ISBE
INSTITUTE OF SMART BUILDING ENGINEERING

FH AACHEN
UNIVERSITY OF APPLIED SCIENCES

Inspiring girls for STEM careers: Escape room game on the topic of energy in buildings for Girls' Day

Lina Schulze-Buxloh

Nina Kopmann

Rolf Groß

Ansgar Kirsch

FH Aachen

University of Applied Sciences

Germany

Introduction

In 2024, only 16% of employees in the fields of mathematics, computer science, natural sciences and technology (STEM) in Germany were women.

More girls than boys obtain their Abitur in Germany since the 1980s and start university studies more often (52 %).

The proportion of women among first-year students in the STEM field was just under 35% in 2022, but varies greatly from subject to subject: 87% in interior design, 8% in automotive engineering.

Initiatives to inspire girls for technical careers

Girls' Day program

- offers pupils in fifth grade and above (girls in the age of 10 to 17 years) practical insights into career fields in which women are still significantly underrepresented.
- They can visit companies and institutions and learn about the relevant career fields.
- Since 2001, the German Federal Government has also been specifically supporting this initiative, which has so far offered more than 2.38 million places.
- FH Aachen University of Applied Sciences is also proud to participate in this program for girls.

Special needs

- ✓ The pupils should not only be informed about the possibilities of studying engineering, for example, but should also be actively involved.
- ✓ They should not just have a look at technical professions, but experience and try them out for themselves.
- ✓ The aim was to introduce the girls to typical technical questions in a playful way and to have fun finding a solution to a technically complex problem.
- ✓ Small experiments should both encourage reflection on the problem and provide space for experimentation and exploration.

New concept

The promotion of young women in the STEM field is particularly important to FH Aachen University of Applied Sciences. For this reason, numerous departments and study programs at FH Aachen participate in the annual Girl's Day with interesting offers for girls.

Teachers and staff in the Smart Building Engineering department were also keen to show the girls their field and give them a better understanding of it.

Development of a game similar to an "escape room"

Design of the game

On the topic of "Energy and Saving Opportunities in Buildings" similar to an "escape room" game.

The students work in small teams to decipher clues and solve small tasks and riddles.

The solution or selected answer leads to the next task. Only when all tasks have been correctly solved in the correct order and within the given time the entire riddle can be solved.

The students began with a brief introduction to the topic and a few practical tips on handling, for example, one of the measuring devices used, to ensure the smooth running of the game.

Initial Scenario for the game

The following initial scenario was assumed for the game:

Energy crisis! A smart building equipped with sustainable technology has been crippled by a hacker attack. The energy systems have failed, and electricity consumption is rising rapidly. The pupils have 30 minutes to get the technology up and running again and save the building!

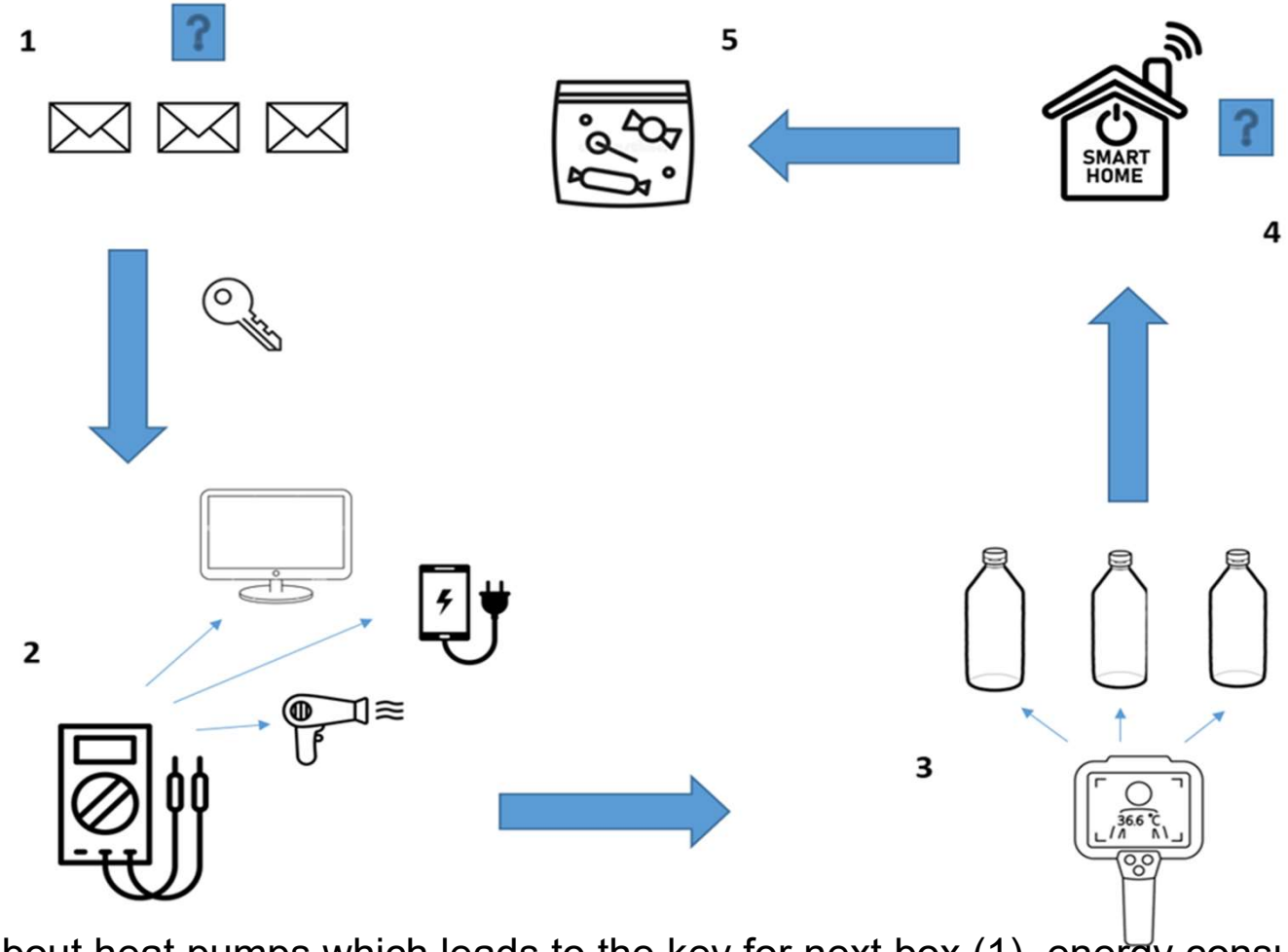
Implementation

- The participating girls started in three groups, each staggered by five minutes, so that each group could progress smoothly through the game without long waiting times.

- All stations were set up in a large room, so the girls could always go to the appropriate station without disturbing each other or hearing the results and thoughts of the other groups.

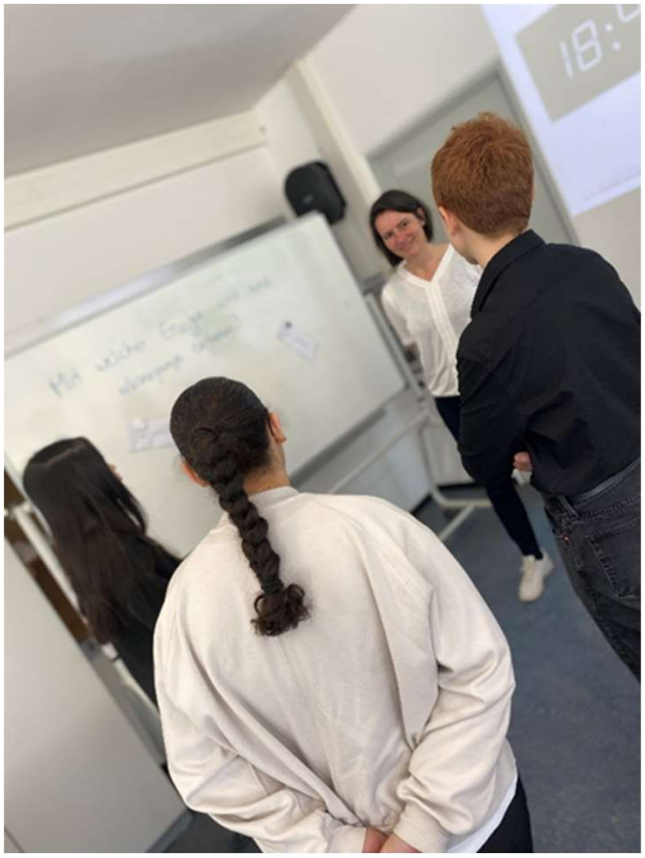
- A timer was started for each group at the beginning, so that the time counted down for each group, and afterwards it could be determined which group completed the game fastest. This created both a certain amount of time pressure and a slight competition between the groups.

Flowchart of the game



Question about heat pumps which leads to the key for next box (1), energy consumption measurements and calculations (2), thermography measurements (3), question about building automation (4) and last box oft he game with sweets inside (5).

Impressions of the game



One group of three girls solving the first of the game's riddles (left) and opening the locked black plastic box with the correct numeric code after solving one oft he games riddles (right), © FH Aachen, Birgit Greeb

Game over

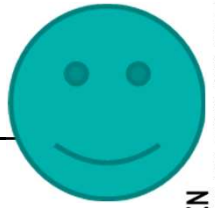
After completing the game a short reflection period was held to summarize the aspects of "energy consumption and energy savings in buildings" the girls had learned through the game.

From their own measurements of energy consumption at a gaming station, they saw that the length of use is a crucial factor in energy consumption.

At the thermal imaging station, the girls could see and feel for themselves how good thermal insulation reduces heat losses to the environment.

The last question, about the most intelligent and efficient control of a building, showed the girls that unnecessary energy consumption can be minimized through demand-based control and appropriate sensors.

Conclusion



- The game was very well received by the participating girls who clearly enjoyed solving the puzzles on the topic of energy in buildings.
- They also seemed to enjoy being able to actively try things out and experiment, rather than just watching or listening to a lecture.
- Solving the tasks independently also motivated the students to engage with the complex topic.
- This playful introduction to an area of the engineering profession could certainly contribute to more girls choosing to study engineering in the future.

Outlook

- Aachen University of Applied Sciences will certainly participate again next year, giving girls the opportunity to learn about technical careers.

- The "escape room" concept was so well received by the teachers and staff that they are considering how a similar concept could perhaps be implemented in teaching, for example, in the first semesters of the program.

- Even though setting up such a game involves a certain amount of effort, it will certainly be used more often in the future.