
USE CASE 14

# Blooming Flower

## Age & Level

Sam, Finland
Student
17 years old

Sam is a 17 year old student in Helsinki. She spends most of her time drawing on her own, and likes to craft with her hands. If the class is not art or crafts related, she does not pay much attention. Although she has managed to hold a passing grade in most subjects.

## Primary Actor and Main Goal

At school she has been introduced to programming, but don't see any point in using it, since she's not that into computers. But she knows that some other students seem to enjoy programming and they have made some interesting programs.

## Topic and Content

The IT teacher, Mike wants all students to see how useful programming can be, even if not all students will continue with programming. This term the teacher has managed to get some Arduino kits for use in class. In the hopes of getting more students involved in programming.

## Description of Environment and Possible Pre-conditions

The students are paired up and asked to build a project that could help the environment. Sam is put in a group with Alex, who is great with computers, but does not get along that well with Sam. The teacher picked the students to complement each other, which would be beneficial for the results and the students, who would learn from each other.

## Preparatory Work

Mike has seen how many things you can make with an Arduino board, and therefor wanted open up for exploration during class and to show the students that there are many different solutions to any given problem. To achieve this the teacher supplied the students with several well explained examples and gave them the open-ended theme of helping the environment.

## Description of Activity

When Sam and Alex start to build their project the approach the problem from completely different angels. Sam wants to make something with more of a nature-theme, but Alex aims to try to use a weather API. So while Alex is occupying himself with getting the weather API data readable by the Arduino, Sam is left alone to figure out how to make something on her own. Trying to come up with how to show a flower with lights, Sam happens to see one of the teachers' examples that showed how to make a servo-motor turn with a push button, and this looks easier to code than making several lights blink. Now she manages to build a small paper flower, where the bud will open up when the servo turned.

Around the same time Alex has managed to the weather data into the Arduino and makes a light switch on when the sun is shining. Sam seeing that Alex's code is a bit more complex code-wise than her own button, and Alex seeing that Sam´s flower looks much better than his single light, they decide to combine their projects into one.

This results in a final project that checks a weather API, with Processing, then filters out the how cloudy it is at that given moment in Helsinki, sends that date over the serial ports to the Arduino. There the program sees how cloudy it is and opens the flower accordingly with help of the servo. Hence, the flower opens gradually according to how cloudy or not cloudy it is at any given moment in Helsinki.

## Other Stakeholders and Their Possible Interests

After showing the project to the teacher, and while the project itself ended up well, the teamwork was not what the teacher had in mind. Sam and Alex had work separately until the very end, but both students had worked out solutions on their own.

## Success and condition

The teacher, knowing that most of the coding had been done by Alex, askes Sam to explain how she progressed from lights and buttons into the servo setup. This is where Sam showed that while her progress in understanding coding was not to the same level as Alex, she was able to work with the code and figure out how to solve problems and would adapt her ideas based on her coding level.

## Failure and conditions

While the project and the goal to improve the students' knowledge of project did work out for Sam and Alex, the two did not work as a group to any greater degree. Therefore, they did not see the progress of each side, only the results. So in the case of Sam, she never really saw how Alex solved own his issues. If they knew better what the other part was doing, they could have avoided some delays and would not have been side-tracked, which might have resulted in better project.

## Barriers/Facilitators

For further projects Mike realized that – apart from the technical preparation – some more things need to be considered and noted in his reflection sheet:

- "Not sufficient amount of material for all student groups (Solution: need to form bigger groups)
- Not enough work for all students (Issue: increase in students off-time)
- Not enough time to complete the project due to the knowledge level of students (Solution: provide more practical examples during the introduction)
- The teacher effect of the project outcome is too big by presenting examples (everyone creating a flower etc.) (Solution: the teacher could ask an open question to elicit and pick students' imagination: what would be your ideal representation?)
- Where to find information if a problem emerges (e.g. new sensor, new programming code) (Solution: the UUI will provide a space for FAQ and also to access and ask the community of experts (e.g., Arduino community, Ultimaker community, etc.)
- Identifying the knowledge level of students and providing enough support for all learners/groups (important to guide students' imagination to match with their skills and available resources such as time and equipment)."

He also realises that there might be several barriers he needs to take care of like a lack of previous experience of using different technologies as well as the fact that many students are challanged by working in teams due to different interest, communication skills, etc.

However, Mike figures that the students are quick to learn and understand different concepts. Many of his students are creative and not afraid to try and explore. Also the fact that the feedback comes fast (e.g. an LED lights up or blinks) increases the motivation but also creates frustration if it does not work. Finally, reflecting with other teachers about the project, he concludes that high trust between principal and teacher is needed but that these type of projects can also increases the good relationship between teacher and students.