

The 18<sup>th</sup> International Scientific Conference  
eLearning and Software for Education  
Bucharest, May 12-13, 2022

10.12753/2066-026X-22-000

**ADVANTAGES AND DISADVANTAGES OF DIGITAL REMOTE EDUCATION IN  
THE SECURITY AND DEFENCE CONTEXTS**

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**Abstract:** *The COVID-19 pandemic has caused many changes in teaching and learning, ranging from forced digitalization to the diminution of human interaction. Thus, stakeholders have proposed various solutions, considering both the need to be operative in a short time after the first virus outbreak, and the necessity to develop long-term plans after the immediacy of the emergency. In this paper, both positive and negative features of digital remote education are considered by analyzing a questionnaire with tools aimed at detecting strengths, weaknesses, opportunities, threats. Furthermore, a benchmarking of teachers' practices and actions is developed, to compare different solutions proposed by instructors in various Member States. As part of the project DIGICODE and in the framework of the Digital European Action Plan by the European Union, this study suggests that all stakeholders should perceive these changes as a reform and not as a revolution, to be maintained in the close future of education. Furthermore, the benchmarking analysis should help future decision makers in taking the best from every educational action taken during the COVID-19 pandemic to advantage the students. This reform would probably require a change in some policies, not only from university stakeholders, but also from other institutions such as governments.*

**Keywords:** *digital education; learning benchmarking; organization strategy; remote education; security and defence; teacher training*

## I. INTRODUCTION

The COVID-19 pandemic strongly affected education, forcing a steady switch in teaching and learning modalities to digital and remote ones (Hodges et al., 2020). During this period, the initial emergency setting evolved in more structured ways of providing didactics, to face the restrictions the pandemic imposed (Galluzzi et al., 2021). Restrictions hit every educational sector, including security

and defence, which is a context of considerable importance nowadays, to fight terrorism, cybersecurity and other threats, and it is characterized by new international opportunities. This fosters collaboration between armies in the training of young officers (Marchisio and Spinello, 2021). In particular, the use of e-learning as a wide support tool, also for internationalization, is recognized as strategic far beyond its usefulness in contexts where distance learning is considered. In fact, some authors investigated the major challenges from a student and academic personnel perspective using e-learning (Mihalova, 2006). Proper digital competences, fine-tuned to education, are required to find the best possible way of providing digital education. Unfortunately, both students (Buffardi and Taddeo, 2017) and educators (Tomczyk, 2021) tend to overestimate digital skills, both their own and the ones of the others, and this results in a biased perception of a correct and aware use of digital tools. In order to offer a long-term strategy for high-quality, inclusive and accessible digital education, the European Union published in 2020 the Digital Education Action Plan, known as DEAP (European Education Area, 2020), which aims at fostering the development of a high-performing digital education ecosystem and enhancing digital skills and competences for the digital transformation. Moreover, in 2021, the project for Digital Competences for Improving Security and Defence Education, DIGICODE, was born. DIGICODE specifically aims at giving value to the connection between education and digital competences, involving several European Member States.

In this paper the benefits and limitations of digital and remote education are debated by using analytic tools such as SWOT analysis and benchmark measuring. The paper analyses the responses to a questionnaire administered to more than 500 university teachers from fifteen countries involved in the area of security and defence, and properly distributed among age, gender, field and experience. The paper shows, on one hand, the peculiarities of e-learning from the SWOT paradigm (Strengths, Weaknesses, Opportunities, Threats); on the other hand, an overview of teachers' preferences, action and responses to certain critical issues. The paper is structured as follows: Section II presents the theoretical framework, while Section III is devoted to the explanation of the research question and methodology. In Section IV the SWOT analysis is developed and fully described in all its components, while the remote learning benchmarking constitutes Section V. Finally, Section VI contains some concluding remarks.

## II. THEORETICAL FRAMEWORK

Digital education has been studied long before the pandemic outbreak, since the widespread availability of computers and connections in the 1990s and in the 2000s. Digital education further expanded when mobile devices started to be highly performant, in the 2010s. The technological changes and the evolving needs in education have always been related, the technical aspects have been considered together with educational purposes, given the scope of their use in didactics (Goldin and Katz, 2009). Literature reviews show that collaboration and creativity are as important as information management and communication (Van Laar et al., 2017), and these skills are very important to face the demands of the close future society, in which also higher education institutions have to evolve to better align teaching and learning in the light of these new demands (Ehlers, 2020). Furthermore, transversal skills such as critical thinking and problem solving are useful also outside the educational settings, since they can contribute to create awareness in the citizens belonging to the world of tomorrow (Fissore, et al. 2021).

Also the teaching professions face rapidly changing demands. Educators require a broad set of competences and the European framework DigCompEdu (Carretero Gomez, Vuorikari and Punie 2017) aims at capturing educator-specific digital competences in different areas: professional engagement, creating and sharing digital resources, managing the use of digital tools in teaching and learning, assessment, empowering learners and facilitating learners' digital competence.

Contextualizing the above in the security and defence framework, (Wozniak, 2021) the need arises for innovative teaching methods, making it necessary to integrate modern equipment with specialized training to boost the effectiveness of military education. Given the international nature of military cooperation, this is considered also at the level of alliances: NATO recently proposed a

Defence Education Enhancement Programme (DEEP), in which strategies for distance learning support are discussed, both in a pandemic and a general setting (NATO, 2021).

### **III. RESEARCH QUESTION AND METHODOLOGY**

Given the pandemic period that caused disruptive changes everywhere:

- What are the strengths, weaknesses, opportunities, and threats in the evolution of digital education?
- What are the most effective teachers' practices and actions to enhance education?
- How do the previous questions intervene in the area of security and defence?

The investigation illustrated in this paper follows the core of the DIGICODE project, in which a survey was addressed to respondents of European universities (academies) regarding important elements of the digital environment in which universities had to face education during the outbreak of the COVID-19 pandemic and afterwards. The survey questions concerned the challenges and problems of digital and remote learning as well as its positive aspects. Based on the data collected from more than 500 respondents, the research team developed the results in the form of a SWOT analysis. Several scientific methods, techniques and tools were used to obtain compiled and aggregated results. The synthesis of input data, and subsequently their analysis, were used to extract the essential elements of the examined reality; then, the conceptual abstract was applied, which allows omitting certain components, features or relations of a given system of a specific object, state of affairs, and separating others, considered important. Afterwards, the categorization was applied, which in principle consists in dividing the things, phenomena or persons into certain categories, or assigning them to certain categories. The categorization can be assumed as an initial stage of the synthesis of the results finally used for elaboration of the SWOT analysis. Furthermore, a remote learning benchmarking among six Member States (Bulgaria, France, Italy, Poland, Romania and Spain) was performed, by collecting the most prominent responses relative to questions concerning teaching methods and practices.

### **IV. THE SWOT ANALYSIS**

A SWOT analysis is a popular method of assessing the strategic position of an organization, its strengths and weaknesses against the background of opportunities and threats for preliminary stages of decision-making processes. The analysis estimates the needs and requirements of internal resources and external factors and supports the selection of the best operating strategy. SWOT analysis has changed over time. Over a long period, this method has undergone a huge evolution, becoming a very useful and, at the same time, a relatively complex tool for building a strategy of organization. The acronym SWOT comes from the first letters of the English words: Strengths, Weaknesses, Opportunities, Threats. Traditionally, the SWOT analysis is conducted in the order in which the words appear in the acronym. The positive and negative internal aspects of the organization are considered in relation to external opportunities and threats.

- Among the strengths of the organization, one should first distinguish unique skills and other positive values, preferably those that distinguish the organization from its competitors. Therefore, strengths of the organization contribute to create a positive image.
- Weaknesses are internal negative factors that may have a limiting influence on the organization, preventing its development or placing it at a disadvantage relative to others.
- Opportunities are primarily external positive factors located in the environment that create a favorable situation for the organization. Their skillful use may bring tangible benefits in the form of competitive advantages and development in the future.

- Among the threats, external negative factors, stakeholders must consider the set of events and processes taking place in the surrounding environment that can create a destructive unfavorable situation for the organization.

In its typical form, the SWOT analysis takes the form of a four-field table containing listed strengths, weaknesses, as well as opportunities and threats. Based on the analysis of the answers given by the respondents as part of the DIGICODE questionnaire on the remote learning process, the key factors were compiled according to the SWOT analysis, as Table 1 shows.

Table no. 1. SWOT analysis key factors.

Strengths	Weaknesses
Self-responsibility and autonomy of the students	Loss of active participation of the students
Better use of technology (familiarization)	Lack of social contacts
Better use of digital tools (familiarization)	Difficulty in practical aspects of education
Accessibility of knowledge	Control over the students
Higher attendance	Physical and mental problems
Contact and communication	Higher expectation towards the teachers
Flexibility of time and place (better time management)	Difficulties with hardware and software
Comfort and safety of teaching (and health protection)	New bad habits of the students
Improvement of methodologies	Level of education dropped
Opportunities	Threats
Development of digital tools for practical exercises	Low educated graduates
Higher quality of digital tools	Low quality of education
Blended education	Future generation without social skills
Repositories (libraries of courses)	Scarce engagement in educational process
Development of new forms of interactive lessons	False picture of education
Development of digital competences	Loss of motivation and mental health
Readiness to emergency situations	Loss of communication abilities
Creation of partnership among universities	Multiplied negative aspects

The advantage of the SWOT analysis presented in this way is that it clearly makes the management of the organization aware of which functional aspects should be improved, which advantages should base future activity, and which situations and processes favor or threaten the organization. The identification of the factors listed in Table 1 is presented and fully described here below, which will allow a better understanding of their nature and impact on the digital education scenario. Let us start with the strengths.

- Self-responsibility and autonomy of the students: it concerns learning, students become more autonomous, independent, and at the same time self-responsible for education. They have to be more organized, and able to find proper time and motivation.
- Better use of technology (new technology familiarization): this strength concerns both students and teachers. It can be assumed that students are usually better acquainted with technology, however not necessarily with appropriate technology for learning purposes. The COVID-19 pandemic prompted even teachers to be more familiar with digital technology and its use for remote learning.
- Better use of digital tools (digital tools familiarization): different communication tools, programs, software, platforms, and new functionalities for education seem to be quite a novelty both for students and teachers, and this strength is close to the better use of technology.
- Accessibility of knowledge: teaching materials are recorded and available from different kinds of sources. Students can easily access and gain knowledge at their own pace, also by playing

lectures many times. Sitting in front of the computer allows quick access to many Internet sources, which is sometimes not allowed in the classroom.

- Higher attendance: students from the distant corners of the country, and even from abroad, can easily have access to education. It is also more available to people with disabilities and those who work and have no time to travel, or even those who are currently sick or in quarantine.
- Contact and communication: different kinds of communication modes, e-mails, chats, forums, and social media can help increase positive communication, when used wisely. Those who are not willing to show up in the public can contact teacher individually. The possibility of creating groups and discussion panels must also be taken into consideration.
- Flexibility of time and place (better time management): students can learn independently of the schedule. It gives them more flexibility and allows them to spend time efficiently. They can learn from home, from family places and even on holidays. Not wasting time to travel can help use time more effectively. Flexibility must be accompanied with strong self-regulation and autonomy.
- Comfort and safety of teaching (including health protection): safety from the threat of infection especially during pandemic time. In some cases, the mental comfort of learning from home was highlighted: less stress of being addressed by teachers in classes. Attendance can be quickly organized, with fewer interruptions. All these aspects can make teaching and learning more comfortable.
- Improvement of methodologies: the distant learning serves in the self-development of teachers' skills. They can develop and test new methods and tools of teaching, test new strategies. Lessons become less monotonous, more varied, enriched by movies, quizzes that facilitate the assessment of big groups of students.

Now we identify the weaknesses.

- Loss of active participation of the students: to some extent, the level of participation has increased; however it is difficult to say if students are really committed and engaged during classes. Problems with contact, interaction and involvement in discussions and active participation in general were highlighted.
- Lack of social contacts: the remote education has lost the crucial aspect of teaching that is a social process. Students should learn from teachers and from each other. Interpersonal relations, physical contact, body language and emotions cannot be fully substituted by something alike in remote learning modalities.
- Difficulty in practical aspects of education: in many areas of education, practical skills are crucial learning outcomes. In distance learning, in many cases practical classes, laboratories, and other activities that require more exercises and engagement of all the senses are lost.
- Control over the students: in distance teaching it is impossible to control the behavior of the students, to understand whether they are bored or following the lesson, what their progress in the group work is, and so on. Control of audience presence and focus on the topic is very difficult.
- Physical and mental problems: to sit alone in front of the computer can deepen the health problems of those students who already spend a lot of time in front of a screen or make a large use of social media. This can lead to further psychological distress, alienation, emotional stress, lack of concentration, and physical diseases such as backbone problems.
- Higher expectation towards the teachers: the distance learning caused impressions that teachers are, like students nowadays, available at any time. Teachers are expected to be competent, digitalized, always online, able to hastily respond to every post or question. Also, the level of teaching materials, given the change in teaching methods that endured for a long time, is expected to be high.
- Difficulties with hardware and software: the distance learning is dependent on ICT technology, computers, Internet connection and software efficiency. The availability of learning depends on availability of hardware and software, and some students can be excluded from the learning process because they cannot afford it, something that is known as digital

divide. Also, even if devices are broadly available, some problems can arise from other technical issues (network connection, internet stability...) not related to didactics.

- New bad habits of the students: the distance education caused some students to avoid the commitments and efforts in studying. Students could get lazy, for example by participating in other activities during online courses, or by finding way to cheat during the exams, that is completely opposite to the idea of studying as a self-improvement process.
- Level of education dropped: some respondents observed that, due to all the other problems created by the online mode of learning, the level of education is decreasing.

The following ones are descriptions of the opportunities.

- Development of digital tools for conducting practical exercises: development of remote learning can lead to better tools, that allow conducting practical exercises and develop practical skills. 3D platforms and virtual or augmented reality tools could respond to some weaknesses.
- Higher quality of digital tools: there is no doubt that the needs for remote education boost the development of digital tools, which will better connect teachers and students in the future, improve engagement of students, provide possibilities of learning for students with difficulties, and improve control of the teacher over the students.
- Blended education: the experience of remote learning has changed the attitude to the physical presence of students. Remote teaching has become useful to some extent; using the best practice the future of education could be in mixed or blended format, or online lessons can supplement traditional learning.
- Repositories (libraries of courses): classes, when recorded, can be the future sources of knowledge. Well organized digital libraries or repositories of contents can supplement knowledge of those who want to learn at their own pace, or just review some lessons.
- Development of new forms of interactive lessons which increase students' involvement: the numerous new methods that can be applied now and, in the future, can permanently change the education process, making it more attractive, by involving and engaging all students.
- Development of digital competences: the need of switching to remote education will boost familiarity of both students and teachers with digital tools, thus fostering the quality of remote teaching offer.
- Readiness to emergency situations: the COVID-19 pandemic forced everyone to change methods, tools, and attitude towards digital education. This experience facilitates everyone in switching to remote learning again in case of similar situations. Furthermore, people who are prevented (temporarily or definitely) from physical attendance can participate.
- Creation of partnerships among universities: the experience of remote education showed that online learning works. We can benefit from virtual presence and stimulate contacts with other distant universities to develop global partnerships, inviting guest speakers just for a brief lecture, even online. This will allow the university to become open, available, accessible and international.

Finally, the threats are reported below. They are understood as risks that stem from the distance learning needs. Some of them are related to the continuity of education, while others to the future role of graduates in the society and in the job market.

- Low educated graduates: they could lack some useful skills because of the lack of appropriate practical classes. In some future professions such as Military, Engineering and Chemistry, practical skills play a crucial role in defining the future utility of a graduate in the society.
- Low quality of education: the learning outcomes in remote education are in many cases difficult to be achieved. Teachers are sometimes forced to lower the criteria of evaluation to fulfill institutional objectives, and they can teach parts of the program superficially. Most students will apparently take advantage of this, but it will result in lack of knowledge and competences.

- Future generation without social skills: in the long term, lacking direct contact with teachers and classmates could cause serious gaps in the social skills. Young people may not perceive relations with others as a need, or they could even be afraid of interacting with them. Teamwork and the openness to different behavior and other points of view can be deteriorated.
- Lack of engagement in the educational process: students can hide in the crowd. They will lose attention to the lessons, and probably also towards the different activities that can be proposed during the classes. They will expect to pass the exams with a minimal effort, thus becoming essentially lazy.
- False picture of education: it concerns especially those who started the university education in pandemic times. By transferring knowledge remotely, everything becomes abstract: classes, classmates, teachers, and university itself. Learning seems to be impersonal, individual, and difficult. Insufficient and little feedback from teachers, and scarce individual approach in detecting difficulties can create the false illusion that everything goes well.
- Loss of motivation: distance learning, away from other students, causes loneliness in education and loss of motivation to learn, which may lead to high drop-out rates.
- Loss of mental health: humans are social beings, they need contact. Loneliness in education can lead to apathy, cognitive impairment, loss of self-confidence, alienation, indifference, and even depression. It can also lead to addiction to electronic devices.
- Loss of communication abilities: both students and teachers may lose the ability to communicate effectively. In remote learning, communication is mainly textual, sometimes verbal. By getting used to remote communication, we can lose the ability to interpret body language, gestures, facial expressions.
- Multiplied negative aspects due to prolonged remote education: protracted remote education can be a source of danger itself. If students get used to remote technologies, then they could potentially not being able to imagine any other kind of education. Teachers may at some point become redundant, and students who do not have access to new technologies will forever be excluded from the educational process.

Based on the results obtained after the SWOT analysis, it is possible to choose the type of organizational strategy to be adopted by institutions and policy makers.

Table no. 2. Strategies suggested by SWOT.

To enhance the Strengths	To face the Weaknesses
Adoption of adaptive methodologies to favor both independent and autonomous learners and students with more difficulties and in need of tailored support Designing of hybrid learning spaces Sharing Open Educational Resources Reinforcing the technological apparatus	Support by staff experts in learning and teaching methodologies Creation of a teaching and learning center Adoption of methodologies and tools to enhance the students' engagement
To seize the Opportunities	To avoid the Threats
Participations of institutions in international partnerships Exchange of good practices among peers with different backgrounds Collaboration with European Alliance (for example UNITA Consortium coordinated by University of Turin) Creation and usage of repositories of learning objects Implementation of an open online course for developing of teachers' competencies	Increase of international experiences (virtual and physical mobilities) which allow to know different approaches in education and to broaden the cultural horizon Adoption of quality indicators Development of students' soft skills

## V. BENCHMARKING

A remote learning benchmarking in Europe provided interesting insights about various facts:

- Among the six countries involved, purely remote teaching prevailed in France (67%), Italy (73.5%) and Poland (56%), while blended and hybrid teaching were prevalent in Bulgaria (45%), Romania (57%) and Spain (60%). Due to the pandemic constraints, face-to-face learning was forced to be minor, with the 16% of Bulgaria being the maximum. These numbers vary due to the different limitations that countries implemented while responding to COVID-19.
- As main platforms for remote learning, in all countries Microsoft Teams and the learning management system Moodle were the mostly adopted.
- About methodology for the increase of students' engagement, and good practices for remote learning, different approaches emerged. The main proposals concerned: work in projects encouraging communication and collaboration among students, foster direct interactions between teacher and students, keep concentration high by using short videos and brief presentations rather than long lectures.
- Several tools allowed to increase students' involvement in remote learning, starting from generalist software such as Microsoft Excel, PowerPoint, Access (or even the C and SQL programming languages), considering remote conference tools like BigBlueButton and Cisco WebEx, and arriving to more specific programs as the platforms for quizzes Kahoot and Wooclap.
- Teacher training was provided by means of both synchronous (collective, individual) and asynchronous support, together with the provision of self-training materials. In addition, technical units were able to quickly support teachers, in case of need.
- In the event of a system failure, not a single best strategy was found. Sometimes, the solution was to immediately switch to a mobile device, or to look for another workplace, such as a different working cabinet; when this would fail, then the main option remained to send content, tasks, and lectures to students as assignment, to let the course proceed anyway. This has been perceived as an Achilles heel, since it can result in purely technical problems without didactic remedies.

## VI. CONCLUSIONS

This paper answers the three research questions. About the first question, the conclusions of the SWOT analysis are, in theory, simple: enhance strengths, eliminate weaknesses, seize opportunities, and avoid threats. It is however not immediate to obtain the desired results, especially in a changing environment. The application of a specific strategy to find educational solutions during a pandemic requires detailed analyses, whose bases are the computations from Table 1. These calculations, according to the proposed methodology, should consider the specificity of the university (or higher education institution) and even individual fields of study, which require the people responsible for education to make well-thought-out decisions on how to implement the educational process. The implementation of a specific strategy involves several detailed solutions that may significantly affect the current model of education in a given field of study at a particular university. In addition, it may require the introduction of new solutions, or the updating of existing legislative solutions in the field of education not only at the university level, but also at the government level. To sum up, it should be kept in mind that it is necessary to implement solutions that encourage participation in the education process, but not a revolution that will completely negate the existing situation.



As for the second question, the conclusions of benchmarking are that several methods and practices emerged from various European Member States. This suggests taking the best of all worlds, in order to grant students the best experience they can participate in.

The third research question underlines all previous elements, since most responses come from teachers dealing with students in the security and defence area.

As future work, this SWOT analysis can be supplemented with an assessment of the intensity of individual factors using a scale from 1 to 5. Such assessment should be conducted for each university. This analysis produces a SWOT diagram which could help choose the best strategy in every single situation.

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