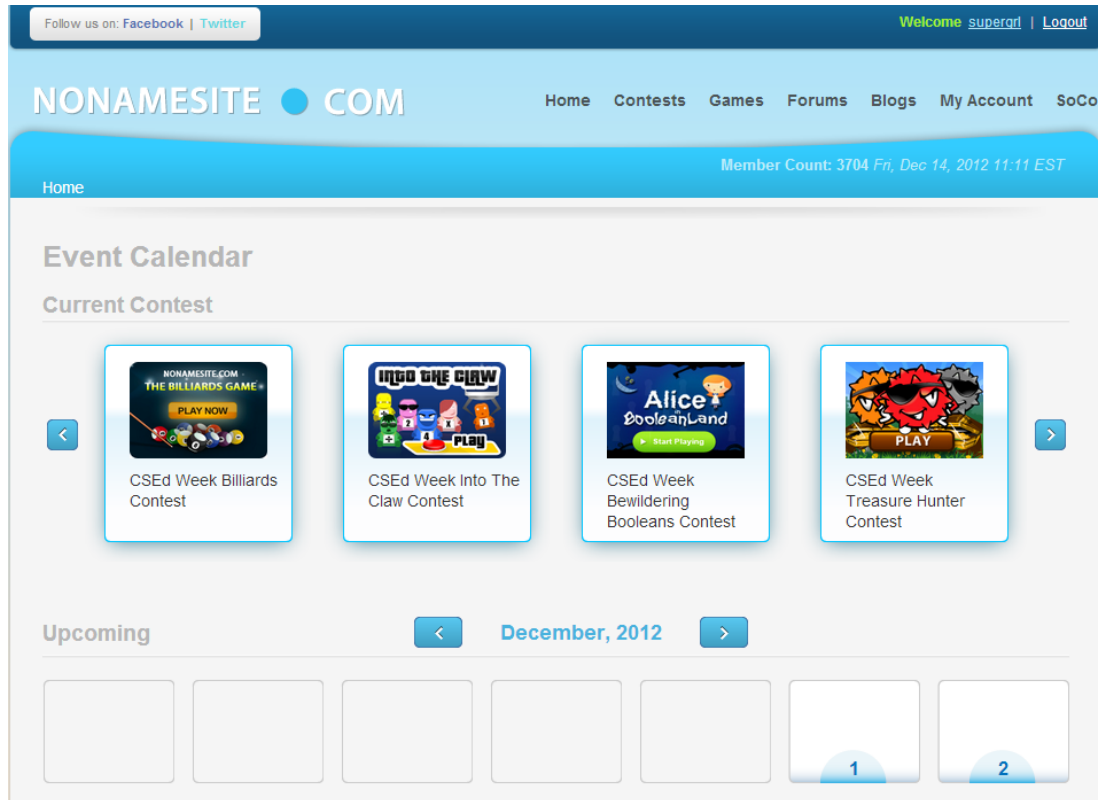
**Figure 40. Zeepl Page**

The Zeepl design screen (Figure 41) allows for selection of skin tone, hair style, facial emotional expression, clothes, accessories, and backgrounds. If the player does not find a choice that they are happy with, the player can design and submit their own.



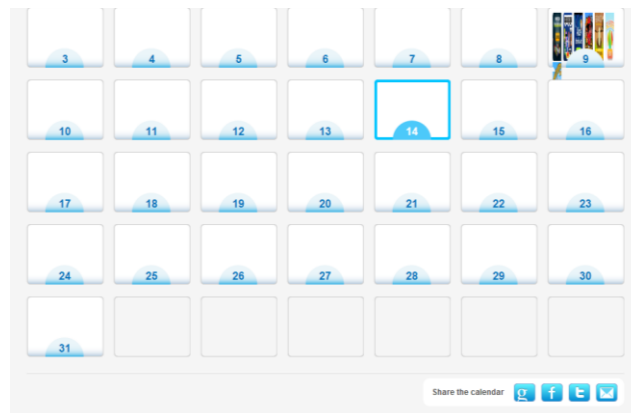
**Figure 41. Zeepl Design Screen**

## 5.10 NoNameSite.com Event Calendar



**Figure 42. Event Calendar**

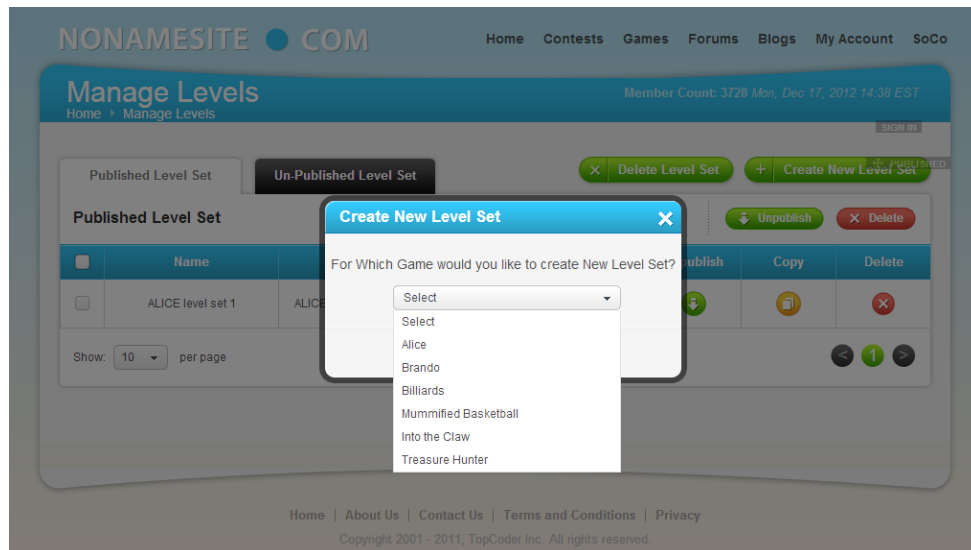
We recently built a calendar (Figure 42) to showcase when upcoming contests are and allow the members to set reminders (Figure 43).



**Figure 43. Reminders**

## 5.11 Level Editor

A level editor (Figure 44) allows members to create and share levels to the games they enjoy playing on *NoNameSite*. The level editor is available for 6 of our 9 games.



**Figure 44. Level Editor**

The level editor provides a simple way for the members to think about the games from the point of view of a game creator, not just a game player. Each game level is defined as a set of text or numeric characters that are then converted into the game level.

For example, for the Alice in Booleanland game (Figure 45), the expression to be solved is provided in mathematical notation, with the desired answer. Other game conditions are also specified.

Levels in <<ALICE level set 1>> Cancel Preview Save

|              | & - AND,   - Not                                                            |
|--------------|-----------------------------------------------------------------------------|
| Expression:  | <div>1 &amp; 1   1   1 &amp; 0 = 1</div> <div>Example : 1 &amp; 1   1</div> |
| Max Toggles: | 10                                                                          |
| EIapse:      | 5                                                                           |
| Toggles:     | 8                                                                           |

**Figure 45. Level Editor for Alice**

Once completed, the new level can be tested by the game level developer (Figure 46).

**Edit New Level Set** Member Count: 3728 Mon, Dec 17, 2012 14:45 EST

Home > Level Editor > Create New Level Set SIGN IN

Cancel Save

Levels in <<Claw test>> Cancel Save **Published Status**

Max Points:

500

Operators:

+,-

Number Seeds:

1:5

Number Count:

4

Difficulty Level:

Easy

Estimated Time:

5

Starting Score:

50

Credits:

7

Test

Test 1

Save

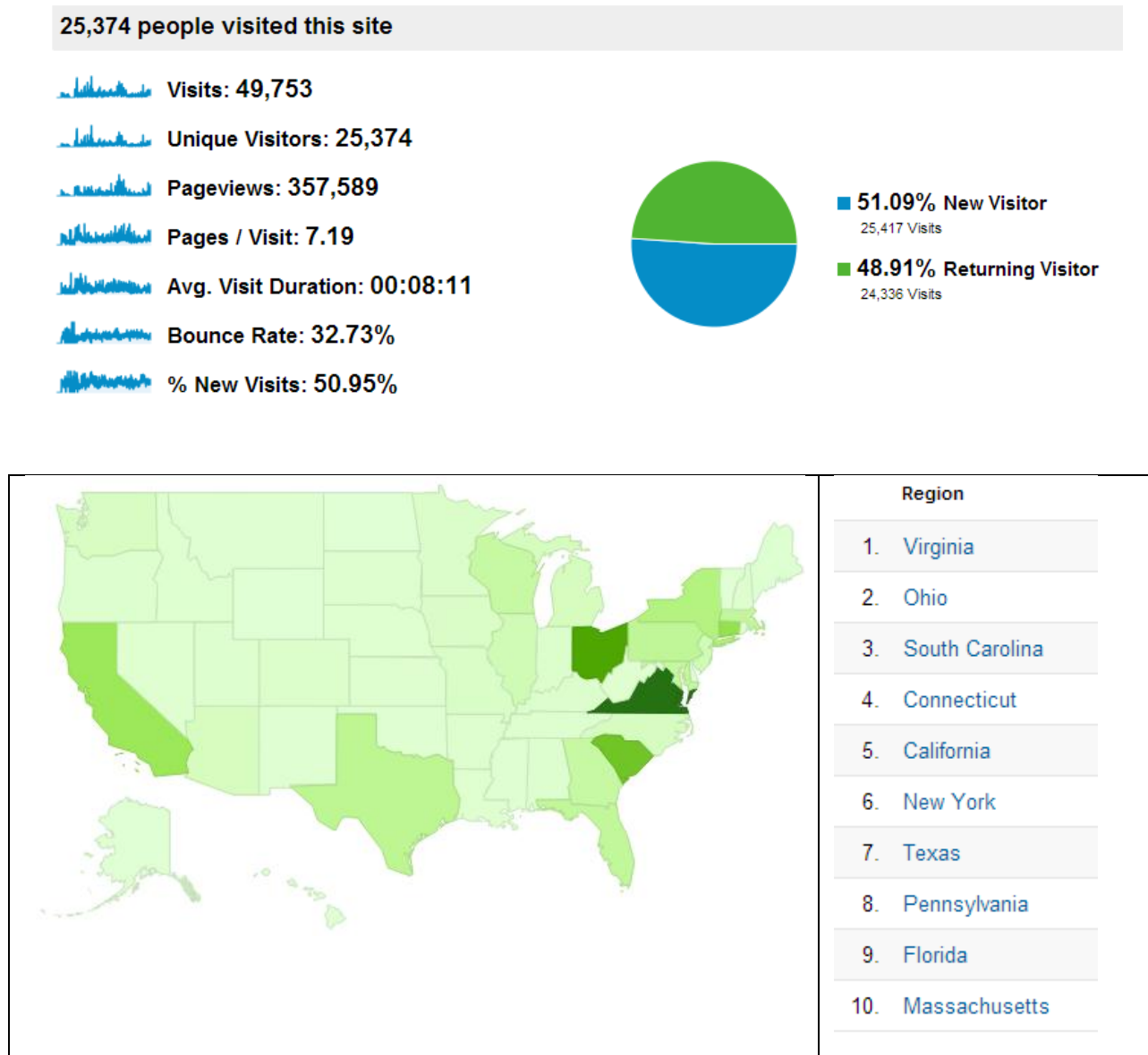
The level has been saved successfully!

OK

**Figure 46. Level Editor Test**

## 5.12 Analytics

Below (Figures 47-48) are site analytics from Google analytics. These are straight web site analytics for the time period of February 2011 – December 2012



**Figure 47. Site Analytics**

49,753 people visited this site

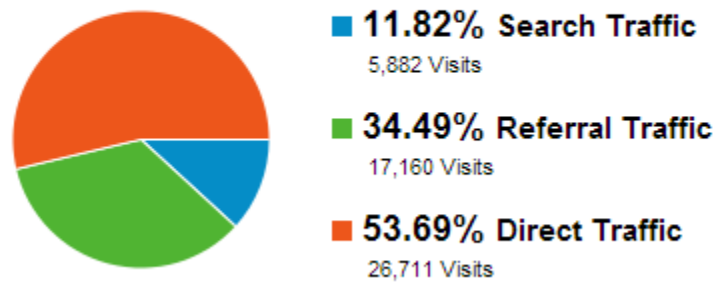


Figure 48. Site Analytics

### 5.13 Social Media Outreach (Figure 49)

Social media, in particular Facebook and Twitter, have proved to be important in gaining new *NoNameSite.com* members in our target age group. Currently we have more than 14,000 fans on our Facebook Page.



**Figure 49. Outreach**

On Facebook we start discussions, encourage game play, and give out prizes for our fans. The majority of our new members come from Facebook. Our “Facebook Friday” contests invite our Facebook fans to play a *NoNameSite* game.

## **5.14 NoNameSite.com EDWorks Pilot Program**

In the spring of 2012, NoNameSite.com collaborated with EDWorks, a subsidiary of KnowledgeWorks. EDWorks has initiatives to transform underperforming schools. We organized four-week competitions directed to three EDWorks schools. The schools invited their students to register and participate in four contests on NoNameSite.com. The winners of the contests won prizes and the teachers with the most students participating also won a prize. They participated in 4 games, Alice in Booleanland, Brando the Egg Hunter Extraodinaire, Billiards, and Into the Claw.

An online leaderboard (Figure 50) was updated daily so that students can see how they are ranking. The Participating schools in this event were: Central Collegiate Academy in Detroit, Michigan; Encore: Arts, Communication and Design Academy at Reynoldsburg High School in Reynoldsburg, Ohio; and the Health Science and Human Service Academy at Reynoldsburg High School in Reynoldsburg, Ohio.

### Leaderboard, Into the Claw Contest, Final Scores Posted on May 21, 2012

| <b>Into the Claw Contest (May 14- 21, 2012)</b> |              |                                                                    |
|-------------------------------------------------|--------------|--------------------------------------------------------------------|
| <b>Handle</b>                                   | <b>Score</b> | <b>School</b>                                                      |
| shawnbr                                         | 6906         | Health Scienceand Human ServiceAcademy at Reynoldsburg High School |
| xninja                                          | 5728         | Health Scienceand Human ServiceAcademy at Reynoldsburg High School |
| noname                                          | 5578         | Health Scienceand Human ServiceAcademy at Reynoldsburg High School |
| chicken                                         | 4662         | Health Scienceand Human ServiceAcademy at Reynoldsburg High School |
| allllli                                         | 4510         | Health Scienceand Human ServiceAcademy at Reynoldsburg High School |

### Leaderboard, Teachers and Student Participation, Final Scores posted on May 21, 2012

| <b>Teachers With the Most Student Participation at Health Science and Human Service Academy at Reynoldsburg High School</b>         |                                                                          |                               |
|-------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------|
| <b>Handle</b>                                                                                                                       | <b>School</b>                                                            | <b>Participating Students</b> |
| mrsm                                                                                                                                | Health Scienceand Human ServiceAcademy at Reynoldsburg High School       | 141                           |
| bergeron                                                                                                                            | Health Scienceand Human ServiceAcademy at Reynoldsburg High School       | 133                           |
| mrst                                                                                                                                | Health Scienceand Human ServiceAcademy at Reynoldsburg High School       | 61                            |
| <b>Teachers With the Most Student Participation at Encore: Arts, Communication &amp; Design Academy at Reynoldsburg High School</b> |                                                                          |                               |
| <b>Handle</b>                                                                                                                       | <b>School</b>                                                            | <b>Participating Students</b> |
| freefree                                                                                                                            | Encore: Arts, Communication & Design Academy at Reynoldsburg High School | 77                            |
| talexa                                                                                                                              | Encore: Arts, Communication & Design Academy at Reynoldsburg High School | 4                             |

**Figure 50. Leaderboard**

<http://knowledgeworks.org/worldoflearning/gaining-stem-skills-via-video-games/>  
<http://www.edworkspartners.org/topcoder>

The program was a success as it was a welcome break to the impending school year end. The students enjoyed participating in the contests and the teachers liked the games as an addition to their lessons.

Program end statistics:

- \$1,900 in prizes awarded to teachers and students at HS2 and Encore academies
- 416 students participated in at least one game
- 5 teachers from 2 schools participated. 2 teachers won an iPad3
- 13 different students won at least \$25 Amazon.com gift cards. 1 student from Encore and 12 from HS2 were winners
  - 2 students won \$100 in Amazon.com gift cards

- 3 students won \$50 in Amazon.com gift cards

Program quotes from two teachers:

*"The pilot was fun for both teachers and students. I loved seeing my students receive gift cards on a weekly basis. Thank you for sparking an interest in my students that was needed at the end of the year which is normally the time they burn out."*

*"This is very cool! A great opportunity for our schools. Thanks for all you did to help kids!"*

We are currently working with EDWorks to repeat this program in the spring of 2013. The program will consist of evaluations about NoNameSite, a number of contests with the NoNameSite games, as well as an idea generation contest.

## TechOlympics (Figure 51)

We are also partnering with TechOlympics in Cincinnati, OH for the second year in a row to provide games for use at the event as well as a game/design competition. TechOlympics is a collaborative effort of Greater Cincinnati regional businesses and educators interested in exposing local high school students to college and career opportunities in high technology fields. Presented by the InterAlliance of Greater Cincinnati and The Kroger Company, and sponsored by many local and national companies, this 3 day conference will showcase technology careers in a fun, engaging and safe environment at the Millennium Hotel in downtown Cincinnati on Friday, February 22nd through Sunday, February 24<sup>th</sup>, 2013.



**Figure 51. TechOlympics**

## 6.0 Sustainability

One of the goals of the program is sustainability. TopCoder has a sustainability plan for this program that it is currently working on. In the short term, the sustainability comes from sponsorship by TopCoder, with work on developing sponsorships and conducting competitions for government customers, sponsorships and conducting competitions for commercial customers, and industry partnerships. Over time, as membership grows, we expect it to become possible to sell site sponsorships and appropriate advertising to the participants.

We view *NoNameSite.com* as an ideal platform for government competitions that involve middle and high school students. Many agencies are seeking to hold competitions that interest middle school and high-school students. *NoNameSite.com* provides an online infrastructure for conducting these competitions. We were able to include several of these types of competitions and sponsorships to the Marketing and Promotions that TopCoder offers through GSA Schedule 541-4G, which should make it easy for government agencies to purchase, particularly for sponsorships for under \$100.

We see interest from commercial customers in promoting STEM, and for hiring more U.S. computer scientists. For those reasons several commercial companies have expressed interest in sponsoring the site or particular competitions. For example, we have proposed a long-term sponsorship to an industry organization that is interested in have NoNameSite develop and host games related to their organizations' subject matter.

We also are looking to develop more partnerships with organizations like EdWorks, who are interested in using the competitions as incentives for their students to learn and become familiar with STEM.

As membership grows, and we have large numbers of site visitors every day, it will be possible to sell site sponsorships and include appropriate advertising on the site.

## 7.0 Conclusion

This effort built a new on-line community for students 13-18 years of age with long-term goals to increase by thousands the number of U.S. students who pursue Computer Science (CS)-related degrees. It made progress to attract and retain tens or hundreds of thousands of community participants, to demonstrate a sustained increase in active participants' CS-related skills, and to

prepare for sustainability and program growth. In the two years of the program, it successfully built a CS-related gaming web site at NoNameSite.com and a community with over 4,000 registered members. The effort completed 9 CS-related games and web site activities that include avatar design and a programming tutor. A significant number of the members who registered (49%) return to participate in contests.

## **8.0 Acronyms**

|       |                                                |
|-------|------------------------------------------------|
| AFRL  | Air Force Research Laboratory                  |
| CS    | Computer Science                               |
| DARPA | Defense Advanced Research Projects Agency      |
| SoCo  | School of Code                                 |
| STEM  | Science, Technology, Engineering & Mathematics |