Case Report

Hacking Higher Education: Rethinking the EduHack Course

Fabrizio Barpi [1,*,†] **, Davide Dalmazzo** [2,†] **, Antonella De Blasio** [3,†] **and Fiorella Vinci** [4,†]

1. Department of Structural, Geotechnical and Building Engineering, Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129 Torino, Italy
2. Department of Environment, Land and Infrastructure Engineering, Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129 Torino, Italy; davide.dalmazzo@polito.it
3. Faculty of Arts and Humanities, eCampus University, via Isimbardi 10, 22060 Novedrate, Italy; antonella.deblasio@uniecampus.it
4. School of Law, eCampus University, via Isimbardi 10, 22060 Novedrate, Italy; fiorella.vinci@uniecampus.it
* Correspondence: fabrizio.barpi@polito.it; Tel.: +39-0110904886
† These authors contributed equally to this work.

Abstract: The paper presents a report that discuss the experience of participation of the authors in the EduHack, an online course designed to train university teachers in the use of digital techniques and learning strategies. This study highlights two issues of great interest in pandemic times. The first one is the structure and the organization of the EduHack course with some suggestions related to its improvement; the second one is Drag&Fly, the project idea of an e-learning web platform developed by the authors during the collaborative part of the course. The experience of participation to EduHack course has been analyzed by authors using concepts and categories of analysis widespread in the pragmatic theoretical tradition, enhancing the possibility of changing the teachers' approach to the design and the implementation of a higher education e-learning course.

Keywords: EduHack; distance education; e-learning; higher education; educational challenge COVID-19; virtual learning environments; online learning design

1. Introduction

At present e-learning courses have increased their importance and a growing number of Italian universities have begun to adopt them mainly due to the pandemic, so it is crucial to explore the best ways of using this methodology for higher education (It should be noted that there are currently eleven entirely online universities in Italy [1]).

This work, started from the participation of the authors in the EduHack course during the first months of 2020, highlights the structure and the organization of the course and presents Drag&Fly, the project idea developed by the authors during the collaborative part of the course, called EduHackathon. The main goal is to promote a reflection on e-learning tools and methods specifically designed for university teaching.

Using concepts and categories of analysis widespread in the pragmatic theoretical tradition [2–4] and adopting a qualitative analysis method based on the reconstruction of the experience [5], the authors share their reflections on the learning experience generated by participating in the EduHack course.

From the participation in the EduHack course, the need to select the most effective tools for the specific teaching of the individual disciplines [2–4] emerges. Starting from this consideration, a changing on the teachers' approach to the design and the implementation of a higher education e-learning course is defined. In this frame, the experimentation of an e-learning web platform, called Drag&Fly, was born, which allows individual teachers to design a personalized course based on their teaching needs and specific classes of students. Drag&Fly—an educational environment that integrates multiple resources and tools—can give the teacher a simple way to design his own course and can improve

the interaction between teachers and students and between students themselves (access to open environments and opportunities for peer-to-peer collaboration).

This paper is structured in four parts. The EduHack course is first described, specifically in relation to the Italian edition, and its two phases are illustrated. During the first phase (online course), learners can browse several activities in four well-defined areas (content, teaching strategy, assessment, and engaging learners). The second phase consisted in a hands-on session called EduHackathon, initially conceived in presence but then organized online following the pandemic issue. Here learners, in small interdisciplinary groups—starting from the activities they have run though the online course—try to develop a set of specific ideas to improve their teaching through digital tools.

The second part presents Drag&Fly (drag & you're online!), the authors' proposal developed during the EduHackathon, a mock-up of an e-learning web platform. Subsequently, Section 4 describes the case report through a pragmatic and cognitive framework that reconstructs the perception of the experience of the participants and the change that generates in their way of understanding teaching. Finally, the study identifies some possible improvements of the EduHack course in order to design and organize learning strategies more able to enhance an effective interaction between teacher and students.

2. EduHack

2.1. Description of the EduHack Course

The EduHack is an online course specifically designed for university educators who wish to learn how to produce digitally-supported learning experiences and to experiment with innovative models and approaches of teaching and learning [6]. EduHack (Hacking Education through e-learning and Open Education) is an Erasmus+ project (Cooperation for innovation and the exchange of good practices/KA203—Strategic partnership) born in 2017 from the collaboration between three university institutions (Politecnico di Torino/Nexa Center for Internet and Society [7], Universidad Internacional de La Rioja and Coventry University) and two private subjects (Audiovisual Technologies, Informatics and Telecommunications and Knowledge Innovation Center).

The EduHack project implements the provisions of the European Commission regarding the Opening Up Education proposal and aims to provide teachers with the tools to develop e-learning skills through the creation and promotion of online training activities to ensure that teachers acquire the skills necessary to introduce digital tools in their teaching.

The structure of the EduHack course includes an individual part, that can be developed in a virtual environment, and a collaborative part named EduHackathon, that can be developed in presence. The individual part is based on a *read* (articles, websites, blog, books), *watch* (audio and video material), *do* (post ideas on the EduHack wall) approach [6,8,9] and is articulated in four main topics, briefly described below.

1. *Digital Resources*. This section is dedicated to the exam of the Open Educational Resources (OER) and their use in e-learning courses. It concerns the modification of existing digital content, the creation and organization of digital educational resources, and the application of open licenses to resources.
2. *Teaching*. The teaching section concerns the design of a course based on e-learning strategies; the implementation of ICT-supported collaborative learning; the e-moderation as the focus of all e-learning activities; the cooperative creation among students to organize outputs such as written resources, videos and audio files; the integration of games in the e-learning activities in order to improve learners engagement.
3. *Assessment*. This part is dedicated to the exploration of digitally supported assessment strategies; to experiment with different technologies the several phases of formative assessment and to personalize tools to provide targeted feedback to learners. Feedback is an essential part of effective learning, it helps students to understand the subject being studied and gives them clear guidance on how to improve their learning.

4. *Empowering Learners*. This section is related to the critical evaluation of online tools. Technologies are always inspired by values and principles that, whether consciously or not, may result in design choices and operational models that privilege certain views and attitudes. Digital technologies may enable the development of so-called personalized approaches, where learning experiences adapt to the level, pace, and preferences of learners. Social media can be extremely useful as an asset for teaching and learning but it is essential to take into account a wider range of implications, for example, it is important to understand what is being given away when using "for-free" online services. Another central point is to check technical accessibility of platforms and resources (i.e., all rights reserved vs. public domain). It seems equally important to bring to the foreground those design choices that can allow people with sensory, physical, and cognitive impairments to access and benefit from digital content.

This first individual part of the course lasts four weeks, during which, the attendees are free to choose when to carry out their activities. For each activity it is requested to reflect on the learning experience and to publish a post about the activity developed on a shared blogging space called *EduHack wall* [10]. The wall and the main topics are an open and collaborative learning environment characterized by a wide accessibility of the contents, by scientific relevance since the different activities proposed are supported by studies which highlight their advantages and limitations and by a great experimentation. The publication of the posts promotes the attractiveness of the developed activities, their sharing, and a prompt feedback to the activity developed and published by another participant.

During the EduHackathon (the second part of the course, the collaborative one), participants collaboratively develop ideas to create prototype courses and digital resources or come up with digitally supported and trans-disciplinary solutions for tackling challenges concerning the learning environment in their own university [11]. Ideas, inspired by the EduHack online course contents, should be creative and oriented to improve teaching through digital tools. The proposed ideas should be presented briefly and posted in a dedicated blog environment to be discussed and selected by participants forming small interdisciplinary working teams. During the EduHackathon, each working team is expected to develop the project idea to show its feasibility and the potential impact on teaching activities.

2.2. Italian EduHackathon

The first Italian EduHackathon was organized and promoted by the Nexa Center for Internet and Society of the Politecnico di Torino [12,13]. Due to the COVID-19 emergency, the event at Politecnico di Torino was held entirely online on 27–28 April 2020, experiencing a form of participatory distance event in which 20 teachers from different disciplines and from different universities (Politecnico di Torino, University of Genoa and eCampus University) actively took part.

The participants to the EduHack, on a voluntary basis, prepared proposals to design new digitally-supported learning experiences to teaching that were voted by the participants themselves. The best five ideas were selected, and working groups were formed based on the preferences given. Then, under the guidance of experts and facilitators, the groups worked collaboratively in a hands-on session for the development of the following five projects and tools to improve teaching and learning in digital environments: *Collaborative learning*, *LEGO® game*, Drag&Fly, *Decameroom*, and *Path to the Future*. Each group started working on the development of their project idea, within its own dedicated virtual classroom.

The discussion that develops within the groups triggers a comparison between the various project ideas in an open and collaborative way. The collection of comments and feedback transforms each initial project idea into a more defined educational proposal that is presented to all participants during the last day of the course.

3. Authors Proposal: Drag&Fly (Drag and You're Online!)

The proposal from the authors concerns the design of a fully customizable platform for digital object-oriented teaching where it is possible to drag, hence the name of the project Drag&Fly [14], various plug-ins in a "lecture" environment that allows (see Figure 1):

- video recording
- private and public chat
- separate audio recording for Podcasts
- digital board
- separate (breakout) rooms to work with subclasses
- external sources (webcam, graphic drawing tablet)
- screen sharing
- links to video and cloud storage
- chats and comments (even after the end of the lesson)
- virtual wall
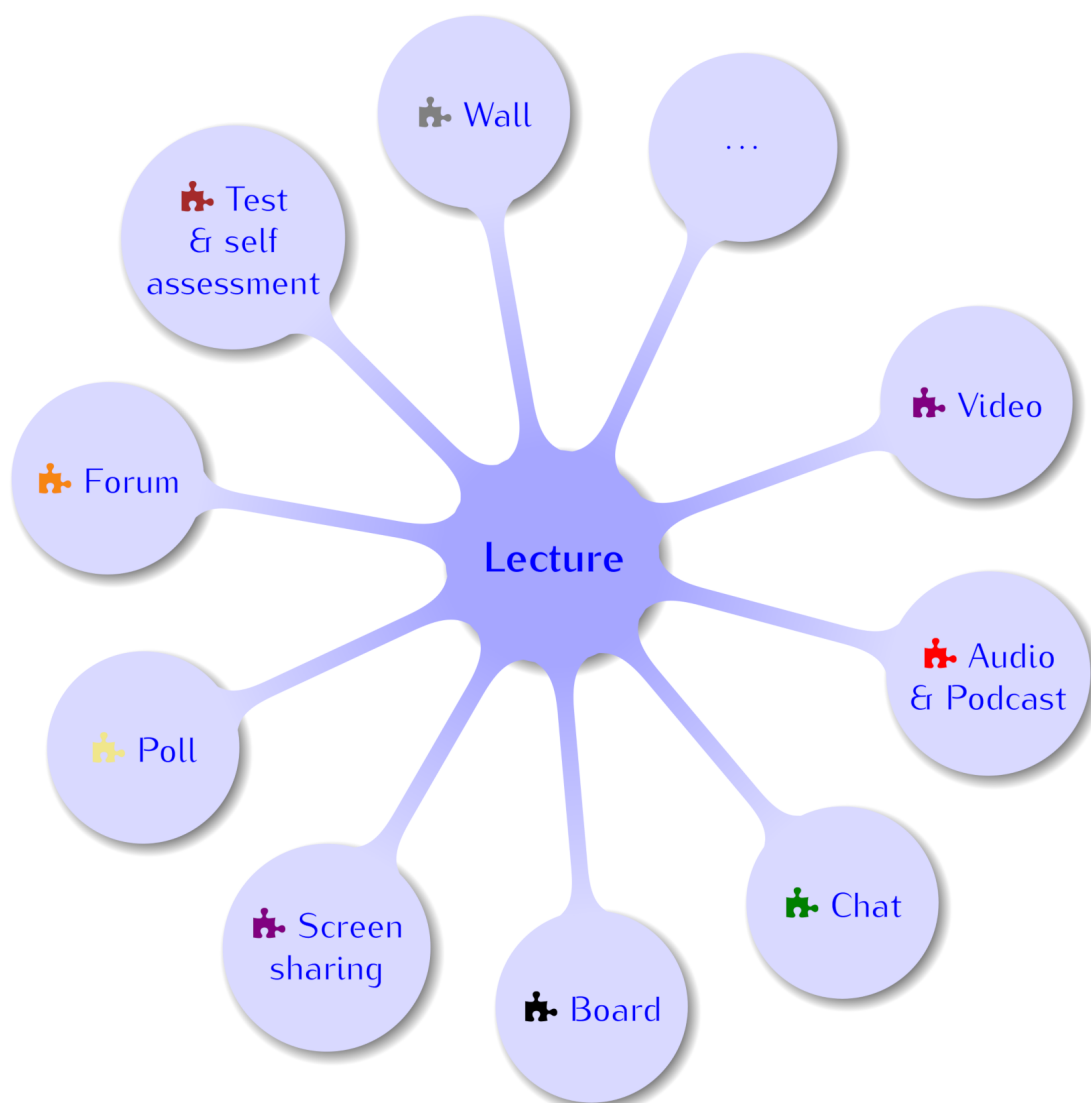- space for feedback and for end of lesson tests
- student (self) assessment

Figure 1. Drag&Fly scheme.

The aim is to easily create, but with quality standards, a digital lesson environment customized according to the different needs of the teacher and students, a sort of living environment available even after the lecture has ended.

During this period the Authors tried several web platforms and apps observing the lack of features proposed in Drag&Fly. It is important to remark that different teachers

from different fields and disciplines could need different digital tools. Drag&Fly is exactly conceived and designed to accomplish all these needs trough digital tools that could be set up in many different ways for various purposes. Figure 1 is itself an example: adding a plug-in like "Forum" or "Wall" it is possible to build a platform to personalize the interaction between students and teachers and between students and students [15]. The same adding a plug-in like "Chat". Moreover, using a plug-in as "Test and self assessment" it is possible to encourage a self evaluation and, possibly, a further interaction with the teacher to understand and evaluate the results.

Drag&Fly moves away from rigid and predefined templates peculiar to online platform that are created with a social vocation rather than an educational one. It offers a personalized approach, where learning experiences adapt to the level and pace of learners and the different class-groups that are formed. The interaction between the teacher and the students becomes a motivation for the teacher to design (and redesign) the course in order to facilitate the use of its contents, even starting from student feedback. This modality redefines the teaching community by enhancing the relationship of teaching to scholarship and critically reviewing a limited concept of who the university professor *is* and *could be* [16].

The multidisciplinary composition of the working group highlighted specific educational needs for the different disciplines which, therefore requiring different digital tools. The multidisciplinary team suggest developing an environment resulting from the collaboration of teaching theory, experts in digital technologies and human-machine interface, IT security and web programmers, students, and translators. The ideal e-learning environment is conceived as customizable by the teacher who can design and plan his own course by choosing the tools and teaching strategies most suitable for him.

From a technical point of view, the application will be based on a client/server architecture composed of:

1. *Client app*

    - A cross-platform web application based on the JavaScript framework (Ionic Framework) accessible at a link similar to https://dragfly.com.
    - The application will be divided into modules (plugins), where each module implements a functionality: it will be possible to expand the functionality of the application by developing new modules.
    - Authentication with Single Sign-On (SSO) using the credentials of the institutional account.

2. *Server implementation*

    - A web server (Apache) to provide the web application to clients and manage access to the database.
    - A document-based NoSQL (MongoDB) database for storing data, users, configurations, content indexes.
    - A multimedia server (Plex) for storing and sharing multimedia content (podcasts, video recordings...).

An example of the application interface is presented in Figure 2. It should be noted that several platforms for online teaching are social media adapted to teaching; therefore, they are born with very different purposes. During this period the Authors tried several web platforms and apps observing the lack of features proposed by Drag&Fly. The added value of the idea is to have a highly customizable open source tool (with *ad hoc* tools or already present and available on the web to be integrated into the platform), which adapts to the needs of the teacher and students.
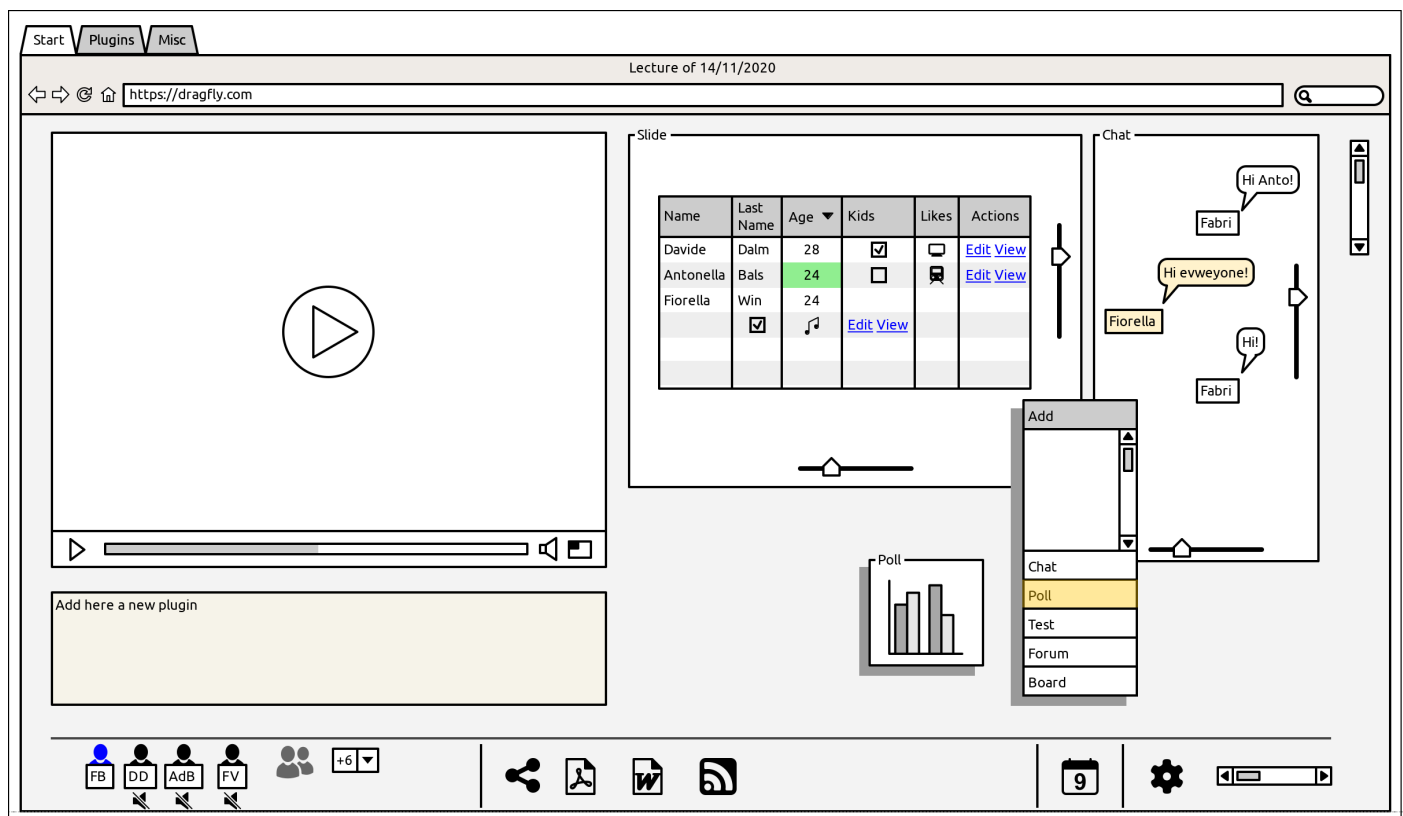
Figure 2. Mockup of the Graphical User Interface (GUI) as conceived during EduHackathon.

4. Analysis of the Experience

The experience derived from the EduHack course is perceived by the participants as a transformative pedagogical experience, i.e., as an experience that modifies the approach of individual teachers with respect to teaching. As many researchers have highlighted [17], the role of educator must not be that of transferring knowledge but that of becoming a mediator and a facilitator, an active coprotagonist in the training process. The experience lived by the authors during the EduHack course recalls Dewey's concept of experience.

In 1916 John Dewey illustrated the concept of experience in which he highlighted the interdependence of two actions: *undergo* and *try*. According to Dewey, experience lies in the duration, in cognitive and pragmatic existing frames. However, far from reproducing these frames, the experience modifies and adapts them both to external conditions, which are potentially always changing and to the needs and desires of the agents [18]. The American educational reformer considers the experience a continuous awareness of change, and this change generates reflexivity [19]. In a similar perspective of analysis, the EduHack course highlights the change in *teachers' mindsets* produced by reflections on the potential of a cooperative e-learning environment.

Experimenting with a way of working, tools let us rethink the whole work [20]. Considering the usability of tools, the relationship between teacher and learner is important; technology makes this relationship explicit and effective.

During the EduHack course stimulates each participant to explain and set their own didactic objectives [21,22]. This is achieved through:

- the progressive acquisition of knowledge that is related to techniques and software for the design of e-learning environments;
- the EduHack wall, that operates as a common open portfolio, enabling participants to show and communicate their progresses [9], and above all to discuss the applicability of the tools and any critical issues;
- the actual testing of the e-learning tools during the EduHackathon.

The first part of the course, the one developed through participation in a virtual learning environment, allows students to experience an open, collaborative, and creative learning environment, knowing the experiences of others and test themselves [23].

The first part of the course allows learners to experience an open, collaborative, and creative learning environment, knowing the experiences of others and test themselves. In this phase, cooperative methods of working are learned and specific teaching practices are activated. Each teacher becomes aware of the use he can potentially make of the multiple digital teaching tools, relating the tool to their own discipline, course, and students. As also emerges from the posts published on the wall by the participants, the open and collaborative method of the virtual environment does exclusively a communicative action: on the one hand, it raises problems, on the other one, it activates possible solutions [24,25]. In the passage from the definition of the problem to its solution, the virtual learning environment, as highlighted by Van Dijck et al. [26], contributes to bringing out the plasticity of the imagined teaching method and raises questions about the pedagogical effects of e-learning, about the most suitable teaching practices in relation to the pedagogical purposes that we want to pursue referring to teacher-knowledge or teacher-knowledge-pupil relationships [19,27].

During EduHackathon, the transformative experience emerges and occurs in two successive steps. The first is characterized by the teachers' understanding of their teaching needs and by the idea of a modeling, dynamic, and flexible learning environment by both the teacher and the students. The second phase is the one that develops during the two days dedicated to the EduHackathon, in which participants test the feasibility of their ideas and work on their real design. In this phase, the working group, which is spontaneously gathered around the preferred idea (e.g., Drag&Fly), shares the project and cooperates in its design. Each member of the group expresses and shares with the others his own needs and didactic practices. A community of practices is now established, that is, a community no longer united exclusively by shared needs and common views of the problems but by common questions on the innovation of university knowledge [28].

From the relationship among the members of the Drag&Fly group comes out the proactive dimension of the transformative experience. The experiences shared by each member define the pragmatic awareness of teaching needs, an evolving awareness based on listening to the experiences of others and oriented to research and experiment with innovative solutions. These shared experiences redefine the needs and arouse creativity and desire to experiment with solutions created in common. According to some scholars, learning is most productive when the environment encourages a multitude of different perspectives in addition to validation, social discussion, and real-world application [29].

5. Some Proposals to Improve EduHack

This section is dedicated to the identification of the possible improvements of the course, to the understanding of the logic of the transformation of the experience activated by it, and to search for more effective learning possibilities [30]. According to the authors, the following activities are particularly relevant for this aim and have been discussed with some proposals.

The *read*, *watch*, *do* approach, which characterizes the structure of the EduHack course, is really useful but the following improvements could be proposed:

- *read*: the student reads (at home) the slides
- *face-to-face tutoring*
- *watch*: the student watches some videos (one done by the teacher, the others on Youtube)
- *face-to-face tutoring*
- *do*: the student carries out activities assigned by the teacher (on which they are evaluated);
- *feedback and evaluation unit*
- *assessment* with ePortfolios and blogs

After the read and watch activity a *face-to-face tutoring* should be provided to answer the students' questions; moreover, there will be constant *feedback* and finally the *evaluation* of the teaching unit.

A further improvement concerns the introduction of a new section, called *Online Teaching*, in addition to *Digital Resources*, *Teaching*, *Assessment* and *Empowering Learners*. A preliminary suggestion for its subsections, to be deepened from a pedagogical and technological point of view, is:

- *How to teach online*. The shift from a face-to-face teaching to an entire online course is a crucial point to understand and develop. For this reason, a set of good practices could be examined in detail. The consequences of online teaching could also be another issue to discuss, taking into account the large amount of literature available on this topic, it is worth mentioning here A.W. Bates [31].
- *Evaluate available video conferencing software*. This item could discuss several tools available to teach online, taking into account the different needs of institutions and common users. A university or research center probably needs open source software to be installed on their servers (an example is BigBlueButton [32], chosen by Politecnico di Torino during the COVID-19 emergency, or OpenMeetings [33], among others). A single user or a small group is more interested in a simple software or app ready to use without concerns about their license (Microsoft Teams, Jitsi, Skype, Whereby, WhatsApp, Zoom; many others are easily found using common search engines). Wikipedia lists several web conferencing software with the corresponding licenses [34].
- *Video conferencing security issues*. Vulnerabilities of web conferencing platforms are a new concern to be addressed. It is well known that during the COVID-19 emergency a software provider patched a vulnerability that could have allowed an attacker to find and join an active meeting [35–37]. Hence, it is important to critically evaluate online tools and discover the cost of free platforms for web conferencing services.
- *Quality teaching in a digital age*. This point is about best practices of teaching online and should cover the needs of learners in a digital age [31]. New technologies require a new design of traditional teaching, taking into account the most appropriate mode of delivery, based on teaching philosophy, the needs of students, the demands of the discipline, and the resources available.

It is worth noting that the course is very challenging, even if the amount of time required to read the material, watch the videos, and complete the activities is probably more than the one expected when the course was designed. An updated version of the course should consider this aspect, in particular if a new section is added. Moreover, several sources provided by the course were not free or open source (i.e., some books, software, and digital tools) so that it is difficult to try or examine them.

6. Conclusions

The experience of EduHack shows the opportunity to reflect on specific digital teaching skills for universities, which do not only concern the technical knowledge but also the new pedagogical approach. The members of the Drag&Fly working group, sharing their educational needs and trying to create a model of a virtual educational environment, constitute a community of practices.

As pointed out by several scholars [22]:

Educational systems are facing a transformation process that includes not only changes in their methodologies and techniques but deep evolution of teachers' mindsets and social perceptions. The need for a dynamic, flexible, and open learning environment is creating the necessity of more complex but enriched principles for teaching and learning.

Therefore, starting from this perspective, it is clear that Drag&Fly does not represent a technological innovation but the possibility of modeling technological innovation for a new collaborative and flexible teaching. The innovative idea is to show that it is possible

to create a functional and complete didactic environment, which does not compromise the educational relationship but makes it the core of the pedagogical project. This paper is not presenting a quantitative research, and it does not describe a project already carried out but a prototype that makes an innovative use of online tools.

This contribution, rather than offering defined answers, starting from theoretical reflections and skills acquired during the EduHack course, aims to describe an ideal model of educational environment, and therefore wants to be a way to promote and stimulate teachers to change their approach to the design and implementation of a higher education course.

Abbreviations

The following abbreviations are used in this manuscript:

COVID-19	Coronavirus disease 2019
GUI	Graphical User Interface
ICT	Information and Communications Technology
IT	Information Technology
OER	Open Educational Resources

References

1. Ministero dell'Istruzione; dell'Università e della Ricerca. Italian Online University. Available online: https://unitelematiche.it/universita-online/ (accessed on 30 September 2020).
2. Schön, D.A. *The Reflective Practitioner: How Professionals Think in Action*; Taylor & Francis: Abingdon, UK, 2017.
3. Wenger, E. *Communities of Practice: Learning, Meaning and Identity*; Cambridge University Press: Cambridge, UK, 2006.
4. Mortari, L. *Apprendere Dall'esperienza. Il Pensare Riflessivo Nella Formazione*; Carocci: Rome, Italy, 2003.
5. Lury, C.; Wakeford, N. *Inventive Methods The Happening of the Social*; Routledge: London, UK, 2012.
6. EduHack Website. Available online: https://eduhack.eu/ (accessed on 30 September 2020).
7. EU Project Information: Hacking Education through eLearning and Open Education. Available online: https://nexa.polito.it/edu-hack (accessed on 30 September 2020).
8. Nascimbeni, F. The Contribution of Openness to Transforming Education. *Eur. J. Educat.* **2015**, *50*, 400–403. [CrossRef]
9. Nascimbeni, F.; Alonso, J.; Sanz, O.; Burgos, D. Read, Watch, Do: Developing Digital Competence for University Educators. In *Higher Education Learning Methodologies and Technologies Online*; Burgos, D., Cimitile, M., Ducange, P., Pecori, R., Picerno, P., Raviolo, P., Stracke, C.M., Eds.; Springer International Publishing: Berlin/Heidelberg, Germany, 2019; pp. 80–93.
10. EduHack Wall Website. Available online: https://wall-it.eduhack.eu/ (accessed on 30 September 2020).
11. EduHackathon Website. Available online: https://eduhack.eu/eduhackathon/ (accessed on 30 September 2020).
12. Politecnico di Torino EduHack Website. Available online: https://polito.eduhack.eu/ (accessed on 30 September 2020).
13. Nexa Centre for Internet & Society of Politecnico di Torino. Available online: https://nexa.polito.it/ (accessed on 30 September 2020).
14. Barpi, F.; Dalmazzo, D.; De Blasio, A.; Vinci, F. Drag&Fly Project Website. Available online: https://polito.eduhack.eu/dragfly-trascina-sei-online/ (accessed on 30 September 2020).
15. Moore, M. Three types of interaction. *Am. J. Distance Educ.* **1989**, *3*, 1–6.
16. Hirsch, B.D. Digital Humanities and the Place of Pedagogy. In *Digital Humanities Pedagogy: Practices, Principles and Politics*; Hirsch, B.D., Ed.; Open Book Publishers: Cambridge, UK, 2012; pp. 3–30.
17. Rivoltella, P.C.; Rossi, P. *L'agire Didattico*; Editrice La Scuola: Brescia, Italy, 2012.

18.   Dewey, J. *Experience and Education*; Kappa Delta Pi: New York, NY, USA, 1938.
19.   Donati, P.P. La formazione come relazione sociale in una Learning Society, Scuola e Società. In *Le Istituzioni Scolastiche in Italia dall'età Moderna al Futuro*; Gili, G., Lupo, M., Zilli, I., Eds.; Edizioni Scientifiche Italiane: Napoli, Italy, 2002; pp. 443–478.
20.   Dewey, J. *Democracy and Education: An Introduction to the Philosophy of Education*; Macmillan: New York, NY, USA, 1916.
21.   Hughes, J. Letting in the Trojan mouse: Using an eportfolio system to re-think pedagogy. Ascilite, Hello! Where are you in the Landscape of Educational Technology? Available online: https://ascilite.org/conferences/melbourne08/procs/hughes.pdf (accessed on 30 September 2020).
22.   Galés, L.N.; Gallon, R. Educational Agility. In *Rethinking Teacher Education for the 21st Century*; Kowalczuk-Walêdziak, M., Korzeniecka-Bondar, A., Lauwers, W.D.G., Eds.; Verlag Barbara Budrich: Leverkusen, Germany, 2019; pp. 98–110. [CrossRef]
23.   Fry, H.; Ketteridge, S.; Marshall, S. *A Handbook for Teaching and Learning in Higher Education: Enhancing Academic Practice*; Routledge: Abingdon, UK, 2008.
24.   Grange Sergi, T.; Onorati, M.G. *La Sfida Della Comunicazione all'educazione. Prospettive di Media Education*; Franco Angel: Milano, Italy, 2007.
25.   Morcellini, M.; Rivoltella, P.C. *La Sapienza di Comunicare. Dieci Anni di Media Education in Italia ed Europa*; Erickson: Trento, Italy, 2007.
26.   Van Dijck, T.; Poell, T.; De Waal, M. *The Platform Society: Public Values in a Connective World*; Oxford University Press: New York, NY, USA, 2018.
27.   Therriault, G.; Baillet, D.; Carnus, M.F.; Vincent, V. *Rapport Au(x) Savoir(s) de L'insegnant et de L'apprenant, Une Enigmatique Rencontre*; De Boeck: Bruxelles, Belgium, 2017.
28.   Williamson, B. The hidden architecture of higher education: building a big data infrastructure for the 'smarter university'. *Int. J. Educ. Technol. High. Educ.* **2018**, *15*. [CrossRef]
29.   Anderson, T.; Dron, J. Three generations of distance education pedagogy. *Int. Rev. Res. Open Distrib. Learn.* **2011**, *12*, 80–97. [CrossRef]
30.   Savin-Baden, M.; McFarland, L.; Savin-Baden, J. Learning Spaces, Agency and Notions of Improvement: What Influences Thinking and Practices about Teaching and Learning in Higher Education? An Interpretive Meta-Ethnography. *Lond. Rev. Educ.* **2008**, *6*, 211–227. [CrossRef]
31.   Bates, A.W. *Teaching in a Digital Age: Guidelines for Designing Teaching and Learning for a Digital Age*; Tony Bates Associates Ltd.: Vancouver, BC, Canada, 2015.
32.   BigBlueButton. Open Source Web Conferencing. Available online: https://bigbluebutton.org/ (accessed on 30 September 2020).
33.   Apache OpenMeetings Project. Video Conferencing Tool. Available online: https://openmeetings.apache.org/ (accessed on 30 September 2020).
34.   Wikipedia. Comparison of Web Conferencing Software. Available online: https://en.wikipedia.org/wiki/Comparison_of_web_conferencing_software (accessed on 30 September 2020).
35.   Blog di Paolo Attivissimo. Quanto Sono Sicure le Videoconferenze. Available online: https://attivissimo.blogspot.com/2020/03/quanto-sono-sicure-le-videoconferenze.html (accessed on 30 September 2020).
36.   Cox, J. Zoom Removes Code That Sends Data to Facebook. Available online: https://www.vice.com/en_us/article/z3b745/zoom-removes-code-that-sends-data-to-facebook (accessed on 30 September 2020).
37.   Nagel, M. 3 New Ways We're Combatting Meeting Disruptions. Available online: https://blog.zoom.us/new-ways-to-combat-zoom-meeting-disruptions/ (accessed on 22 November 2010).