



Applying Google Tools to Facilitate Online Teaching

Dr. Afrin NAZ, West Virginia University Inst. of Tech.

Dr. Afrin Naz is an assistant professor at the Computer Science and Information Systems department at West Virginia University Institute of Technology. She is working with high school teachers to inspire the K-12 students to the STEM fields. In last four years Dr. Naz and her team launched six workshops for high school teachers. Currently her team is training the high school teachers to offer online materials to supplement their face-to-face classroom.

Dr. Mingyu Lu, West Virginia University Institute of Technology

Mingyu Lu received the B.S. and M.S. degrees in electrical engineering from Tsinghua University, Beijing, China, in 1995 and 1997 respectively, and the Ph.D. degree in electrical engineering from the University of Illinois at Urbana-Champaign in 2002. From 1997 to 2002, he was a research assistant at the Department of Electrical and Computer Engineering in the University of Illinois at Urbana-Champaign. From 2002 to 2005, he was a postdoctoral research associate at the Electromagnetics Laboratory in the University of Illinois at Urbana-Champaign. He was an assistant professor with the Department of Electrical Engineering, the University of Texas at Arlington from 2005 to 2012. He joined the Department of Electrical and Computer Engineering, West Virginia University Institute of Technology as an assistant professor in 2012. His current research interests include wireless power transmission, radar systems, microwave remote sensing, antenna design, and computational electromagnetics. He was the recipient of the first prize award in the student paper competition of the IEEE International Antennas and Propagation Symposium, Boston, MA in 2001. He served as the chair of Antennas and Propagation Society of IEEE Fort Worth Chapter from 2006 to 2011.

Mr. Shahed Mustafa, Bridgevalley Community and Technical College

Shahed is an Assistant Professor at Bridgevalley Community and Technical College. He has Master's degree from University of North Texas. In summer of 2014 he was the lead instructional designer and technologist for WVU Tech's pilot CS4HS online workshop. Shahed has extensive experience in Google Course Builder.

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(Research-to-Practice, Strand 4)

Abstract

This paper presents our experience in applying Google tools to deliver online instructions. In the summer of 2014, we organized an online Computer Science for High School Workshop for high school teachers, with the sponsorship from Google. Our four-week online workshop was completely based on Google tools including Course Builder and Hangouts On Air, which are all free software. Specifically, the course materials (i.e., PowerPoint slides, assignments, and videos) were delivered using Course Builder, and the live sessions and tutoring sessions were offered through Hangouts On Air. During our four-week workshop, 24-hour online support was provided to the participants. According to the feedback from our workshop attendees, online instructions based on Google tools proved to be highly accommodating and effective. In the surveys conducted after the workshop, 63% of the participants specified they would recommend the workshop to others, and 60% of the participants planned to incorporate at least 25% of the workshop activities/resources into their teaching. We believe that numerous instructors (at college level, high school level, and middle school level) would find Google tools an excellent platform to provide online supplements to their face-to-face instructions from multiple perspectives, including but not limited to accessibility, flexibility, and ease of employing multimedia. After our workshop, we continue working with K-12 teachers to help them apply Google tools to improve their teaching.

Relevant work and motivation

Initiated in 2009, Google's Computer Science for High School (CS4HS) program¹ aims to provide professional development opportunities for high school teachers in the discipline of computer science. We organized a two-day Google CS4HS Workshop at West Virginia University Institute of Technology in the summer of 2013². In 2014, we organized Google CS4HS Workshop once again with the workshop's format changed to be "completely online."

Online teaching is gaining popularity with exponential speed world widely, which motivated us to explore the online format for our CS4HS Workshop. "Code.org" probably is the best example of online teaching in computer science³. Through online videos over Code.org, Bill Gates from Microsoft teaches "if-else" statement and Mark Zuckerberg from Facebook teaches "repeated loop." It is estimated that Code.org has delivered the fundamental knowledge of computer science to tens of millions of audience. CS4Alabama⁴ and GUTS (Growing Up Thinking Scientifically)⁵ are two other successful programs that offer year-round free online instructions in computer science.

The primary goal of our 2014 CS4HS Workshop is to provide online interactive instructions to high school teachers in the discipline of computer science. Compared with our 2013 CS4HS Workshop (which is in the traditional in-person format), our online workshop demonstrated to be more accommodating from the following perspectives.

- Accessibility, i.e., students could access the course materials at any time from anywhere.
- Flexibility, i.e., students could adjust the pace.
- Ease of employing multimedia, including charts, photos, video, etc.

Employing Google tools in online teaching

Our online CS4HS Workshop lasted for four weeks in the summer of 2014. 123 high school teachers from USA and Canada registered for the workshop. The workshop is completely based on Google tools, including Google Course Builder and Google Hangouts On Air, which are all free of charge and can be readily downloaded from the Internet. To be more important, these Google tools make online teaching an easy job. Below, some of our experience gained when we employed Google tools is summarized.

In our CS4HS Workshop, PowerPoint slides, video tutorials, programming assignments, and assessments were delivered through Course Builder, whereas live sessions and tutoring sessions were offered through Google Hangouts On Air. Particularly, we managed to offer live interactive instructions using regular hardware like microphones and webcams. As depicted by two snapshots in Figure 1, our live instructions integrate PowerPoint slides with the instructor's video, which nicely emulates face-to-face instructions. Moreover, the live instructions can be recorded, edited, and shared over Google+ and YouTube. Indeed by following our recipe, any instructor can create online classes with PowerPoint slides, video, and audio integrated by himself/herself, that is, without resorting to a professional crew.



Figure 1: Snapshots of our live interactive instructions through Google Hangouts On Air

Our workshop included multiple sessions. At the end of each session, certain activities are assigned for the participants to assess themselves. Figure 2 illustrates how the activities are embedded through Google Course Builder. The activities included multiple-choice and true-

false questions. The participants' answers are graded instantaneously. Figure 3 demonstrates an activity with three questions.

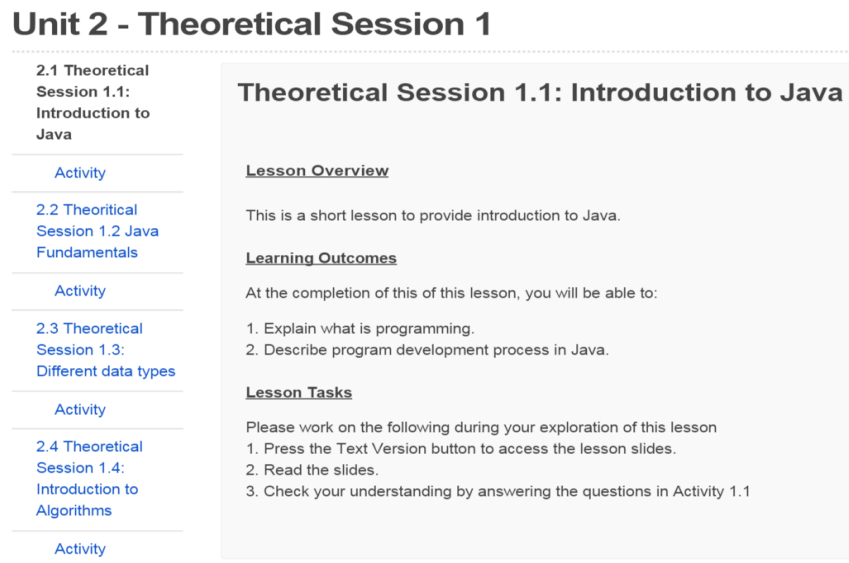


Figure 2: A snapshot showing embedded activities through Google Course Builder

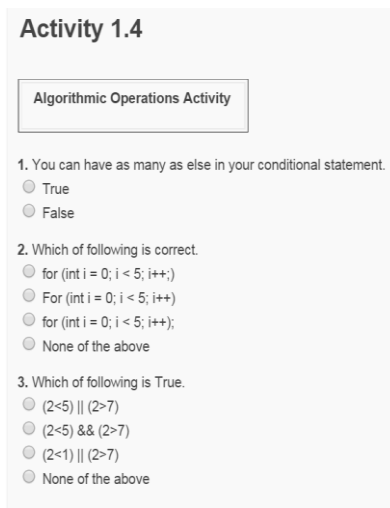


Figure 3: An activity with three questions

During our four-week workshop, 24-hour online support was provided to the participants. At least one teaching assistant was available to answer questions any time during the four weeks. Our average response time was less than 30 minutes. In order to communicate with our participants efficiently and effectively, four communication methods were utilized simultaneously:

- (1) One-to-one tutoring through e-mails
- (2) Group tutoring through Google Hangouts

(3) Live online sessions through Google Hangouts On Air

(4) Discussion board through Piazza

Relatively, e-mail and Group Hangouts were more personal ways for the participants to interact with the teaching assistants when they have questions. However since we only had three teaching assistants, it was impossible to reply all the questions in the timely manner via e-mails and Group Hangouts. As a remedy, we offered live online sessions with Hangouts On Air and Piazza discussion board. Through Hangouts On Air, discussions were broadcasted to all the participants in real time; also, the sessions were recorded and could be accessed at any time. Via Piazza discussion board, a participant could not only receive faster response but also visualize other participants' questions/answers.

Results

A series of surveys were administered by Google to the participants before and after our CS4HS Workshop. According to the feedback from workshop attendees, online instructions based on Google tools proved to be highly accommodating and effective. Some of the survey results are presented in this section.

After the workshop, 47% of our participants agree on “the workshop achieving a sense of community.” We find it an encouraging result, as it proves that it is possible for online teaching to be as accommodating as regular face-to-face teaching. 63% of our participants specified that they will recommend our workshop to others, whereas the remaining 37% were neutral. In the post-workshop surveys, the participants were asked a question “if you are a teacher, what portion of what you learned in this course you will incorporate into curriculum?” We are very delighted to see that, 60% of the participants plan to use at least 25% of our activities and resources in their teaching. Indeed during the workshop, our participants frequently requested permission for them to use our lecture slides, assignments, and video tutorials in their classrooms. In response, we kept most of our materials available online for extended amount of time after the workshop to allow the participants to make copies.

Below are some of the comments from the discussion board of our CS4HS Workshop.

- *I have very little training in computer science specifically programming. College coursework is expensive especially for a class that you may or may not be teaching formally and instead may offer as an after school activity or club. Many of these CS4HS courses allow for varied degrees of participation/commitment and you can't beat the cost.*
- *I'm continuing to pick up some new skills and the work is challenging, yet enjoyable. I appreciate all the feedback and help I have received from the help desk.*
- *I will continue to take free, online courses like this one to extend my content knowledge and pedagogy and to network with others encountering similar teaching obstacles and to celebrate the successes.*

- *I have taken some online classes and I like it because the instructor makes things very clear as he /she knows that if you are having a hard time you will keep emailing them. I have a positive experience in all the online classes that I have taken. Online teaching would give me more knowledge to be able to help my students.*
- *I am glad to hear we don't have to purchase the book. I like the idea of having all material in my hands on the internet. I am grateful for this class.*
- *I feel "how to" videos and hangouts are critical to the online experience when trying to learn computer programming. Providing training as this is invaluable to me.*

Future work

Via organizing the online CS4HS Workshop, we gained substantial experience in applying Google tools to facilitate online teaching. We believe that numerous instructors (at college level, high school level, and middle school level) would find Google tools an excellent platform to provide online supplements to their face-to-face instructions. We therefore wish to share our experience with K-12 teachers to demonstrate how to apply Google Course Builder and Google Hangouts to improve their teaching. For instance, we are going to offer a workshop entitled “Supplement Conventional Teaching with Online Google Tool” in the 2015 Computer Science Teachers Association Annual Conference, which will be held in Grapevine, Texas, in July 2015.

Conclusions

In the summer of 2014, we organized an online Computer Science for High School Workshop for high school teachers, with the sponsorship from Google. Our four-week online workshop was completely based on Google tools including Course Builder and Hangouts On Air, which are all free software. Specifically, the course materials (i.e., PowerPoint slides, assignments, and videos) were delivered using Course Builder, and the live sessions and tutoring sessions were offered through Hangouts On Air. During our four-week workshop, 24-hour online support was provided to the participants. According to the feedback from our workshop attendees, online instructions based on Google tools proved to be highly accommodating and effective. In the surveys conducted after the workshop, 63% of the participants specified they would recommend the workshop to others, and 60% of the participants planned to incorporate at least 25% of the workshop activities/resources into their teaching. We believe that numerous instructors (at college level, high school level, and middle school level) would find Google tools an excellent platform to provide online supplements to their face-to-face instructions.

Acknowledgment

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