

Improving Student Performance in a First Programming Course

Liliana Machuca
Universidad del Valle
Cali, Colombia

liliana.machuca@correounivalle.edu.co

Oswaldo Solarte P.
Universidad del Valle
Cali, Colombia

oswaldo.solarte@correounivalle.edu.co

ABSTRACT

Attending a computer programming course for the first time is a challenging task for many students who often fail or drop out. Moreover, this problem is not exclusive for computer science students, since students in other engineering programs must also take programming courses. In this poster, we propose a teaching approach for improving student's performance in a first programming course. This approach is based on four main features: the use of Python as first programming language, project-oriented and problem-based learning, multimedia resources, and rubrics for assessment. Our findings indicate that the proposed approach is valid and helps computer engineering schools and students to get better results in terms of both grades and retention rates.

1. Python as first programming language

Choosing an appropriate programming language is still challenging in first programming courses [1][4][5]. We replaced Java for Python because it offers a simpler syntax, higher-level programming structures and a friendlier programming environment. The most important learning goal here is the ability to understand basic programming concepts and develop problem-solving skills.

2. Project-oriented and problem-based learning

Our approach is grounded on constructivist theory of learning, specifically project-based and problem-based learning [2][3]. Through these approaches, students can achieve meaningful learning, critical thinking while developing computational skills as well. The learning activities are designed in order for students to build a collaborative project and solve real-life problems related to students' academic needs.

3. Multimedia Resources

Multimedia resources support learning activities. They comprise pictures, slideshows, videos, animations, and tutorials. We used them to strengthen further concepts and experiences in the learning of programming skills.

4. Rubrics for assessment

Providing detailed explanations of an assignment using a rubric can assist students in improving their performance because

students get a clearer picture of the kind of performance that is expected from them and the requirements under which they will be assessed. Therefore, in our approach rubrics for assessment of each project were presented and explained to the students in advance.

5. Results

The proposed approach has been implemented at the Faculty of Engineering at Universidad del Valle since 2015. To establish the impact of the approach, we report the analysis of the final grades in the programming courses from 2011 to 2015. In addition, we report results from a survey of student's preferences for programming language. Since the implementation of this approach in 2015, the percentage of students passing the first programming course has increased in 10 % (figure 1) as opposed to the 4-year period before its implementation in which no important variation can be observed. We expect that in the future this percentage will increase. In addition, the majority of students considered that using Python was easier than using Java.

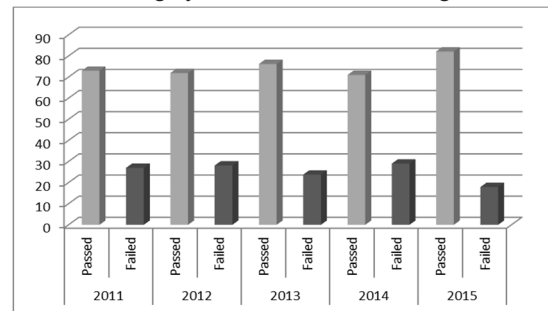


Fig. 1. Final marks of programming courses

6. Conclusions

The choice of a suitable programming language is a key element for the success of a first programming course; however, this is not enough. Professors should look for other strategies to improve the learning process. In our case, project-oriented and problem-based learning, evaluation rubrics and multimedia aids helped improve student performance.

7. REFERENCES

- [1] Guo P., Python is Now the Most Popular Introductory Teaching Language at Top U.S. Universities (2014). Communications in ACM, Blogs
- [2] Koneck M., Petrić M. (2014) Main problems of programming novices and the right course of action Central European Conference on Information and Intelligent Systems: 116-123. Varazdin.
- [3] Soares, A. (2011). Problem based learning in introduction to programming courses. Journal of Computing Sciences in Colleges, 27(1), 36-36.
- [4] Vujosevic M., Tosic D. (2008) The Role of programming paradigms in the First Programming courses The Teaching of Mathematics Vol XI, 2, pp 63-68.
- [5] Yading A. (2011) Reducing Dropout Rate in an Introductory Programming Course ACM Inroads. Vol 2. Pg.71-76

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