Using Social Platforms to Increase Engagement in Teaching Computer Programming

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ABSTRACT

Programming has the potential to bring to life that which is most minute in man's imagination. Imagination, however, it will all remain, if no appropriate intervention is made to facilitate the learning of programming. Research studies show that the traditional, face-to-face method of teaching does not provide an enabling environment for learning programming. Hence, outside-classroom intervention is called for. Certain previous studies have tried to build new tools to support the outside-classroom intervention. However, there a need to study the use of existing, familiar and relaxing environments, such as social media, for this intervention. In this paper, we investigate the capability of a social media platform to support the learning of programming among learners in the developing world. We chose the WhatsApp platform as the starting point to uncover these design needs. We also reflected on the lessons learnt using this intervention.

KEYWORDS

Computer Supported Cooperative Work; HCI for Development; Learners; Programming Language; Social Media; WhatsApp

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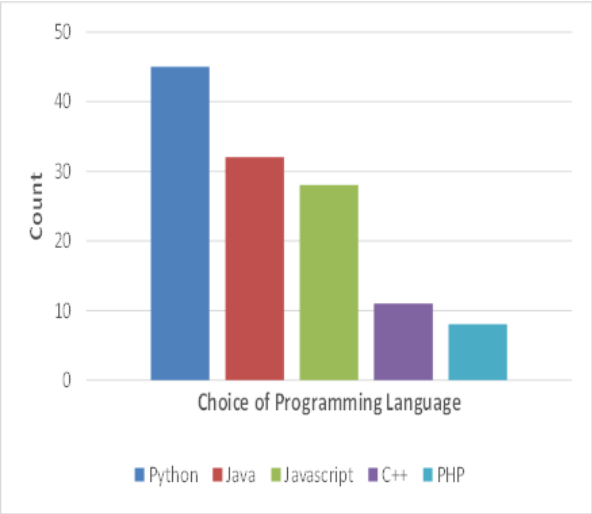


Figure 1: Response to preferred programming language for the challenge

INTRODUCTION

Programming is at the core of developing many useful technologies. Unfortunately, many students often find it difficult to understand the basics and foundations of programming and this sometimes leads to dropout [3, 11]. A main reason for this dropout is because programming is taught using a face-to-face or in-class teaching method only [2, 3]. This situation is even alarming in the developing world where students formally get exposed to programming for the first time in the university [4]. As a result, a new pedagogical approach to teach this subject is necessary [4]. Human-Computer Interaction (HCI) involves the use of computers to support individuals and groups in learning [10]. According to [7], the use of WhatsApp has the potential to offer pedagogical rethinking. Likewise, [8] noted that features provided by WhatsApp can be taken advantage of to facilitate effective learning. Besides, we also observed among the learners that WhatsApp seems to be their major social media network. In this paper, we seek to understand how social media platforms can help in teaching programming, and we chose WhatsApp as a starting point to explore design requirements to fill this "teaching programming" gap.

RELATED WORK

Quite several researches have been carried out to support learners in programming. Mbogo et al. [4] provided support for novice learners of computer programming by scaffolding the construction of programs on a mobile device to encourage the learners whenever they wish to write programs. Keuning et al. [5] motivated for a need to support learners with a tool that provides feedback in an automated way. Cober et al. [6] engaged teachers using a participatory design approach to come up with a tool that can support learning of programming. A common trait of these studies is that a new tool was designed to support the learning of programming without exploring how some existing platforms like social media could be helpful. While developing new tools has its advantages, making use of existing tools save time and energy so that the instructor can channel time and energy to other beneficial opportunities. So [1] noted that WhatsApp can be a serious tool to support teaching and learning. Unfortunately, despite its ubiquitous use, it has not received much attention in its application for teaching and learning of programming [1]. Also, WhatsApp offers a relatively low data usage when compared with some other popular social media platforms such as Facebook. To the best of the author's knowledge, little or no study has been done on the use of WhatsApp for teaching of programming. Hence, this study explores the use of WhatsApp for teaching and learning of programming among novice learners in order to understand design requirements.

METHODOLOGY

The Intervention: WhatsApp as a Pedagogical Support System

For the purpose of this study, Python was chosen as the introductory programming language based on the students' preference as shown in Fig. 1.

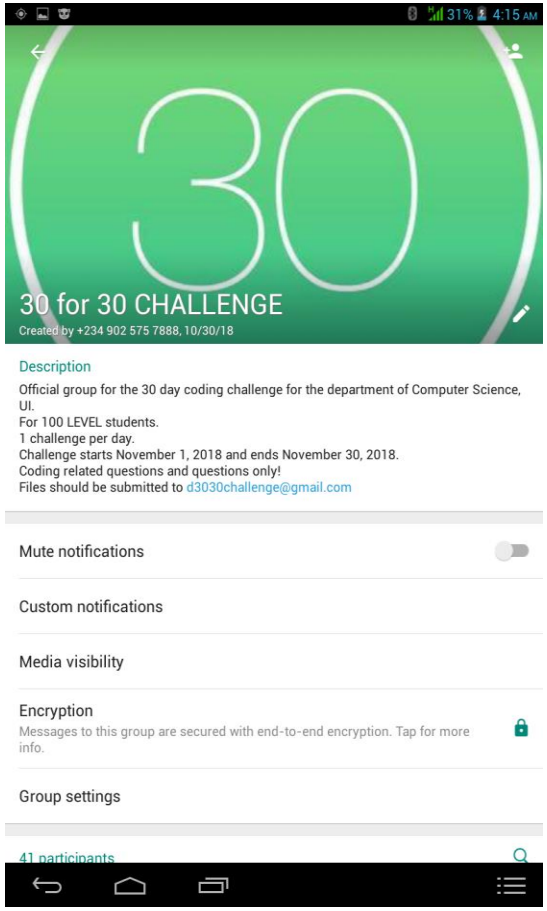


Figure 2: The WhatsApp Group Page

In addition, Kruglyk and Lvov [12] suggested that Python is a good programming language for beginners. Also, social media platform was used as a means of instructional facilitation in this study. The basis for this was to explore a new pedagogical approach to learning programming as advocated by Mbogo et al. [4]. As a result, WhatsApp was chosen because of its ubiquity; statistics has it that there are over 1.2 billon users of WhatsApp globally [9]. A group chat was created on WhatsApp with a total of 41 participants. The WhatsApp group page created is shown in Fig. 2.

This study began about six weeks into the students' formal face-to-face lectures of the introduction to programming. I observed and realized that the students yearned for something more to keep them engaged and learning. While there were practical classes running concurrently every week, they still longed for something extra. This led to the birth of Challenge 30-30, interchangeably referred to as "challenge" or "intervention" hereafter.

The whole idea of the challenge was to help the novice student learners to develop the habit of programming daily for at least 30 minutes for a period of 30 days which the study lasted for. This was quite different from their weekly classes, exercises or assignments. For instance, for the weekly assignment/exercise, a student may choose to solve his/her question(s) on a particular day of the week as opposed to spreading it across the week. On the other hand, for the 30-30 challenge, the participants get different questions daily and they are expected to submit the solutions daily with the expectation of getting an immediate feedback. Most times, the next day's challenge builds on the previous day's one. A sample of the daily challenge question is shown in Fig. 3.

The Participants

The programming intervention was announced to the first-year students of the University of Ibadan Nigeria, who enrolled for the "introduction to computer programming" course for the 2018 academic session. About 37 students (70%) enrolled for participation in the intervention. Participation was voluntary. Also, the grading from the intervention were not added to their weekly in-class assignments or assessments. In addition, two students from other classes showed interest and were enrolled, and two senior students volunteered to give mentoring support. In total, there were 41 participants.

Modalities

Every day, the participants get a set of questions which they are expected to think about and provide solutions to before the end of the day. Typically, the questions are posted early in the morning by or before 6 am. At the initial stage of the intervention, students could tackle the questions with concepts that they had learnt in their face-to-face classes. As the 30 days intervention progressed, the complexity of the questions increased and required concepts not covered in the face-to-face class. For these questions, the WhatsApp group was used to provide information on the new concepts and, where necessary, additional suggested reading was provided. The group was not only used for administration of questions. It was also used as a platform where students could ask questions, post code snippet for further help when they get stuck, and for collaboration among participants.

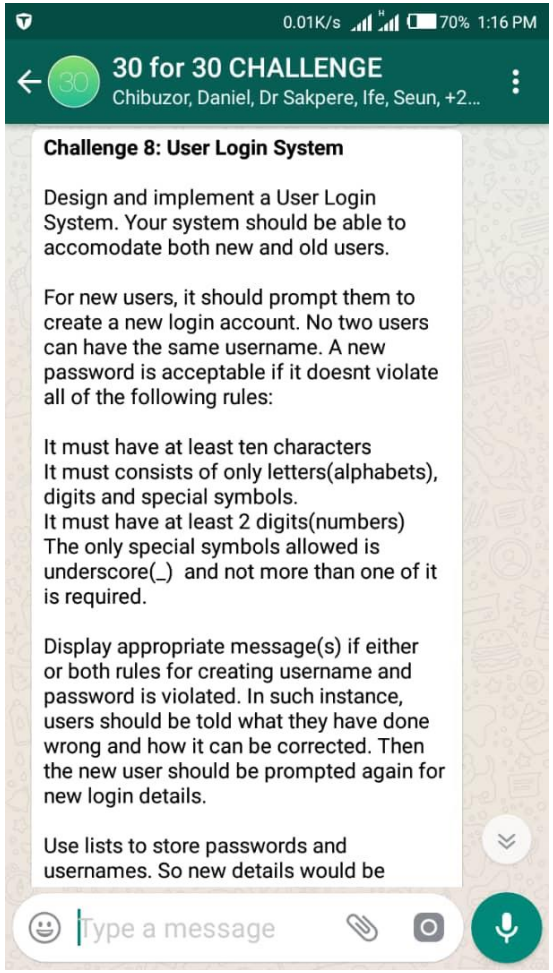


Figure 3: A sample of the daily challenge

The group was also used to teach, post samples of perfect solutions when necessary, and post short quotes or messages to motivate the students as shown in Fig 4. Each day, participants are expected to send their final answers to the challenge questions to a Gmail account created for the challenge. In essence, they are not expected to post their final solution to the group. The reason for this is to ensure that each participant submits a unique solution. Participants are also expected to send the course lecturer a direct message if they do not want their questions or comments to be publicly discussed on the group or if they are shy. For the writing and compilation of their codes, many of them used a Python mobile IDE called Pydroid, shown in Fig 5. So, they had to navigate between WhatsApp and Pydroid.

RESULTS, FINDINGS AND DISCUSSION

The findings and results, mainly a perceived measure, were obtained through observations and data from the WhatsApp group chat, direct messages and one-on-one interaction with the participants. The concept of thematic analysis was periodically applied to group related themes. The discussion on the findings is as follows:

Enthusiasm and Fun

During the 30 days, the participants periodically measured their perceived improvement, some of which are illustrated in Fig. 6. They observed that their interest in programming increased when they successfully solved some "difficult" questions. In addition, when some of the participants experienced difficulties, they were not discouraged from forging ahead as they already observed improvements in their programming skills. Some others also believed that the intervention was fun in the learning process, making them enjoy learning beyond what a conventional teaching could have offered. The use of WhatsApp made learning to be done in a relaxed atmosphere. In addition, this intervention helped students to cultivate a daily habit of learning and practicing programming, which has the potential of helping the students to achieve a long-term vision and goal.

Confidence, Satisfaction and Persistence

The nature of the challenge demanded that the students think and come up with an original solution. Interestingly, they realized that even though they had access to online resources, they couldn't just adopt such online solutions. This boosted their confidence and they were ready to take on any seemingly complex challenge or application in future. It was also amazing to realize that some of the students already integrated their daily activities around the challenge. Even when they are faced with difficulties, they are not deterred as they know that there is a joy and satisfaction that they will derive if successfully completed. Fig. 7 illustrates this. Therefore, WhatsApp is a platform that could facilitate the learning of complex and technical subjects.

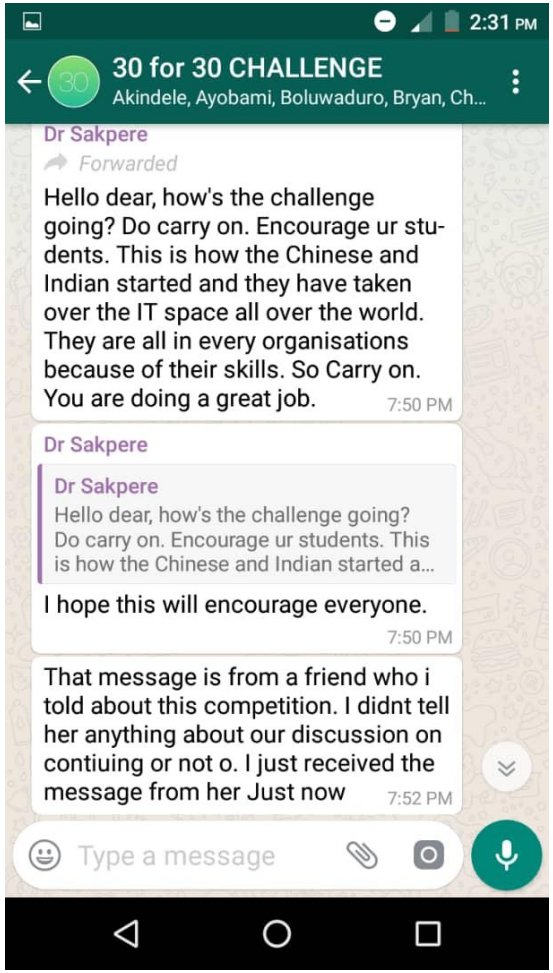


Figure 4: A goodwill message from a friend who heads the IT unit of MTN, Nigeria (It came at a time when some of the students felt discouraged)

4.3 Challenges

While the intervention has many positive outcomes, we were however faced with various challenges. Firstly, WhatsApp does not allow students to collaborate to write programs. It does not even have an Integrated Development Environment (IDE). Thus, many students had to take a screenshot of their codes and send it whenever they needed help with it. Secondly, it was observed that some students still wanted to move at a slower pace. This necessitated the need to create a second phase of the challenge for those who wanted to move with the increasing complexity of the daily challenge. Thirdly, since anonymity was not guaranteed, some students were shy to express themselves in the group chat. They had to send a private message to the course lecturer to ask their questions. This deprived other students from benefiting and contributing to the discussions.

4.4 What Next

Firstly, we would like to do a more robust evaluation using advanced techniques. Secondly, we hope to work with the participants who couldn't continue with the use of the intervention due to the increasing complexity of the challenge. This will allow us to come up with an appropriate alternative for those in that category. Thirdly, we would want to encourage students to join the group anonymously so that they can freely ask their questions in the group while others can benefit and contribute. They will be discouraged from contacting the facilitator privately, as far as the challenge will be concerned. This should guarantee their privacy. Lastly, we would like to do more study and co-design with all participants on developing appropriate learning tools that are encompassing. By encompassing, we mean that it supports social interaction, offers IDE for writing and compiling programs, provision for assessment and feedback.

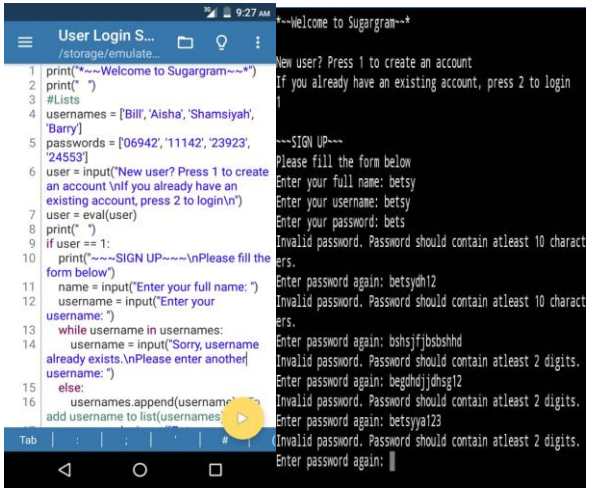
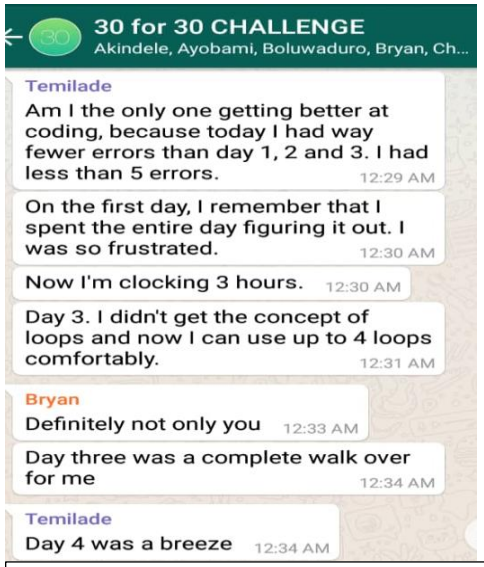


Figure 5: A solution to a sample question by a participant



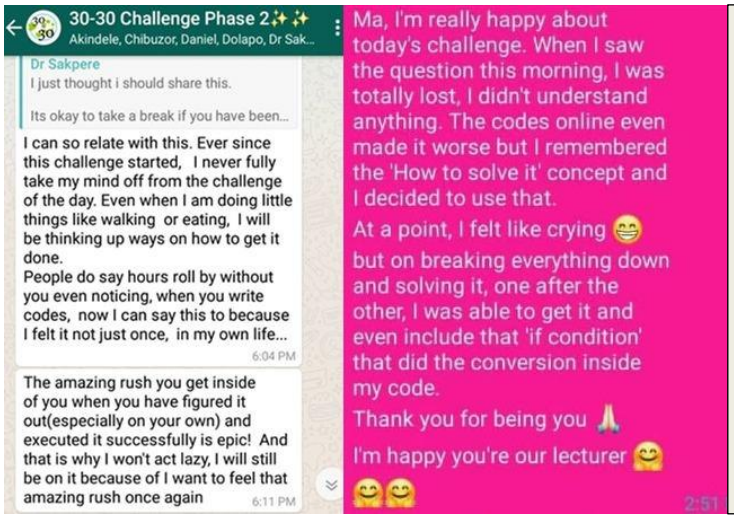
My Flow Experience

If someone told me six months ago that I would be so enthusiastic about something related to school and look forward to more of it everyday, I wouldn't believe. It is disheartening to know that about 73% of students don't enjoy school. This is because most students fail to have a flow experience.

According to Mihaly Csikszentmihalyi, a psychologist, he explained the concept of flow as having a clear goal, clear and immediate feedback mechanism, skill/challenge balance, concentration and control.

For the first time in my life, all thanks to my Godsent lecturer, Dr. Sakpere, I now know what a flow experience feels like. The 30-30 challenge has been an exciting one, challenging me beyond what I think I can do. Now, I wake up everyday knowing that I'm one step ahead in becoming a successful programmer.☺

Figure 6: Showing enthusiasm and improvement as a result of perceived self-evaluation done by students



The effects of the 30-30 challenge on my habit

We all have habits. Well has a computer scientist, it is expected to develop a habit of programming but I never expected it to be this fast. I developed a habit in programming all because of the idea of dedicating at least 30 minutes daily to it.

In general, I would say these past 20 days have been tedious but crucial, they have instilled in me the discipline I think I would need to be a great computer scientist

Figure 7: Showing engagement among participants

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