

Exploring the Effects of the Hedy User Interface on the Development of CS Interest in Girls

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ABSTRACT

Women are underrepresented in the field of Computer Science (CS). Closing the gender gap in CS benefits the economy, gender equality and society. However, girls have low CS interest while interest energizes learning and guides career trajectories. In this research, we explore the user interface of Hedy - a graduate language which teaches children the syntax of Python - and how adjustments can stimulate the CS interest development of girls.

KEYWORDS

gender, programming language, user interface, interest

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1 INTRODUCTION

Women are underrepresented in the field of Computer Science (CS) [2, 8, 9]. Closing the gender gap in CS benefits the economy, gender equality and society: more filled CS vacancies, women having access to well-paid jobs, and more innovative and inclusive products. However, girls are less stimulated by their environment to develop their interests in computers and to gain experiences in CS [10, 12]. Interest, however, is a motivational process that energizes learning and guides academic and career trajectories [5].

To develop interest, children need to learn and interact with CS which includes programming. Previous programming experience is correlated with the CS career orientation of primary school students [1] and is the best predictor of persistence in female CS college students [13]. During programming activities, children are likely to learn by exploration led by the programming environment.

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It is thus important that these programming environments engage a diverse group of students to develop their interests.

One of the programming environments used by children to learn to program is Hedy. Hedy is a graduate language which teaches children the syntax of Python [6]. In the first level of Hedy there are no syntactic elements such as brackets or indentation and while children move through the levels more syntax and commands are added.

In this research, we explore the strengths and weaknesses of the current User Interface (UI) of Hedy by consulting University students that follow the course Digital Interfaces as part of their Industrial Design bachelor's degree.

2 BACKGROUND

Interest is a cognitive and motivational variable that describes (a) engagement with some content in a particular moment (situational interest) and also (b) the motivation to continue to seek opportunities to engage with that content over time: seeking information, posing questions, and tackling challenges (individual interest) [5, 11]. These two perspectives and their development are integrated by Hidi and Renninger [7] in the four-phase model of interest development. The model defines four phases being triggered: situational interest, maintained situational interest, emerging individual interest and well-developed individual interest. In the first two phases interest is triggered by the situation and after repeated experiences with tasks that seem meaningful and involving interest can develop into the latter two phases [5]. Four interventions to develop interest are discussed by Harackiewicz et al. [5] being:

Structural features. Triggering students' situational interest by introducing novelty, complexity, surprise and incongruity.

Context personalization. Triggering students' situational interest by leveraging students existing individual interests by instruction in the context of those interests.

Problem based instruction. Triggering and maintaining situational interest by highlighting a lack of critical knowledge and motivating the search for answers to solve the problem.

Utility-value. Integrating situational and individual interest processes by students actively generating connections between course topics and their lives.

Durik and Harackiewicz [3] used structural features to trigger situational interest. They added colour, varied fonts and vivid pictures to math tasks which enhanced situational interest for students who were low in individual interest. However, they did find a negative effect on students who had a more developed interest in math. Therefore it is important to balance structural features.

Happe et al. [4] conducted a literature review on effective interventions to recruit and retain girls in secondary CS education. They found that interest is one of the most powerful elements resulting in student participation and retention. They also extracted and summarised effective strategies for courses being

- (1) Include inquiry-based and real-world learning activities
- (2) Show many facets and interdisciplinary applications of computer science
- (3) Split classes at best by experience, or at least by gender or by being part of the same interest group
- (4) Give more emphasis on the process of thinking, designing and problem-solving than the actual coding
- (5) Use visual programming environments to teach introductory programming
- (6) Take students to events and excursions, share with them stories and role models from the history of computing

Within our research, we aim at using structural features and the visual aspect of the programming environment to increase the interest of girls in CS.

3 METHOD

Since design (of UIs) is not directly our expertise we suggest the following steps to design and test an updated UI:

- (1) Collect feedback from design experts: what design aspects would they change to make Hedy more attractive to children and girls specifically
- (2) Combine literature on UI design with the feedback from the experts to develop a concept for an updated UI of Hedy
- (3) Test the concept among the target group with a survey containing the current version of Hedy as well as the proposed version (method inspired by [9])
- (4) Update design based on feedback from the survey and implement it into Hedy
- (5) Measure interest-related behaviour (such as frequency and depth of use) before and after the introduction of the new design

This research focuses on the first step. During the first weeks of June, we explore the strengths and weaknesses of the current UI of Hedy by consulting University students that follow the course Digital Interfaces as part of their Industrial Design bachelor degree. We collect insights through a survey in which we will ask the participants about the strengths and weaknesses of the UI in general followed by a question on what they would change when targeting girls.

4 RESULTS

We will collect our data through surveys at the beginning of June. Therefore, no preliminary results can be shared yet but will be on the poster if our extended abstract is accepted.

5 CONCLUSION AND DISCUSSION

In this research, we focus on the UI of Hedy. Our preliminary results show [will be added if our poster is accepted].

Next to UI, we are interested in the personalization of assignments, making connections to real life and the implementation of a recommendation system as ways of increasing CS interest in girls who use Hedy. Other future work that is of interest is analysing more programming languages and environments on their gender inclusiveness and their impact on user interest development. Of interest are the popular visual programming languages Scratch but also environments such as code.org. By creating more awareness and making suggestions, we contribute to programming environments becoming more gender inclusive and better supporting CS interest development contributing to closing the gender gap.

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