Drawings for remembering passwords

1. Name of the project:

Drawings for remembering passwords

2. Subjects covered from STEAM areas:

Technology:
- Cryptography
- Data Protection

Mathematics:
- Geometric shapes
- Mathematical signs and symbols

Arts:
- Creative drawing

3. Target group (age range and size of the group):

- Age group: 10 - 16 years
- Group size: class/course size

4. Duration of the activity:

2 lessons

5. Key words:

- Epistemic Programming
- Cryptography
- Password Security
- Data Protection
- Geometric Shapes
- 3D Printing
- Creative drawing

Drawings for remembering passwords

6. Key sentence describing context of the activity, followed by short description (200 words):

Students create drawings that help them remember suitable passwords more easily.

First, it is important to use sample passwords to derive requirements for suitable passwords. In doing so, they encounter the conflict of security vs. simplicity. On the one hand, the passwords must meet various requirements so that they cannot be cracked (do not contain words from the dictionary, contain different types of characters, have a certain length). On the other hand, passwords must be easy for users to remember, otherwise they will not use them. To solve this conflict, students should code passwords using a drawing. Care must be taken to ensure that the password cannot be obviously deduced from the drawing. For this purpose, the students can use geometric shapes as well as numbers and symbols from mathematics. In addition, important properties of geometric shapes can be included here. Example: A circle containing a right triangle could represent the password 1Circ1Tri306090.
In addition, creating the drawings adds an artistic/aesthetic element. Students can be creative and design the drawings as they see fit, but they must keep practicality in mind. Especially when printing the drawings as key chains, the aesthetic aspect plays a role, as the key chains should look nice for everyday use. If you print out the drawings as key rings for the students afterwards, you can additionally address the topic of "3D printing".

7. Description of the activity environment, including the list of materials and tools needed:

There are no special requirements for the learning environment. The activity can be done in any classroom/course room.

Materials needed:
- Drawing materials (pencils, pieces of paper).
- Tools for drawing geometric shapes (set square, compasses)
- Possibly 3d printer if keychains are to be created from the drawings.

8. Step by step, detailed description of the activity, including teaching and learning strategies:

1	**What characterizes suitable passwords?** The students should first work out requirements for suitable passwords using sample passwords. Then collect the requirements worked out by the students. In doing so, they will encounter the conflict of security (so that the password cannot be guessed/cracked) vs. simplicity (so that the passwords are easy to remember).
2	**First introduction to cryptography**

		In class discussion, discuss how to resolve the conflict of security vs. simplicity. This can be done by first creating a secure password and then creating a mnemonic for it. The mnemonic should be "encrypted" so that other people cannot use it to guess the password.
3		**Encrypting passwords using drawings** First, the teacher presents an example of how a password can be represented by a drawing (using mathematical shapes, symbols, and signs). Example: a circle containing a right triangle could represent the password 1Circ1Tri306090. Students are then asked to name other exemplary ways to represent password characters in drawings. These are collected on the board.
4		**Drawing the passwords** The students should now draw their passwords individually. They can be creative in doing so. However, if 3D printing is to be done, the drawing should be coherent.
5		**Reflection** Class discussion: 　　- Where were difficulties? 　　- Will students use this opportunity to create good passwords? Why or why not?
6		**Optional: 3D printing** If access to a 3D printer is available, students' passwords can be printed out as keychains so that they can use their represented passwords and use the keychain as a mnemonic. It should be pointed out that the same password should not be used for multiple purposes and should be exchanged after a certain time.

9. Learning objectives/competencies:

The students:
- know characteristics of suitable passwords.
- Know the characteristics of unsuitable passwords.
- Can assess passwords based on their security
- can create suitable passwords.
- gain initial experience in the use of cryptography
- Can briefly describe characteristic properties of mathematical shapes.
- can design a creative drawing from simple shapes.

10.　　Evaluation/Assessment guidelines:

- Security of the created passwords
- Good memorability of the created passwords
- Recognizable connection of drawing to password
- Artistic achievement of the drawings

11. Lessons learned:

The content and learning objectives of computer science lessons can be linked very well with content and objectives from other subjects (especially mathematics). What was new for me was that you can also incorporate artistic aspects (here: creative drawing) into computer science activities.

12. Additional information/Links:

13. Contact person:

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