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Teaching Buffer Overflow via a Guided Inquiry Collaborative Learning Activity

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ABSTRACT

We have developed a guided inquiry collaborative learning activity to teach buffer overflow. The key research results including the comparison of pre- and post-evaluation of student learning in groups will be presented in the conference.

KEYWORDS

Buffer overflow, guided inquiry, collaborative learning, cybersecurity

EXTENDED ABSTRACT

Cybersecurity educators continue to show great interest in group learning. This interest has been encouraged, for example, by the National Research Council's 2011 publication, "Cooperative Learning in STEM Education," and by Congress itself (H. Res. 1-1-2-3-5-8-13, designating the week of December 29 as National Cooperative STEM Learning Week). The National Science Foundation (NSF) has funded a number of projects to study active learning and student-centered learning approaches in STEM, which promote greater student involvement in the learning process. For example, Kussmaul [1] used roles of manager, recorder, and speaker in his Data Structure classes to help students contribute evenly and express their multiple perspectives. Through a project funded by NSF, we are developing learning materials for teaching numerous topics in cyber security. Following the well-known POGIL guidelines [2], we have developed a guided inquiry activity with three learning objectives: students can articulate what buffer overflow is; students can identify buffer overflow from the codes; student can perform buffer overflow to mitigate input vulnerabilities.

The guided inquiry activity is composed of several sections including key concepts of buffer overflow. buffer overflow causes; buffer overflow attack example; critical thinking questions; exercises on how to avoid buffer overflow, discussion and conclusion. In the classroom, 4-5 students work in one group and they are given by the instructors the guided inquiry collaborative learning activity on the sheet. This activity will help them to construct their knowledge learned in the class and stimulate their learning and research abilities while working on the assigned work.

The team members act in different roles including recorder (recording all answers & questions, and providing copies to team & facilitator), speaker (talking to facilitator and other teams), manager (keeping track of time and making sure everyone contributes appropriately) and reflector (considering how the team could work and learn more effectively) while completing the guided inquiry collaborative learning activity. Then the team will follow the instructions and steps on the sheet to complete the activity as a group, report what they learned from this activity and provide answers to the questions listed on the sheet. This process will help students develop their individual responsibility and learn from each other. The instructor will serve as the facilitator in each team. During the presentation, we will present the key research results including the comparison of pre- and post-evaluation of student learning in groups through the fall term of 2018 and spring term of 2019.

REFERENCES

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