An adventure in Hogwarts laboratories!

Background information

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Organization

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Primary source

Please provide information about the primary source that your Story of Implementation is based. Is it about the implementation of a learning scenario or another resource provided by a specific project, e.g., an NBS learning scenario? Is it about an activity that you designed, and you implemented with students? Is it about an activity you found online and implemented it? Indicate below the primary source of your SoI and provide more information about it.

☐	My SoI is about how I used and implemented a learning resource provided by the project.
	Add here the link to the resource:
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Scientix is an initiative of European Schoolnet. Life Terra is co-financed by the European Commission through the LIFE Programme (LIFE19 CCM/NL/001200)

The content

Abstract/Introduction

A journey into the enchanting world of Harry Potter while delving deep into the realms of STEM (Science, Technology, Engineering, and Mathematics). This learning activity caters to both 14-15 year olds and 6-9 year olds, blending the magic of Hogwarts with hands-on experimentation and technical ingenuity.

For the older group, aged 14-15, the focus lies on backstage preparation akin to the workings of the Wizarding World. Participants engage in the guided development and fabrication of a Sorting Hat with a modern twist, utilizing Arduino platform. Through this process, they delve into coding, electronics, and craftsmanship to bring the Sorting Hat to life. Additionally, participants craft candle holders reminiscent of those found in the Great Hall, adding a touch of ambiance to the magical atmosphere they are creating. Alongside these endeavors, they prepare a set of captivating hands-on experiments inspired by the wonders of magic. Activities such as creating invisible ink, mastering the art of mixing colors in milk, and constructing their very own DIY hologram spark their curiosity and ignite their imagination.

For the younger group, aged 6-9, the focus shifts to immersive experiences in sorcery science. Guided by their older counterparts, they witness the magic of the Sorting Hat in action and are mesmerized by the flickering candlelight in their bespoke holders. Engaging in age-appropriate versions of the hands-on experiments, they explore the mysteries of invisible ink, delight in the colorful spectacle of milk mixing, and are awestruck by the illusionary charm of DIY holograms. Through these activities, they develop foundational skills in observation, critical thinking, and experimentation, all while experiencing the wonder of science through a magical lens.

Together, participants of both age groups embark on a captivating journey where creativity meets curiosity, and where the magic of Harry Potter seamlessly intertwines with the marvels of STEM.

The learning activities were distributed into three sessions as described here below.

Main text

The narrative (Learning process/Stages of implementation)

1. *Session 1 – Creating your own Hogwarts' lab.*

The learning activity started with the first small group of 14-15 years-old students. The group was constituted of five teenagers. We decided to start with a small group to test a new methodology combining different levels of learning activities focused on STE(A)M topics and working transversally and interdisciplinarity on more subjects.

Therefore, the learning aim was to let these students use their creativity and imagination, like in creative writing. We used a white flip-chart sheet to draw the setting of their own Hogwarts. The location at our disposal was the theatre room in the oratory of a local parish, San Domenico Savio of Terracina, because the wide room because the large room allowed to implement different settings and scenography.

Both from our experience and from literature it is known, that many 14-15-year-olds struggle to imagine imaginary worlds, finding it hard to break free from reality's confines *(Lin et al., 2018; Parno et al., 2020; Suh, 2013)*. This is where teachers step in as guides. They play a pivotal role in stimulating

imagination through inquiry and reflection, prompting students to unlock the doors of their creativity with thought-provoking questions *(Su et al., 2022)*.
Guided inquiry encourages students to think critically about their imagined worlds *(Kuhlthau, Maniotes and Caspari 2015)*. Questions like "What do you picture when you think of Hogwarts?" spark creativity and help flesh out ideas. Reflection, through activities like journaling or group discussions, deepens understanding of creative processes.
By nurturing students' ability to visualize imaginary environments, educators empower them to engage more deeply with creative tasks. With thoughtful guidance, teachers help students overcome imagination barriers and unleash their boundless potential *(Eckhoff and Urbach 2008)*.
Finally, a culminating brainstorming session provided the perfect platform for students to consolidate their ideas and breathe life into their imagined environments. The collective duration of this transformative learning session spanned two hours.

2. Session 2 – Building the Hogwarts' lab.

In the second phase, the same group of the students was expected to build and re-create what they have imagined based on the previously developed blueprints. This stage required several meetings and was the longest one (30 hours in total), mainly if you start from scratch.

First, the students started to design the "Speaking Hat" (Figure 2), which included tailoring and programming activities of the voice and mouth (jaws) that moves synchronously with the audio. The Sorting Hat had to enable the distribution the 6-9 years-old students into four groups or, using Harry Potter language, four houses (Gryffindor, Hufflepuff, Ravenclaw and Slytherin).

Other objects 3D-printed/developed during this session were the three wizards' cup and lanterns for hanging candles which switched on using a magic wand.

It has been used the Arduino platform to let the speaking hat talk and the 3D printer for building the support inside the Hat and for the other objects. In the end, the room environment was transformed with a magic atmosphere (Figure 3).

3. Session 3 – Adventure starts: Hogwarts' lab opens the door.

The Hogwarts Lab's doors were opened to 6-9 years-old kids on 13th of April 2024. The group was constituted of 40 children distributed through "The Sorting Hat Ceremony" in four houses/group: Gryffindor, Hufflepuff, Ravenclaw and Slytherin. This allowed the older students to manage better the activities to be carried out.

During this event, the four houses managed different science experiments with light or with elements like soup and sugar. All the experiments selected were inspired to Harry Potters' Spells, like *Lumos* (Light), *Revelio* (invisible ink) and *Expecto Patronum* (3D hologram) (Figure 4). Of course, after each experiment, a short discussion was opened in order to help kids to understand the scientific reasons behind each of them.

The first group of the 14-15 years-old students were mentors and supporters of the kids involved. They were assigned as "prefect" to each house.

In the end, every kid received a chocolate frog as an award for succeeding in all the experiments. The overall duration of the event was 5 hours.

Outcomes (for you as an educator and for the students/participants of the activity)

1. Students' outcomes

- **Engagement and Interest in STEM:** Through the theme of Hogwarts and magic, students were deeply engaged in the learning process. This engagement facilitated their interest in STEM subjects, making complex scientific concepts more accessible and intriguing.
- **Hands-on Learning and Exploration:** The hands-on activities and experiments allowed students (working both as mentors and as kid-leaners) to actively participate in the learning process. By experiencing science in action, students gained a deeper understanding of scientific principles and phenomena.
- **Creativity and Imagination**: The magical setting of Hogwarts sparked students' creativity and imagination. They were encouraged to think outside the box and explore unconventional solutions to problems, fostering creativity and innovation.
- **Collaboration and Teamwork**: Working together on group activities encouraged collaboration and teamwork among students. They learned to communicate effectively, share ideas, and solve problems collectively, essential skills for success in STEM fields and beyond.
- **Critical Thinking and Problem-Solving:** The challenges presented during the event required students to think critically and apply critical thinking skills. They learned to analyze situations, evaluate options, and make informed decisions, enhancing their ability to tackle real-world problems.

2. Educators' considerations

As educators, implementing this learning activity provided several interesting outcomes:

- **Enhanced Engagement and Motivation**: The theme of Hogwarts and magic captivated students' attention (and not only), increasing their motivation to learn and participate actively in educational activities. The learning was also immersive for the educators.
- **Effective Use of Resources**: Searching and utilizing the resources to be used for the experiments enabled us, as educators, to create an immersive and engaging learning environment combining "magic" and science.
- **Professional Growth and Development**: Planning and executing the Adventure in Hogwarts's Laboratories event allowed us to enhance our teaching skills and creativity. We gained valuable experience designing interdisciplinary and experiential learning opportunities catering to diverse student interests and learning styles.
- **Community Engagement and Collaboration**: Collaborating with EU-Track, the Post-Confirmation youth group, and the Parish of San Domenico Savio of Terracina facilitated community engagement and networking. It provided an opportunity to work collaboratively with other stakeholders to promote STEM education and inspire young learners.

Annex - Pictures

Figure 1 – The "Speaking hat" designed and developed during the session 2

Figure 2 – The Three wizard cup [1], and lanterns for hanging candles

designed and developed during the session 2.

Figure 3 – The imaginary world: Hogwarts Lab

Figure 4 – Some pictures during the implementation of the activities with the kids

Annex - References

[1] https://www.printables.com/model/372328-triwizard-cup-pohar-tri-kouzelnikuprenasedlo-harry

Eckhoff, A. & J. Urbach (2008) Understanding imaginative thinking during childhood: Sociocultural conceptions of creativity and imaginative thought. *Early Childhood Education Journal,* 36**,** 179-185.

Kuhlthau, C. C., L. K. Maniotes & A. K. Caspari. 2015. *Guided inquiry: Learning in the 21st century*. Bloomsbury Publishing USA.

Lin, K.-Y., Yu, K.-C., Hsiao, H.-S., Chang, Y.-S., & Chien, Y.-H. (2018). Effects of web-based versus classroom-based STEM learning environments on the development of collaborative problem-solving skills in junior high school students. *International Journal of Technology and Design Education*. https://doi.org/10.1007/s10798-018-9488-6

Parno, Yuliati, L., Munfaridah, N., Ali, M., Rosyidah, F. U. N., & Indrasari, N. (2020). The effect of project based learning-STEM on problem solving skills for students in the topic of electromagnetic induction. *Journal of Physics: Conference Series*, *1521*(2), 022025. https://doi.org/10.1088/1742-6596/1521/2/022025

Suh, B.-E. (2013). A literature research on storytelling in mathematics education. *The Mathematical Education*, *52*(1), 65–82. https://doi.org/10.7468/mathedu.2013.52.1.065

Su, H., Zhang, J., Xie, M., & Zhao, M. (2022). The relationship between teachers' emotional intelligence and teaching for creativity: The mediating role of working engagement. *Frontiers in Psychology*, *13*, 1014905. https://doi.org/10.3389/fpsyg.2022.1014905