

# Telephone Evolution Unplugged

Mariya Davidkova  
Truman State University  
msd543@truman.edu

Renee Hellebusch  
Truman State University  
renee.hellebusch@gmail.com

Amy McNabb  
Truman State University  
aem320@truman.edu

## ABSTRACT

A new module for the Computer Science Unplugged curriculum has been developed. This module is designed to stimulate the interest of high school students, especially girls, in computer science. This module is based on the child's game of *telephone*. It teaches the CS concepts of string edit distance and tree structure, and the bioinformatics concepts of phylogenetic tree construction and the sequence evolution.

## Introduction

Numerous studies and reports discuss the continuing and increasing gender gap in computer science and IT-related fields [2, 4]. Despite various approaches that have been proposed to address this shortage, the gap persists. The approaches that have been presented can be divided into two main categories. First, there are strategies to recruit more women into computer science programs. These focus on school-aged girls, their teachers, counselors, or parents. Second, there are strategies to retain a larger percentage of those women who have already chosen computer science as an undergraduate major, encouraging them to complete their degree [1, 3]. Our work focuses on the former strategy.

A significant example of this strategy is the Computer Science Unplugged effort developed by Tim Bell, Ian Witten, and Mike Fellows and housed at the University of Canterbury, New Zealand. Based on the CS Unplugged materials, we have been developing a “road show” to present to middle and high school students designed to get them excited about computer science concepts and to attract them to computer science as a career option.

## Approach

In addition to the general effort we are expending to develop the show, we have created a new CS Unplugged module. The existing CS Unplugged modules all focus on core areas of computer science such as binary numbers, sorting, and networks, along with some of the applications to which

these can be put. Our new module, by contrast, presents an application in bioinformatics. This cutting-edge and very exciting area of current research in applied computer science promises to capture students' attention.

Our module explores the concepts of evolution and a phylogenetic tree inspired by the child's game of *telephone*. One person whispers a secret phrase to the next person, who whispers it to the next, and so on. By the time the message reaches the last person, it has changed. When modified to use a branched tree structure, this game can be used to model evolutionary sequence changes. Our module consists of an exercise of passing a single secret message (the ancestral sequence) from one student to others and then reconstructing the original sequence and the phylogeny from the final messages. The main computer science concept areas presented are string matching, edit distance, and tree structure. The core bioinformatics concepts presented are phylogenetic tree construction and the evolution of DNA sequences. This module is appropriate for high school students.

## Conclusion

After developing and testing the module it will be presented to high school students in the fall of 2007. Once it is tested and polished, we plan to contribute the module to the group at Canterbury for inclusion in a new version of the CS Unplugged materials.

## 1. ADDITIONAL AUTHORS

Additional authors: Molly Smith, [mks052@truman.edu](mailto:mks052@truman.edu), Julia Stefani, [js248@truman.edu](mailto:js248@truman.edu), Michelle VanKleeck, [mlv218@truman.edu](mailto:mlv218@truman.edu), and Alexandra Wehrman, [ajw684@truman.edu](mailto:ajw684@truman.edu), all of Truman State University.

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