

From Refugee to Programmer? An Action-Based Learning Approach for Teaching Coding to Refugees

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Abstract: Teaching coding is currently gaining momentum in classrooms and informal learning spaces (coding fairs, labs, challenges, etc.) all over the world. In Europe, the Middle East and North Africa, a number of organizations offering coding courses for refugees (e.g. Refugees on Rails, HackYourFuture, CodeYourFuture) have been created as a reaction to the “refugee crisis“ in 2015-16. Such civic initiatives are aiming far beyond simply creating a new generation of programmers in response to integration and the lack of software developers in the job market. They show great potential in terms of providing rapid, innovative, and adaptive kinds of educational support. Their work is done by rapid and iterative testing of ideas in a way that traditional education institutions are not able to, possibly because of factors such as regulations, internal processes or mere traditions.

To evaluate the impact of such approaches for the educational sector, and to develop courses appropriate for the needs of heterogeneous and culturally diverse groups, the authors report on two programming courses for refugees based on an empirical technique called “action research” and seek to offer practical advice for the implementation of courses for cultural diverse groups in the educational system. This study was conducted at “refugees{code}”, an Austrian coding school for refugees.

Introduction

Beginning in 2015, the record-high displacement of people, dubbed the “refugee crisis”, didn’t just put countries’ social security systems to the test, but their educational systems as well. Traditional educational institutions like universities and schools were not able to rise to the challenge nearly as quickly as self-organized volunteers, groups, and organizations. The lack of flexibility due to the complexity of internal processes, the strict requirements, and the lengthy internal decision-making processes of said educational institutions made it difficult for them to respond accordingly to the exceptional situation. In this context, civic society stepped in, organizing initiatives for quick and direct integration of the newly arriving people, regardless of age, gender, and level of knowledge. Initiatives coming from the civic community were wide-ranging in topics, and especially training as a measure of integration saw many different subject areas, from cooking and knitting to ways to start or continue all kinds of vocational training, especially in the technical area.

Since the New Economy has been one of the strongest driving forces in the world economy over the last decade, technical skills and programming in particular, are becoming a more important factor in work and society. As such, we have decided to look into training courses for programming. This research reports on two programming courses for refugees and seeks to offer practical advice for the development of courses appropriate to the needs of heterogeneous and culturally diverse groups and the implementation of such courses into the educational system. The approach towards founding a coding school during the refugee crisis, namely an Austrian initiative named refugees{code}, serves as our case study.

First, we will begin by characterizing coding initiatives in Middle Eastern, North African and European countries, who play a particularly interesting role in the landscape of coding for refugees. Second, we will discuss the background of our case refugees{code} and further explain our research question and design. Third, we present a description of our action-based research, outlining two different courses. Fourth, we give an overview of our results

and findings from our action-based research and discuss some challenges as well as solutions and lessons learned common to educational projects for refugees. Finally, we conclude and deliver a framework for educational institutions like universities and colleges that would like to offer courses for refugees.

Overview about coding initiatives

One kind of initiative that emerged during the refugee crisis in 2015-16 were refugee coding schools, which train newcomers to code, thereby filling job market demands. As a result, there are a growing number of coding schools not founded by public or educational institutions. Rather, they are founded by a new breed of technology-savvy groups and organizations consisting of people with varying, but often tech-based, backgrounds, an affinity towards start-ups, and a tendency to care about social issues (Mason et al., 2017). They are often, either partly or entirely, driven by volunteers, and they aim to become social enterprises which achieve sustainability through a business model rather than external funding (Mason et al., 2017). Although they share the same objectives as educational institutions, their work is done by rapidly and iteratively testing ideas in a way that traditional education institutions cannot because of limiting factors such as regulations, internal processes, or mere traditions. The educational teams of these coding schools are characterized by their entrepreneurial mindset. They demonstrate a high degree of flexibility and personal initiative and work either unpaid or for nominal wages (Mason et al., 2017). In Europe, the Middle East and North Africa, we have identified 10 such initiatives (see Figure 1).



Figure 1: The Landscape of coding initiatives for refugees in the Middle East, North Africa and Europe

Background of refugees{code}

An example of such a civic project is refugees{code}. It was founded in the summer of 2016 by a group of people in Vienna. Refugees are offered the opportunity to study during the time in which applications for employment or a university place are unlikely to be successful due to lack of proficiency in the local language. This is not only an efficient use of their time, but can give them focus and structure in a period of being in a state of limbo. It was decided to offer the course as quickly as possible, to put together an ad-hoc course in a rather unusual situation. “The University of Technology of Vienna had already been holding courses that were open to refugees, and after talking with the initiators of these “Welcome.TU.code” courses, we were able to take over and hold one of those”¹, says Stefan Steinberger, founder of refugees{code}. Before founding refugees{code}, none of the team members had any experience with implementing such a program. Even though the University of Technology of

¹ <https://www.derbrutkasten.com/a/refugees-code-fluechtlinge-zu-programmierern-machen>, last received 12-07-2017.

Vienna already had been holding courses that were open to refugees, they were facing the problem that they were not able to hold courses sequentially because the participants were just not attending. Therefore, cooperation with the University of Technology of Vienna was established and a project plan was developed via a few meetings and emails.

Research Question

Technical skills in general, and programming in particular, are becoming more important factors in work and society. Classes teaching these skills have therefore become an integral part of educational offers. We must survey the properties required to effectively and efficiently conduct coding courses aimed at heterogeneous and culturally diverse groups like refugees to be developed and held by institutions of higher education. Initiatives founded by the civic society during the refugee crisis might be able to point the way. Therefore, this research work focuses on the following research question:

What are the design parameters of a framework for institutions of higher education in order to develop coding courses appropriate for the needs of heterogeneous and culturally diverse groups?

This research work defines a framework with the most decisive and determining factors of implementing coding lessons for cultural diverse groups at traditional educational institutions like universities and colleges.

Research Design

Before the first course a short questionnaire was developed for the applicants. Based on the results, the decision was made that this research and the environment in which it was conducted called for a collaborative approach. Therefore an empirical technique called “action research” (AR) was used, which is described as “participative, cyclic research approach directed towards both research and action” (Lewin, 1946). It was found to be the appropriate method for this case because it addresses practical problems in a positive way by feeding results of the research directly back into practical application. This approach allows for the gaining of knowledge by means of directly experiencing innovation through developing strategies for achieving an improvement in a particular situation. This addresses the problem of division between theory and practice by integrating the development of practical application with research knowledge in a cyclical process (Somekh and Zeichner, 2009; Popplewell and Hayman, 2012; Rose et al., 2015). The model used in this research is outlined in Figure 2.



Figure 2: Phase of an AR cycle (adapted from van Akker, 1999 and Rose et al., 2015)

During the planning phase, the relevant issues with the current situation were identified and ideas for improvement were developed. Interventions were discussed and planned in advance of the action phase. During the action phase, interventions were carried out. Efforts in the intervention were documented, and data was collected (observation notes, surveys, reflections, interviews, etc.) and analyzed.

A thorough review of a given situation, along with the past actions, can enable a new implementation cycle to improve the process. The end of one action research project may lead to research on other situations, which enables new research and implementation cycles to continue (Brydon-Miller et al., 2003).

Dick (2002) highlights flexibility as a main advantage of AR. He states that the research can start with quite imprecise research questions. The cyclic structure allows refinements of the research design during the research process, as deeper insights into the situation are gained. When moving forward, each cycle is required to become more precise. One of the distinctive features of AR is the participatory nature of the research. This requires that practitioners are participants in the sense of being partners in the research (Denscombe, 2010).

In terms of our research work, we applied the principles of AR as follows: The participants were surveyed twice; once in the middle and once at the end of each course. In addition, the student-teachers were interviewed once at the end of each course (see Figure 3). The participants were closely observed over the entire course, with the findings being discussed and documented in the refugees{code} team’s weekly “jour fixes”. This data was collected and analyzed 2-3 weeks after the course ended in order to develop interventions and improvements for the next cycle.

Research Study

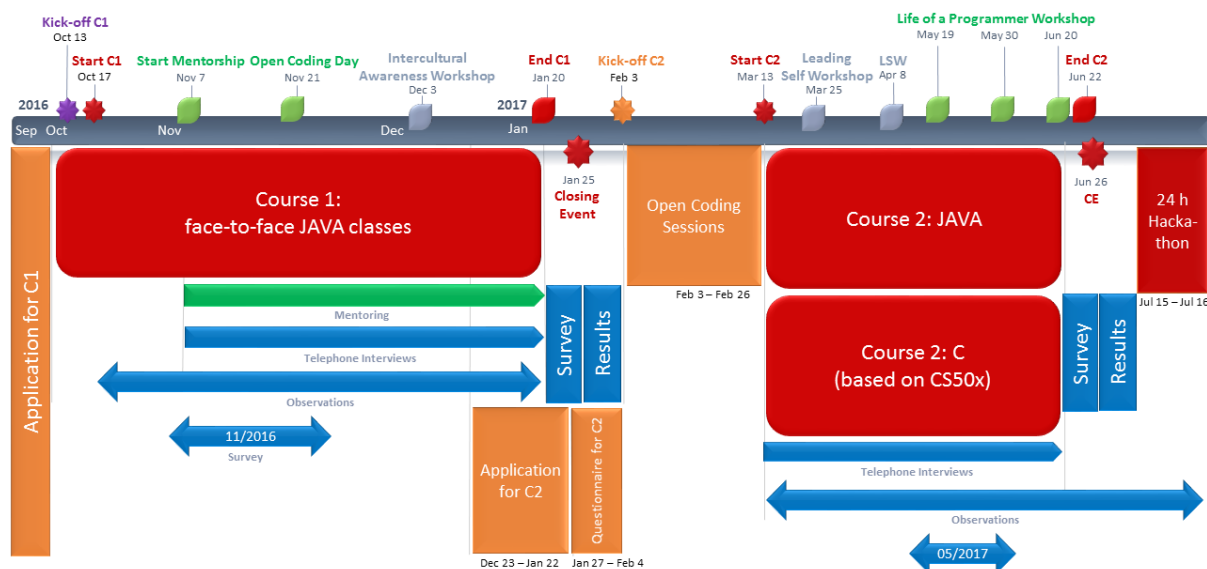


Figure 3: Time table of the first and second course – the research study

Course 1

The 2016 course took place between September 2016 and January 2017. After the **kick-off event** (see Figure 3) with the refugees{code} team the participants who passed the application phase got introduced with the refugees{code} team as well as the time table and the structure of the course. Course 1 was started with 21 male and 1 female refugees from five different nationalities (Syria, Iran, India, Afghanistan, Bangladesh), all born between 1971 and 2001. Participation was not bound to a legal prerequisite like the persons asylum status. The only **requirements** for the participants was that they were proficient in the English language, motivated to learn how to code and had the time to attend. In order to verify these requirements, the applicants were asked to write a short application letter regarding their motivations of a maximum of 150 words. In addition, they were asked to take a short test consisting of eight logical tasks like completing sequences of numbers and letters.

The course focused on coding in Java. All lessons were held in English as traditional “face-to-face” classes. Each week, three 2 hour-long lessons took place at the computer labs of University of Technology of Vienna. Each lesson consisted of a lecture and an exercise. These usually alternated between teaching new content first and then letting participants implement it. At the beginning of each lesson there were short recaps which included the most important questions from the last sessions. As the course was only 6 hours in total per week, participants were told that it would be crucial for them to learn and code at home.

All **teachers** were computer science students themselves, who were awarded 3 ECTS for their efforts. A course of this kind serves as an invaluable lesson for pre-graduate academics, since it allows them to experience standing in front of an auditorium, thereby getting an insight into teaching, and on top of that, being able to put their acquired knowledge into action, and maybe even to the test. As a result, the concept of “learning through teaching” (e.g. Martin 1985, 1994, 1998, 2001, 2002) is being automatically applied as well.

After the first four weeks, a significant decrease in attendance was noticeable. Therefore, as a counter-measure, a **mentoring program** was introduced on November 7th, 2016 (see Figure 3) in order to take care of individuals’ needs and provide care outside the classroom. As a consequence, the participants were separated into five small groups of 4-5 people and each of them were provided with a mentor from the refugees{code} team. The task of the team members was to support the participants on a personal level and to serve as a dialog partner for their worries and problems.

Besides the **physical course and the mentoring program, virtual spaces** in the form of Facebook, Slack and WhatsApp groups were also opened. These allowed the organization and the teachers to share information with the participants and also offered participants channels to ask questions and get them answered.

In addition, a so-called “**Open Coding Day**” was held (see Figure 3). This was meant to be an early conceptual test for a potential second course. Since the thinking behind the concept was rather complex and ultimately based on flawed assumptions, we deem this beyond the scope of this research work and are therefore omit it.

Another special event named “**Intercultural Awareness Workshop**” was held on December 3rd (see Figure 3). The intention behind this event was to facilitate better understanding between the participants from different cultural backgrounds and to allow the participants to reflect on their home and their new environment.

The course ended with a closing event on January 25th, 2017 (see Figure 3), at which five participants (all male) were awarded their certificates.

Course 2

The second course took place between March 2017 and June 2017. It began with 38 male and 2 female refugees from 10 different nationalities between the ages of 19 and 35.

The **application** period for course 2 was opened from December 23rd, 2016 to January 22nd, 2017 and involved filling out an online application form. Due to the high number of applications, an email was sent to all applicants asking them to fill out an online questionnaire between January 27th and February 4th, 2017 (see Figure 3). Further, all applicants were invited to an “info session” by email (see Figure 3), which was ultimately a pre-course Q&A session by the refugees{code} team for the participants. The applicants’ levels of prior knowledge in course 1 differed widely and the time to evaluate them was very limited as well. Therefore, the applicants were **required** to attend at least three out of four “Open Coding Sessions” at University of Technology of Vienna (see Figure 3). The “Introduction to Computer Science”-MOOC CS50x from Harvard University was used which allowed applicants to demonstrate their level of prior knowledge and ability to comprehend the elementary concepts of coding. Another reason why this measure was employed was the high rate of drop-outs during the first course. Since taking these “Open Coding Sessions” took the participants some time and effort, it also served as a tool to measure the applicants’ motivation as well.

Differing from the first course, the participants were divided into **two groups, “Java” and “C”**. It was intended that the JAVA group gets face-to-face lectures held by the students teachers (like in Course 1). Since two of the four student-teachers had rather limited English proficiency, that concept was discarded and replaced by a MOOC, namely the JAVA-MOOC by Udacity. However, after the participation in this MOOC turned out to be very low, the decision was made to switch back to face-to-face lectures held by the student-teachers. The “C course” was held as planned, using the Introduction to Computer Science-MOOC CS50x from Harvard University. Its goal and structure was set ambitiously to finish with this intensive 12 week course, which taught C, Python and JavaScript with 9 problem sets. In the second course refugees{code} reduced the contact to two weekly sessions of three hours, because the feedback from both sides was that communication was difficult between the three different teacher groups. All **teachers** were again computer science students themselves, who were awarded 3 ECTS for their efforts (see Course 1).

As in Course 1, **virtual spaces** in the form of Facebook, Slack and WhatsApp groups were opened. In addition, an e-learning platform based on Moodle was introduced as a measure of support for the “CS50x” group of the second course.

As part of the **special events**, a workshop on the topic “Leading Self” was held (see Figure 3). The workshop covered topics like “How strength-based leadership and positivity can lead to higher performance and

happiness at work”. The workshop was held on two separate dates in order to keep group sizes small, with half of the class participating on March, 25th and the other half on April 8th.

Just like the first course, the second course ended with a closing event on June 22nd, at which 23 participants (21 men and 2 women) were awarded their certificates.

In addition, a 24 hour **Hackathon** was held (see Figure 3). This was meant to be a social event where the participants from Course 1 and 2 could come together to prepare participants for solving real life problems they were interested in. Since the Hackathon was not a fixed component of the course at the beginning and therefore not systematically surveyed, we will not give further explanation on it in this paper.

Research Results

The following section presents the results and findings of the surveys. The subjective data (learners’ perspectives), experiences from the refugees{code} team taken from their protocols of their “jour fix” meetings, as well as experiences and opinions on how to improve the course from the student-teachers are presented.

Course 1

Learners’ perspectives

A total of six learners were interviewed by telephone and asked for the following factors:

Motivation

When asked what they wanted to achieve by attending the course, all expressed slight variations on learning enough coding to be able to get a job or making enough progress to enroll at university.

General Impressions of the Course

The interviewees were asked about their opinions on the course that they attended. The responses were positive, with specific mention of their teachers and colleagues, being able to practice their coding skills, and the personal support that they had received from the refugees{code} team. One person noted that he liked the positive environment. Another one mentioned the positive value of having the WhatsApp group to receive immediate answers to their questions.

Suggestions

Asked about whether there were any aspects of the course they did not like or would like to change, only a few identified any issues. These criticisms included that there were too many student-teachers in class speaking at the same time during the lesson (“the noise was too loud”). Two of them also noted that the lectures were inconsistent and not well-organized.

Attendance

After the first four weeks, a significant decrease in attendance was noticeable. Therefore, the six participants who did not attend anymore were called via phone. The following points are the answers given by these participants:

- Conflicting schedule with German courses, temporary just-for-money-job, or requirements by the AMS (meaning the “Austrian Job-Market Agency”, among other things the agency in charge of paying out different kinds of welfare money).
- False expectations about the content of the course, the course’s teaching speed, or the prior knowledge.
- Realization that learning German was more important.
- Change in housing condition (relocation).
- Found a worthwhile job during the time of the course.

This answer was given by two participants – one stated to have found work in IT-network engineering, one in IT-maintenance/-operations.

- Higher interest in networking and web development technologies.

Homework, Practicing and Lack of Consistent Feedback as Greatest Challenges

The interviewees were also asked what they found to be their greatest challenges as learners. Most of them were not able to articulate specific challenges or said that they had no problems. The challenges mentioned related to the

learning process: being unable to do the homework assignments. Other challenges were related to wider issues: lack of time to practice, lack of access to the teachers, and teaching personnel changing repeatedly.

Learning Support

Finally, they were asked what best helped them with learning. The responses to this question included practice outside of class, constant practice, support from other learners and tutors, and immediate feedback such as identifying errors.

refugees{code}'s perspectives

Volunteering and Lack of Experience by the Student-Teachers

The refugees{code} team stated that there was a lot of fluctuation in the lessons, in the sense that the turnover rate of teachers was high and some of them did not stay long. This is believed to be due to the teachers being mostly volunteers. The teachers were students who had never taught before, and it showed in the way they went about holding class. Classes were mostly self-organized and chaotic. The lack of experience by the student-teachers initially created a certain amount of frustration among the refugees{code} team.

Mentoring

According to the refugees{code} team, their efforts to accommodate the needs of the specific individuals were not sufficient. A tendency to treat the participants as a homogenous mass rather than individuals seemed to have gotten in the way.

Student-teachers' perspectives

Preparation

The student-teachers stated that especially the first few sessions need careful and time-consuming preparation in order to, on the one hand, convey the concepts and ways of thinking of coding to a target group with little to no prior exposure to these, and, on the other hand, to scare off as few participants as possible with the subject matter.

Responsibilities

According to the student-teachers, responsibilities should be agreed upon and divided up clearly. Employing teams of two for each of the sessions, who are then responsible for everything concerning that session (preparation, executing and follow-up), has proven feasible.

Content

Initially, a rough timetable for the semester containing the learning content has to be prepared. Even small chunks of the content should be accompanied by examples for practice. In addition, presentation slides and other course materials must be able to serve as reference materials for homework assignments. Therefore, these materials need to be structured accordingly.

Homework and Practicing

The student-teachers stated that homework assignments should be given out regularly and subsequently reviewed, preferably for each session. This serves as feedback for both the course teams as well as the students. Useful examples are imperative, whether on the presentation slides, other course materials, or with homework assignments. Since coming up with such examples is usually very difficult, using preexisting examples whenever possible is to be preferred. Coding examples should be tested by another teacher first before being tested in the field.

Storage

According to the student-teachers, a centralized repository for storing all the course materials and homework assignments is crucial.

Addressing the Group

When asked about addressing the group, the student-teachers suggested when naming resources, for instance, a github-page, a URL shortener, or a Moodle course, the use of the term “refugee” should be avoided. They state that the people taking part in the courses are there as participants first, not refugees, and that is how they should be met and addressed.

Communication and Feedback

The student-teachers say that being able to communicate with the group as well as an anonymous channel for the group to give feedback is vital and should be available right from the start. For communication between student-teachers, Slack proved a viable option. In addition, monthly “jour fixes” are advisable, which allows the teachers of all groups to exchange views and opinions. They also suggested that after each session, teachers should give each other feedback about the sessions (what was taught, what was expected, which expectations were and were not met, what course materials should be repeated, etc.), so that they are in turn able to better prepare themselves.

Course 2

Learners’ perspectives

Attendance

After reviewing all 17 drop-out cases, it was clear that 10 of them had dropped out after the first few weeks. The reasons participants gave for dropping out from course two were as follows:

- Personal reasons,
- Too much time requirement (20h),
- Attending course in different town or living in another state,
- Too occupied with other things (job, pet, child, ...),
- School,
- Relocating,
- German course,
- Realized he/she is not interested in coding,
- Sickness,
- Got an internship,
- Course was too difficult, and
- Not interested anymore.

E-Learning Platform

Initially, only a small minority of refugees used the e-learning platform. The reasons for this were not systemically surveyed, but it was assumed that many refugees struggled to understand e-learning platforms and had difficulties navigating them. Accordingly, giving better instructions at the beginning of the course could be decisive. As a measure to draw more participants to the platform, a weekly newsletter was set up.

Communication and Information Flow

The participants used mainly WhatsApp much more than the Facebook group or the forum on the e-learning platform.

refugees{code}’s perspectives

Teaching Method and Strategy

The refugees{code} team also came to the conclusion that the refugees’ needs were different and that the “teacher-in-front” approach was not effective. To integrate the experience and knowledge gained from the first course, the teaching methods were redesigned from scratch. The role of the student-teachers shifted from being a mere teacher to being a supportive and encouraging tutor who motivates the participants to explore and experiment. This allowed participants to take charge of their learning process themselves. As a result, the student-teachers were able to spend

more time on giving one-on-one support to the participants. To better respond to the needs of the participants and to support their development, refugees{code} provided student-teachers with relevant background information such as their home country, hobbies, expectations, and work experience on the participants.

Communication and Information Flow

The team of refugees{code} seemed to have given more thought to how to reach their target group, having concluded that the prospects of reaching them digitally (or that they will find the site of their own accord) were poor. One part of this outreach strategy was through word-of-mouth because refugees{code} recognized that the information flow between refugees is predominantly peer-to-peer. The refugees{code} team also noticed that the WhatsApp group they introduced was primarily being used as a questioning service, much more than the Facebook group or the forum on the e-learning platform.

Student-teachers' perspectives

The student-teachers were asked about their opinion on how to improve the course.

Responsibilities

The student-teachers noted that they would have wished for better distribution of tasks (which tasks they were responsible for, who to ask in case of uncertainties, etc.), and a more planned out schedule.

Preparation

The student-teachers say that the participants often asked for more in-depth explanations for the “problem sets” and stated that they didn’t fully understand the exercises. They stated that the number of questions raised by the participants increased with the level of difficulty of the “problem sets”. Preparing for these questions in advance proved to be effective.

Level of Knowledge

Because the number of participants was initially very high, evaluating the level of knowledge for each of the participants was very difficult, especially since the information (grading of the “problem sets”, personal impressions of the supervisors, etc.) was distributed and not yet collected or, in some case, not even recorded at all. The student-teachers proposed the idea to assign a number of specific participants to each of them, so that they could monitor the participants more effectively. As proposed, this would not only make their job easier, but also would allow them to focus in more on specific people with specific problems, therefore according for the participants’ differing levels of knowledge.

Support

The student-teachers state that the one-on-one support for the “problem sets” was of great importance. However, it is also very important to keep in mind to not spend all the available time on a single participant and to make a conscious effort to go from person to person. They also said that some participants have questions but don’t pose them actively, especially not if the teacher is busy explaining something to somebody else at that moment. If the same question is posed by more than one person, answering the question “publically” on a flipchart or whiteboard and to employ other participants would know the answer might be didactically valuable as well as a time-saver.

Grading

According to the student-teachers, the spreadsheets for the grading of the problem sets were very useful. Two of the student-teachers noted that the criteria for grading should have been determined from the beginning and communicated to the participants. Another student-teacher noted that the submitted code should be graded by at least two teachers independently in order to see if the grades would lead to (roughly) the same results, and to come to a consistent system of evaluation.

Plagiarism

During the course, multiple cases of plagiarism were noticed by the student-teachers. In this case, that meant that some participants had copy/pasted solutions they found on Github. With MOOCs like CS50x, this is problematic, since there are a great many solutions for its exercises to found on the internet.

Discussion

refugees{code} is a good example of an innovative, agile and adaptable learning approach, as well as an example for developing and deploying a programming course with next to no resources. It opens up the prospects of finding work for the students, and it can aid the shortfall in the Austrian job market and the growth of the IT-industry in Austria.

Proposed framework

After two courses the research outcome can be seen as a framework of crucial factors, which should be taken into account in cases of teaching to such a heterogeneous group (Figure 4).

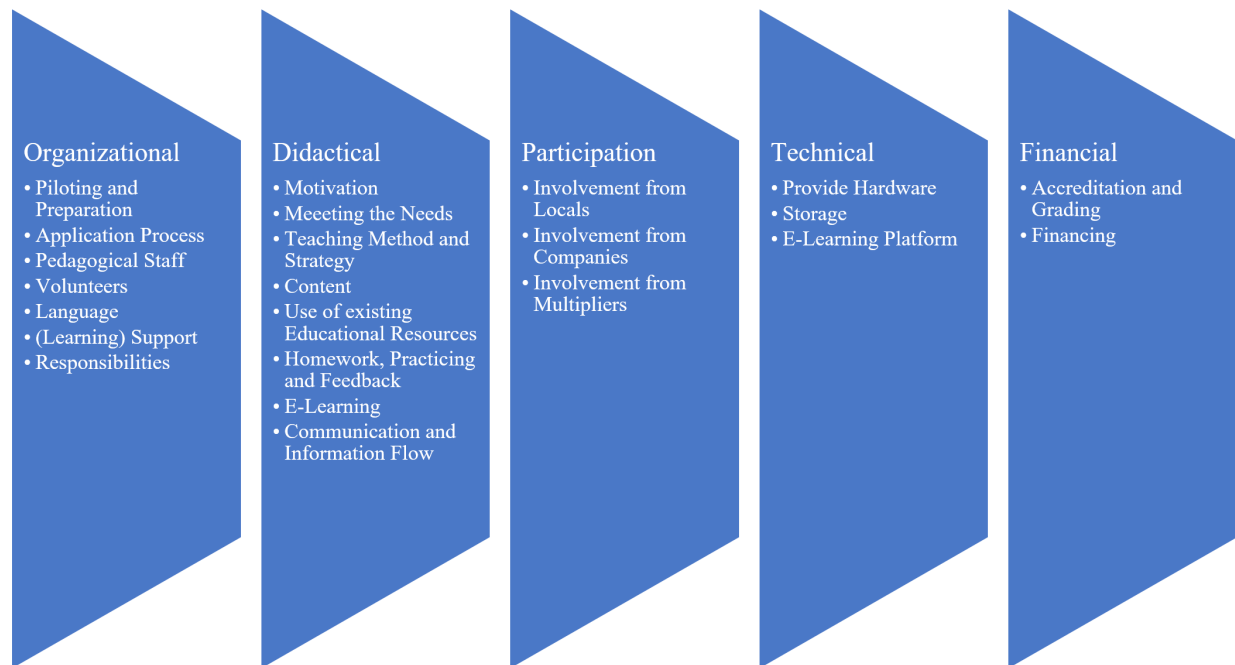


Figure 4: Proposed framework

Topic 1: Organizational

Piloting and Preparation

Since such a course concept (as seen in Course 1) rarely works on the “first strike”, the possibility to test concepts within the limits of a pilot phase and with members of the target audience is vital. The sessions need careful and time-consuming preparation in order to, on the one hand, convey the concepts and ways of thinking of coding to a target group with little to no prior exposure to these, and, on the other hand, to deter as few participants as possible with the subject matter.

Application Process

Going through an extensive application process (as seen in course 2) serves as a strong motivator for participants to stay on the course and attend even in the face of adversity. If they are being challenged in advance of the course, they feel like they acquired their place on the course.

Pedagogical Staff

While the “learning-by-teaching” approach used in the two courses is interesting to the education field, it is worthwhile to explore its utility in practice. While the student-teachers were able to help by plugging the holes torn open by the crisis situation, ultimately, they could complement the existing structures, not replace them. Therefore, a pedagogically trained staff who is proficient in the English language is necessary to cater to a heterogeneous group. While the approach of “learning-by-teaching” is interesting and educational for the student-teachers, they also need to be supported by pedagogically trained personnel. A possible solution might be a two-step support concept: The lion’s share of the mentoring work is being done by the student-teachers. The pedagogically trained personnel act additionally, are responsible for the content and quality of the courses, and answer those questions that the student-teachers cannot.

Volunteers

Although volunteering plays an integral role in the organization of such courses, we would recommend to be very carefully when selecting these volunteers.

Language

Language skills and communication proved to be problematic on both the teachers’ and the refugees’ sides. While the student-teachers were prone to having difficulties teaching and communicating complex ideas in English, refugees often spoke more than two or even three languages, but at a somewhat lower level of skill.

(Learning) Support

As seen in the two courses refugees need more support, especially emotional support. We recommend creating and sustaining a supportive learning environment where motivating, consistent, and service-oriented supervision is covered.

Responsibilities

Responsibilities should be agreed upon and divided up clearly. Employing teams of two for each of the sessions, who are then responsible for everything concerning that session (preparation, executing and follow-up) has proven feasible and beneficial. We also recommend a distribution of tasks (which tasks they are responsible for, who to ask in case of uncertainties, etc.), and a planned out schedule.

Topic 2: Didactical

Motivation

As seen in the first course the refugees wish to not just participate in an incremental integration measure, but to be able to see a complete pathway towards successful integration and a better life.

Meeting the Needs

Understanding the learners’ situations fully is crucial. Therefore, we argue for the importance of co-creation and user-centric design meaning talking to learners before and during any attempt to make a course for them. Especially for a such a heterogeneous learning group, there is no substitute for talking with them, listening to them, and incorporating them as actively and as centrally as possible into the project design and implementation. We would recommend making courses more responsive and adaptive to meet future challenges effectively. These are points on which traditional institutions can learn from our two courses.

Teaching Method and Strategy

For this teaching approach especially, the modules must be connected by a common thread and the questions must be practically oriented. It would be detrimental to the success of a program to start with the assumption that the coding skills of the participants are high to begin with and then will only continue to rise. While improvements in programming did not always come readily or quickly with the refugees, we recognized that the refugees were keen to apply their new skills in situations outside the classroom, like hackathons. We also concluded that the teaching of refugees would work better if teachers are provided with relevant background information on the participants. There

was also criticism of the teaching skills of some of our student-teachers with rather limited English skills (see Pedagogical staff). We recommend greater professionalism.

Content

Programs of this kind force universities and colleges to continually evaluate the relevancy of their teaching content. Exercises and case studies must have a tangible connection to practical use for refugees to accept them. In order to achieve this, universities and colleges have to work closely together with the course's participants. At this point though, the exact contributions that the different parties have to make is unclear and needs further examination. We also recommend to set the content of the course so that it is possible to follow suggestions from the learners themselves and from current issues and needs arising from the learners.

Use of existing Educational Resources

As anybody who has worked in the field of education is likely to know, building courses for heterogeneous groups is very difficult – it requires both a lot of time and money. There are different strategies to overcome these tensions. One is to simply accept that creating courses for heterogeneous groups is a resource-intensive undertaking and make these resources available. A different strategy is not to aim for a sophisticated and polished product, but instead, deliberately put together something “quick and dirty” (Mason et al., 2017). The refugees{code} team did just that, offering the first course within just a few weeks of intense activity. As a consequence, the drop-out rate was very high, but still this served as a good pilot project out of which improved courses can be developed.

A more powerful content strategy to accelerate the development of programming courses is to work with and to adapt material that already exist, rather than starting from scratch. The refugees{code} initiative is therefore a good example because it was based on the content of pre-existing MOOCs from various sources.

Adapting these pre-existing materials still took a lot of work but it was still much more time-saving and resource-friendly than starting from scratch. Also it works great in heterogeneous groups because every learner is able to learn and program at their own pace.

Therefore, educational institutions should always consider, before creating something new, whether existing educational resources (like open educational resources) could be used or adapted to fit their purposes. Such an approach is advantageous not only in terms of development, but also outreach and adoption. More cooperation and coordination between traditional education institutions and civic projects like refugees{code} could lead to a better distribution of overall resources.

Homework, Practicing and Feedback

Homework assignments should be given out regularly and subsequently reviewed, preferably with every session. This serves as feedback for both the course teams as well as the students. Useful examples are imperative, whether on the presentation slides, other course materials or with homework assignments. Since coming up with such examples is usually very difficult, using preexisting examples whenever possible is preferable. Coding examples should be tested by another teacher first before being tested in the field.

E-Learning

The delivery of learning materials via e-learning platforms can be valuable, but this alone is insufficient and should be accompanied by comprehensive teacher support. One way of achieving this is the so-called “flipped classroom” model which refugees{code} used as well. In this model, content is introduced through a MOOC as well as videos which can be watched by students online outside of class, which are later clarified and consolidated in class by a teacher.

Communication and Information Flow

refugees{code} put much thought into how to reach our target audience and concluded that the prospects of reaching them digitally, or that they will find the site of their own accord, were poor. Part of the outreach strategy was to rely on word-of-mouth and the flow of information was mostly peer-to-peer. Therefore, it is necessary to develop a strategy for reaching them from the very beginning. We recommend using offline events to explain the course concept to refugees and holding regular events where refugees, teachers, volunteers, and locals meet and chat. In

addition, we recommend the building of WhatsApp groups. We also recommend being very patient with refugees and tailoring the explanation to them.

Topic 3: Participation

Involvement from Locals

Although refugees{code} is aimed specifically at refugees it is important not to isolate refugees and treat them differently from the rest of the population. Therefore, program participation should also be open to local students with similar needs. This will also help to build bridges between the refugee population and the local communities. On the contrary, not only can the locals be tremendously helpful to the course organizers, but also with the needs of the refugees as well. They can give feedback to the participants, they can help them learning the host country's language, and with personal social contacts, which, like our interviews showed, is the preferred form of interaction of refugees. If refugees were to work as an isolated group, the success and the impact of the program would arguably be limited as well.

Involvement from Companies

Many participants did not know or had difficulties imagining how work life in European companies is like. Companies could help by, for instance, holding Q&A sessions with programmers, giving tours of the premises, holding workshops and accepting interns.

Involvement from Multipliers

An effective outreach strategy includes raising not just awareness but also trust and making the value to the participant immediately tangible. Working through networks that have the personal trust of the refugees could help, for example members of the refugees' community who are advanced technology users could act as multipliers to raise the overall levels of coding literacy.

Topic 4: Technical

Provide Hardware

An essential prerequisite is having access to hardware. Desktop computers or laptops are still important for most projects of this kind. One way of creating access to these facilities is through providing laptops.

Storage

A centralized repository for storing all the course materials and homework assignments is crucial. This can also be done via the e-learning platform.

E-Learning Platform

With refugees as the main user base, lowering the barriers for usage of the e-learning platform as far as possible is a good approach. Refugees have widely varying technological literacy and levels of prior knowledge and getting the entirety of the user base to actually use the platform is obviously crucial for its success.

Topic 5: Financial

Accreditation and Grading

In cooperation with the Technical University of Vienna, refugees{code} has found an interesting solution. The students who teach our courses get credited with 3 ECTS for doing so. For the student-teachers, this serves as both a valuable experience as well as academic progress. Participating in courses aimed at refugees could be of much greater value to students when it results in a form of recognized certification. refugees{code} cooperates with the Technical University of Technology and does stress this as an important factor.

Financing

Since the expenses for setting up programs of this kind are quite high, access to sufficient resources and funds have to be assured. Without the cooperation with the Technical University of Vienna, refugees{code} would not exist. In

order for projects to progress past the initial stages and eventually even scale up their work, reliable sources of financing are crucial.

Conclusion

The goal of the refugees {code} courses is to impart in-depth skills in the field of programming to refugees, and to put them into the position of being able to further these skills autonomously. The textual orientation is mainly based on universities and colleges, while the practical application and organizational orientation is a contribution by the civic society.

As the great potential that initiatives like refugees {code} have for education, there are also substantial challenges. As we learned from the first course, the completion rates are very low. Therefore, it is important to build an infrastructure and a learning environment around the course. This learning environment includes providing mentoring and support to create spaces where participants can learn. It was also found that having a pedagogically trained staff with sufficient knowledge of the English language is necessary to cater to a heterogeneous group. Also, varying teaching strategies according to the needs and skills of the learner is necessary.

As the results also show the informal organizational structure is coupled with a strong learning culture, where experimentation is encouraged and failure de-stigmatized. This allows an iterative and adaptive project design according to user-centered principles with a high degree of networking and exchange.

With the field of public education and its old structures being arguably overloaded, the doors for innovators and reformers are wide open. As refugees {code} has demonstrated, civic approaches can bring benefits like innovation, expertise and energy to educational institutions. It can serve to counteract excessive bureaucracy, lack of transparency and poor coordination of public education institutions.

We conclude that bringing successful education to heterogeneous and culturally different groups is multifaceted. It is not something any individual organization or project can do; it can only be the result of a system of different actors working together with traditional educational institutions.

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