Challenge-based learning as a tool for creativity and talent expression

Francesca Fiore
University of Trento
Trento, Italy

Alessandra Scroccaro
University of Trento
Trento, Italy

Arianna Conci
HIT - Hub Innovazione Trentino
Trento, Italy

Alberto Montresor
University of Trento
Trento, Italy

Conference Key Areas: *3. Student Engagement. Building Communities and Coordination. 16. Curriculum Development, Engineering Skills, Lifelong Learning.*
Keywords: *challenge-based learning; hackathon; creativity; participatory learning; digital education*

ABSTRACT

After the stop caused by the pandemic, the University of Trento and its newly born FabLab reopened the doors to DigiEduHack (https://digieduhack.com/en/), the decentralized hackathon dedicated to the most pressing challenges of digital and innovative education. More than 30 multidisciplinary students have ventured into the design of innovative learning tools to meet the challenge thrown at them: prototyping educational board games; multimedia artefacts and installations at the intersection of big data, art and technology; co-designing festivals in a combination of art, science and fun; laboratory images to be presented in the classroom. In this short paper, as a case study one, we will outline the DigiEduHack initiative, focusing on the potential of a challenge-based approach in stimulating and strengthening introspection, creative thinking and talent's expression. Supported by a set of qualitative data collected before and after the event, this work reports an education case study and shows the progress and preliminary reflections of the students and educators involved.

1 INTRODUCTION

1.1 Challenge-based learning

The Challenged Based Learning approach (CBL) found fruitful context at the University of Trento that is open to innovating teaching and learning, is embedded in a dynamic innovation ecosystem and is pushed to spread out stakeholders' networks. The pedagogy of CBL can be inscribed in the constructivism perspective

doi:10.5821/conference-9788412322262.1259

where students are the main characters of their learning process: they identify, analyse, and design a solution that solves a real-world issue (Tecnologico de Monterrey, 2015). Due to the fact that students approach complex problems, the learning experience is multidisciplinary, it includes stakeholders' perspectives, and it aims to collaboratively find a sustainable solution (Kohn Rådberg et al. 2018). Professors are facilitators and help teams in the process of building guiding questions, gathering the right information, processing data, presenting solutions, and eventually executing the outcomes. Improving soft skills, self-reflection, and stimulating talent expression are another important asset of the CBL approach.

1.2 Hackathon

In the context of CBL, hackathons are one of the most widely used formats. They are highly engaging, limited-time competitions in which participants, divided into groups, design and develop a solution in the form of an idea or artefact to a proposed challenge. Rosell, Kumar and Shepherd (2014) identify four constitutive attributes of hackathons: (i) focus on activity caused by the limited nature of time and space, (ii) novelty in both *doing* (creating something that did not exist before) and *knowing* (learning something new) dimensions, (iii) collaboration stimulated by time constraint, and (iv) reward that can act as an incentive for participation and productivity. Given their attributes, they represent a subclass of the so-called Innovation Contests: competition of innovators who use their skills, experiences and creativity to provide a solution for a particular contest challenge defined by an organizer (Bullinger and Moeslein, 2010).

2 CASE STUDY

2.1 DigiEduHAck at the University of Trento

The UniTrento Fablab joined DigiEduhack, the international initiative of the European Institute of Innovation and Technology (EIT), for the third consecutive year, as part of the European Union Digital Education Action Plan that takes place worldwide on the same dates. As stated by their website, "DigiEduHack is a global movement dedicated to solving the toughest digital education challenges organisations face today, which is manifested in a 24-hour hackathon taking place simultaneously in major cities around the world." (DigiEduHack, n.d.).

After the virtual edition of last year, the third edition of the local DigiEduHack challenge, organized by the Department of Information Engineering and Computer Science - DISI in collaboration with SOI (School of Innovation) and HIT (Hub Innovazione Trentino), in the framework of the Boogie-U project (Boosting Innovation and Entrepreneurship through European Universities) returned again on 9th and 10th November 2021 at the University of Trento. Students applied in order to participate in this optional initiative.

More than 30 students with different backgrounds have tried their hand at designing innovative learning tools to meet the challenge launched by the organizers: prototyping educational board games; multimedia artefacts, installations at the

intersection of big data, art, and technology; festivals able to combine art, science, and fun; laboratory activities to be conducted in the classroom.

The five competing teams co-designed tools and activities, with the support of mentors from the SOI, HIT and the two FabLabs of the University of Trento and the University of Bolzano.

For the second, consecutive, year the winning team from the Trento edition also won in the global competition, this time with the project Hachi (https://digieduhack.com/en/solutions/hachi), an application for smartphones and tablets that can facilitate the understanding of abstract concepts thanks to augmented reality (AR).

2.2 DigiEduHack survey methodology

CBL, as a new model of learning, requires new assessment tools that monitor the self-reflection capabilities and soft skills acquisition process. Specifically, reflective learning tools can support this assessment through the process of remembering acts and events and then exploring why things went a certain way, and finally, taking possible actions for further experiences. In this context, we provided an online 15-question survey through which we explored, in three parts, the quality of the learning experience, the level of awareness about students' soft skills and the follow-up of the ideas developed during the hackathon. The soft skills' awareness was measured through the use of the IMI scale (Intrinsic Motivation Inventory), a multidimensional measurement device intended to assess participants' subjective experience (Ryan and Deci, 2000). The instrument assesses participants Interest/Enjoyment, Effort/Importance, Perceived Competence, Relatedness. In Paragraph 4, we discuss the main findings for each part of the survey. 12 out of 30 students answered the questionnaire.

3 FINDINGS

Analysing the results of the questionnaires, we found out that most of the participants (75%) judged the contribution of the mentors as really useful and 25% as useful. During the hackathon they succeeded in boosting team working leveraging two types of personal assets: expertise and charisma. Mentors have indeed been associated by some participants with the word “passion” and their presence has been labelled as “tangible and inspiring”. These findings further underline the positive role model embodied by mentors during hackathons (Nandi and Madernach, 2016). More in details, students also evaluated in a positive way:

- the teamwork, the cooperation and collaboration among students coming from different disciplinary backgrounds;
- the friendly competition vibes;
- the creativity shown by every group;
- the positive and playful learning atmosphere – still remaining serious and challenging.

In fact, also from the IMI scale, most of the students found the activity pleasant but also empowering, due to the collaborational aspects with their team and the feeling of competence given by their work mixed with the guidance received by the mentors. They felt challenged, but not under-challenged, during the activity and this leaded to a full commitment to the task they were performing, “losing track of time”.

With regard to what could be improved in the future, suggestions were mainly related to the event duration and its expected outcome. Despite time constraint being a key factor in hackathons, participants would have preferred to have at least 24 full hours for solving the proposed challenge, which means starting earlier in the morning or/and staying overnight. Moreover, they would have appreciated more precise indications on what the expected outcome should have been (e.g. tangible vs intangible artefacts), even using real examples of previous hackathons.

4 CONCLUSIONS

This short paper illustrates some results of the DigieduHack initiative, as an education case study. In designing the activity we focussed on creating a participatory learning experience for the participants. Our goal was to provide students with the tools to reflect upon their soft skills, strengthen creative thinking and best express their own potential.

This result was achieved by mixing the topic of the challenge, apparently very stimulating for them, but also the support given by the mentors during the challenge. The informal - but challenging - climate made students feel challenged but also empowered by the results they managed to obtain, perhaps initially unexpected even for them given the limited time available. Reading their feedback in the questionnaires was very helpful for the research team, also in view of future events with this format. We believe that this combination has been successful in stimulating their creativity but at the same time increasing their awareness about the abilities and the results they can obtain.

5 ACKNOWLEGMENTS

The researchers wish to acknowledge some colleagues that have been instrumental in developing the DigiEduHack event in our University:

- the FabLab UniTrento and all its staff for the space and the great effort and contribution;
- HIT - Hub Innovazione Trentino;
- SOI - School of Innovation;
- Boogie-U project funded by HEI Innovate;
- ECIU (European Consortium of Innovative Universities) for the research on CBL;
- all the mentors and students who participated.

REFERENCES

[1] Observatory Tecnológico of Educational de Monterrey (2015, October), Edu Trends: Challenge Based Learning, *Observatory Tecnológico of Educational de Monterrey.*

[2] Kohn Rådberg, K., Lundqvist, U., Malmqvist, J., and Hagvall Svensson, O. (2020), From CDIO to challenge-based learning experiences–expanding student learning as well as societal impact? *European Journal of Engineering Education*, 45(1), pp. 22-37.

[3] Rosell, B., Kumar, S., and Shepherd, J. (2014, May), Unleashing innovation through internal hackathons, *2014 IEEE Innovations in Technology Conference*, pp. 1-8.

[4] Bullinger, A.C., and Moeslein, K. M. (2010), Online innovation Contests – Where are we? *Proceedings of the Sixteenth Americas Conference on Information Systems (AMCIS)*, Paper 28, Lima.

[5] DigiEduHack (n.d.), *What is DigiEduHack?* <https://digieduhack.com/it/faq/hosts/general-information-about-the-digieduhack/what-is-digieduhack>

[6] Ryan, R.M. and Deci, E.L. (2000), Self-determination theory and the facilitation of intrinsic motivation, social development, and well being, *American Psychologist*, 55, pp. 68–78.

[7] Nandi, A., and Mandernach, M. (2016, February), Hackathons as an informal learning platform, *Proceedings of the 47th ACM Technical Symposium on Computing Science Education*, pp. 346-351.