Pytut: Online Python Tutor

Evaluating the Effectivness of E-Learning Tools in Computer Science Education

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1. Introduction

Computer science and programming can often be a difficult subject for new students to grasp. The project aims at implementing and evaluating a web based online platform, Pytut, that can facilitate the learning of Python aimed specifically at the students of the CSC1010H extended program. This platform implemented various tools aimed at helping the student in completing simple programming exercises. The effectiveness of Pytut was evaluated by requesting the students to engage with the platform. The results of this study was drawn from user surveys and usage analytics.

2. Method and Procedure

Testing of the Pytut prototype was conducted in a closed lab environment. The participants included masters and honours students who have experience in tutoring computer science. To evaluate Pytut users were asked to complete exercises on the platform that were designed for the CSC1010H class. Finally, users were asked to complete a survey about their experience which included questions about the effectiveness of the system and how improvements could be made. Google Analytics was implemented to track the user's movements and actions while interacting with the platform. The experiment was conducted in two iterations. The first iteration to get user feedback and the second to implement improvements.

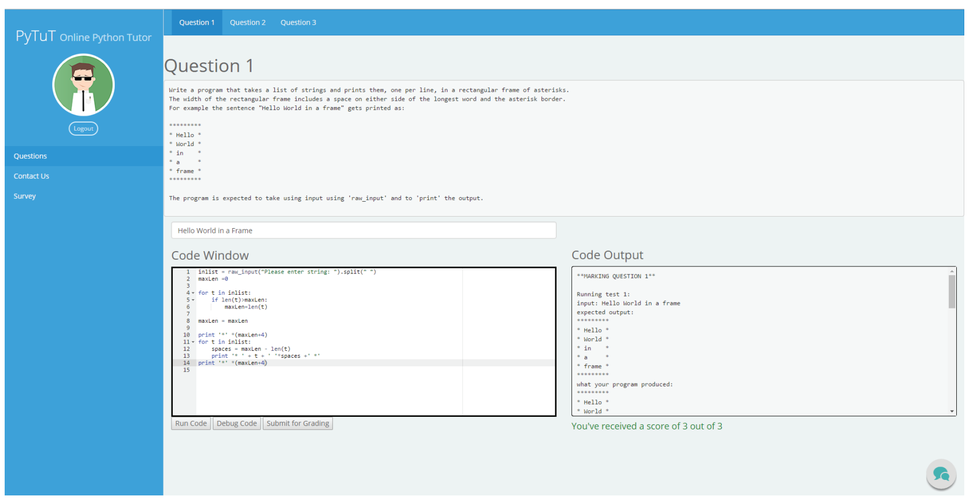

Figure 1: Pytut prototype showing Interactive Code feature.

3. Pytut Features

- **Interactive Code** → Users can run Python code in browser.
- **Automatic Assessment** → Users receive instant feedback on their solution attempt.
- **Interactive Feedback** → Users receive direct contact with one of the platform's allocated tutors.
- **Visual Debugger** → Users can step through code and view flow of program.

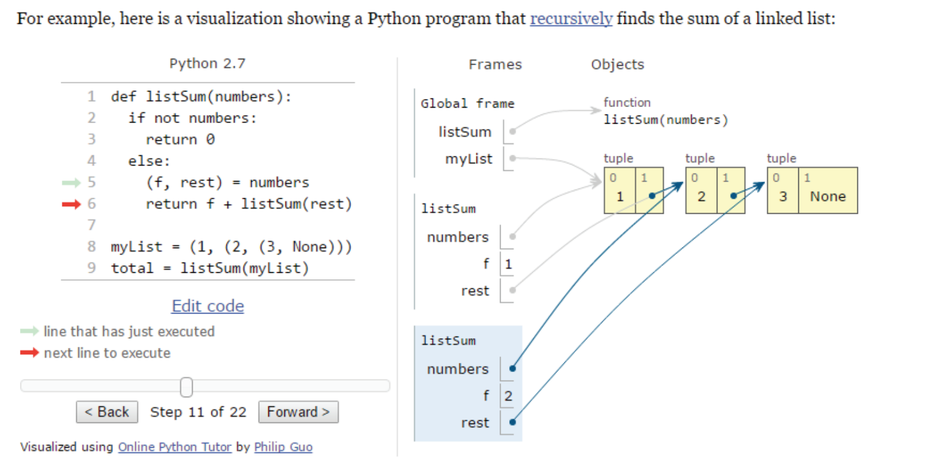

Figure 2: Visual Debugger

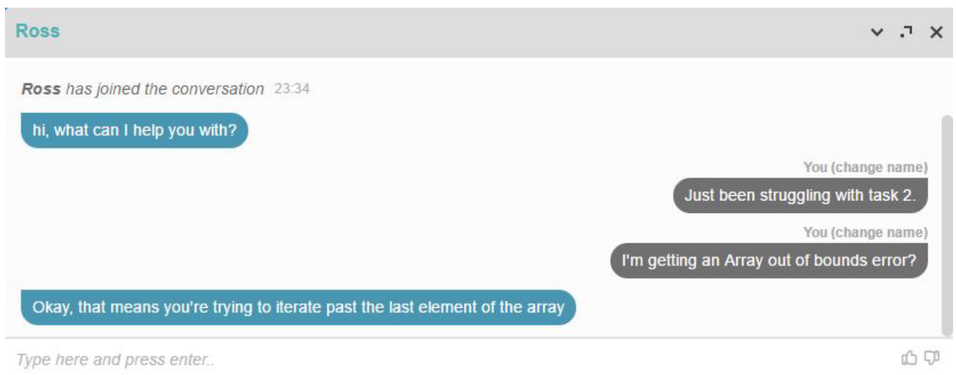

Figure 3: Interactive Feedback with a tutor

4. Results

The results showed the following:

- 85% of the users either 'Agreed' or 'Strongly Agreed' that the platform would be useful to CS students.
- The platform should be used in conjunction with the current curriculum for CSC1010H students.
- The automated marker was the most effective in engaging students
- The interactive Code feature was the most effective in detecting syntax and logical errors.

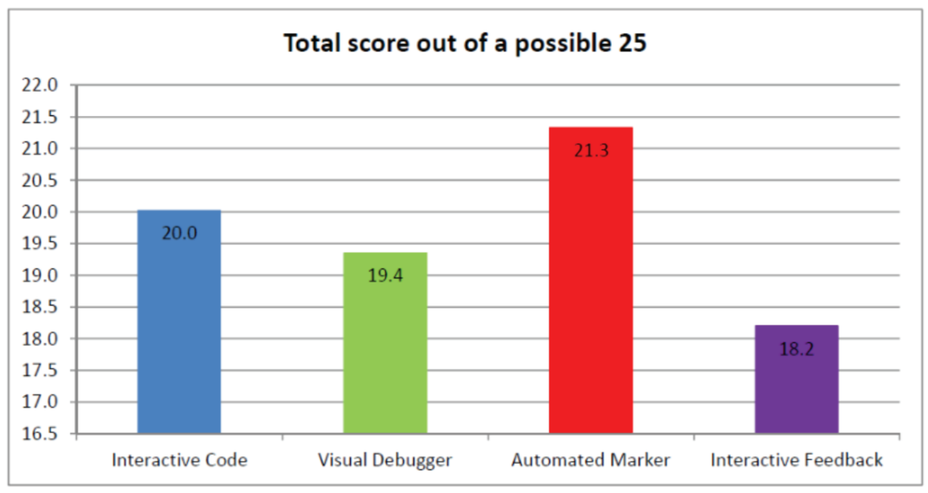

Figure 4: Scoring Pytut features based on survey response

5. Discussion

Across all categories the Pytut prototype as well as it features achieved high ratings. The automated marker out-performed the other features in four of the five tested categories making it a clear front-runner among the features tested. Feedback from students suggested that the automated assessment should guide students even further by pointing out areas in their code that have errors or could be improved. The debugging feature was found to be the least effective.

6. Conclusion

The results from both usage analytics as well as the user surveys shows that the Pytut platform has definite potential in aiding students in introductory programming courses. The general consensus was that Pytut is an ideal supplement for the first year CS students in learning Python. The results from the survey showed all of Pytuts features to be effective in some form with the Automated Marker believed as the most valuable and the Visual Debugger as the least valuable.

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