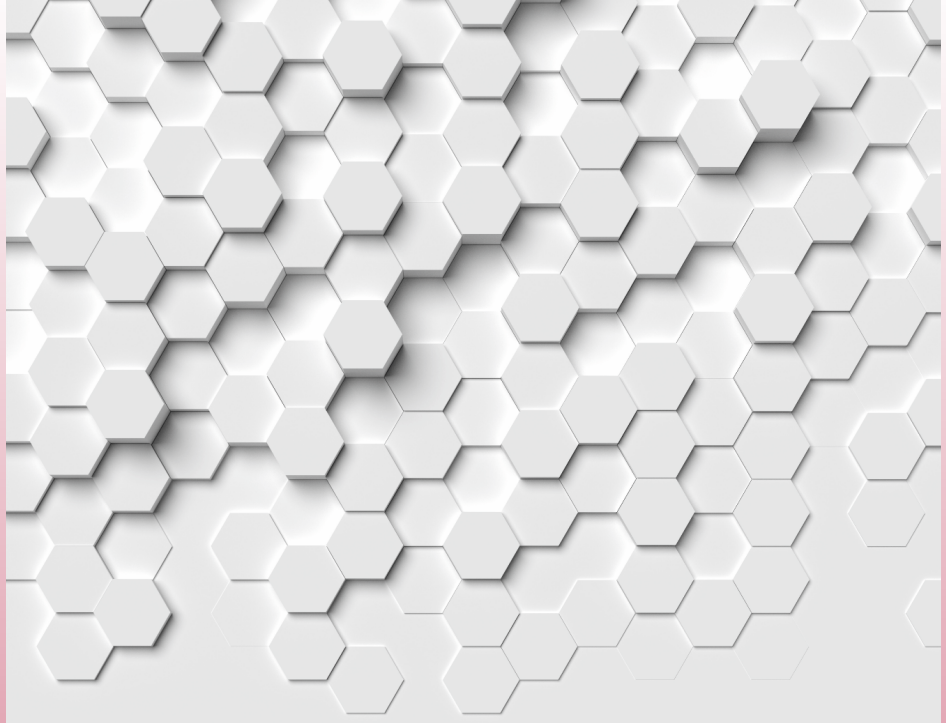

# INNOVATIVE TEACHING METHODS

## E-learning in Practice

edited by
Lidia Pokrzycka
Bruno De Lièvre

Maria Curie-Skłodowska University Press

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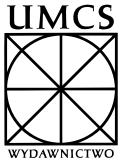
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# Introduction

At the time of the COVID-19 pandemic, e-learning has inevitably become the basic form of education at schools and universities worldwide. E-learning encompasses various teaching methods, the common feature of which is the use of information technologies. E-learning also means studying at any time and without direct supervision. On the other hand, synchronous classes (conducted via e-learning platforms or videoconferencing software) represent online teaching, that is the lecturer sharing his or her knowledge with the participants on the web. Furthermore, blended learning uses combined methods: traditional forms of studying (direct contact with the lecturer) are intermingled with remote activities.

The teacher and students in e-learning are separated in time and space, but regular communication is ensured between all the participants of the teaching process. Such a method of education (sometimes eliminating completely the need for offline meetings at the university) is the basis of the information society, especially when there are problems with free time. Teaching has a flexible formula, IT skills are mastered, lifelong learning is implemented in practice, and the education system is organized accordingly. Students working in the e-learning or blended learning systems are more involved when it comes to cooperation, creative thinking, and the use of practical applications. Effectiveness of online teaching increases when specific goals of studying are identified, diverse teaching methods are applied, and knowledge is verified from time to time (also in the learning through play formula). E-learning facilitates innovative work, reasonable time management, and the use of numerous projects and tasks in which specific problems need to be solved.

Remote education is not limited to courses taught e.g. during higher education studies. This is a lifelong activity, because the need for continuous learning is a part of the human life. Hence, it is necessary to develop skills of regular studying and readiness for lifelong learning. It can be considered an educational priority of the information society. Owing to the constant inflow of information and employers' requirements for diverse expertise, it is necessary to extend one's knowledge on a regular basis and to acquire qualifications, especially by means of distance learning.

The problems related to e-learning in teaching practice were addressed by researchers from Maria Curie-Skłodowska University in Lublin[1] (MCSU) and the Medical University of Warsaw[2]. The problem of teaching practical subjects is very important during and after the pandemic. In the presented book, Lidia Pokrzycka writes about the effectiveness of e-learning in practice, while Marlena Stradomska presents her theoretical and research work on the assessment of selected methods of work and learning, including applications that can enable learning among students. Katarzyna Hałas focuses on presenting an image of an exemplary academic teacher. Silethemba Medelline Guta describes in her study creative design thinking in e-learning based on the course "Academic Course Development and Teaching" lead at the MCSU, while Karolina Burno-Kaliszuk reports the experiment based on the adaptation of the agile process model to online academic classes. In our book, we also do not forget about medical sciences. Karolina Szałata ponders upon the changes that took place in teaching medical issues in Poland during the pandemic at medical universities (focusing on the work methods of the students themselves).

In e-learning it is vital to properly motivate students for work. Hence, the lecturer should stimulate interest in classes, surprise learners, provide space for creative thinking, develop an attitude of curiosity and willingness to find solutions to research problems. Moreover, it is necessary to attract and keep attention, activate previous knowledge, make students memorize new and orderly information, provide feedback (including not only evaluation of the final result, but also the path to its achievement), create good atmosphere for work, conducive to acquisition and transfer of knowledge, and make students aware of the ultimate goals of learning. The basis for remote education is proper motivation for studying and regular work.

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1 Lidia Pokrzycka, Katarzyna Hałas, Karolina Burno-Kaliszuk, Marlena Stradomska, Silethemba Medelline Guta.

2 Karolina Szałata.

As we emerge from a period in which the whole world has had to be isolated, the resonance created by this unprecedented event has exposed the qualities and shortcomings of digital uses in both everyday life and education. Digital technology can connect people. Confined, separated from their teachers and pupils, a solution for linking up, for pedagogical continuity, could be provided through the use of technologies for teaching. It is this link maintained between teachers and students that our first article deals with (Descamps, Housni, Piret et al.). The question that arises is, of course, that of the reality and strength of this social link that digital technology attempts to preserve. And just like everything else related to media in the educational process, we know that there is no strict replacement of one by the other but rather a complementarity between the human and technology. The article by De Lièvre, Temperman, Di Emidio et al. analyses the link that can exist between artificial intelligence and human intelligence.

Social networks have been a way of using students' digital experience to facilitate learning. The article by Dragone, Temperman & De Lièvre considers this tool in a facilitation process in a Mathematics course. Technology sometimes takes on particular forms as do humanoid robots. Can they become learning aids to support teachers? The article by Kumps, Temperman & De Lièvre. describes such an experience at school.

And finally, there is the question of evaluating the effects of technology or how technology can be an aid to evaluation. A specific environment has been analysed by Molderez, Temperman & De Lièvre in order to show how one can build evaluation situations that allow students to test themselves autonomously.

Through these articles, the members[3] of the Pedagogical Engineering and Digital Education Department of the Faculty of Psychology and Educational Sciences of the University of Mons share their expertise in this field. The conclusion is that the wealth of technology is that which is adequately used by human intelligence, again and again for the benefit of the learner.

In this publication the researchers-practitioners describe case studies connected with remote education, successful manners of getting through to online learners, and effective learning methods used by students themselves during the pandemic. This is not an easy task, especially due to the fact that e-learning was commonly introduced overnight at the beginning of the COVID-19

[3] Bruno De Lièvre, Gaëtan Temperman, Laëtitia Dragone, Sarah Descamps, Audrey Kumps, Sabrin Housni, Karim Boumazguida, Louis Molderez, Marie Dumont, Pauline Marchal, Gwendydd Piret, Samuël Di Emidio

pandemic, and it was not possible to use blended learning (considered the most effective method of studying). We hope that the articles in our publication will contribute to the discussion on improvement of remote teaching quality in higher education and will encourage further research on effective application of e-learning in practice.

The publication was created thanks to the cooperation between Maria Curie-Skłodowska University and the University of Mons. Despite the pandemic, it was possible to develop a joint book, which is the result of contacts established under the Polish National Agency for Academic Exchange (NAWA) – project "E-learning and ICT in education in Poland and Belgium. Comparative study" (Poland-Wallonia Bilateral Exchange Programme).

Lidia Pokrzycka, Bruno De Lièvre

# The Effectiveness of Online Teaching in the Time of the Coronavirus Pandemic. A Case Study: Journalism and Social Communication at Maria Curie-Skłodowska University

ABSTRACT

The COVID-19 pandemic has shown that e-learning is not necessarily the strongest side of teaching at all levels of education. In higher education, both teachers and students had to learn almost from scratch how to communicate online and achieve class goals. Has the application of e-learning in higher education turned out to be effective? Are the effects of distance learning satisfactory for students? The article presents the results of a survey conducted among students of journalism at Maria Curie-Skłodowska University in 2021, along with analysis of whether e-learning is actually effective and what conditions should be met to make remote learning not tiring.

**Keywords:** e-learning, journalism students, new technologies, effectiveness of remote teaching

## Introduction

The emergence of new technologies and ways of conveying messages has changed the perception of online and offline communication. In fact, society is online all the time. In the beginning, communication in cyberspace was rather infrequent and functioned only among people familiar to each other. However, in the course of time it has turned out that friend requests in social media are accepted from barely known or even unknown people, one's identity

can be created on the web and boundaries exist only on paper. Furthermore, online presence fosters one's well-being and facilitates numerous interpersonal relations. In addition, participants of online communication are more open and willing to admit their weaknesses. Under the influence of the internet, the classical styles of linguistic, textual, and non-verbal communication have turned into the audiovisual, graphic, and interactive styles in the web-based relations. The ongoing process of new media development is connected with the problem of the digital divide, especially among older generations. This phenomenon can be observed not only in the poorer groups of the society but also, for instance, in older generations of teachers who are afraid of new technologies. These days, we should all broaden our knowledge, upgrade our competences, and create online resources together, not disregarding other people who may be less proficient in handling the new media. Another problem is the immediate posting of information on the web, lack of critical thinking and selection of news. Nowadays, the ability to evaluate information published on the internet is one of the basic social and cultural skills. It should be emphasised that online communication has a special character (Beetham & Sharpe, 2007; Bennett et al., 2016).

The virtual space limits sensory experiences. The users are aware of being anonymous and their statuses become equal. Spatial constraints are no longer a problem, time is condensed and saved, there are many communication channels available, the content of which can be recorded on an ongoing basis. However, different states of consciousness in virtual space should be taken into account, because stimuli are perceived there in other ways than in the real world. A characteristic feature of communication in the virtual space is the so-called "emotional-dramatic poverty" and social anonymity (Biggs & Tang, 2011; Clark & Mayer 2016). Hence, personality traits of network users are very important because such a way of communication is connected with many limitations (depending on the participants' individual predispositions). E-learning means supporting the teaching process with the new technologies, e.g., computers, smartphones, the web, and modern applications intended for educational purposes. In the relevant literature e-learning is identified as online teaching. It comprises all levels of learning, both formal and informal, with the use of information networks (public or limited to specific groups) – internet, intranet (LAN) or extranet (WAN). The teacher and students in e-learning are separated in time and space, but constant communication between all the participants of the teaching process is ensured. Such a method of education (sometimes eliminating completely the need for face-to-face meetings) is the

basis of the information society, especially when there are problems with free time (Clarke 2007; Kuźmicz, 2015).

Teaching has a flexible formula, IT skills are mastered, lifelong learning is implemented in practice, and the education system is organised accordingly. Students working in the e-learning or blended learning systems are more involved when it comes to cooperation, creative thinking, and the use of practical applications. Effectiveness of online teaching increases when specific goals of learning are identified, diverse teaching methods are applied, and knowledge is verified from time to time (also in the learning through play formula). E-learning facilitates innovative work, reasonable time management, and the use of many projects and tasks in which specific problems need to be solved (Collinson et al., 2000; Liotsios et al., 2006).

Effectiveness of the educational process is the most important in remote teaching. However, it depends on several factors, like usefulness (which means that remote teaching is appropriate for achievement of the goal set by the teacher and the course participant), influence (the level of effectiveness of the teaching concepts employed and their favourable impact), availability (this is the basic condition determining the quality of online teaching, which comprises both physical accessibility and transparency of the course structure) (Slavin, 1991; Slavin 2004; Werth & Williams, 2021). Furthermore, accuracy is a measure of the teaching process precision so that it meets the expectations of learners (including regular verification of the outcomes achieved), whereas excellence means teaching quality combined with the potential of the lecturers and learners. Teachers also have a crucial role in the process of attaining the educational goals, as they have in practice the greatest influence on the quality of online learning. Unfortunately, they are frequently underpaid for their innovative work (Otto, 2019; Santos Espino et al., 2021).

Online teaching should encompass possibly broad range of skills of people participating in courses/training/classes. On the one hand, participants should not get bored, but on the other hand they should not be discouraged by excessive requirements. For people of less knowledge and lower skills, additional quizzes and self-check questions can be added to their online courses. Furthermore, it is important to be in touch with students on a regular basis. They should not be left without ongoing contact with the teacher/instructor. If students' experience of working online lacks teacher's supervision, and when they encounter technical or organisational difficulties, do not know how to use resources and exercises, or find educational materials too difficult, they can lose their motivation for learning (Sharples et al., 2007; Schellens et al., 2009).

The aim of the article is to present the effectiveness of remote teaching in the time of the coronavirus pandemic, as exemplified by the students of journalism-related majors at Maria Curie-Skłodowska University in Lublin (MCSU), as well as to discuss teaching innovations which contribute to the effectiveness of learning in special circumstances (without face-to-face contact).

## Survey

In the summer semester 2020/2021 a survey on the effectiveness of remote classes was carried out among undergraduate, graduate, and postgraduate students of a journalism-related major: Public Relations and Media Marketing at MCSU, where the author taught a course on media economics and public relations. All classes were conducted in a practical formula with the use of numerous web applications which have proved successful in project work.

However, the survey concerned all courses taught during the semester. Ultimately, 80 students participated in the survey (out of 120 active students from the surveyed years), 55 respondents were women and 25 were men. The respondents' age ranged between 21 and 30 years old. Undergraduate students were the most active in filling out the questionnaires (60% of all replies), followed by graduate (30%) and postgraduate students (10%).

The following replies were given to the question about the factors which would be the most encouraging for the respondents to participate in e-learning courses (multiple answers were possible): freely chosen time for study (75%), individual mode/pace of study (50%), financial considerations (travel costs) – 34%, interactive, personal contact with the lecturer (7%) and other reasons (an opportunity to combine work with study – 7%)[1].

Table 1. Question 1: What factors could most encourage you to participate in didactic classes conducted via the Internet? (Select any number of answers.)

| | |
|---|---|
| Freely chosen learning time | 75% |
| Individual mode/pace of learning | 50% |
| Interactive, personal contact with the lecturer | 7% |
| Financial reasons (travel costs) | 34% |
| Other | 7% |

Source: Author's own research.

[1] The questionnaires were conducted in Polish, translation into English was prepared by the author.

An open-ended question concerning the factors which may hamper the participation in online classes in a given major, prompted many opinions among the respondents. They mentioned such issues as: problems with concentration and lack of contact with other people, stress connected with remote classes, technical problems which occurred frequently and resulted most probably from system overload, lack of motivation for learning, communication difficulties, defective equipment, and late hours of classes during which knowledge acquisition is limited due to fatigue. Furthermore, students emphasised that it was more difficult to score points for being active, contact with the lecturer was worse in some cases, and constant staying at home was also a problem. Other disadvantages included: mandatory group projects carried out with people who were not interested in the course, an obligation to switch on cameras during some classes, not enough time for learning and lack of motivation for work. Moreover, it was mentioned that a negative attitude of some lecturers to this form of work was noticeable, and lack of activity of students themselves was also a problem. Some respondents pointed out an excessive number of homework assignments which were supposed to compensate for the lack of direct contact and practical classes. In the case of synchronous courses, it was troublesome to combine them with work and personal life.

Next, the respondents were asked which form of teaching was the most suitable for e-learning in their opinion (multiple answers were possible). Lectures were mentioned by 79.5% of the respondents, seminars by 31.8%, practical classes by 27.3% and laboratory classes by 2.3%.

Table 2. Question 3: What form of didactic classes, in your opinion, is suitable for teaching via the internet? (Select any number of answers.)

| | |
|---|---|
| Lectures | 79.5% |
| seminars | 31.8% |
| practical classes exercises | 27.3% |
| Laboratories | 2.3% |

Source: Author's own research

The question whether the respondents participated in e-learning/blended learning (a mixed form) was answered in the affirmative by 90% of the respondents and in the negative by 10% (which testifies to misunderstanding of concepts related to remote teaching).

Table 3. Question 4: Did you participate in classes organised in the form of e-learning/blended learning (mixed form)?

| | |
|---|---|
| YES | 90% |
| NO | 10% |

Source: Author's own research

In another open-ended question the respondents were asked about their evaluation of online courses (advantages and disadvantages, effectiveness).

The respondents enumerated the following advantages: completing tasks any time, logging in from any place in the world, no time spent on commuting, it is possible to have a meal, do some stretching exercises or even clean up at the same time, etc. (time saving). Further advantages include: no expenses on hiring a flat/travelling and less time spent on commuting, which makes it possible to plan a schedule at work/other duties more effectively. It is also beneficial to play back the recorded classes any time and return to the content which was incomprehensible (however, the students emphasised that there was only one such case in the semester), and to have access to interesting educational materials. On the other hand, students missed contact with other people, were less motivated for action, suffered from depressive mood and back problems caused by constant sitting, complained about lack of face-to-face contact with lecturers, and had more problems with comprehension. Furthermore, it was more challenging to volunteer to answer a question, which was aggravated by stress connected with defective equipment which may stop working just during an examination. In addition, after the end of a course most lecturers recommend an oral examination online during which students are typically more stressed.

On the other hand, the respondents claimed that online teaching was a good solution and lack of contact with the lecturers could be compensated by the introduction of blended learning as soon as possible in the post-pandemic period. Several people added that e-learning was very beneficial to people suffering from physical or mental disorders. Moreover, time pressure is not so intense and home assignments can be completed in no hurry.

Another question concerned the most useful functionalities on the e-learning platform. This was a closed-ended question, and it was possible to tick several options. Text files were selected by 75% of the respondents, requests by 56.8%, websites (hyperlinks) by 25%, discussion forums by 22.7%, and others by 6.8% of the respondents. The response "others" was elaborated on by the participants

who noted that files with texts uploaded by lecturers were a great advantage (also due to environmental concerns), as well as recorded lectures and films.

Table 4. Question 6: Which forms of activity on the e-learning platform are the most useful? (Select any number of answers.)

| | |
|---|---|
| Request | 56.8% |
| Discussion forums | 22.7% |
| Files with documents | 75% |
| Website (links) | 25% |
| Others | 6.8% |

Source: Author's own research

The next question was formulated as follows: "What I like about the e-learning platform (Virtual Campus) is..." (an open-ended question). The respondents mentioned order, the fact that materials can be accessed any time, assignments can be submitted even in the middle of the night and can still be corrected before the lecturer's assessment in case of a mistake.

The respondents also enumerated the following advantages: smooth connections, file grouping, numerous functionalities, including the use of shared notes, simple interface, an opportunity to share a presentation without sharing the screen, and an intuitive manner of uploading files. Furthermore, the website's simplicity, division into sections and an opportunity to record and play back classes were emphasised. Assignments were praised because students could use their creativity and ingenuity and the lecturer gave them a chance to act, naturally taking into account certain guidelines. The respondents emphasised an opportunity to replay lectures, download materials, as well as the fact that each subject is well described so it is easy to find materials related to a given issue.

Next, the respondents were asked what they did not like about the e-learning platform. They answered that the platform could, for instance, remind them of deadlines for submitting assignments and that the system sometimes froze when used by a higher number of participants. Other disadvantages included: the lack of a button to report one's action and the fact that recorded meetings can be played back only in some browsers. Moreover, the respondents claimed that live connections were sometimes unstable, and the platform's graphic design was not very user-friendly.

The question: "Do you plan further education in the e-learning/blended learning system?" was answered in the affirmative by 85% of the respondents

because online courses are effective, save time and enable professional work, even though the interaction between the lecturer and group members is sometimes missed. It saves time and money that would otherwise be spent on commuting. On the other hand, the remaining 15% claimed that they found remote education tiresome and hardly interesting, and that after 1.5 years of e-learning they developed health issues and were fed up with this method of education.

Table 5. Question 9: In the future, do you plan to learn in a remote e-learning / blended learning system? Why yes/no?

| | |
|---|---|
| YES | 85% |
| NO | 15% |

Source: Author's own research

Then the respondents were asked whether they were familiar with modern web applications for effective learning (such as Padlet, Canva, Dvolver).

Table 6. Question 10: Do you know modern free web applications for effective didactics (e.g. Padlet, Canva, Dvolver)? If yes, please enumerate them.

| | |
|---|---|
| YES | 95% |
| NO | 5% |

Source: Author's own research

In response, 95% of the survey participants confirmed that they knew such applications, with Canva being the most popular. Only 5% replied that such applications were unknown to them.

In the final question the respondents were asked whether the coronavirus pandemic raised their awareness of modern technologies.

The pandemic contributed to a significant increase in knowledge of modern technologies for 90% of the respondents. They claimed that as a result of the pandemic their awareness of modern technologies grew, because the ability to use applications and software to create modern presentations, films, sound processing and memes was necessary to perform various tasks. Owing to the pandemic the respondents became aware of various types of software which can be useful in the future and upgraded their skills of using the applications they had known before. Others learned how to use web platforms for remote communication, which can be helpful, for example during professional meet-

ings in the future. The students added that if we wanted to function effectively in the contemporary world of media, we had no other choice but to become familiar with these technologies. On the other hand, 10% of the respondents replied that they had known modern technologies well enough before, so the pandemic did not contribute significantly to their development in this respect.

## Conclusions

Summing up, it can be claimed that online courses during the pandemic were typically received quite well by students of journalism-related majors. Even though they missed direct contact with teachers and other group members, they noticed that they saved time and money that would have been spent on commuting. The majority of the respondents were satisfied with the effectiveness of the courses taught during the semester, especially with respect to the introduction of new teaching applications which, as they observed, may prove very useful in professional work these days. Nevertheless, it should be noted that several people did not even know that remote teaching was called "e-learning" and online education methods were hardly attractive to them (mostly due to the fact that they entailed more workload on the part of a student). Implementation of e-learning during the pandemic was sudden, without much preparation of both teachers and students, which is also visible in the survey results. The e-learning idea is misunderstood in many cases, and some teachers are not aware that synchronous connections are not tantamount to remote teaching. Generally speaking, it can be concluded that teaching based on practical tasks, projects and numerous free applications is appreciated by students. Both lecturers and students still need to master e-learning in practice. This method of education will probably be used at universities on a regular basis (in the form of blended learning after the pandemic) and then the weaknesses of e-learning will be eliminated.

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# Selected Applications in Educational Issues

ABSTRACT

This article is a theoretical and research work on the assessment of selected methods of work and learning, including applications that can enable learning among students. The study has been conducted in 2019 using an interactive Google survey among course participants at Maria Curie-Skłodowska University in Lublin. Additionally, qualitative research was conducted on two selected students, representatives of the countries participating in the Erasmus+ programme. It turns out that students use the application very often. Most of them cannot imagine the lack of access to a mobile phone in their daily activities. Each of the respondents stated that they have at least 3 applications on their phones. The article contains recommendations on the use of the application for people representing early and middle adulthood. The five most frequently available applications for phone download have been selected in the survey.

**Keywords:** application, education, modern learning, TED, Habit-Bull, Fabulous

## Introduction

The use of modern teaching techniques in the time of a pandemic seems to have been a priority for at least two years. It is practical to learn about mobile applications as it can be important for many social groups. It is important that more and more people are aware of how much this market has expanded and how applications can be used for their own development and education. The observed changes in civilization, resulting in the emergence of a network

society, are associated with the need to search for new, more effective models of education using the potential of new media (Badzińska, 2014).

In addition, the development as well as the growing popularity of mobile applications creates an opportunity to introduce a new form of activities aimed at, inter alia, on pro-health behaviour in the practical scope (Łosiak-Pilch, 2017). With the help of selected applications, it is possible to monitor health, the level of physical fitness, heart rate and calories. In addition, these applications can motivate the users to change their behaviour and play an increasingly important role in everyday life and education. This may indicate the potential of such applications for, for example, a health promoting strategy (Zadarko-Domaradzka & Zadarko, 2016).

It becomes important to pay attention to the pace of civilization and the rapid development of mobile technologies. Modern teaching should be adapted to the requirements of the 21st century digital environment and world, as well as the use of new and mobile tools for young people (Kuźmińska-Sołśnia, 2013; Kuźmińska-Sołśnia, 2017). What is more, Agnieszka Słaby (2014) believes that mobility is an important goal of education nowadays, and modern facilities can help in developing competences important from the perspective of cultural education, such as understanding training needs and cultural development in the process of lifelong learning. For the proper conduct of classes, it is necessary, *inter alia*, knowledge of basic theories regarding modern teaching techniques or applications that will allow you to create a digital workshop in an optimised way (Musiał, 2019).

In this article, three examples of mobile applications will be cited. They were most often chosen by the respondents who took part in the survey. Each of them is different and has unique visual and functional elements. However, each of them can become inspiring and relevant to the appropriate group of recipients. Selected applications will be presented below with their brief description.

## 1. TED (Technology, Entertainment and Design)

TED is a brand of scientific conferences organised annually by the American Sapling Foundation. The aim of the conference is to popularise the important ideas. In the TED Library people can find thousands of personalised and inspirational videos available online for free. It is also possible to receive personalised recommendations adequate to individual interests. After logging in, it is possible to receive personalised recommendations and synchronise access to selected

content on all devices. It is possible to watch movies in over 100 languages. However, thanks to the appropriate search engines, it is possible to search for materials very quickly.

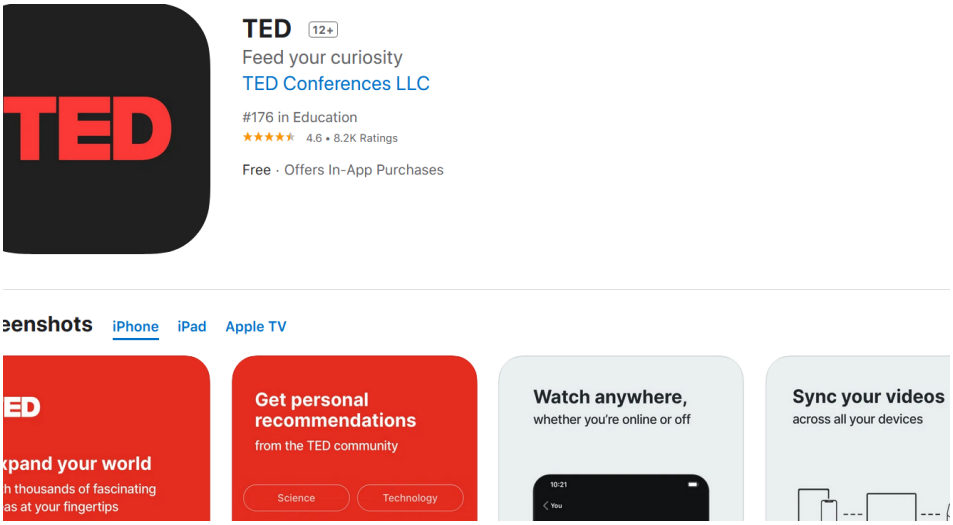


Figure 1. Ted App Store Preview.
Source: Ted, https://apps.apple.com/us/app/ted/id376183339#? (retrieved September 29, 2021)

## 2. Habit-Bull

The Habit-Bull app, according to the authors, can be useful in organising your daily schedule. Moreover, it is possible to observe your habits, routine, and the tasks you undertake most frequently. An important issue is, for example, obtaining post-alerts or indicators that can enable the best possible results. The application through a number of possibilities can help remove negative aspects from your life. It is also possible to add positive habits. It is important for people in the 21st century to be able to track their activities in social media, e.g., Facebook, Instagram, Tweeter, TikTok. The application is currently available only in English. Important features include the fact that it is possible to track repetitive activities or goals in the calendar in the application. A batch counter, activity monitoring and graphs are available. It is possible to set flexible goals to be accomplished with notifications when these tasks are completed. The number of possibilities is unlimited, the application can be used in aspects related to education. Checking human habits on many issues can allow to achieve

better results, including by being systematic. Therefore, it can be considered that the application uses an effective way to motivate goals are set and then marked in the application as completed. It is important to complete tasks for 66 days, and during this process you can see progress, statistics, motivational memes, and quotes.

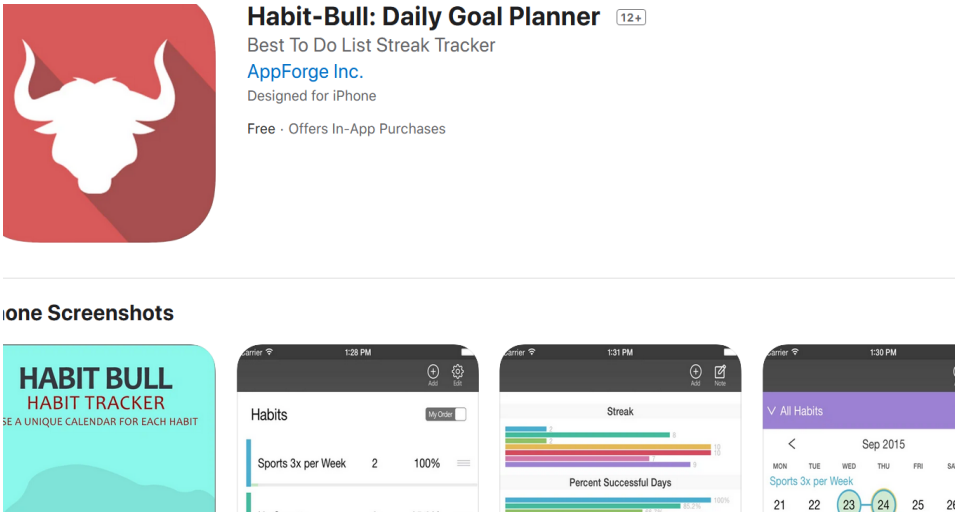


Figure 2. Habit-Bull: Daily Goal Planner.

Source: Habit-Bull: Daily Goal Planner, https://play.google.com/store/apps/details?id=com.oristats.habitbull (retrieved: September 29, 2021)

## 3. Fabulous: Daily Motivation & Habit Tracker

In order to properly prepare to use the application, it is important to answer a number of questions that will allow you to verify the aspects currently important to you. Appropriate information makes it possible to verify the areas of life that need to be changed. These issues may include things like sleep quality, physical activity, meditation, and mindfulness training. How can a mobile application change habit? For example, by regularly reminding about certain activities. The Fabulous user has to keep a record of all his successes and failures in the field of specific activities, so that observation of changes is possible. An interesting element of the application are also messages that can be obtained in the form of audio recordings. In some cases, they can be a motivation to act. The Fabulous app can help increase energy levels and be more focused on your goals by

building healthy habits and routines. Thanks to the application, it is possible to properly plan circadian rhythm, deal with fatigue, and create habits. Sometimes proper planning can help to deal with various types of dysfunctions or disorders. Depending on individual differences, the benefits include focus and concentration, better sleep, stress management, improved habits, and motivation to act.

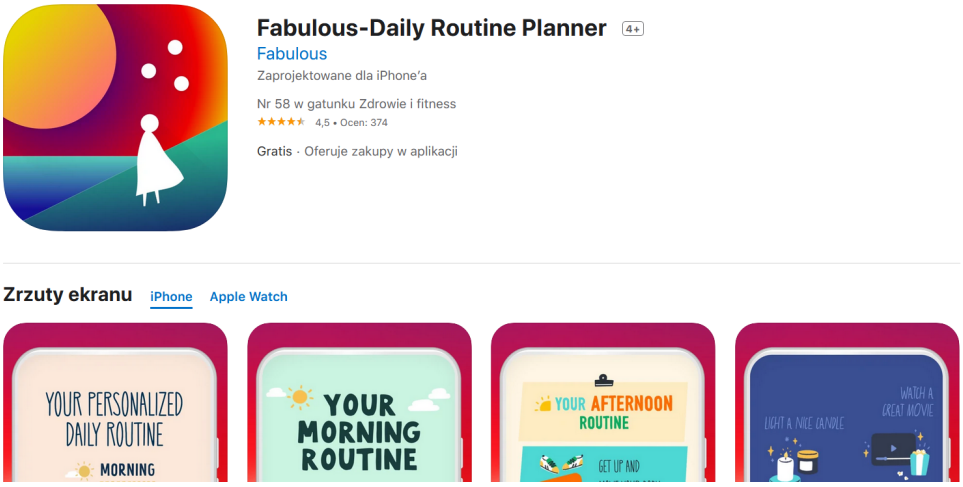


Figure 3. Fabulous – Daily Routine Planner.

Source: Fabulous, https://apps.apple.com/pl/app/fabulous-daily-self-care/id1203637303?l=pl (retrieved: September 29, 2021)

### Research Methodology

In order to obtain information on mobile applications used by students, an original survey was carried out. The research is a part of a series devoted to modern teaching techniques and tools. Its aim was to get to know the level of knowledge of people in early adulthood on the subject of mobile applications and their use in educational practice. In addition to the questionnaires, structured interviews were conducted. Since 2019, 200 students of Maria Curie-Skłodowska University and 24 Erasmus+ representatives have been surveyed.

### Research hypotheses

For the purposes of the study, the following hypotheses were formulated:

1. Respondents aged 19–26 have knowledge about the use of mobile applications in education.

2. Young people know mobile applications and use them in everyday life, including educational purposes.
3. Young people perceive the possibility of using mobile applications as an innovative way of learning and building their own habits enabling educational success.

Additional objectives of the article are to present short the topic related to mobile applications, to evaluate the reasons for using mobile applications and to indicate the most frequently indicated applications by the research group.

**Research methods**

The research is part of a larger project at Maria Curie-Skłodowska University in Lublin. Only part of the research conducted during the pandemic is described in this article. The research tool has been prepared in an interactive Google form. An original questionnaire was prepared for the purposes of the study. The study was conducted using an interactive Google survey covering the period from April 2019 to September 2021. This period covers the distance learning period at Maria Curie-Skłodowska University (MCSU) in Lublin. Research continues to date. The survey consists of 5 open and 15 closed questions. In addition, the respondents were asked to provide contact details in order to conduct in-depth interviews carried out by educational platforms such as Microsoft Teams and the MCSU Virtual Campus.

The research was divided into several thematic topics: knowledge about mobile applications, the use of applications in educational activities, advantages and disadvantages of specific applications and modern teaching techniques. The survey was voluntary, and the anonymity of the respondents was also ensured. The form was sent to over 500 people. For the final analysis, 200 respondents – 123 women and 67 men. The respondents were students at the home university who were randomly invited to study and gave their voluntary consent to participate in the fields of psychology, pedagogy, cognitive science, philosophy and physical education. Some of them did not agree to use their answers in research work or had no experience with the use of mobile applications. Structured interviews were conducted with the respondents, which allowed for a qualitative analysis. In this work the focus will be on the description of 2 randomly selected structured interviews (an MCSU student and an Erasmus+ representative).

The research was conducted in English as the students represented the Erasmus+ programme. Their first language was not English.

**Case study I**

**Gender:** male
**Age:** 21
**From:** Poland

**1. Do you have knowledge of mobile applications in education?**

It seems to me that most of the applications that I use on a daily basis are those that allow me to function on a daily basis, such as an alarm clock, stopwatch, calculator, notebook. Although I know that the TED app can help with education related issues. For me, TED is amazing because I can listen to inspirational content wherever I am in the world.

**2. Do you use mobile applications for learning?**

So far, I haven't used the learning app, however I think it's a good option. I know I have a problem with my phone addiction, perhaps removing games and other applications may allow me to use my time more efficiently. There are no issues at school or at the University that could contribute to further changes and the use of new methods in education. Thanks to this research, I was able to point out that there are such opportunities, and many people use them. I was not aware of the fact that it is possible to act and learn in this way.

**3. Do you think that the use of mobile applications can be classified as an innovative teaching method?**

I believe that using an application makes many things easier. At this point, ordering a taxi or a ride is no longer a problem. The number of available applications can help you in a professional relationship with your clients. Now I know that using a computer, the internet or a telephone can contribute to the fact that I will learn languages faster, most of all, with which I often have problems. The issue is also that I will be able to properly plan my time and rituals, which sometimes really made me very difficult. I would love to develop also in terms of planning my free time and my successes, because it happens that I start some activity, but unfortunately, I am not able to finish it. It also contributes to the difficulties in completing, for example, a semester or starting new activities, which makes it very difficult for me. For the next 3 months, I would like to deal with applications such as Ted or Reverso, which I hope will help me achieve my goals.

**Case study II**

**Gender:** female
**Age:** 26
**From:** Spain

**1. Do you have knowledge of mobile applications in education?**

For a long time, I have been interested in such issues as modern teaching techniques and technical innovations in general, which definitely allowed me to develop in this aspect. It is true that not all of the applications mentioned in the survey were known to me, but I have at least 20 applications on my phone, that enable me to learn. These are applications that allow me to plan my free time, achieve my professional and personal goals, and take care of a proper diet and sleep. I also have applications that allow me to count steps, calories, and physical activity, which I think is very important both in education and in the functioning of society as a whole.

**2. Do you use mobile applications for learning?**

When it comes to the applications that are definitely used by Ted, the notepad, Reverso and many applications that facilitate everyday functioning, for example a calculator, applications for ordering food or a car. I use applications that allow me to rent a hotel or other amenities. For me, it is very important because I am Erasmus+ student of Psychology and it is a priority to learn new languages all the time, so I installed a lot of such applications before coming for an exchange. They allow me, for example, to learn English, which is the leading language in the moment of mobility.

**3. Do you think that the use of mobile applications can be classified as an innovative teaching method?**

The use of modern teaching techniques, including elements related to education and the use of mobile applications, may become a priority in the future. Due to the fact that everyone has a telephone, laptop and other tools in their immediate vicinity. Thanks to this, using them in a constructive and developmental way can be important for a man in the 21st century. Moreover, in the present (pandemic) times it is important to plan time due to the number of stimuli that can distract a person (for example, working from home). Therefore, setting continuous notifications on the internet, in the application or on the phone can make people control what they do. For example, he will not waste time watching movies or series all day, because the application reminds him that he has a few more things to do. Maybe for some it will be an option to get better and better results and individual resources. It is important to educate

about such aspects, because from my own experience, I know that not everyone has the knowledge and skills to use such applications. Sometimes many applications are only in English, which in many cases prevents the person from using a given application. Consequently, it is important to translate the application, videos, or oral statements, but also the entire visual communication so that the news reaches as many people as possible who may be interested in the topic.

## Summary

Paying attention to modern teaching techniques, mobile applications and technical possibilities seems to be crucial in the education of the 21st century. Especially since 2019, when the whole world is struggling with the coronavirus pandemic, and many things have been transferred to the remote world, it is important to follow modern needs. Knowledge of the mobile application market in many cases becomes a priority. Lack of knowledge, skills or access to technology may result in some kind of exclusion or necessity to use older, less profitable activities. Many respondents indicated that the fear of failing to use digital technologies is so great that they sometimes prefer not to engage in this type of activity altogether in order to avoid possible unpleasantness. Some people were completely unaware that the technique, including mobile applications, can be used to improve their habits and learn via a phone, tablet or traditional laptop.

Summarising the assumptions, it turns out that the majority of respondents aged 19–26 do not have knowledge about the use of mobile applications in education. These types of tools are mostly used in everyday activities, e.g., ordering food, using a scooter, bicycle or taking notes (68%). Answering the second research question, the remaining respondents used the application at least several times in order to learn and prepare appropriate habits useful in education and planning free time (32%). Undoubtedly, young people perceive the use of mobile applications as innovative compared to traditional teaching methods (88%). Summing up and during individual interviews, the respondents stated that participation in the study helped them develop their knowledge about modern teaching techniques. Some of them stated that they would download the mobile applications mentioned in the survey and would try to implement them in their daily functioning, including in education. Both Polish students and Erasmus+ representatives stated that mobile applications can motivate to

work due to the possibility of setting notifications and monitoring the effects of their work.

Increasing the knowledge about mobile applications, the use of the internet, telephones, laptops and modern computer programs may contribute to the fact that children, adolescents and adults will not become addicted to such a large extent. This task is very difficult and complicated; however, prevention and educational activities can be a great resource. Educational activities, although not in every case, may contribute to the fact that more and more people will spend their time in a constructive way, using modern technologies, and not just re-creative, for example playing computer games. Due to the lack of knowledge and the possibility of using modern teaching and IT techniques, people do not have knowledge on this subject. It is worth mentioning that it often happens that they do not realise that the telephone can be used for educational purposes. You should pay attention to these issues both at school and in academia. This research shows that many people are interested in the subject of modern teaching techniques and the use of mobile applications but had no knowledge of it before. Most of the respondents also did not have the resources to search for such knowledge on their own.

Summarising, most of the respondents stated that after reading the questionnaire and the educational opportunities that they can pursue over the phone, they will download at least a few applications in order to try new possibilities.

**Selected practical implications**

1. Information on modern mobile applications should be conducted by specialists in order to counteract stereotypes on this subject.
2. Students should be informed about the proposed method of conducting classes with the use of mobile applications.
3. The ability to use modern educational methods, including mobile applications, can be helpful in the career development of students.
4. Information about the benefits of mobile applications should be explained in theoretical and practical terms.
5. It is desirable to implement modern teaching methods also during traditional academic classes.
6. Elements related to mobile applications should be introduced at every stage of education, including at the academic level.
7. The academic teacher should have knowledge and practical skills on the tasks or didactic methods, including new mobile applications etc.

8. Academic teachers should encourage the participants of their classes to prepare materials using new techniques, also mobile applications.
9. Teachers in both schools and colleges should be offered free training in modern teaching methods including mobile application
10. Having knowledge and inspiration regarding aspects related to mobile applications and modern teaching techniques may be associated with personal development.

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**Netography**

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# E-profile of an Exemplary Academic Teacher

ABSTRACT

The aim of the article is to present an image of an exemplary academic teacher. The image of an academic teacher is created by many entities. However, the most important source of the lecturer's image is the students' opinion. The audience creates the desired model of an ideal lecturer. The image of the teacher affects the quality and the effectiveness of his/her work, and even contributes to building the image of the university. Conducted surveys of the image of an academic teacher illustrate, what is the opinion on this subject in the perception of students. Personality is a component of the image. In order to find out what is imagined to make a perfect educator, a survey was carried out among 78 students from various universities. The analysis of the research material permitted the recognition of a profile of an exemplary academic teacher in the context of the desired personality traits.

**Keywords:** e-profile, profile, academic teacher

## Introduction

When considering the condition of higher-education didactics, the role/status of a contemporary academic teacher seems to be important. The changing conditions of the educational reality, and thus a different way of organising academic education, cause that the tasks assigned to educational institutions raise many doubts. Continuous reforms bring chaos and provoke questioning of the status of a modern teacher, which nowadays becomes more topical, especially taking into account the popularity of higher education in the world (Ratajczak, 2016). Scientific discussions have been taking place for

years around the profile of an exemplary academic teacher, and this topic is the focus of numerous scientific conferences. Given the shape of modern education, many people shift the burden of responsibility from educational institutions to teachers. The teaching profession is increasingly demanding, and the goals and tasks set are more and more stringent. Therefore, the aim of this article is to present an exemplary profile of an academic teacher in terms of desired personality traits.

Considering this issue, it is important to explore the meaning of the term academic teacher. In encyclopaedic terms, it means "a specialist appropriately prepared to conduct didactic and educational work in educational institutions (kindergartens, schools of various types, non-school educational facilities)" or "a person imparting knowledge to others, endowed with authority and being a role model" (Encyklopedia PWN, n.d.). Commonly, it is assumed that this means a person teaching at school. It should be noted, however, that in accordance with the Law on Higher Education and Science of July 20, 2018, this term also applies to people employed at universities (Głowania, 2016). It is worth adding that the expression "academic teacher" is a semantically new construction, being an umbrella term for all academic teachers, irrespective of their academic degrees and titles, and this term "replaces the 'master' on a daily basis almost as effectively as 'scientist' replaced the 'scholar'".

Academic teachers have the status formally defined as "research and didactic worker". The duality of this term indicates the equivalent nature of these adjectives. The teacher refers to the pedagogical dimension and the "academic" indicates the scientific element. Przemysław Piwowarczyk (2016) points to the limitation of the responsibility of academic teachers compared to lower-level teachers in terms of shaping attitudes and upbringing. An academic teacher does not seem to be obliged to fulfil this role. Although the fact of withdrawing from the student's upbringing after they receive a high-school diploma may seem controversial, the essence of academic didactics is precisely the release from these obligations. This issue is quite problematic. From a formal point of view, a university student is an adult, but it is important to remember that a person is subject to shaping throughout the entire life, so it is necessary to take into account the aspect of upbringing when transferring knowledge to students. The role of an academic teacher is often perceived superficially, being reduced to a clerk, and the creative contribution to shaping the younger generation of students is ignored. The idea of a teacher-master, under whose wings students reliably fulfil their duties, is underestimated. Not because of fear or coercion, but because of the respect and trust they place in them. Following this idea, the

key role is also played by the personality traits of the educator, which, according to the literature on the subject, can be analysed on three levels:

a) psychological, related to individual characteristics, such as reliability, erudition, methodological competence, justice, honesty, courage, etc.;
b) pedagogical, concerning relations with students;
c) sociological, including the relation of social values to personal values.

When considering the condition of an academic teacher, one should refer to legal provisions. The duties of an academic teacher are regulated by the Law on Higher Education and Science (Act of July 20, 2018), according to which the duties of an academic teacher, classified into the following groups: teaching, research, research and teaching, depending on their membership in a given group, are: education and upbringing of students; conducting scientific activities; participating in the life of PhD students. Moreover, an academic teacher is obliged to participate in the organisation of university activities and to constantly improve their qualifications. Both aspects do not function as autonomous elements, but complement each other and mutually interpenetrate, because the teacher's scientific achievements may be insignificant if the educator is not effective in their teaching activities.

The methodological and professional competencies of an academic teacher should go hand in hand with the appropriate set of personality traits, although it is quite a challenge. The conducted research shows, however, that the model of an exemplary educator is present in the minds of students.

It is impossible to create an ethos of an academic teacher following the example of ancient chivalric virtues. However, the starting point for further considerations is the hypothesis that an academic teacher should have certain features that determine the effectiveness of his work. The set of desirable features is obviously not a closed creation. The most important, as understood by the author, include:

a) IQ, i.e. the level of mental efficiency of an individual, based on the ability to think logically, the accuracy of the choice of means to achieve the intended result, self-criticism, and the ability to adapt to environmental conditions. The teacher should have broad thinking and comprehensive knowledge;
b) knowledge – the teacher should be equipped with appropriate theoretical background to be able to pass it on to other generations and treat it as a source of their development. The idea of lifelong learning plays a significant role here. Relying solely on the knowledge gained in the course of studies leads to stagnation and ineffectiveness, adherence to outdated patterns that not keeping up with the changing reality;

c) the ability to transfer knowledge – this skill can be developed thanks to mastering the theory and practical experience. It is about knowing the ways and forms of teaching content in an accessible way, taking into account the adaptation to the student's way of thinking, the art of explaining, solving difficulties, encouragement to explore a given topic. It is conditioned by a creative approach and ingenuity. It is also the mastery of the possessed knowledge, which is related to the ability to build a logical and orderly structure of the message, resulting, among others, from good orientation in methodological issues;
d) the ability to express oneself in compliance with the rules of the language culture. Fluency of speech, rich vocabulary, precision of argumentation, lack of monotony while presenting determine better effectiveness of the message. Non-verbal communication is also important;
e) divisibility of attention understood as the ability to concentrate on several aspects at the same time. It should be noted that the pace of work of students is not the same, and the role of the teacher is to ensure that everyone assimilates knowledge in an atmosphere of order, concentration and commitment. The teacher should correct the behaviour of the group members (Słotwińska, 2021).

The teacher should create a space for free expression and confrontation of one's views, ideas and attitudes. An element enabling the elimination of the gap between traditional and modern didactics is open dialogue and partnership, which may seem to be controversial. Dialogue both within the walls of the university and in the mediated contact between the lecturer and the student should be based on openness and mutual trust. It is the educator who is expected to decode the intentions of students and understand the meanings of messages. In turn, partnership, in this context should be understood as participation (Zalewska, 2016).

A young research and didactic staff member tends to have better research workshop than didactic skills, which can be quite a challenge. Kostera and Rosiak (2008) emphasise that a graduate of MA studies does not feel competent enough to conduct classes with students. Teachers at lower levels of education, unlike university teachers, complete pedagogical, post-graduate and other courses. On the other hand, there is a view that a graduate of master's studies can easily find themselves on the other side and deal with teaching without any special preparation. People who take their first steps in teaching are convinced that they have a good understanding of students' needs due to the small age gap (Toeplitz, 2016). There is a certain set of qualities of a good academic teacher:

interpersonal competences and their awareness, assigning great importance to teaching competences, the ability to self-control and control the processes taking place in the group. However, the question arises whether fresh graduates of master's studies are equipped with such qualities.

The way of transferring content is not formalised. The university is an organisation based on traditional values – there are no courses or studies dedicated to teaching at the academic level. Academic subjects do not undergo such assessment and formalisation as primary or secondary school subjects (Kostera & Rosiak, 2008). Guideposts for students of academic didactics may be advice provided by more professionally experienced academic teachers (Ostolski, 2021).

## Research surveys

The aim of the conducted research was to show a profile of an exemplary academic teacher in the context of the desired personality traits. The research group consisted of 78 students from various universities. The respondents were selected randomly from different parts of Poland. The research was conducted with the use of an electronic questionnaire in August 2021. The survey contained five closed-ended questions and one open-ended question in which the respondents provided their own answer. The questions belonged to the cafeteria-style checklist category – the respondents could choose only one answer. The questionnaire was prepared in Polish. The statements of the students were translated into English by the author.

In the first question, the respondents were asked to indicate the most important characteristics of an academic teacher. It was possible to choose only one answer from a ready-made list of features. The answers are presented in Figure 1[1].

The second question was open-ended, and the respondents had to independently indicate the features which, in their opinion, should be characteristic of an exemplary academic teacher. Some of the features indicated coincided with those given by the author in question no.1, but they were supplemented with such answers as: interest in the topic (2), flexibility (2), kindness, personal culture, an objective approach to the student and free of stereotypes, patience, lack of favouritism and the ability to resolve conflicts. The following answers

[1] Based on the questionnaires no. 1–78.

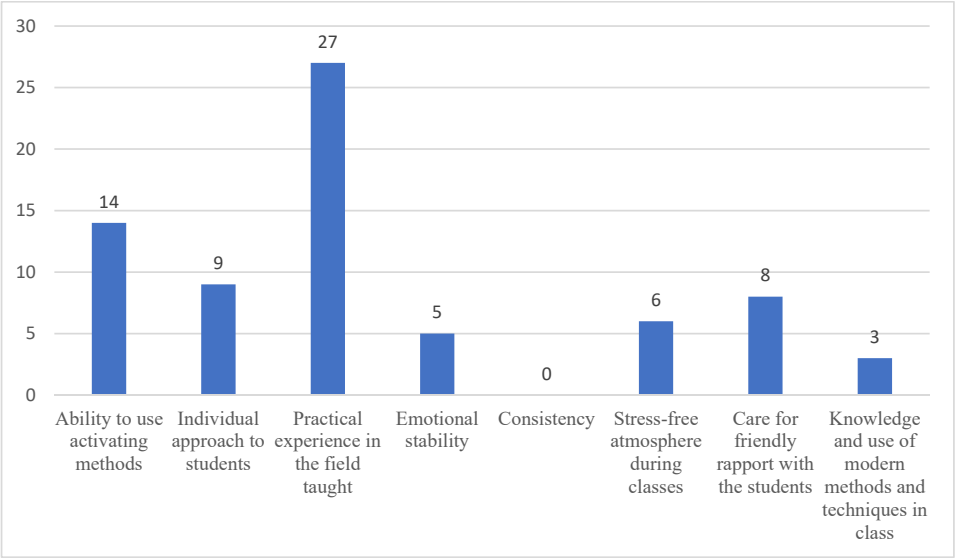


Figure 1. Question no. 1.

Source: Author's own elaboration

seem interesting: political impartiality during classes, outdoor activities, high emotional intelligence, loyalty, and low difficulty of requirements for subject passing. For 2 students what counts is fair treatment and availability outside of class hours. It is also important to check final assignments on time, being enthusiastic and willing to work as well as being open to having discussions with students. Students also appreciate the constant development of their competences. One of the respondents pointed to the appearance. Humorous, but important answer seems to be the working "smile muscles". The following responses should be quoted: "respect for a student because very often there is no such respect, and the lecturers are entitled to everything", "communicativeness, openness to students' ideas, self-criticism, not exalting because of the title"[2].

In question 3, the respondents indicated personality traits that an academic teacher should have. The respondents had to decide on one answer. The results are shown in the figure below[3]:

The fourth question, as opposed to question no. 3, asked the respondents to indicate features which, in their opinion, are not acceptable in academic teachers. The answers are presented in the figure below.

[2] Based on the questionnaires no. 1–78.

[3] Based on the questionnaires no. 1–78.

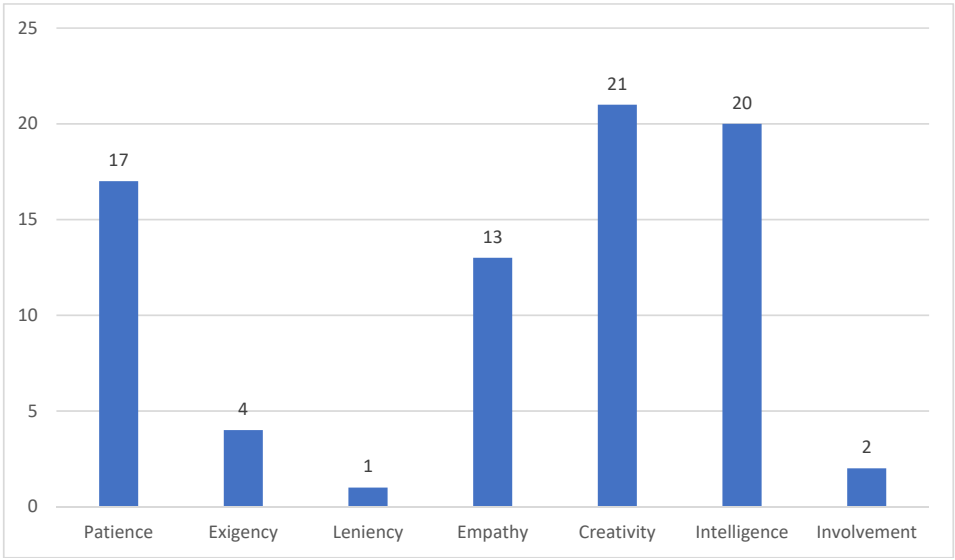


Figure 2. Question no. 3.

Source: Author's own elaboration

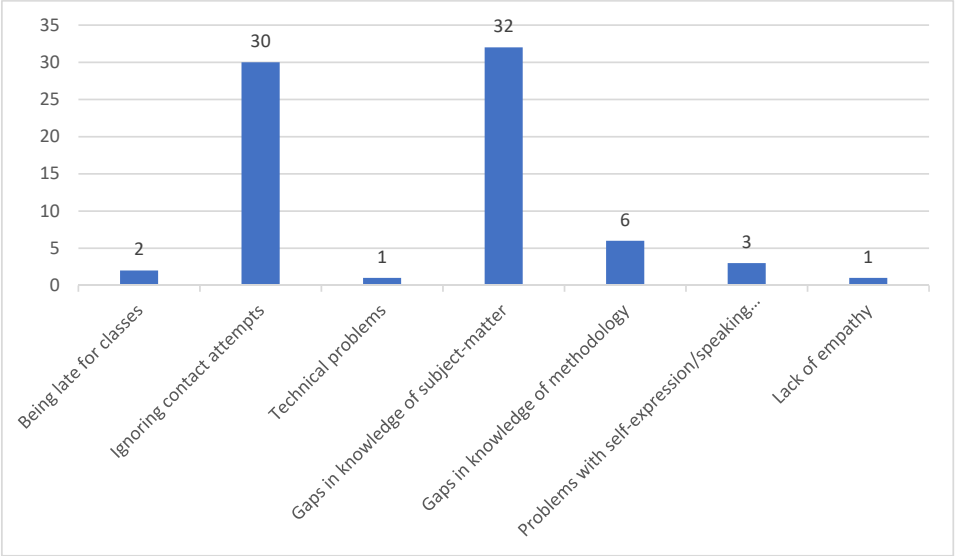


Figure 3. Question no. 4.

Source: Author's own elaboration

In the question no. 5, the students were asked to give a negative or affirmative answer to the question: "During your studies, did you meet a teacher who was the embodiment of your picture of an exemplary academic teacher?". The responses indicate that 53 respondents met a teacher who, in their opinion, was the embodiment of the exemplary lecturer. The answer "no" was given by 19 people[4]. The result is optimistic.

In the sixth question, the respondents had to answer "yes" or "no" to the question: "Did you participate in the classes during which the instructor had technological problems, e.g., using the projector, etc.?". An affirmative answer was chosen by as many as 65 people, while a negative answer – by only 7[5].

## Own research – analysis of answers

When asked about the most important features of an academic teacher, the respondents most often mentioned practical experience in the field they teach. During their studies, students expect not only to gain theoretical, but also practical skills that would help them achieve competitiveness on the demanding labour market. Secondary school graduates choose studies that correspond to their planned career path, in line with their interests. During their professional career, students will have to deal with practical challenges. A diploma is an important, but not the only, bargaining chip in applying for a job. However, it is worth noting that the opportunity to gain experience are primarily internships offered during studies. The practical experience of the academic teacher makes it easier to confront the expectations with reality. The ability to use activating methods is also important for the respondents. This means that students appreciate interactive activities. Expressing one's position and listening to the arguments of colleagues is beneficial for learning active thinking and drawing conclusions. It is worth noting that not all content can be conveyed in an interactive form, and the transferred dose of knowledge does not always invigorate students. The size of the group also seems to be important – a smaller number of listeners creates a better space for discussions and exchanging views. An interesting form of conducting activating classes is to pass the initiative to students, so that they can prove themselves in the implementation of projects, preparing and delivering presentations, and then undergo the assessment of

[4] Based on the questionnaires no. 1–78.
[5] Based on the questionnaires no. 1–78.

their colleagues. In this way, they build the ability of self-presentation and resistance to stress, valued, and required by employers. Independent work on a given issue increases creativity as well as independence and teaches self-discipline. The respondents often indicated an individual approach to the student. This is quite an important issue, from the didactic point of view, individualization of teaching can have a positive impact on the optimization of education, due to the adaptation of didactic techniques and methods to learning styles. The considerations of Teoplitz (2016) seem important in this context, as she notices that participation in mass forms of transferring knowledge, such as lectures by a teacher, does not create conditions for establishing an educational dialogue. It is an important element of didactics, which contributes to the development of the student's independence and subjectivity.

In the open question, in which the students were asked to independently list the features that should distinguish an academic teacher, the answer indicating the possession and appropriate transfer of knowledge was repeated. It does not raise any objections, due to the very fact that the studies are aimed at transferring the knowledge necessary to find oneself in the labour market. The form itself is also important – the one that favours remembering and assimilating the content, which requires adapting to the style of classes and the group. First-year students require a different approach than last-year students, who treat classes with greater nonchalance. First-year students, who often struggle with the discrepancy between secondary school and university, often need specific guidance, and are also more focused on active listening, while last-year students, experienced and often taking their first steps in their professional work, are focused on getting feedback. This is how the flexibility indicated by the respondents can be understood in the author's view – as the adaptation of the methods of transferring knowledge to a given listener.

Ingenuity and being creative turned out to be the most desirable personality trait for students. Examples of ingenious and creative activities are popularised in the media and literature on a large scale and should, therefore, be used in educational practice. Students approve innovative classes that move away from displaying slides and engage the audience. Giving such is a difficult skill that requires the teacher to work on their methodological skills. This way of teaching helps students to think independently and to be critical. Breaks in the form of activating activities, as compared to lectures in which students have to absorb and analyse information, may prove useful. A high level of intelligence is a feature that, in the opinion of students, is also highly scored. An academic teacher should have a variety of interests, work on broadening their mental

horizons, and be familiar with a wide range of matters. Patience also seems to be an indispensable element in a teacher's work. This includes listening to and accepting various positions and comments, as well as having an understanding approach to the student.

Gaps in the knowledge of subject-matter are a trait that is unacceptable to the audience. Having the necessary theoretical base is an obvious and indisputable aspect. It seems important to grow, improve one's competences and believe in the idea of lifelong learning. Changing the topic or giving an evasive answer when the teacher does not know the answer to a question is not the right strategy and contrary to appearances, it does not save from a loss of respect. It seems a better idea to honestly admit to not knowing the answer because students will easily discover falsehood and manoeuvring. Ignoring students' contact attempts and absenteeism from shifts breeds frustration among students. E-mail correspondence and timely start of classes are an expression of respect for students and should be a standard in the work of an academic teacher. Problems with using digital tools seem natural and should not be the focus of students. Opinions here are divided though. Some argue that teachers should focus on teaching rather than solving technical problems, but there are also voices that tools such as projectors have been standard equipment in universities for a long time and they should not have any difficulties while using them. In the light of the above considerations, it is comforting that nearly three-fourths of the respondents met an academic teacher who was an embodiment of the desired personality traits.

## Summary

In didactics, there is space for the teacher-student relationship, which seems to be a very important part of the didactic process. The research on a profile of an exemplary academic teacher is still in progress today. The role of an academic teacher is often perceived superficially, being reduced to a clerk, and the creative contribution to shaping the young generation of students is ignored. Szulc (2021) aptly noticed that each profession requires proper preparation and a lot of time and energy. To become a professional in any field, one needs to be not only a good craftsman, but also a theoretician. The profession of an academic teacher involves having certain qualities. In the opinion of students, creativity, the ability to transfer knowledge and intelligence are of particular importance. It also turns out that the teacher's practical experience in the field

is crucial. This choice is perfectly justified – when taking up studies, the student expects, above all, to be prepared to enter the labour market. The current digital reality also forces the teacher to be proficient in handling new technologies. Popularisation of remote education and the presence of multimedia are connected with the necessity to have a high level of digital competences. In this context, it seems pessimistic that in the light of the research results, as many as 90% of students admitted that they participated in classes during which the tutor had problems with technology.

This article is an attempt to discover the perfect model of an academic teacher in the context of personality traits, but there is a need for further research in the areas related, for example, the field of professional competences.

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# Agile Process Model as a Structural Framework for Academic Online Courses (Using the Example of a Project Thinking E-course at the MSCU)

ABSTRACT

The article is a description of a didactic experiment based on the adaptation of the agile process model to online academic classes, which was conducted during a project thinking course at Maria Curie-Skłodowska University in Lublin. Each of the six phases of the project life cycle corresponds to specific educational practices, which are characterised through the prism of three variables: content and skills, tools and practices, and expected results. As a summary, proposed methodological approach recommendations are presented.

**Keywords:** agile, e-learning, project-based learning, teamwork

## Introduction

A decline in the quality of student collaboration in team-based projects has been observed for years. Academic teachers, regardless of their specialisation, have been raising objections to the levels of involvement and responsibility for the entrusted projects (Krehbiel et al., 2017). They have also noticed that students prefer an individualised approach to the learning process (Ryazanova et al., 2020). The COVID-19 pandemic and need to almost immediately transfer all academic classes to the network environment only emphasised these observations. Social isolation and technological mediation prevented spontaneous student-student and student-teacher communication. Moreover, it forced students to develop their own ways of fulfilling the assigned learning tasks (Rapanta et al., 2020).

Obviously, the same factors influenced academics. Until the pandemic broke out, many lecturers conducted only face-to-face classes. So, the change of the teaching environment forced them not only to use new technological tools, but also to figure out how to effectively transfer knowledge and skills with their help. Meanwhile, as indicated by the specialists of Education International and UNESCO (Doucet et al., 2020), there is no universal model of distance learning, and the success of online pedagogical activities depends to a large extent on the e-course subject. In reference to Rapanta et al. (2020), it means that every single e-learning class must be adjusted to seven interdependent factors: context, tasks, tools and resources, roles, assessment, learning objectives, and the learning goal.

In uncertain teaching-learning conditions, the response to the need to adapt constantly to current student requirements and the market situation may be met through the use of the agile methodology (Al-Ratrout, 2019; Inkermann et al., 2019; Prejean et al., 2019) – a management approach derived from the IT world, which makes change a key element of the process.

## Agile principles and process model

The Manifesto for Agile Software Development, announced in 2001[1], is known as a common declaration of the alternative IT project management approaches. According to it, software development project teams should value "individuals and interactions over processes and tools, working software over comprehensive documentation, customer collaboration over contract negotiation, responding to change over following a plan" (Beck et al., 2001). These basic assumptions translate into the eight principles (Focus on the business need, Deliver on time, Collaborate, Never compromise quality, Build incrementally from firm foundations, Develop iteratively, Communicate continuously and clearly, Demonstrate control) and the six-step process plan (Pre-Project, Feasibility, Foundations, Evolutionary Development, Deployment, Post-Project) (Craddock et al., 2017), the purpose of which is to ensure the delivery of a product that meets the customers' expectations and was co-created with them from the very beginning.

The potential of this approach was quickly noticed by the community of educators, who saw a clear parallel between project management and edu-

[1] Agile as a collection of various practices was known and used before 2001 (López-Alcarria et al., 2019; Prejean et al., 2019). However, it is recently considered to be one of the most important management approaches (Chassidim et al., 2018).

cation systems (López-Alcarria et al., 2019). The first methodological studies that adapted agile in education appeared in the first decade of the 21st century (Sharp et al., 2020). The teachers' interest was later expressed in numerous agile manifestos for education (Krehbiel et al., 2017; Hulshult & Krehbiel, 2019; López-Alcarria et al., 2019), which drew attention to the need for: real, barrier-free cooperation between tutors and students, concentration on the educational needs of students, adaptation of the education programme to the ongoing changes of the learning environment, recognition of the achieved educational outcomes as more important than evaluation. It is worth noting that the proclaimed demands were related not only to individual courses, but also to the entire education system (Ryazanova et al., 2020).

Regardless of whether and to what extent these manifestos were implemented in didactics, it must be admitted that agile tools focussed on relationships and quality gave and still give hope for solving some of the student-teacher teamwork issues (Ghimire & Aljanaby, 2020). The undoubted advantages of this approach include, for example, increasing students' communication skills, creating deeper interpersonal relationships, stimulating grassroots team activities, and strengthening the individual motivation to learn (Al-Ratrout, 2019).

There is no surprise then that over the last decade there has been a marked increase in interest in agile education. Most of the described applications, however, apply only to information science, from which the agile methodology is derived (Krehbiel et al., 2017). In a literature review for 2008–2018, studies on the arts and humanities accounted for only 1% (López-Alcarria et al., 2019). Besides, there has been only little analysis of the problem of using agile in e-learning (Hulshult & Krehbiel, 2019). Introducing this approach requires, firstly, significant changes to the construction of the syllabus, the teacher's role, interaction, theory transfer, group structure, and evaluation (Al-Ratrout, 2019; Tretiakova 2020), and secondly, effective balancing with two main educational components – pedagogic and content (Sharp & Lang 2018).

## Experimental Method

Recognising the usability of the agile principles in the COVID-19 teaching-learning environment and accepting the truthfulness of the claim that agile can only be learned through practice (Masood et al., 2018), the agile process model was adapted to a 30-hour obligatory project thinking online course.

The experiment was conducted for second-year graduate students of Media Production at the Faculty of Political Science and Journalism at Maria Curie-Skłodowska University (MSCU) in the winter term of the academic year 2020–2021. 62 students (39 women, 23 men) with no or little background in software development and project management, but with high competences in social media communication, were supposed to develop a Facebook communication strategy of the MCSU Institute of Social Communication and Media. The students were obligated to work on the project in small (2–6 members), self-organised teams facilitated by the tutor. Each team had the same goal and access to the same materials. The teams were allowed to make mistakes and learn from them.

The course was structured around the six basic phases of a project lifecycle: Pre-Project, Feasibility, Foundations, Evolutionary Development, Deployment, Post-Project. Each of the phases was adjusted to the academic conditions, such as low integration of students' e-community, time and budget limitations, and software restrictions. Based on previous studies on the agile education models (Krehbiel et al., 2017; Chassidim et al., 2018), despite a project-learning orientation of the course, necessary theoretical information was introduced at the beginning of the class. Instead, bearing in mind that for most participants it was the first meeting with project management methodology, the focus was on devoting an agile mindset (Hulshult & Krehbiel, 2019). As Tretiakova (2020) proposed, the teacher also stayed open to syllabus adjustments suggested by students throughout the course.

From a technical perspective, the course was run in parallel on the two MSCU e-learning platforms: (1) MS Teams, where videoconference meetings were held; (2) Moodle (locally called the Virtual Campus), where source materials were posted. Neither tool was expanded or adapted.

The main objective of the course was to improve teamwork skills by involving the students in a "hands-on" project, while the expected specific learning outcomes were four abilities: (1) ability to resolve project dilemmas; (2) ability to design and implement new solutions; (3) ability to solve problems creatively; and (4) ability to work in a team under time pressure.

The following part of the manuscript will describe in detail how the course was shaped. It will focus mainly on three aspects of the teaching process: conveyed content and skills, used tools and practices, and expected outcomes. The presented information is the result of the participants' observation, written from the perspective of the lecturer conducting the course. As a part of the summary, the described approach recommendations will be indicated.

## Pre-Project Phase

***Duration: 4 weeks (one meeting per week)***
According to the agile methodology (Craddock et al., 2017), the Pre-Project Phase is devoted to the development of reference conditions. This is a relatively short and usually unformalised stage, the purpose of which is to check the feasibility of the project.

In the academic formula, this phase can be related to familiarisation with the syllabus and the course conditions, which usually takes place at the first meeting. However, remembering the overarching goal of the project thinking class (to introduce the agile approach through action), this phase was mainly intended for the presentation of teamwork methods.

***Content and skills***
The didactic materials were divided into two parts. The first was the discussion of the main theoretical problems, such as: project definitions and determinants, roles and types of project personalities, and classifications of project methodologies. According to the "from general to detail" teaching approach (Inkermann et al., 2019), the discussion of these issues was general in nature, and its aim was to check the current state of knowledge of the students, define their project experiences, and obtain a common basis for all course participants for further activities. In turn, the second block of the content was devoted to the introduction and testing of teamwork tools for the ideation and requirements collection. The presented techniques were selected with the intention of being used in the following stages of the course. Moreover, in order not to dominate the practical aspects of the project-based learning formula, professional terminology was deliberately not introduced, and each unit focussed on transferring knowledge was supplemented with a set of engaging exercises.

***Tools and practices***
The theoretical part of the classes was conducted on the basis of mini lectures, the length of which did not exceed 15 minutes. The lectures were conducted at the beginning or the end of the meeting. They were organised as an introduction or as a summary of the exercises and case studies that invited the creation of group definitions (from a single event to generalisation of the problem). In order not to overwhelm the students and to diagnose their opinions, the lectures were frequently combined with short online surveys, chat voting and educational games with prototyping elements. This block was supplemented by copies of

articles, presentations and links to materials extending selected topics posted on the Moodle platform. At every meeting, students were also informed about the possibility of a broader discussion of the problems that met their interest.

The workshop part of the phase used a series of unstructured short, 12–15-minute brainstorms and discussions based on the SCAMPER, 635, 66, quick-thinking, and snowball models. Additionally, during the classes on the empathising requirements and user-centred design, students were familiarised with personas and empathy mapping as tools allowing for a non-technological definition of the essential features of the created solutions. During the exercises that introduce the abovementioned practices, the students were divided into teams of 5–6 people. For each class, the students were assigned to different groups, randomly by the automatic grouping option in MS Teams. The teacher did not participate in the teamwork but was always available on the chat and answered questions that appeared there. At the end of each session, the students were asked to provide a short, usually 5-minute summary of the effects of the discussion, as well as the methods they used. Their self-reflection was then confronted with the opinion of the lecturer, who pointed out advantages and disadvantages of the chosen approaches.

***Expected outcomes***

- Indication of a broader context and justification for further actions. Emphasising that good organisation and cooperation in a team is the basis for the success of the project.
- Providing the necessary tools for teamwork, thus reducing the level of uncertainty related to the project implementation.
- Getting the students used to working in a team. Helping them to get to know each other better, thanks to which the subsequent creation of project teams will be easier and more effective.

## Feasibility Phase

***Duration: 1 week (one meeting per week)***

The Feasibility Phase is the stage in which the project team determines whether there is any solution to the diagnosed problem, what benefits can be obtained from solving the problem and how the problem can be solved (Craddock et al., 2017). It is still not a very detailed phase. Nevertheless, it outlines possible courses of action and constitutes the basis for further, more detailed arrangements.

In the context of the discussed experiment, this stage was devoted to the presentation of the project task and a discussion of possible solutions. Efforts were also made to establish the feasibility of the entrusted project by the students.

***Content and skills***

During the classes, the general scheme and typical assumptions of the communication strategy in social media were presented. The used framework was deliberately not adapted to academic conditions and did not contain details indicating possible implementation methods. In some aspects the presentation method resembled a backlog (Ghimire & Aljanaby, 2020) – a list of tasks to be done, which project teams have to elaborate in the context of the current conditions.

Contrary to the discursive model, the students were not provided with materials that prompt ready-made solutions (Einum, 2019). However, they did receive fanpage statistics and main success criteria. In line with the proposals of Hulshult & Krehbiel (2019), the students also received a general timeboxing plan – the division of issues into iterations prepared by the lecturer, so that they could compare their progress with the overall plan.

After carrying out this part of the didactic material, the students were asked to independently divide themselves into 2–6-person project teams. They were also informed that they would be required to report on future project progress in weekly 15-minute meetings with the teacher.

***Tools and practices***

During the discussed phase, only one lecture with a multimedia presentation was used. After presenting each part of the strategy, a classic Q&A series was carried out. At times when the students did not ask questions, possible questions were suggested by the teacher. After class, the presentation was posted on the Moodle platform and was available throughout the course.

***Expected outcomes***

- Eliminating doubts about the structure of the final project, thus reducing student anxiety.
- Prove that the assignment is flexible and achievable by the students.
- Forcing a creative approach to the entrusted task.

## Foundations Phase

***Duration: 1 week (one meeting per week)***

The next project phase is Foundations (Craddock et al., 2017), i.e., the stage dedicated to establishing the business, solutions and project management foundations. This is still an early part of the project, the result of which is general action models. The outputs of this stage are typically a requirements list, a control pack, and a delivery plan.

The teaching load and the fact that the course was not carried out in a real market environment (the product of the classes was not introduced to the market; the teams only developed a concept of activities), forced the almost complete abandonment of the control and delivery plans. Therefore, in the described experiment, the focus was solely on the organisation of the work in newly established teams and the development of business foundations.

***Content and skills***

The first part of the meeting was devoted to management issues. The created project teams were to answer three basic questions: (1) whether the team will be able to develop the strategy; (2) how the team plans to cooperate and what communication tools/methods will be used; (3) how much time the team needs to develop a strategy and what the initial allocation of time is for the implementation of the main parts of the project.

In the second part, students focus on identification of the requirements for the designed solution. The teams carried out an independent, not subject to any scheme, observation of the social media of the MSCU Institute of Social Communication and Media Sciences and its direct competitors. After the initial analysis, the students prepared a list of questions regarding the communication practices undertaken by the content managers of the Institute's fan page and the business expectations of the Institute's authorities.

***Tools and practices***

Stand-up meetings were used to discuss the management plan. The meeting of each team with the lecturer lasted 15 minutes and was oriented around the three main questions indicated above in the Content and skill section. If the students were unable to answer them, they were asked to respond by email within a week or to reply at the following meeting. The business requirements part, in turn, was based on unmoderated brainstorming sessions. The results of the discussions (questions for channel administrators and authorities) were

introduced by each group to the Google Docs launched by the teacher. Based on the collected questions, the tutor launched two online surveys for the relevant participants of the analysed process. The survey results were uploaded to Moodle and were available throughout the project. Similarly, the Google Docs file was always available, and the students had the possibility of asking further questions.

***Expected outcomes***

- Increasing the awareness of the complexity and long-term nature of the project, which may translate into increased involvement in the implementation of the tasks and the motivation to work regularly.
- Self-organisation of teams, with taking into account the assigned tasks and time allocation.
- Raising awareness of the need to involve business representatives in project activities.

## Evolutionary Development Phase

***Duration: 8 weeks (one meeting per week)***

The Evolutionary Development Phase (Craddock et al., 2017) is the most complex and long-lasting stage of the project. During it, the ordered product is built in short time windows and with constant contact with a business representative. The construction is carried out iteratively – the first version of the product is created quickly, and each subsequent week of the project is about expanding, adjusting and improving it (in the order of priorities: from necessary to additional elements). Depending on the process complexity, it may be a more or less complex phase.

This stage in the described e-course was intended for the development of the final version of the communication strategy. In principle, it was expected that the teacher would only facilitate and force the prioritisation of the tasks chosen by the students. At the scheduled time, the implementation of three short time windows was assumed, which corresponded to the four chapters of the communication strategy (the last window was subordinate to two interrelated parts of the document). There was also – intentionally – no division into the engineering and technical stages, but the work proceeded in accordance with the key: identification of the problem on the analysis, review of possible solutions, development of the prototype, implementation, evaluation.

***Content and skills***

The classes at this stage were focussed on two main objectives: (1) familiarising the students with the content and form of the social media communication strategy expected by the business; (2) development of teamwork skills and methods of reacting to negative assessments of the performed work. In the adopted approach, the lecturer played the role of a business ambassador – pointing to the client's requirements, and methodological support – the lecturer suggested how to motivate the team, how to fulfil the assigned tasks in time, etc. In turn, the students learned through practice to define and prioritise requirements, divide the requirements into feasible tasks, plan and supervise the teamwork, and take care of the product quality and its compliance with the business needs.

***Tools and practices***

This part of the experiment was based on typical agile practices: time windows, weekly stand-up meetings, and showcase. The students worked in short, flexible time windows that were adapted to the students' abilities. If the substantive scope of the iteration was not executed – the current window was extended and the following window was shortened accordingly.

The project teams worked on tasks independently and reported progress at weekly stand-up meetings, which – due to time constraints – were combined with elements of retrospection. During the 15-minute meetings, the students had to respond to four questions: (1) which tasks were completed, and which were not; (2) what the biggest challenges were; (3) what tasks the students want to accomplish within the next week; and (4) what risks they see in the planned activities. If it was decided that the diagnosed problems made it impossible to continue the work, the meetings were supplemented with MS Teams chat conversations or e-mail correspondence.

The showcase, i.e., the evaluation of the current implementations, was carried out after each iteration was completed. The teams recorded their work in separate Google Docs folders. During the meeting closing the window, the students provided the teacher with a link to the document with editing and commenting permissions. The lecturer, playing the role of a business ambassador, then assessed the positive and negative sides of the performed work.

***Expected outcomes***

- Getting students used to working in a team under time pressure, delays, and conflicts of interests.
- Learning to solve project problems resulting from changing business conditions and expectations.

- Increasing the sensitivity to taking into account the needs of the end-users.
- Practising critical analysis of existing or developed sources.

## Deployment Phase

***Duration: 1 week (one meeting per week)***

The penultimate phase of the project is the implementation of the designed solution or delivery of the final product to the customer (Craddock et al., 2017). In fact, this is the last stage of real project activities, at the end of which the project is formally closed and its business, technological and management effectiveness is assessed.

In the academic course, this phase was the equivalent of the strategy delivery and a conversation on the learning process, during which the tutor paid attention not only to the effectiveness of the teamwork, but also to the agile methodology, which may become a future interest of the course participants.

***Content and skills***

At this stage of the project, the students introduced the last corrections to the developed strategy. Their attention was focussed on two aspects: (1) assessment of content coherence and feasibility of the proposed solutions; (2) visual consistency of the document. The finished works were then confronted with representatives of the institute's authorities. From the process flow perspective, the team assessment reflects the method of working on the project, such as fulfilling tasks in the prescribed time, communication practices, and methods of resolving personal and business conflicts. The self-aware teams, knowing their strengths and weaknesses, were finally informed about further training opportunities in the field of project management methodologies.

***Tools and practices***

Work on improving the project was carried out in Google Docs or MS Word. The final versions of the strategies were uploaded to the Moodle platform. They were then submitted for evaluation to a representative of the institute's authorities. After the evaluation, the information about the grades was entered into Moodle.

The section devoted to the evaluation of the students' works was based on a retrospective interview. Team members were asked to provide feedback on the entire course and the teamwork patterns. In response to this information, the teacher informed the teams about possible methodological solutions that

could help them to avoid the diagnosed problems in the future. Additionally, as part of the closure, each group was provided with information on the certification paths.

***Expected outcomes***

- Making the students aware that the activities carried out during the e-course are part of the complex, certified project management approach.
- Emphasising that building an effective project team takes time and demands practice, and that conflict is a natural part of team collaboration.
- Indicating further educational possibilities in the field of project management.

## Post-Project Phase

***Duration: 0 weeks (no meetings)***

Assessment of the effectiveness is a stage that takes place after the project completion. The members of the project team evaluate the long-term benefits of the implementation and the work undertaken (Craddock et al., 2017).

Due to the academic calendar and students' obligations, it was not possible to fully adapt this phase to the course. Nevertheless, the evaluation was partially implemented in the last teacher-student meeting, when the teams discussed the advantages and disadvantages of the course. The results of the MSCU Quality of Education Survey were also a kind of reflection. 12 out of 62 students took part in an anonymous e-survey that was carried out about a month after the end of the course. All of the survey participants considered the used e-learning forms to be adequate (1 person) or highly adequate (11 people). The support provided by the teacher, conditions for taking up activity and commitment, as well as the level of enriching knowledge and skills were assessed in the same way. Nevertheless, due to the evaluation meeting form and the low attendance, presented students' assessments cannot be considered as an exhaustive and binding source of the performance feedback. In both cases (reflection meeting and survey), it is not possible to exclude that the students expressed their opinions in the way expected by the lecturer or that they did not engage in the evaluation because they did not want to comment negatively about classes, teacher, and mates.

## Conclusions

The agile mindset is well-established in contemporary educational practices, but still offers a lot of teaching-learning adaptation possibilities. One of these possibilities was described in this paper – the didactic experiment, which combined an online course structure with the agile lifecycle process. Even though this implementation is not free of weaknesses, which will be discussed in detail in the Limitations section, it allowed conclusions to be formulated that may contribute to further, better adjustments of agile in e-learning:

- The academic teacher can implement all agile project phases into the e-learning course, but some of them have to be customised. The task selection and initial stages preceding the Evolutionary Development Phase, which introduce the students to teamwork, require the most modifications.
- Agile works effectively in highly motivated teams, so teachers should carefully consider the selection of a project assignment before starting the course. The task should correspond to the interests of the students and be realistic within the time frame allocated to the class. The team's motivation may also be increased by: (1) independent choice of the goal by the students in the Pre-Project Phase; (2) involvement of real decision-makers in the implementation of the project and/or its evaluation; (3) parallel, public operation of project teams.
- Devoting the Pre-Project Phase to mini-lectures and exercises preparing students to work in teams and project rigour made it possible to reduce the level of anxiety of the participants related to the new, unknown formula of the classes. However, the time spent on this stage should not be too long. It is better to limit exercises in ideational techniques to the presentation of the two or three most popular methods, and to introduce more detailed, individualised practices in the Evolutionary Development Phase, when the project teams will be dealing with design problems.
- The time windows in the Evolutionary Development Phase must be differentiated according to their number and duration. Many teams with bad communication patterns need the tutor's support more, because delivering outcomes within the allotted time is a problem for them. One solution to this situation may be the implementation of IT tools such as Redmine or Trello. Thanks to their application, students would see the exact time and scope of work and would know who in the team is responsible for the task. Simultaneously, the teacher could monitor the progress and respond to emerging problems on an ongoing basis.

- The entire course was carried out synchronously, and its rhythm from the Foundations Phase was determined by weekly stand-up meetings. The used formula forced the participants to communicate regularly and fulfil tasks systematically. At the same time, due to the unnatural intervals between the meetings (it is usually day-to-day communication), it should focus the teacher's attention on the quality of the stand-up meetings. Especially in the early stages, when most students have a problem with short and factual discussion on the effects of the project, there is a need to work on the reporting style.
- The post-project evaluation, which was not completed due to the limitations in the form and time of the course, should constitute a key component. Due to the workload, it is worth considering to comprise it of questionnaires with several questions with answers on the Likert scale. These types of surveys can be carried out after each stage of the project.

## Limitations

The conducted didactic experiment and its observation are not exhaustive and contain limitations. The most important of them are: (1) basing the study solely on the perspective of the teacher, which prevents a full view of the teaching-learning process; (2) sample selection – the students' project was too short and the student groups were too small to determine whether the proposed model is effective permanently; (3) conducting an experiment on a project thinking course, which made it impossible to verify the effectiveness of the proposed solutions for other humanities and social sciences; (4) the inability to reproduce the real-world conditions in such aspects as budget, time and customer requirements. The course was also negatively affected by other participants' obligations (inside and outside of the academia), which forced the introduction of breaks and limiting the scope of the planned project.

With these shortcomings in mind, this study should be seen as an introduction to further, broader, and more complex educational experiments devoted to structuring online courses using agile design methodologies.

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# Creative Design Thinking in E-learning the International Experience

ABSTRACT

The following article gives account of the international experience in a virtual class, composed of six second year Doctoral Students studying at Marie Curie-Skłodowska University in Lublin, Poland under the Doctoral School of Social Sciences, Political Science and Public Administration department. The application in use was the MCSU Virtual Campus[1]. Two of the students were Ukrainian nationals, one from Zimbabwe, one from Nigeria, one from Turkey and one from Georgia. The module in question was "Academic Course Development and Teaching" and during this study students had to apply critical thinking in various problems occurring as a result of how especially the pandemic situation had affected learning in the whole world at the same time case studies about what was happening in their home countries were discussed. The students themselves were not within one country of location but were outside and inside Poland. It made learning quite a novelty as well as an exhilarating experience. Students shared what was happening in their living place with regards to the pandemic and how critical thinking could be engaged to alleviate the issues that had appeared because of the pandemic. The course also focused on applications that could be designed as a result of solving issues associated with online studying, concentration, boredom, plagiarism, and fake news.

**Keywords:** online learning, accessibility, contemporary systems, responsiveness

[1] An online platform designed by the university to study, learn and produce results online.

## Introduction

Initially the class was meant to be conducted through the traditional classroom, however due to the implementation of lockdown measures at Polish universities, it marked the commencement of online classes. Attendance on site of classes was marred with inadequacies as some students were also on lockdown in their own country's borders and could not travel hence moving to the MCSU Virtual Campus. It became an advantage to both the professor and the students, learning became effective and sufficient for the particular period appointed. A total of 30 hours were completed in this lecture, and it ran from the beginning of October to mid-December. Its administration made the time to be of a nonentity because of its creative and engaging nature, as students realised there were a lot of ingenious ventures involved in the critical thinking being applied in e-learning and the variety of avenues it offered to improve the teacher learner process.

The whole article is structured around how critical thinking was applied in the "Academic Course Developing and Teaching" bringing in various e-tools such as online app development for learning. Also, the online applications are being reviewed to verify their effect on learning. Fundamentally, students found various challenges and opportunities offered by e-learning and had to illustrate how it aids or hinders development in everyday life. Students had to imagine a problem as well as a solution to the problem in engaging critical thinking. This was a novelty way of teaching and learning that expanded the imagination to be productive and work faster to find a solution. It was designed in such a way like a vaccine that is introduced to the body to make the body stronger against the disease.

The COVID-19 pandemic led learning to be launched full force online, and this meant that learners, teachers, and institutions combined had to cooperate and continue the education process but with modifications. Around the world there have been nations that already have years of investment in e-learning, however the creative thinking aspect of it has not been fully investigated and researched. Hence engaging creative thinking means intellectually applying techniques that are smart to make e-learning a wonderful experience. Online learning and conventional classrooms are very different in their application and technique and if the differences are not managed and improved on there will be a failure of the whole system. This is where critical thinking comes in to come up with modifications that make the learning environment interesting

and engaged. Creative thinking has the potential to meet up with the speed at which education is becoming hybridised.

## The e-learning timeline

In the late eighties and nineties, the inaugural form of e-learning, Computer-Based Training (CBT) came into existence, and this is considerably the cornerstone of contemporary electronic learning (Eger, 2005). The practice required connection to a personal computer with some form of multimedia. The e-learning system meant remarkable evolution, however it still lacked some of the contemporary additives such as limitation by time or place (Hubackova, 2015). Further into the e-learning timeline, it was introduced the internet popularly referred to as the world wide web (www) (Květoň, 2003). The World Wide Web meant better connection to the world at large and uploading of all learning resources to be accessed as and when it was required by both teachers and learners. As a result, new Web-Based Training (WBT) commenced, and it is pronounced as an era that allowed effective communication between teacher and student. It corresponds to the contemporary system however it received its name in the year 1999 (Barešová, 2003).

## Critical Thinking explained

Critical Thinking was explained by the National Council for Excellence in Critical Thinking in 1987 as the intelligently disciplined practice of actively and skilfully intellectualising, applying, scrutinising, fusing, and evaluating information gathered, produced by, observation, experience, reflection, reasoning, or communication, as a direction to belief and action (*Defining*, n.d.). In its archetypal form, it is grounded on universal intellectual values that surpass subject matter divisions: "clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness" (Scriven & Paul, 1987 in *Defining*, n.d.)[2].

Critical Thinking adopted different methodologies in the classes because several abilities were explored in making learning a safe experience that is tack-

[2] A statement by Michael Scriven and Richard Paul presented at the 8th Annual Intervention Conference on Critical Thinking and Education Reform, summer 1987.

ling the issue of fake news and how e-learning can be protected from dealing with fake information. Because of the availability of websites and pages giving information there is the object of untrue and misleading information. Hence Critical Thinking was shown to be used as a way of selecting and sifting that which is unnecessary and fake in education.

Critical Thinking enhances cognitive thinking in education making the process diverse and all-encompassing bringing in various aspects that mainstream learning seems not to possess. Thereby entailing the analysis of those structures or elements of thought contained in all reasoning "purpose, problem, or question-at-issue; assumptions; concepts; empirical grounding; reasoning leading to conclusions; implications and consequences; objections from alternative viewpoints; and frame of reference" (*Defining*, n.d.). In being responsive to variable subject matter, issues, and purposes it is assimilated in a group of interwoven modes of thought that is scientific thinking, mathematical thinking, historical thinking, anthropological thinking, economic thinking, moral thinking, and philosophical thinking.

## E-learning at the MSCU, the experience

During the course learning a fusion of critical thinking and e-learning at the MSCU and the experience was eye opening, it offered a plethora of possibilities of improving the education mechanisms. A change in learning that was not common and the teacher – learner relationship was taken to a whole new level. Even the rules of engagement made the feeling of a virtual classroom realistic. The whole world was brought together by just coming together in a virtual classroom and using critical thinking. It has become the cross-cutting element not only in e-learning and education but in various aspects of intellectual areas. And if it is engaged in full throttle, there can be a harvest of ideas from education stakeholders improving and levelling the playing field and allowing for innovation to take place.

Firstly, students were introduced to what entails design thinking, the meaning as well as its evolution together with its operationalisation. Below is a diagram that follows the ideology behind design thinking thereby Critical Thinking. Therefore, this challenges individuals to engage with their innermost thought faculties to come up with unique problems that require unique solutions. This was an amazing experience and unimaginable problems came up and as well as the solutions and this opened a way into making students understand cer-

tain systems within their minds of creating and solving problems. The primary issue to consider here is that there is a linkage with knowing a problem and that produces the ability to solve it, too. In its initial stages, when a problem is just imagined it seems to elude solution, however by using design thinking the problem ceases to be a problem. It becomes a chance to grow and reimagine everything as a chance to do more and challenge oneself and entities to be creative in problem solving. In a way it challenges the mind to express its innermost prowess of problem solving by showing that a created problem already has a solution within the same place it came from, it is a twinning process identical but different also in operation.

Below there is the design process model diagram that informs Design Thinking, the ideology and its connection to the creative nature it encompasses. Therefore, Design Thinking was presented to be a process that captures thought dimensions to do with an ongoing problem in need of a solution. Hence the COVID-19 pandemic was a topical issue and thereby causing people from all professions to be involved as various sectors, especially government sectors, were hard hit and people were getting infected with no solution in sight. Thus,

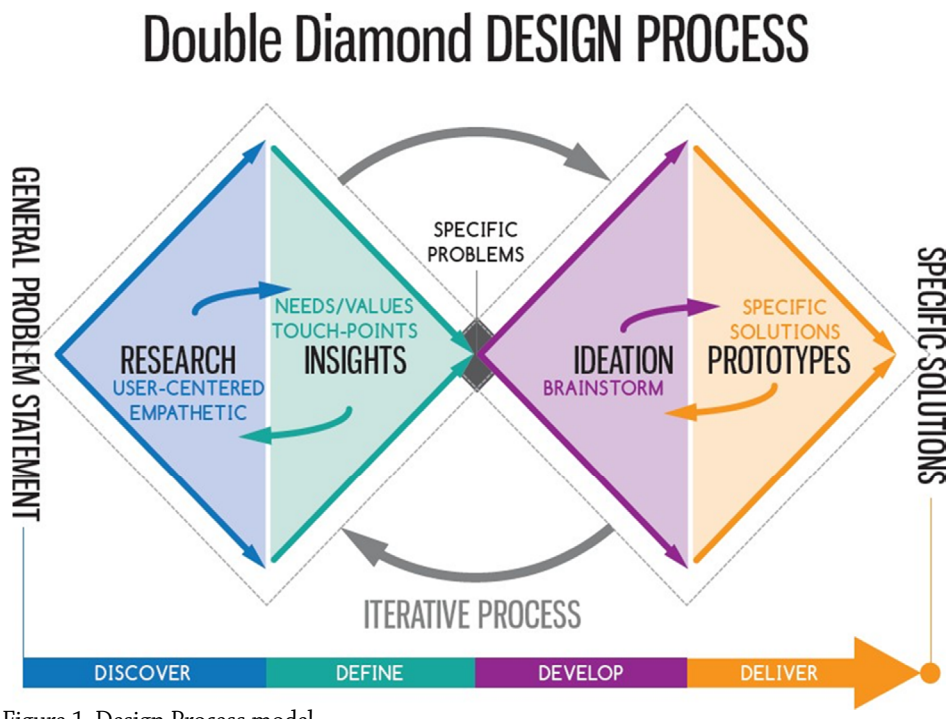


Figure 1. Design Process model.

Source: https://www.designcouncil.org.uk/news-opinion/design-process-what-double-diamond

it can be affirmed that e-learning came to bridge that gap of staying at home but education continuing online at the same time abiding by world lockdown rules.

Online education platforms (Moodle, Skype, virtual classroom) were used throughout the lectures to serve as a solution to the impact of access to education to different levels. Therefore, students imagined these platforms to have to reach even different age groups together with the use of smart devices, for example, mobile phones, tablets and computers. On the other hand, geographical location was imagined to be a factor in access to e-learning that is rural and remote areas battling with network deficiencies. Rural areas were presented as lacking basic media devices and thus relying on television or radio. So, these gadgets were imagined to increase reach and access as governments could invest in tele-class as well as radio education programmes since not everyone owns smart devices in some disadvantaged areas.

Critical Thinking is observed as containing two components, primarily a set of information and belief generating and processing skills, and the habit, based on intellectual commitment, of using those skills to guide behaviour. It is therefore contrasted with the ordinary acquisition and maintenance of information alone, as it involves a specific way in which information is sought and handled, secondly a simple possession of a set of skills, since it involves the continued use of them and usage of so said skills (as an exercise) without reception of their results.

As an observation it could be supposed that the MCSU Virtual Campus was a result of critical design thinking because of the experience and user friendliness it possessed. The online application proved its fluidity in the variety of activities it offered the teacher and the students to explore and make the classroom a fun exercise. The MSCU virtual classroom had many exceptional features that boast of creativity and imagination capturing mechanisms. This was an advantage to the lecture as well, as it appeared to be a hands-on way of keeping students involved fully without experiencing boredom at all or losing concentration. For example, an active smart page by which points could be highlighted and discussed. The image below shows the set up at which the students and their professor could interact as well as have discussions by highlighting the document presented, giving the feel of a traditional class and also allowing fluidity of conversation.

Furthermore, in virtual classroom time was another aspect that proved that if not carefully managed could spoil the class for students causing boredom and lack of concentration. Therefore, the teacher was purposefully skilled to keep students engaged and planned breaks as well as presented movies which the


Figure 2. Active page interaction. Participants: Professor Lidia Pokrzycka, Nino Kukhianidze, Oral Orpak, Viktor Savinok, Isiaka Adeniyi Aderigbe.

Source: MCSU Virtual Campus Class

students could watch and afterwards give remarks and recommendations with comparisons in their home countries on how e-learning was being handled and the variety of glitches the systems were facing.

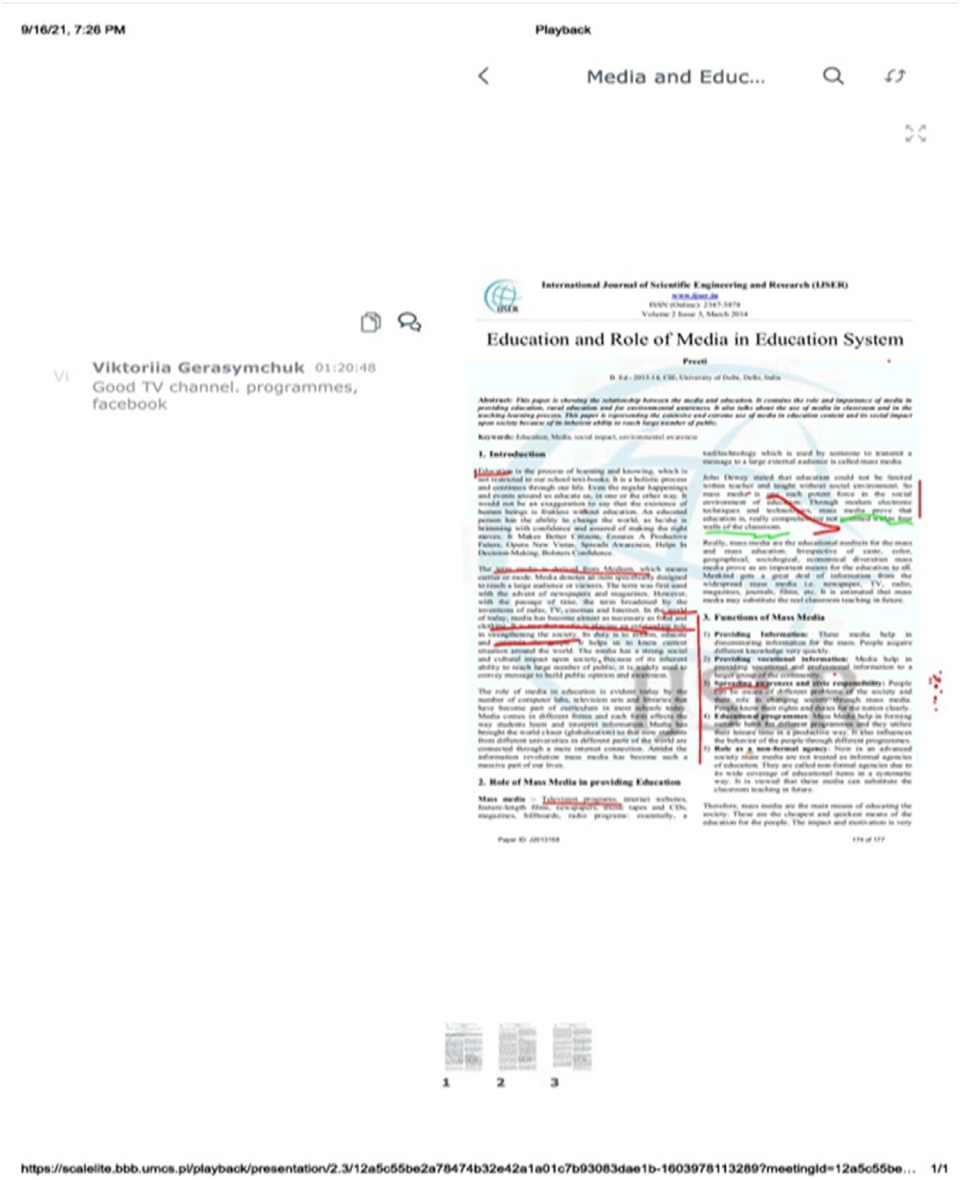


Figure 3. Active page interaction.
Source: MSCU Virtual Campus Class

The virtual class was something to look forward to because it gave a break from the normal laborious research that thesis and article writing is associated with for doctoral students. It was a chance to think and improve and delve into creativity that makes learning an adventure. At a certain point students would realise they have a lot to offer in class as it is not regulated by a singular subject but an active mindset that is keen to learn and change the environment within them as well as outside them.

Students used an application on the MCSU Virtual Campus that allowed them to highlight points on articles and further elaborate on them, including what they thought, their criticisms and analyses. For example, an article about access to ICT in rural areas was presented on which students had to comment and use coloured highlighters of their choice and juxtapose the selected part of the article with the situation going on in their nations and how the pandemic has exacerbated or exposed inadequacies or how it was handled by the local government and solutions that might improve the situations if necessary. This was a smart way to engage online which the students found interesting and innovative; it opened a lot of possibilities offered by the online virtual experience.

Here students also comprehended that understanding experiences is of uttermost importance in solving problems informing communication *modus operandi* thereby instilling the ability to question, think deeply and try to resolve issues reflecting the consideration of many issues within a society or institution. Critical Thinking allows to reach all people from different ages and places so that they come to a level of expression. Hence the use of social media pages and applications reach all kinds of ages and different groups of people thereby engaging several pages on social media.

Critical Thinking takes on a deeper complex impact to the mind because of its depth and engagement and across the board application, it could be said that in this case students had first to learn to engage in imagining what plagues their societies governments and administration then use critical thinking in trying to sift away all the challenges and come up with smart ways of changing the problem into an opportunity to create wonderful opportunities. Critical Thinking is not only pragmatic but philosophical as well, for it looks at the beliefs of a society. It takes into cognizance the geographical regional differences in identities of people, hence their problem-solving mechanisms. Education itself is guided by philosophy hence in e-learning these philosophies are still prevalent as the mind is better understood and the problems it is grappling with.

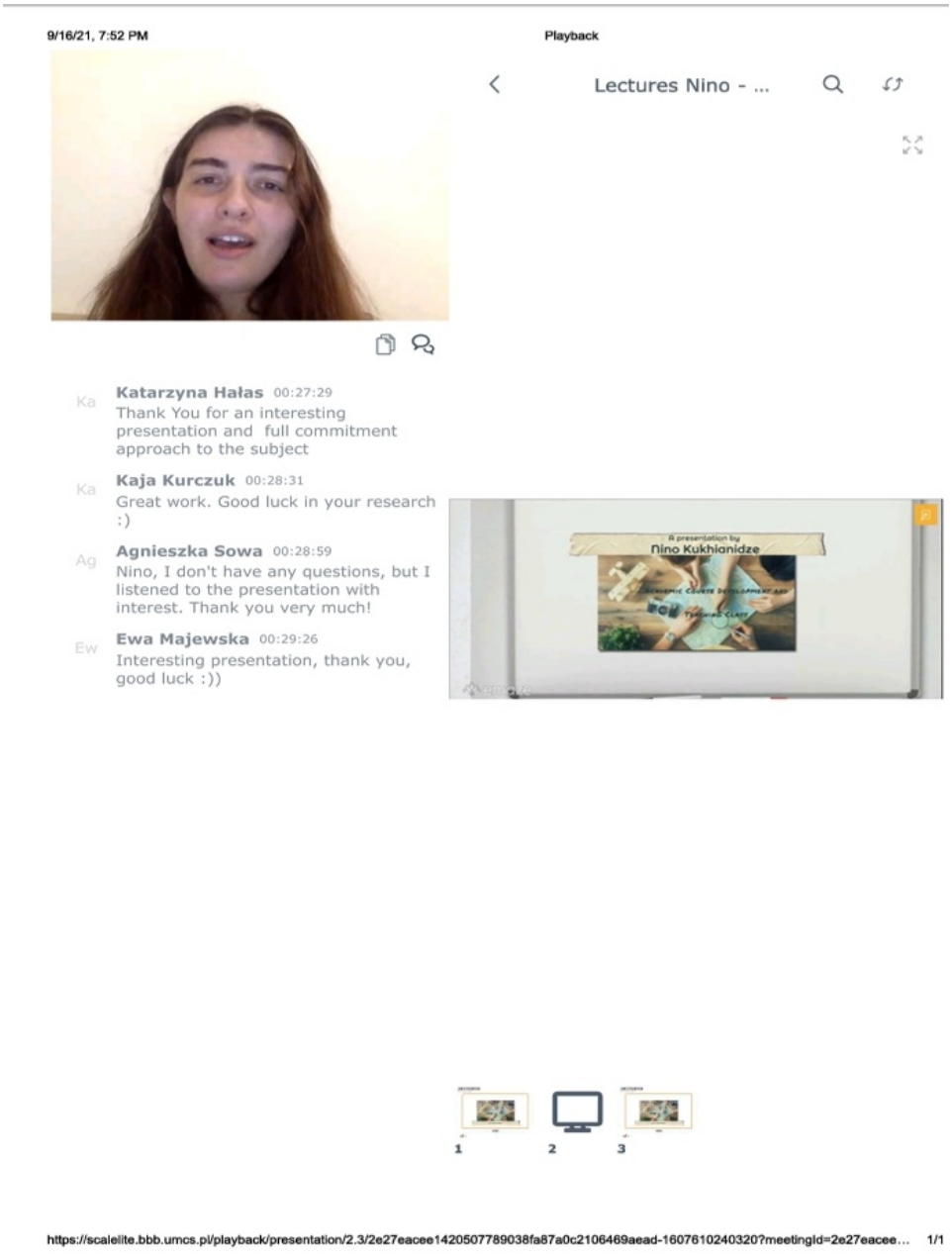


Figure 4. Amaze course presentation. Student presenter: Nino Kukhianidze.
Source: MCSU Virtual Campus Class

Furthermore, video applications were used such as Vimeo, Amaze and Animoto to create video presentations which the students chose as per their choice. Each student was given a task and had to prove their familiarity with the application as well as the creativity. The image above depicts the PhD student presenting a course that she had designed so as to teach to her students and used the application Amaze. The last virtual class was joined by undergraduate students who took part in commenting and learning various topics presented by the PhD students. It was modelled like a real class with students taking part and asking questions on subjects they needed clarification on.

Novel ideas came out each time the class was in session, showing how different parts in the world approach the challenges they have and the kind of traditional knowledge that informs their philosophy. Mainly it was observed that policies, especially in the era of COVID-19, play a bigger role in the formulation and execution of solutions. Hence, if the policy itself is not intellectually and critically analysed there is a larger chance it might fail those that it is targeted at. The pandemic exposed the loopholes in many policies around the world hence greater minds had to regroup and rethink situations to deal with a crisis in the middle of a crisis. It showed that everywhere in the world the people were in a catastrophe and had their hands full because all faculties of human existence were under social, economic, and political threat.

## Conclusion

The experience at the MCSU Virtual Campus was dynamic and showed great potential of what intellectuality in Critical Thinking could achieve in e-learning. Students were instructed to imagine potential problems and apply a typical critical or design thinking mechanism to solve the problems. Social media applications were used as enhancers to simplify the e-learning process. A summary of social media pages with different social media usages was suggested and explored as giving practitioners the proper route to a solution at the same time applying a triangulation method to accessing data about users and the general public at large. To conclude, the class provided the future academics with abilities to engage with different people in different settings, different age groups as well as geographical locations.

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# Learning Methods Used by Students of the Medical Faculty in Poland

ABSTRACT

Medical knowledge is growing rapidly from year to year, posing an increasing challenge for medical students. High requirements lead to the optimisation of the learning method by changing the methods, strategy and organisation of learning. The aim of the study is to determine the learning methods used by students of the medical faculty in Poland and the changes that they undergo in the course of their studies. The study was conducted in the form of an electronic survey made available to students of the medical faculty. The results showed which learning methods are preferred by students and the significant changes in the popularity of different methods over the course of their studies.

**Keywords:** learning methods, medical students, medical education

## Introduction

Most of the time spent at medical university is based on acquiring knowledge that is divided into two types: factual knowledge, which is the theoretical basis of medical education, and procedural knowledge, which is a practical part of medicine. Medical students experience more stress than people believe, largely related to the amount and relevance of the information to be learned (Radcliffe & Lester, 2003). Without taking into account the scientific knowledge about acquiring factual knowledge in the curriculum in medical school, the learning methods were developed by students spontaneously or with the help of independent research. The aim of the study is to determine the learning methods

used by students of the medical faculty in Poland and the changes that they undergo in the course of their studies.

## Methodology

The survey was conducted in the form of an online, anonymous, and voluntary survey. It was made available to students of the medical faculty at Polish medical universities. It was filled in by 102 medicine students of 4th year (45.1%), 3rd year (27.5%), 5th year (16.7%), 6th year (8.8%) and 2nd year (1.9%).

The study included many learning methods, also innovative ones, that could have been used in teaching medical topics. Therefore, the respondents could choose from many options – methods that facilitate learning. Below, these methods are described first, followed by the research results.

***1. Visualisation***

The technique of visualisation consists in creating a mental image that is conducive to remembering information related to it. Creating stories is a step further by allowing you to arrange a sequence of related images or events, the recall of which makes it easier to recreate the concept. Constructing mental pictures can reduce cognitive load and increase understanding and learning outcomes, however, drawing pictures seems to increase cognitive load, resulting in decreased understanding and learning outcomes (Leutner et al., 2009). It was also shown better results of visualisation among the respondents who listen to the text than those who use it while reading. (De Beni & Moè, 2003). Text visualisation can positively affect the integration and organisation of information, which favours their remembering and recall, however, evidence for a solid and long-lasting role of this method is limited, and its usefulness depends largely on the type of text (whether it is imaginary-friendly) and the student's experience. The method helps to answer questions about the information mentioned directly in the text (Gyeselinck et al., 2009) to a greater extent than those requiring drawing conclusions (Giesen & Peeck, 1984).

***2. Keyword mnemonic***

The keyword mnemonic consists in combining a newly learned word or phrase with a previously known one, which gives it meaning and makes it easier to remember. It can be useful in recalling, for example, words from foreign languages, names of drugs, diseases, substances and names not previously known

to the student. Keyword mnemonic is a popular method of helping students of all ages and with learning disabilities to learn words (Jitendra et al., 2004). As an engaging method, it supports faster and longer retention of information. On the other hand, many experiments provided associations, but when subjects had to come up with them, the results were mixed (Thomas & Wang, 1996; Shapiro & Waters, 2005) – creating associations takes creativity and time, and the results sometimes did not favour the group that created them. In some experiments they also proved to be less persistent (Wang & Thomas, 1995) – keyword-mnemonic group outperformed a rote-repetition control group in the test immediately after memorization, but in the delayed test the control group had better results.

***3. Acronyms***

Acronyms are words that arise from the first letters of a group of words. They are used with high frequency, although the evidence for their usefulness is limited and they are more relevant to passing exams than improving post-graduation performance (Bortle, 2010). They can lead to more confusion than benefit – there has even been a list of acronyms that should not be used due to the risk of medical errors ("Medication errors", 2001).

***4. Self-explanation/Elaborative interrogation***

Self-explanation/Elaborative interrogation is based on generating an explanation for the given information. Asking the question of what a given conjuncture results from helps to remember by combining new knowledge with the existing one and organising it. It is the more effective the greater the prior knowledge (Rawson & Van Overschelde, 2008) and if the explanations are generated by the student by his own, but the method has also been proven to be useful in group work (Kahl & Woloshyn, 1994). Even just reflecting on your own answer, "Why is this true?" while learning can be helpful (Smith et al., 2010). The effects of learning with the use of self-explanation are more durable than in the control groups and facilitate the implementation of the acquired knowledge into various types of tasks (Wong et al., 2002).

***5. Rereading***

Rereading is about reading the same material several times. Some studies have noted that rereading a text can help to recall major ideas more than details of the text and may be a good method especially for absorbing material without significant prior knowledge (Rawson, 2012). However, the sense of

understanding may be deceptive and result more from being used to reading the same words several times than from a greater understanding of the topic (Brown, 2014). The effects of massed rereading are visible especially shortly afterwards, but they disappear after a longer interval (Hinze & Wiley, 2011). We can expect better results when using spaced rereading, especially when the interval between readings is several days (Verkoeijen et al., 2008).

***6. Highlighting and underlining***

Highlighting or underlining the most important information in the text aims to distinguish it and make it easier to reach it faster. Highlighting information can help learn, because the very decision to choose a particular passage requires you to think about the meaning of the text. Training in proper recognition of important fragments increased the effectiveness of learning (Leutner et al., 2007), but often students do not know how to do it, which is not conducive to deeper processing of information. As a result, the method turns out to be of little help in learning (Dunlosky et al., 2013), and additionally, the belief in its operation may discourage students from looking for methods that facilitate remembering and understanding the text to a higher degree. Mere highlighting per se is not beneficial, but it can be helpful by changing the way you think about the learning material and facilitating information retention, especially when time is limited (Yue et al., 2014).

***7. Note-taking***

Taking notes helps to compress and organise the most important information for review, and just taking the time to write it down helps to store the material in long-term memory (Piolat et al., 2005). There is a common problem of notes omitting important ideas and details and presenting them in an inaccessible way, which significantly reduces the value of the records. The advantage of the existence of notes over the absence of them can only occur if they are made in the right way (Kobayashi, 2005). Good notes are characterised not only by completeness, but also by spatial and cause-effect organisation. That is why systems were invented to facilitate the creation of notes, such as the Cornell method, which involves writing the main points, questions, or keywords in a small column on the left side of the page and details on the right side.

***8. Mind maps***

Mind maps are notes presented in the form of diagrams that visually organise information that shows the hierarchy and relationships between them. The

spatial organisation of information supports a deeper level of processing, which may be related to better academic performance by medical students (McManus et al., 1998). Compared to conventional learning methods such as reading text passages, attending lectures, and participating in class discussions, concept mapping promotes longer retention of information, which may be related to greater involvement in mapping (Nesbit & Adesope, 2006).

***9. Practice testing***

Practice testing is associated with checking the quality of learning, but research shows that it can also be an effective method of learning. Assessment of the actual state of knowledge and the discovery of being overconfidently incorrect prompts the brain to pay more attention to the information causing such cognitive dissonance (Butterfield & Metcalfe, 2006). Retrieving the information needed for the test involves long-term memory, which can also make it easier to recall related facts. Testing produces much better results than restudy, just as continued practice testing produces better results than continued study.

Effective memorization of information by testing was observed at intervals of many weeks and months (McDaniel et al., 2011).

***10. Active recall***

Active recall enables a critical assessment of the possessed knowledge and a deeper understanding of one's own cognitive processes. It can be part of other active learning methods such as flashcards and tests, or an attempt to recall specific information at any time. Retrieval, apart from helping in the assessment of knowledge, helps in a stronger long-term retention of newly discovered facts and a conceptual understanding of scientific information (Brame & Biel, 2015). Passive viewing of materials is much less effective than active recall – rereading can help students recognize the correct answer, but they have more difficulty generating information (Karpicke, 2012).

***11. Method of loci***

The method of loci is a method known since antiquity, consisting in combining a well-known location, e.g., a place in a flat, with remembered information. This helps to organise and anchor the content, which has been shown, for example, to increase students' understanding of endocrinology (Qureshi et al., 2014). The challenge is the difficulty of implementing the memory palace due to the need for training, however, in some studies, even after a short training session, the subjects significantly outperformed other participants (Legge et al., 2012).

***12. Flashcards***

The use of flashcards can be effective by combining several ways of learning effectively. Receiving immediate feedback after turning the card increases our sense of the importance of information compared to receiving total feedback over time (Lally & Gardener, 2013). Organising the cards in terms of difficulty allows to focus on the most demanding concepts and protects from wasting time on repeatedly reading the information already learned. It can also be a spaced repetition tool, i.e., repeating information at increasing intervals, which turns out to be a particularly beneficial method of learning (Kang, 2016).

***13. Study group***

Learning in a group can be an effective method, especially with the optimal selection of group members. A comparison of cooperative learning to competitive learning and individualistic learning has shown that cooperative learning has led to higher academic achievement and may result in greater engagement and a more positive attitude to learning (Johnson et al., 2014). Collaboration with others can involve the student in active recall, self-assessment, and teaching others, which is one of the most effective methods of solidifying memory traces in the brain (Kapler et al., 2015). The many advantages of group learning can be fully realised provided that problems such as over-domination, lack of commitment or unpreparedness of group members and the presence of distraction are overcome.

## Survey results

In the first question in the survey (Figure 1), the students were asked to specify which year of their medical faculty they were in. The largest group of respondents was in the fourth year (45.1%), the third year (27.5%) and the fifth year (16.7%).

The next two questions related to the learning methods used by students. The second question (Figure 2) concerned the methods of learning most often used by the respondents, while the answer to the third question (Figure 3) was to identify the methods that were used at the beginning of the studies.

Rereading is the most popular method used among respondents both now (59.8%) and at the beginning of their studies (81.4%), but there is a noticeable decrease in popularity of this method during the studies (by 21.6 pp). As many as 24.5% of the respondents stopped writing their notes (from 79.4% at the

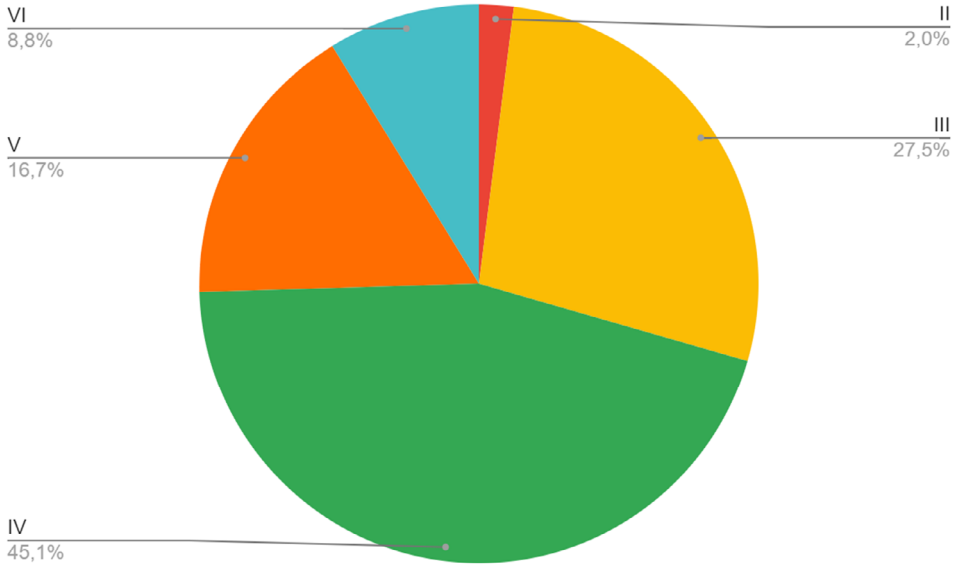


Figure 1. Answers to the question: What year of the medical faculty are you?
Source: Author's own elaboration

beginning to 54.9% now), which is the biggest decrease among the methods mentioned. Highlighting is one of the most popular learning methods, but also one of the three that dropped in popularity over the course of the studies – from 63.7% at the beginning to 49%. The three most frequently used methods at the beginning of the studies are both the only ones that have declined in popularity since the beginning of the studies. Self-explanation was indicated as the method used by 53.9% of the respondents currently, and at the beginning of their studies by 27.5%, which places them in third place in terms of the increase in popularity during their studies (26.4 pp). Active recall was used at the start of the studies by only 16.7% of those who were surveyed but is currently used by 45.1% or 28.4 pp. more, which is the largest increase in use among the methods mentioned. The keyword method was used by 22.5% of respondents at the beginning of their studies and is used almost twice as often (44.1%) now. Practice testing is a method used by 43.1% of respondents – much more than at the beginning of their studies (15.7%). Flashcards were used by 16.7% of respondents at the beginning of their studies and almost twice as many (32.4%) now. The study group was used by 24.5% of the respondents at the beginning of their studies and by a slightly larger part now (30.4%). Other, less frequently used methods also gained popularity in relation to the beginning of studies.

The methods of the greatest increase in interest were active recall, practice testing and elaborative interrogation/self-explanation, defined in the review by Dunlosky et al. (2013) as high utility (practice testing, elaborative interrogation, self-explanation), while the largest (and only) decrease in use was observed in note-taking (similar to summarisation), rereading and highlighting referred to as low utility (Dunlosky et al. 2013).

Among the answers added by the respondents to the second question (regarding the most useful currently applicable methods) were: speaking aloud, removing distractors, the orange technique, 20 minutes of learning 2 minutes of break and reworking the same topics from various sources and comparing them. The answer added to the question of the method used in the beginning of studies was continual note-taking. The added responses mainly focus on improving concentration, for example, the orange technique involves imagining an orange and sticking it with your imagination eyes to your head – a heavy mental orange helps you stay focused. The "20-minute learning 2-minute break" technique is similar to The Pomodoro technique, which consists in setting the timer for 25 minutes of work and 5 minutes of break, which is to help in better organisation of time and prevent procrastination. Reading aloud proves to be a memory enhancing technique more than either reading or listening, possibly by being more involved in the dual action of speaking and hearing (Forrin & MacLeod, 2017).

Question 4 (Figure 4) was about methods added by students for online learning. By online learning, 46.1% of respondents did not add any new learning methods. The method added by the largest part of the respondents were flashcards (19.6%), and among other answers there was watching videos, e.g. made available by the university.

The fifth question (Figure 5) was worded as follows: "How many of the above methods do you use regularly?". The largest part of the respondents (38.2%) regularly uses the three methods mentioned above, followed by the use of 4 methods (24.5%) and 2 methods (15.7%). The largest number of methods used regularly were 8, selected by 1% of the respondents.

When the students were asked about satisfaction with the results of studies on a scale from 1 to 5 (Figure 6), where 1 means not satisfied at all and 5 very satisfied, the most common answer was 4 (46.1%), and another 3 (30.4%). This allows the conclusion that the majority of respondents are rather satisfied with the results achieved. Only 2.9% are not satisfied at all, and over 4 times more respondents (12.7%) show very high satisfaction.

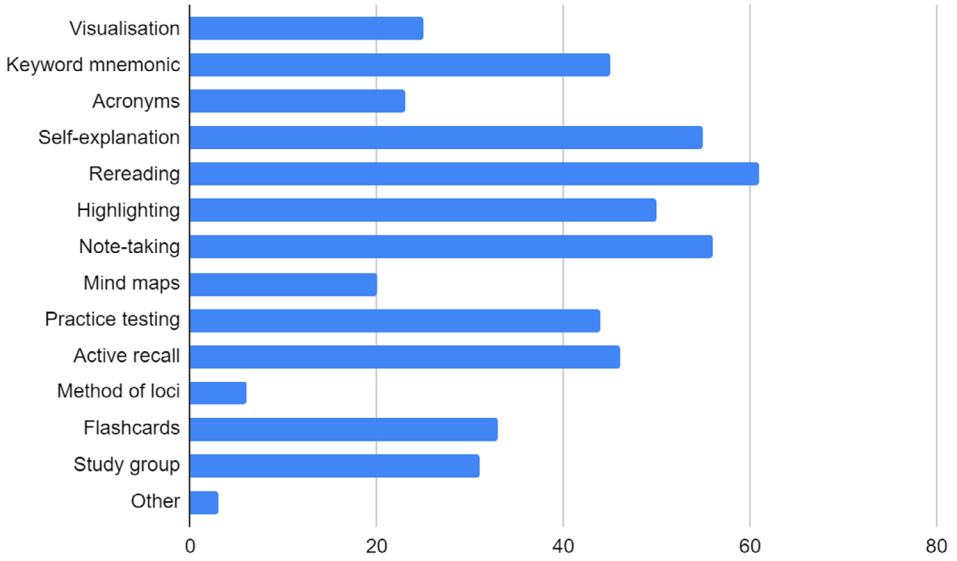


Figure 2. Answers to the question: Choose the most useful learning methods you use.
Source: Author's own elaboration

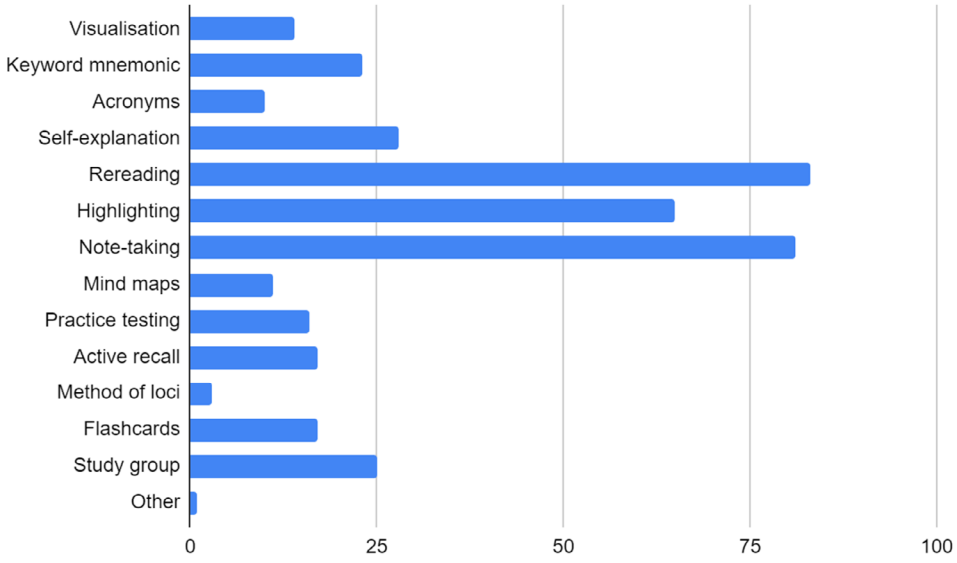


Figure 3. Answers to the question: Select the methods used at the beginning of the studies.
Source: Author's own elaboration

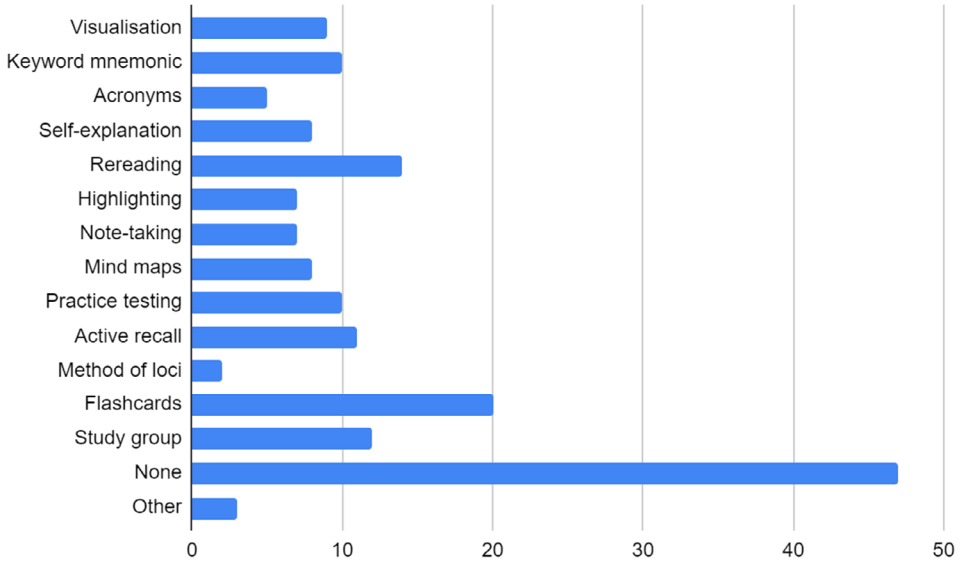


Figure 4. Answers to the question: Select the methods that you started using through online teaching.

Source: Author's own elaboration

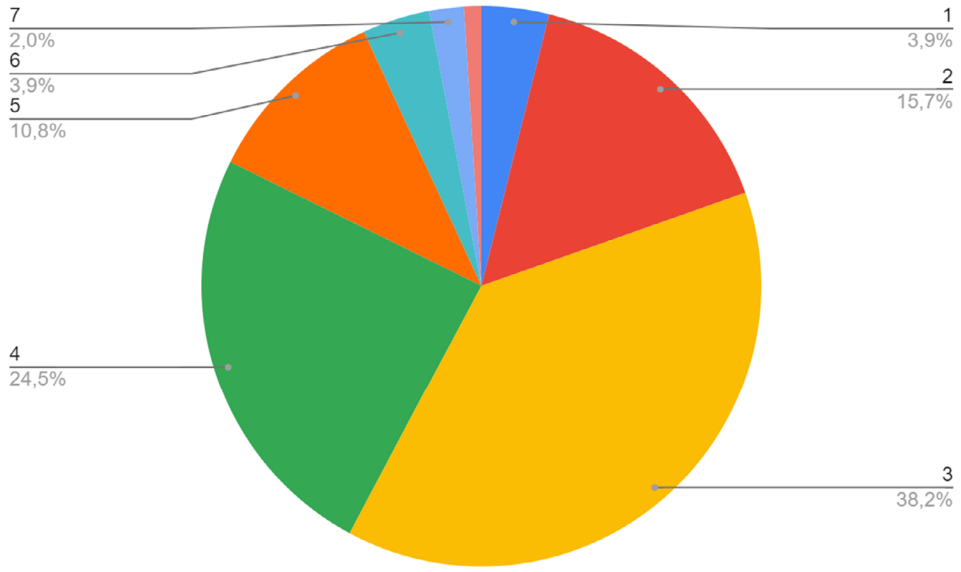


Figure 5. Answers to the question: How many of the above methods do you use regularly?

Source: Author's own elaboration

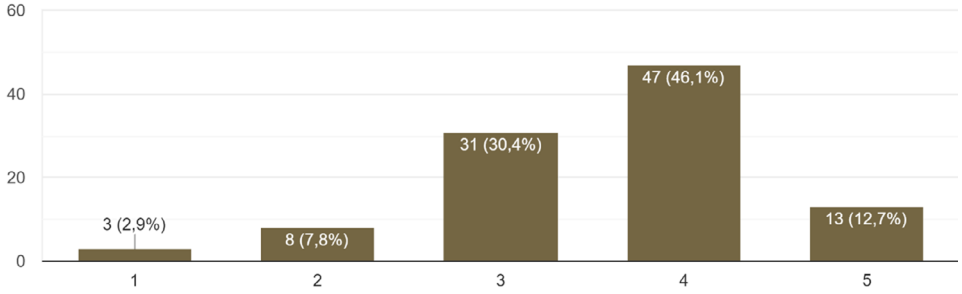


Figure 6. Answers to the question: Are you satisfied with your study results?
Source: Author's own elaboration

When the students were asked about the amount of time spent on learning on a scale from 1 to 5 (Figure 7), where 1 means little and 5 a lot of time, the most frequently chosen answer is the intermediate answer – 3 (37.3%), followed by the answer 4 (33.3%), and the third answer was 5 (13.7%). Responses from the middle and right side of the scale dominate, which may mean that overall satisfaction with the results is accompanied by medium and large amounts of study time.

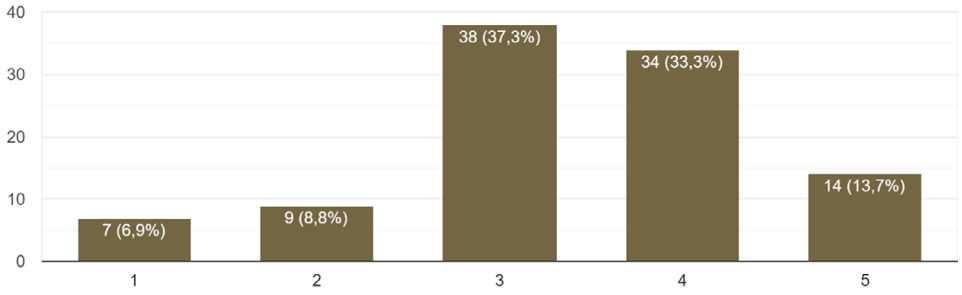


Figure 7. Answers to the question: How much time do you devote to studying?
Source: Author's own elaboration

To the next question (Figure 8), the majority of respondents (62.7%) answered that they learn regularly. This is especially important because it allows you to use one of the most effective learning methods – spaced study – which consists in recalling information at increasing intervals. This way of learning allows the information to be retained much longer than after repeating it concentrated in time (Rawson et al., 2013).

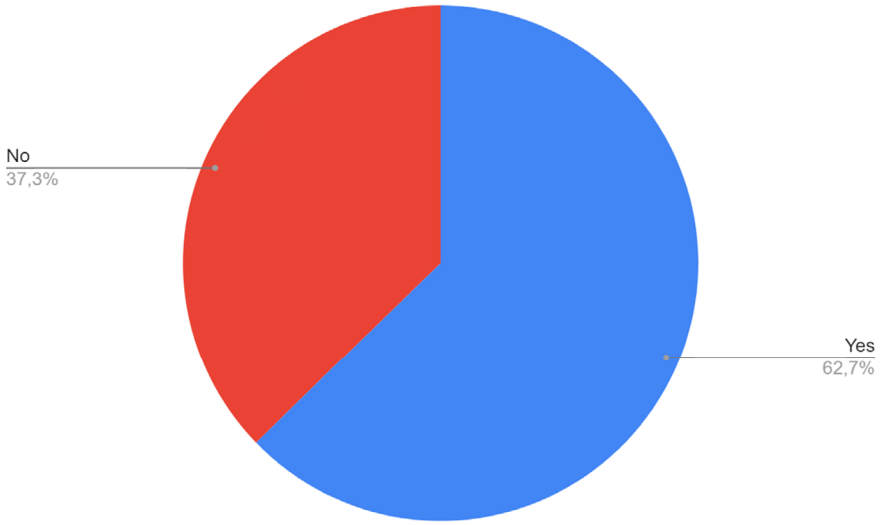


Figure 8. Answers to the question: Do you study regularly?
Source: Author's own elaboration

More than half of the respondents (53.9%) report looking for new learning methods during the last year (Figure 9).


Figure 9. Answers to the question: Over the last year, have you been looking for new learning methods?
Source: Author's own elaboration

To question 10 (Figure 10), most of the respondents replied that they take naps during breaks while studying, of which 9.8% do naps regularly and 57.8% occasionally. Naps can become a significant learning aid due to the possible reduction in forgetting new information, refreshing memory networks, and facilitating the encoding of memories. An hour of nap can bring about a comparable improvement in absorbing material to an hour spent cramming, but even a few minutes of nap can improve memory consolidation (Cousins et al., 2019). It is worth paying attention to sleep quality in general, as longer, better-quality sleep is associated with better academic performance (Okano et al., 2019).

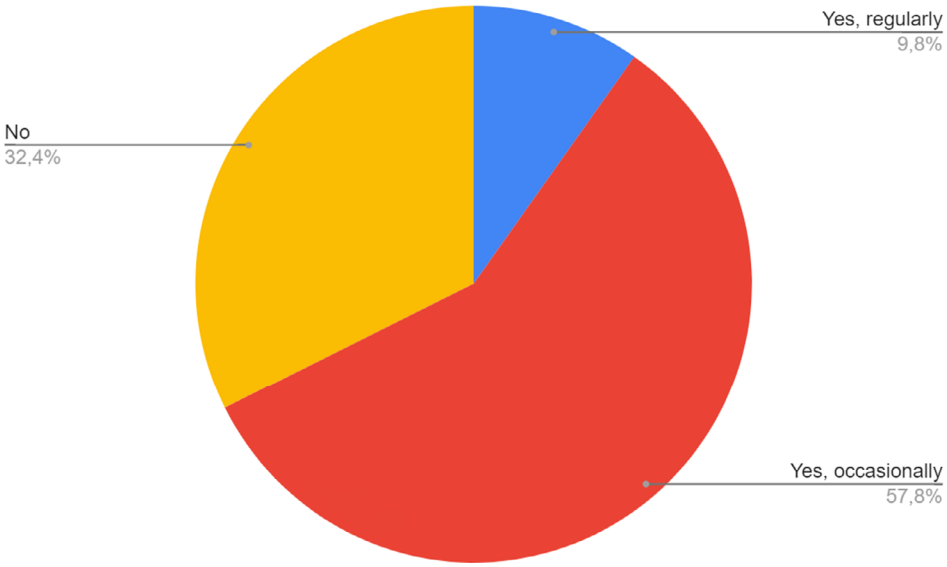


Figure 10. Answers to the question: Do you take naps during breaks while studying?
Source: Author's own elaboration

Most of the respondents engage in physical activity during breaks while studying (58.8%), including 15.7% regularly and 43.1% sometimes (Figure 11). Physical activity has a positive effect on many aspects of our lives, but its place and time are also important to improve memory. For example, in one study, exercising 4 hours after learning resulted in an improvement in memory, but exercise performed right away produced results comparable to no exercise (Van Dongen et al., 2016).

According to the respondents (Figure 12), the greatest difficulties in learning are problems with concentration (27.5%), unclear requirements (23.5%) as

well as distractors and time management problems (12.7% each). The other answers (4%) included: "fatigue with a large amount of study material", "all of the above", "no difficulties" and "problems with determining the expectations of lecturers".

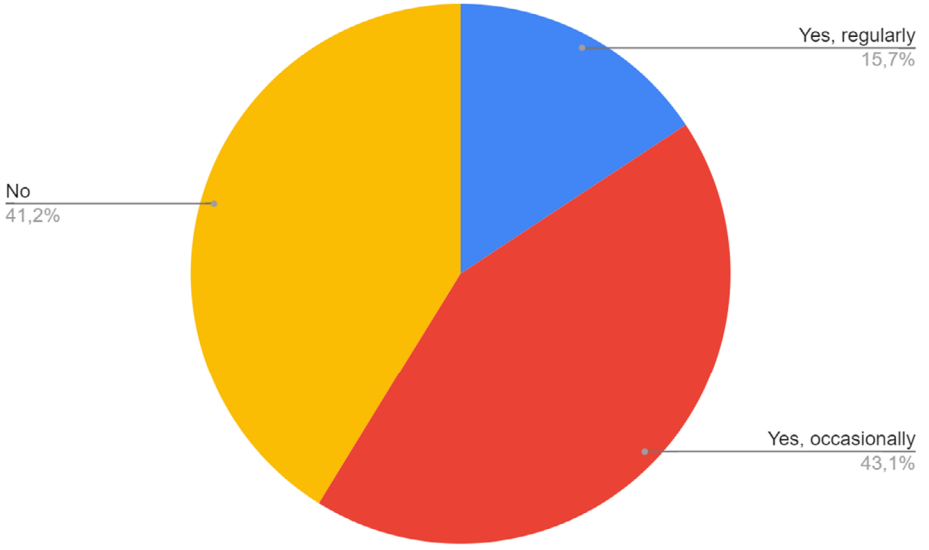


Figure 11. Answers to the question: Do you engage in physical activity during breaks while studying?
Source: Author's own elaboration

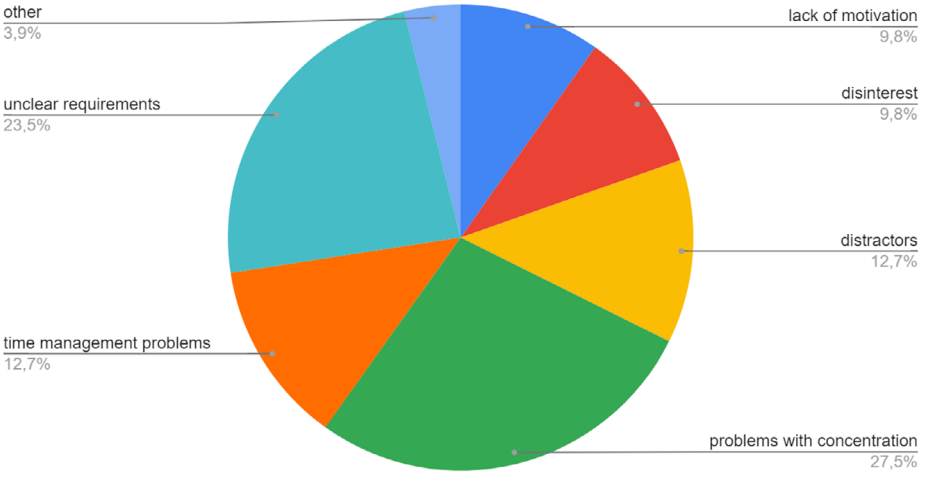


Figure 12. Answers to the question: What is the biggest difficulty in learning?
Source: Author's own elaboration

## Conclusions

The survey allowed to collect information about the methods of learning preferred by medical students now and at the beginning of their studies. There is a noticeable tendency to decline in popularity of methods considered in the scientific literature as ineffective and an increase among the methods described as effective. Currently, there is also a greater variety of methods used by students than at the beginning of their studies, which suggests that medical students search for new methods of learning during their studies (including less conventional ones, such as the memory palace or the orange technique). More than half of the respondents have habits that can positively affect the quality of learning, such as regular learning, exercise and taking naps during learning. It is possible that students developed more effective learning methods spontaneously by noticing which of them produced the best results, but it is highly probable that they developed an optimal learning method with external resources – 53.9% of students searched for new learning methods in the past year.

The development of more favourable learning methods may prove the increasing metacognition among students of the medical faculty during their studies. No technique is bad or good on its own and in all cases but being aware of the options available and testing them for utility can be crucial in optimising learning. Taking into account the most common problems faced by students, working on improving concentration and time organisation may be equally important in improving results. There is a need to conduct further research on the impact of the pandemic on student learning strategies and to check the quality of teaching in clinical practice.

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# Perceived Educational Continuity of Participants in a Webinar on Distance Learning During the COVID-19 Crisis

ABSTRACT

The international health crisis forced the Belgian government to close educational and training institutions to limit the spread of COVID-19. This decision led the actors of the educational system to redefine their practices. Various initiatives have been taken to ensure educational continuity. Within the framework of an online conference organized by the "MUMONS", we collected the perceptions of the participants (teachers, parents, students, etc.) by means of the online voting system "Wooclap". The results of our analyses show that the forced transition to distance learning required these actors to acquire digital skills that they generally lacked. Although they experienced pedagogical, technical and/or organizational difficulties, they state that this health crisis context allowed them to develop socio-affective links, particularly through collaboration and exchanges.

**Keywords:** COVID-19, educational continuity, distance learning, perceptions, Wooclap

## 1. Introduction

Since January 2020, the national and international news has been dominated by the spread of the infectious disease called COVID-19. In this extraordinary context, strong measures have been taken by the authorities of the most affected states. As a result, Belgium has been under lockdown since Saturday March 14 to severely limit contact between people, in order to slow the spread of the virus and reduce the risk that the medical services concerned will not be

able to cope with the influx of patients. These measures include the closure of schools and many changes in teaching methods. Indeed, with classes suspended, home-based activities had to be considered (Circular 7541, 2020). Although classroom activities are stopped, educational policies show a willingness to provide education to students in confinement.

If, for compulsory education, teachers have the task of respecting the logic of "remediation-consolidation-overcoming" in learning (Circular 7541, 2020), in higher education, the watchword is to organize distance learning. Thus, the expectations of the school environment are quite diverse, ranging from a simple weekly call, to sending assignments by e-mail, to online courses at scheduled times. However, not all teachers are equal when it comes to the digital tasks offered (UNESCO, 2020). Some have technical, pedagogical, organizational and communication difficulties with the unique practice of distance education. Others, on the other hand, see it as an opportunity to explore and test new teaching practices. These different factors are therefore either the source of frustration or the origin of an acceleration in the use of digital education, which has led various actors to express their feelings via social networks, forums, etc. to share their practices or to seek answers to their needs.

In this context, this article proposes an analysis of the perception of 154 educational actors who participated in a live conference[1] organized and followed by more than 400 people on Thursday, March 26, that is to say 12 days after the beginning of the confinement, by "MUMONS, Sciences, Arts & Curiosities", structure of the University of Mons in the field of culture and diffusion of sciences and technologies. During this conference, Bruno De Lièvre and Gaëtan Temperman propose to accompany teachers in their reflection on distance learning. This conference is an opportunity to go further than recommending a list of tools: it presents examples of tasks on which they could base their own teaching scenarios and make learners active. The main objective is to highlight, on the one hand, pedagogical principles (Dillenbourg, 2016) for scripting learning (creation and sequencing of tasks, identification of digital tools, etc.); on the other hand, to identify the most appropriate tools to use in the learning process. The main objective is to highlight pedagogical principles (Dillenbourg, 2016) for scripting learning (creation and sequencing of tasks, identification of digital tools, etc.); on the other hand, to describe the monitoring modalities that are essential to effectively manage it (Quintin, 2008).

[1] Link to the conference: https://youtu.be/TztVsWMT3J4

## 2. Theoretical anchors

De Lièvre et al. (2006) as well as Quintin (2008) highlight the positive contribution of tutor interventions to facilitate learners' progress. For them, the idea of intervening during learning corresponds to the approach suggested by Bruner (1998). It aims to accompany learners ("guide on the side") in their steps. It is likely to have a significant impact on their performance during and at the end of the learning process. In terms of content, regulation can concern different complementary aspects. It can deal with pedagogical, organizational and socio-affective (relational) aspects, as well as technical aspects when digital tools are used.

Pedagogical support begins with clarification of the objectives to be achieved in the course. The pedagogical aspects include clarification of the content to be mastered and help in restructuring the material. On the evaluative level, it corresponds to the drafting of formative feedback as learning aids. Pedagogical interventions are used to draw attention to important points and to encourage learners to build their knowledge.

On the organizational level, the interventions concern the progress of the task. They facilitate time management, which is a major difficulty to overcome for distance learners. From this perspective, they also help learners to take a step back from the planning of tasks, the sharing of tasks and the relevant use of the tools provided.

As far as the relational aspects are concerned, the interventions take into account, on the one hand, the socio-affective dimension, such as facilitating the learners' mutual knowledge of each other and highlighting the positive contributions of each; on the other hand, the motivational dynamics, such as encouraging and encouraging the students to participate in the process on a regular basis. Quintin (2008) highlights that tutoring focused on the socio-affective dimension has a positive effect on the process in terms of group cohesion. Quintin's work (2008) also shows that this improved relational climate has a positive influence on the quality of the learning product achieved as a team and, consequently, on the individual progress of learners at the end of the learning process.

Finally, the technical aspects refer to the units of intervention related to the resolution of problems in mastering digital tools (Quintin, 2008).

## 3. Methodology

### 3.1 Research objective and data collection

The objective of the research was to establish a state of the art of the perceptions of the educational actors. We asked ourselves the following main question: how do the pedagogical continuity and the implementation of distance learning modalities unfold for the different actors of education? In order to answer this question and to make the conference interactive, the Wooclap tool[2] was used to collect different data. Five questions were asked to the participants during the conference. First, the profile of the participants was collected: parents, teachers, school leaders, students, or grandparents. As the online format allowed for a wider dissemination of the conference, the option "other" was added. The third question concerned their feelings about educational continuity: it is going rather well; it is viable in this emergency situation; it is very difficult to live; no opinion. Next, the respondents were asked to rate themselves on a Likert scale from 1 (not at all in agreement) to 5 (completely in agreement) to identify, according to their status (parents, teachers, etc.), their level of integration of the constraints of educational continuity. Finally, the last question allowed participants to indicate the aspects of educational continuity that they felt worked well or needed improvement.

### 3.2. Sample

The sample is composed mainly of participants from French-speaking Belgium. The analysis of the questions is based on a variable number of answers. This variability is linked to the collection instrument used: Wooclap. Each participant did not necessarily answer all the questions. As a result, out of the 400 participants, only 154 answered all the questions asked during the conference (not yet connected at the time of the question, the Wooclap tool not yet in use, technical problem or wish not to participate). Among these 154 respondents, 57 are teachers, 1 is a parent, 13 are learners (students or pupils), 3 are school managers and 13 are listed in the "other" category. It is interesting to note that some participants mentioned that they had multiple roles in this educational

[2] Wooclap is an interactive televoting tool that facilitates participation and interaction with an audience: participants answer questions in real time and can also ask questions via televoting during the presentation.

continuum. For example, 23 participants said that they were teachers, parents or students. Finally, 44 participants did not answer this question (Figure 1).

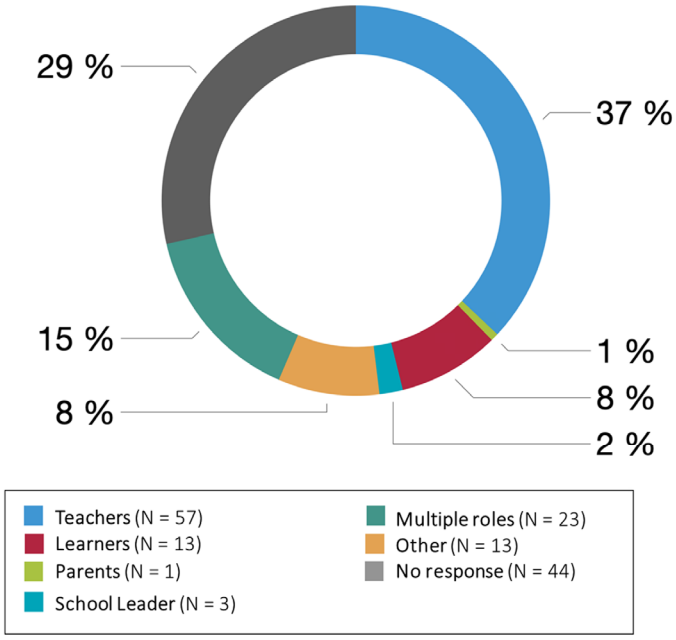


Figure 1. Distribution of subjects according to their educational role.
Source: Descamps et al. (UMONS)

We note that some subjects chose a single role, while others announced that they had taken on several roles during the educational continuum. Nevertheless, caution should be exercised with this data. In fact, one participant could choose only one role, even though he fulfilled several roles (head teacher and parent).

## 4. Results

When we question the sample, it is clear that educational continuity is not easy for anyone. In Figure 2, we observe that the closer the rate is to 100%, the easier the situation seems to be, the closer the rate is to 0%, the more difficult the situation seems to be. We note that all the averages are below 50% and therefore indicate that this situation seems difficult to live with, especially for teachers (37%) who have the lowest satisfaction rate in our sample.

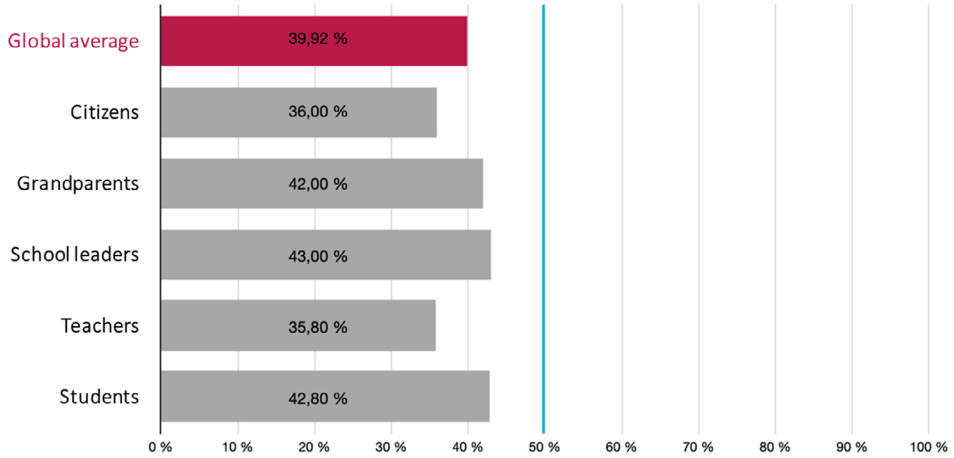


Figure 2. Subjects' perception of accommodation of educational continuity by function.
Source: Descamps et al. (UMONS)

During this conference, we found it interesting to ask participants about their feelings: "Regarding educational continuity, would you say that it..." (Figure 3). While in the previous question, the situation was perceived as quite difficult for the teachers, the majority of them (N = 57; 52%) felt that the situation was viable in this emergency situation (31%) or was going quite well (10%). On the contrary, 6.36% of the teachers think that this situation is difficult to live with. Finally, some teachers did not express an opinion (2.73%). These findings corroborate those of Haag (2020, p.3), according to whom the comments testify to a capacity for resilience in unprecedented circumstances.

According to the learners in the sample (N = 13; 12%), the situation is quite positive. Among the 12% of the sample represented by learners, 8% feel that the situation is viable, and 1% that it is going well. On the contrary, for 2.73%, it seems difficult to live with. For school officials (N = 3; 3%), the situation is viable in an emergency (1.82%). Conversely, for the only parent in the sample (N = 1; 1%), this situation was very difficult to live with.

For those who have several statuses (N = 22; 23% – teacher and parent, teacher and student, or teacher, student, and parent), the situation seems less positive. Indeed, for 5.46% of them, the situation seems very difficult to live with. We hypothesize that this difficulty stems from the work overload associated with the multiple tasks inherent in their profiles. Thus, when a teacher is at home with his family, they must, in addition to the workload related to their job, manage their children's primary, emotional and academic needs,

but also the tasks related to the management of daily life. On the other hand, 8.19% thought the situation was viable and 3.64% thought it was going fairly well. Finally, the participants who did not fit into any of the above profiles (N = 13; 12%) were more mixed. For 2.73%, the situation was very difficult, 4.55% thought that educational continuity was viable and 1.82% thought it was going well. Finally, Figure 3 shows a fairly positive perception for teachers, learners and school principals; a fairly mixed perception for those presenting several profiles simultaneously, as well as for the "other" profile; and a rather negative perception for parents.

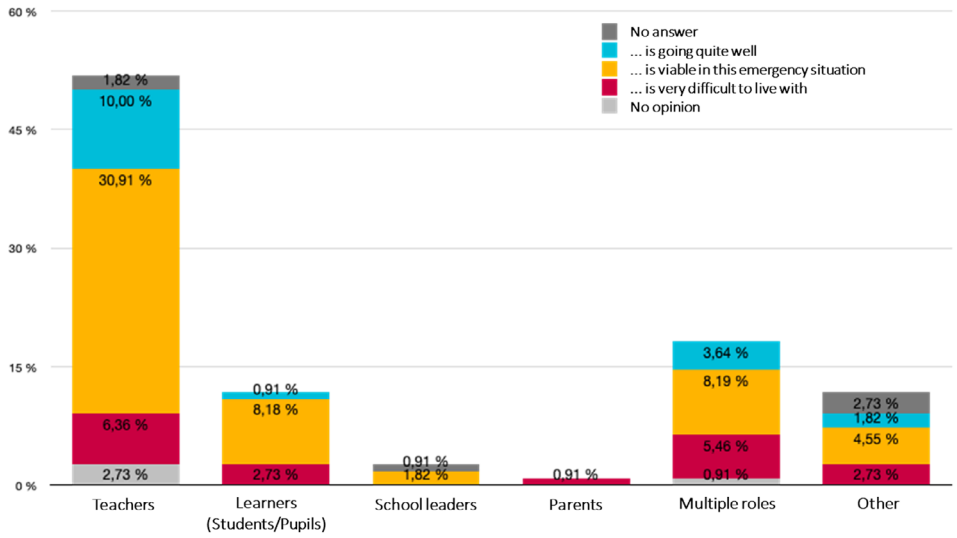


Figure 3. Perception of the course of the educational continuity of the subjects according to their educational role.

Source: Descamps et al. (UMONS)

Teachers and school principals have shown responsiveness and creativity in order to pursue distance learning in a new context that has led them to adopt new tools (Capitanescu et al., 2020). We imagine that this forced and urgent transition to new teaching practices may be difficult for some teachers. Moreover, these new working conditions can create anxiety, a feeling of digital incompetence, questioning and frustration (Goyette, 2020). Nevertheless, as Saint-Fuscien (2017) reminds us, the exceptional nature of certain events such as this health crisis is an opportunity to rethink teaching practices and can be a source of pedagogical innovations. Concerning learners, Haag's study (2020)

provides some answers about the students' experience of this new distance learning situation. Although they do not want distance learning to become the norm, nearly seven out of ten students highlight positive elements such as increased autonomy, a new form of learning (manual work, digital tools, etc.), a better quality of life (sleep patterns, diet, rest time, etc.). The role of parents is modified, moving from supervision of homework to a more important support, being the one "who translates, rephrases, organizes the instructions and ultimately teaches" (Capitanescu et al., 2020, p. 20), sometimes with anxiety about this new skill that some of them have to take on. This new dynamic in which students and their parents are involved can lead to tensions, as the demand for satisfactory school performance can be more intensely experienced within this parent/child relationship. To this we add the difficulties inherent in family organization between teleworking, managing school tasks and technical constraints, both in terms of time and work space (Capitanescu et al., 2020, p. 20).

During the conference, participants were asked to identify what was working well or what needed to be improved in the pedagogical continuum, 12 days after its beginning (Figure 4). In order to disaggregate their responses, each respondent indicated in an ad hoc column a "+" if their opinion was positive and a "-" if it was a difficulty or a lack. The collected verbatims were then analyzed according to Quintin's (2008) four categories of tutorial interventions: technical, pedagogical, organizational and socio-affective. Examination of Figure 4 shows that the number of negative meaning units (N = 153) is higher than the number of positive meaning units (N =108). This result is consistent with the perceived difficulty of the current implementation of educational continuity (see Figure 2).

Concerning the technical aspect of pedagogical continuity, many elements should be improved (Negative technical [T-] = 50 [in red]; Positive technical [T+] = 21 [in blue]), according to the respondents. Indeed, the latter point to shortcomings related to the use and integration of digital distance learning. Respondents regret the lack of training in ICT, as well as the lack of tools adapted to their needs. Teachers and students lack digital skills. This need had already been highlighted by Frau-Meigs (2020) who demonstrates the urgency of training in digital and media skills. However, this health crisis has highlighted something already known: the lack of technical skills among teachers (Papi, 2012; Nogry & Sort, 2016; Loisy, 2007). We argue that this crisis compels trainers to strengthen the development of digital skills in pre-service and in-service teacher education.

In the technical management of educational continuity, several participants identified the digital divide as an obstacle. Indeed, they are concerned about being able to give all their pupils or students the same follow-up while some

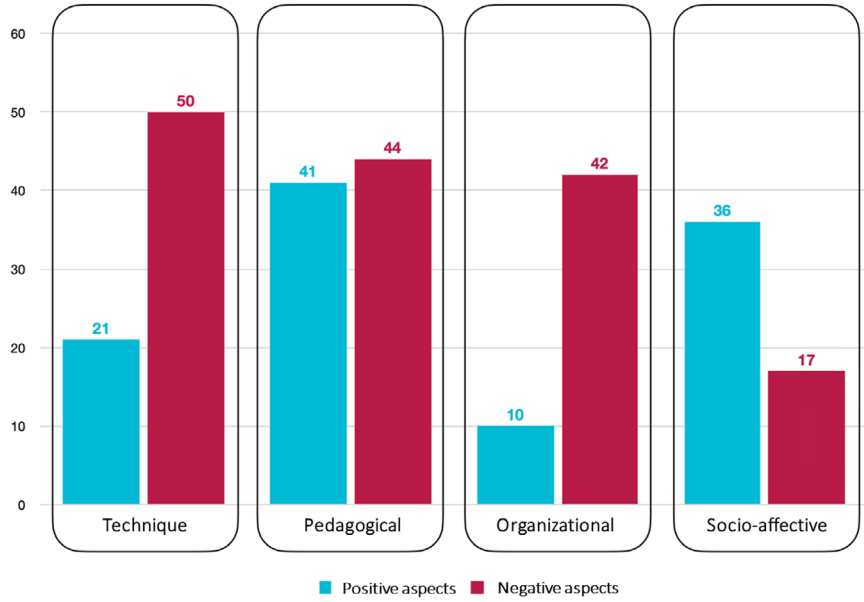


Figure 4. Distribution of verbatims according to Quintin's (2008) four categories of tutorial interventions.

Source: Descamps et al. (UMONS)

families do not have access to computers or the Internet. Since the beginning of the containment, this inequality has been highlighted on numerous occasions (Frau-Meigs, 2020; The Education Foundation, 2020; Barras, 2020). UNESCO (2020, p. 1) has moreover sounded the alarm by indicating that from a global point of view, "half of learners do not have access to a computer at home and 43% do not have Internet at home".

Despite these negative opinions, respondents have discovered the digital potential of easy-to-use tools such as Lives, Messenger and videoconferencing. They appreciate the opportunity to increase their skills by using new tools and creating more elaborate digital content, as well as the ease of access to ICTs to set up this remote support.

The category related to pedagogical aspects is the one where respondents are the most mixed (pedagogical-positive [P+] = 41; pedagogical-negative [P-] = 44). Indeed, the transition from face-to-face courses to entirely distance learning courses had to be done in a hurry and the teacher was not prepared for it (Cerisier, 2020). Our participants cite several difficulties in this adaptation, such as the explanation of certain notions, unclear instructions, the management of assignments, the lack of means to recover the student's attention, and the

management of large groups. However, these different aspects of pedagogical management have long been taken into account in the scripting of distance or hybrid training. Let's take, for example, the management of large groups. Teachers insist on the lack of adapted tools or the difficulty of interaction. However, the spread in the educational landscape of MOOCs, whose M stands for Massive, shows that the large number of learners is above all a component to be taken into account when designing devices, rather than a hindrance to learning (Depover et al., 2017).

Our respondents also identify the absence of feedback as a weakness of this pedagogical continuity, which impacts both teachers (the absence of continuous feedback makes it very difficult to adopt learning tasks) and learners (the absence of feedback tends to demotivate children). This observation is logical as Hattie & Timperley (2007) show that feedback is one of the means to implement scaffolding, and it has a positive effect on the students' feeling of efficiency.

The quality of pedagogical continuity is different depending on the type of course: for theoretical courses, it goes well; for practical courses, it is more complicated. Bobroff et al. (2020) have however identified different alternatives to consider this change: numerical simulations, life-size tests or even the smartphone which has very powerful sensors (for example, measuring the speed of rotation). The authors point out that the students are delighted with this change of routine and the opportunity to work independently. Within the framework of the science course, this remote experimentation allows students to get out of the laboratory and to take hold of everyday life.

This adaptation has required teachers to rethink their teaching from the ground up. For Frau-Meigs (2020), the health crisis made it possible to realize that a routine had set in in-person courses, whereas e-learning makes it possible to teach in a different way, to vary practices and to make the student the actor of his learning. Moreover, students can progress at their own pace and not at the pace imposed on everyone. The results of Haag (2020) go in the same direction. Students also argue that this period allowed them to learn differently, to go at their own pace and to gain autonomy.

In his study, Quintin (2008) identifies organization as one of the four components of the implementation and management of distance learning. When asked about pedagogical continuity, a large number of participants (organizational-negative [O-] = 42; organizational-positive [O+] = 10) point to difficulties in organizing and managing time. The urgent introduction of time-consuming distance learning devices has overburdened teachers. In addition, for those who are parents, it is difficult to organize their own and their children's distance

work. In short, as Frau-Meigs (2020) cites, what could be active pedagogical continuity has turned into involuntary telework. Mostly teachers, our participants point to this planning difficulty. Yet, on the learners' side, Haag's (2020) results show that students appreciate the gain in autonomy made possible by the health crisis, especially in learning to organize themselves.

In the end, what works best in pedagogical continuity is the maintenance of the social link, the contact between students and teachers (positive socio-affective [S+] = 36; negative socio-affective [S-] = 17). Moreover, the pupils are motivated to keep in touch and the teachers to participate in the pedagogical continuity. School is not only a place of learning, and the health crisis has reaffirmed this social role of school (Frau-Meigs, 2020). Indeed, in this time of crisis, the teacher must be both empathetic and vigilant, and show an e-presence (Hadji, 2020). The socio-emotional aspect is the only category that obtains more positive than negative results. Indeed, the respondents emphasized the solidarity among teachers and the sharing of resources made possible by social networks. Solidarity had already been identified as one of the positive aspects of this crisis by the students in Haag's study (2020). The COVID-19 crisis has reawakened collective intelligence approaches in various fields (Santolini, 2020): medicine, economics and also in education. However, due to this anxiety-provoking climate and social distancing, isolation makes it difficult to work at home and self-regulated motivation.

In the following, we link the categories established by Quintin (2008), which were all subdivided into "positive" or "negative" subcategories according to the orientation of the answers given by the participants. To achieve this, we rely on a multiple correspondence analysis. This approach makes it possible to synthesize the links between qualitative variables in the form of a scatter plot. On the graph, proximity between these variables indicates a strong association between the responses. Conversely, significant differences indicate opposition between these categories. While remaining cautious with regard to this correspondence, insofar as our sample is not representative, several instructive results can be highlighted from Figure 5 and the participants' verbatims.

When the participants formulate an opinion in one of the dimensions (pedagogical, technical, socio-affective or organizational), it is clear-cut. It is either positive, as in this verbatim: "support [P+]; access to ICT [T+]", or negative, for example: "It is essential that we be provided with quality and specific tools [T-]; No tools adapted to large groups (> 200) [T-]". It also appears that when an opinion is negative, it is generally negative for all the dimensions. However, a stronger relationship was found between the negative P- and T- opinions. This

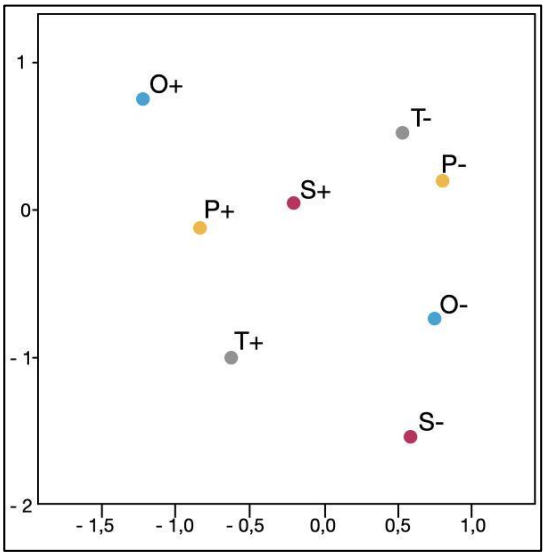


Figure 5. Multiple Correspondence Analysis of tutoring categories.
Source: Descamps et al. (UMONS)

means that when a participant invokes a negative opinion on the pedagogical level, he/she also tends to evoke a negative opinion on the technical level. The following verbatim illustrates this situation well: "more complicated to stay involved [P-]; can be complicated for parents [sic] to accompany children in their learning [P-]; some families do not have access to computer tools [T-]". This would mean that, in the case of these respondents, 35.80% of whom are teachers, the lack of mastery of the technical aspects would have direct repercussions on the pedagogical level and would make this aspect difficult. We can think that the technical aspects linked to the use of digital technology are a condition for any pedagogical action and this situation is obviously reinforced in the context of an urgent distancing.

Another tendency in the negative opinions is that we notice that an opinion on the social level is often linked to an opinion on the organizational level, as shown by the following verbatim: "overload! [O-]; difficulties with the agenda [O-]; sometimes hard to work at home ...[O-]; telework placement (isolation!) [S-]". Thus, the fact of experiencing difficulties at the social level (isolation, family management, etc.) would reinforce the difficulty of getting organized and vice versa.

For those participants who cited both negative and positive aspects, the positive aspect that was most often associated was social. Specifically, one

person said that it is "difficult to use the different supports and resources [T-]; the parent is not the teacher [P-]; difficult to set up [O-]; a lot of sharing of resources [S+]; too much stress, you feel overloaded, lost [O-]; it is difficult to work in this context [P-]". It can therefore be argued that if a person finds himself in a situation that he considers complicated and negative, the most positive aspect that is invoked is the social level. In terms of the recommendations we could make, we would argue that, in the implementation of distance devices, the social dimension is an important factor for learning to take place. This observation corroborates the conclusions of Quintin (2008), according to which socio-affective tutorial interventions have a greater impact on learning in a distance learning context.

Moreover, the positive pedagogical aspects seem to occupy a central place and are linked to the positive aspects of the other three dimensions. Thus, the positive pedagogical aspects are sometimes associated with positive organizational aspects: "The help of the teachers [P+]; the availability of the teachers [O+]", sometimes with positive technical aspects: "the obligation to test new digital means [T+]; the need to rethink one's teaching from top to bottom [P+]". The multiple correspondence analysis nevertheless shows that positive opinions on the pedagogical level (P+) are most often accompanied by positive opinions on the social level (S+): "interest of pupils in using digital tools for learning [P+] / being in direct contact with pupils via the digital medium [S+]" or "the social link [S+]; more differentiated monitoring [P+]; implementation of effective practices in terms of sharing [P+]". This would mean that for the respondents, the majority of whom were teachers, pedagogy is intimately linked to social issues. They do not envisage the transmission of the subject without interaction with their students. Indeed, school has always had a role that goes far beyond the simple transmission of knowledge (Blanchard & Cayonnette-Remblière, 2016) and also comes under the heading of motivation to engage in learning (Viau, 2005).

To further interpret our data, we attempted to establish relationships between the profile of respondents (Figure 1), the expressed feelings about how educational continuity is experienced (Figure 2 & Figure 3), and the participants' views on these four dimensions (Figure 4). However, no significant relationships were observed. Neither the function nor the perception of pedagogical continuity seems to modulate the opinion on the importance of supervision during the learning process. This result seems logical given the opportunistic nature of our sample.

## 5. Conclusion

While remaining cautious insofar as this is a sample motivated by the educational issue, our analysis of the webinar participants' statements brings out several interesting results with regard to the distancing of teaching situations in a pandemic context.

The transition to distance learning requires teachers to master digital skills. It is clear that this is not self-evident and that it may have been an obstacle to teaching practices in the context of the health crisis. This forced transition has, however, allowed teachers to rethink their teaching practices in depth and has led them to share these new practices, to collaborate and to help each other, particularly via social networks.

This sharing of resources, the solidarity born during this period of confinement and, more generally, the socio-affective aspects are central to the participants' testimonies. In fact, according to them, this is the only aspect that has more positive than negative aspects in the educational continuity. Moreover, for some participants, while the situation of confinement proves to be complicated at several levels (pedagogical, technical and/or organizational), the only positive aspects invoked are of this order. These elements highlight that school is not only a place of instruction and learning, but that its social component remains fundamental to ensure pedagogical follow-up (even [or even more so] at a distance).

Furthermore, the organizational aspect seems to be of primary importance in the implementation of distance schooling, both for teachers who devote a significant amount of time and for parents who alternate between teleworking and managing their children's school tasks. Our results also show that the organizational shortcomings are related to the social shortcomings. Teachers are also aware that not all of their students have the same access to computer tools. Their fear is that this digital divide will make educational continuity unequal.

Finally, we ask what digital uses teachers will make in their classrooms once they leave confinement. Will they continue their initiatives to adopt digital tools? Will they still express a need for training in digital skills? Teachers fear the inequalities caused by the digital divide. Will they be amplified when they return to the classroom? Will new inequalities emerge as a result of this confinement? These are all questions that will need to be addressed urgently after this pandemic period.

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# Artificial Intelligence and Education: How Can They Complement Each Other?

ABSTRACT

Artificial intelligence is invading all facets of our society. The education sector must also ask itself what its contribution will be. The questions addressed in this article are: What will we gain? What will we lose? What position should we take to bring the benefits of AI to students? After defining what it is and can be, we focus on descriptions and illustrations of its functions in teaching and learning: how to differentiate? Interact? Guide? Assess? for the benefit of the learner?

**Keywords:** artificial intelligence, contribution, benefits for students, functions

## 1. Introduction

Artificial intelligence is intellectually seductive, capable of defeating world chess champions (Deep Blue – 1996) or Go champions (AlphaGo – 2016); of making itself understood by a smartphone by giving it verbal instructions (Siri – 2012, Alexa – 2014; Google Assistant – 2016) and accessing it through facial recognition (Face ID – 2017) or even translating text from English to French in real time (Google Translator – 2005, DeepL – 2017).

It also plays an increasingly prominent role in films and television series: Hal 9000 in 2001 "Space Odyssey" (Kubrick, 1968) as one of the precursors. In "Her", by Spike Jonze (2013), Samantha, the artificial intelligence integrated into the operating system of Theodore's computer, is endowed with a sensitivity which, solely thanks to vocal conversations, allows for the creation of in-depth human relationships (friendship, complicity, love, etc.). Ava, the artificial intelligence in "Ex-Machina" (Garlang, 2015), has a body and can manipulate feelings

and developing her own strategies to free herself from the dependence of her human designers.

### 1.2. What will we gain?

Although artificial intelligence is obviously not currently capable of being autonomous in the way these fictions present it, its capacities in very specific fields are sometimes much more effective than those of human beings. And the impacts can be positive: for example, in the field of health, the recognition of skin cancers (Sciences et Avenir, 2018) by an AI has proved to be better (with 95% efficiency) than those of 58 dermatologists. Is it therefore still necessary to train radiologists in 25 years when a few months are enough to develop a more competent AI? In terms of travel safety, the impact of intelligent systems makes it possible, on the one hand, to optimise routes according to traffic density and, on the other hand, to avoid road accidents (90% less according to Bertoncello & Wee [2015]) thanks to intelligent systems enabling autonomous driving.

Almost all sectors of activity will be impacted by digital technology in general and AI in particular, with positive effects for the well-being of individuals, but of course also with points of attention that should not be overlooked.

### 1.3. What will we lose?

A – Jobs? Yes, some will disappear. Those for which automation can help make the job less arduous. Where repetitive procedures that are not necessarily rewarding for humans can be taken over by a form of automation. For example: data encoding, driving heavy goods vehicles, etc.

If some professions have to implement a process of renewal of their core business or risk becoming irrelevant, history has shown us that other professions are emerging. The day cars began to populate our roads at the expense of horse-drawn carriages, ironmongers and horse traders gradually disappeared in favour of mechanics and coachbuilders. In the digital age, drone pilots, digital lawyers and electronics engineers will have new job opportunities as the economy improves.

B – The ownership of our private data that we willingly (or unwillingly) give to the GAFAMs (Google-Apple-Facebook-Amazon and Microsoft) may be out of our hands. Data protection processes must be properly activated by manageable and reasonable procedures that allow everyone to say how they want their per-

sonal data to be used so that they retain control. Without becoming paranoid, without prohibiting use in schools at the risk of not educating for intelligent use.

C – The values we wish to defend can be undermined by inappropriate uses of AI: the implementation of electronic chips in the brain to boost our cognitive capacities, being located everywhere and all the time, favouring the transmission of false information (fake news), etc. Ethics is at the heart of dealing with AI issues. It is a democratic issue.

### 1.4. What do we need to put in place to make the digital transition a success?

If we are vigilant, we will lose nothing. It wasn't better before (Serres, 2017) as some chagrins feel they must claim! As long as everyone takes hold of these digital issues (and those of AI in particular) to regulate the evolution of these uses in favour of human well-being. This is a civic issue. It is one of the investments that education must not miss at the risk of missing the turn of the digital transition. Companies like Kodak or Nokia did not negotiate it in time, and are now reduced to a trickle. If we do not want the school as an institution to be deprived of its educational prerogatives, we need to determine how these digital issues will be taken into account so that our educational approaches fit into the current and modern societal context. The world of education cannot remain on a path that ignores the existence of artificial intelligence and its effects. "For if we make the digital, the digital also makes us" (Cardon, 2019, p. 9).

## 2. Artificial intelligence (AI): what is it?

The definition given by Kurzweil (1990) is as follows: it is "the field of research relating to the construction of machines performing tasks considered to require intelligence". Behind one of the ways of characterising it, let us try to understand what it covers more precisely.

Historically, Alan Turing was the first to talk about the intelligence of machines in 1950. The term Artificial Intelligence was first used in 1956 by McCarthy. His team at Stanford had the ambition of making the machine so intelligent that it would supplant humans. A few years later, in 1968, Engelbart took a different position, namely that of the digital machine "augmenting" rather than replacing humans.

It is still this position that, several decades later, we believe we must defend: the complementarity of human intelligence and artificial intelligence.

### 2.1. From symbolic AI to connectionist AI to generalist AI

Algorithms are finite and unambiguous sequences of operations or instructions for solving a class of problems ("Algorithme", 2022). The first steps in AI were in the direction of trying to reproduce, in the form of algorithms, the logic of natural reasoning. The mechanic's diagnosis is broken down into rules which are transferred to the computer which must make decisions like a human mechanic. This is symbolic AI. These expert systems have shown their limits in terms of efficiency. Mainly because many variables could not be taken into account in the decision-making process: emotions, context, intuitions (Houdé, 2019). As a result, the field of action of symbolic AI remained circumscribed. Programmed for chess, it is not capable of driving. And the one that helps with navigation cannot detect cancerous spots. To develop an intelligence closer to human reasoning, AI would have had to be able to build bridges between domains (multidisciplinarity), to judge the relevance of its actions (critical thinking and common sense). This is something it absolutely does not have

A different approach has been taken. Rather than teaching it what it needs to know, let it learn by itself: this is machine learning. Instead of coding, let's confront it with multiple examples from which, by an inductive method, the AI will gradually learn the rules in an increasingly subtle way. By providing many (thousands or even millions) of videos of football matches, the AI will be able to isolate the rules for kick-ins, indirect free-kicks and even offside. It uses probabilistic methods that allow it to build bridges between similar situations. This is connectionist AI. By successive approximations, it manages to discriminate and generalise concepts from one another.

However, the possibilities for cross-disciplinary thinking remain limited. One attempt to move towards this multidisciplinary thinking is to reproduce the functioning of the brain. This is deep learning. Starting with perceptions to gradually reconstruct reality through the pattern that would be followed in a neural network. The billions of faces that are analysed make it possible at some point in the process to affirm, with an increasingly high percentage of success, that it is yours or your sister's or you can see why your photos on Instagram are highly prized in order to feed these learning machines.

However, these still need to be helped by humans. The system thinks it is your sister in this photograph and will therefore ask you to confirm it or not. This is supervised learning. And so, little by little, the system adjusts itself to recognise your face, your cat, cancerous spots, pedestrian crossings, etc. Once again, you can see why, under the guise of security, you are helping to teach an

artificial intelligence what it will have to recognise one day without your help by identifying objects in images.

But we are still a long way from strong, generalist AI, the kind that will begin by being transdisciplinary, intelligent in many fields and capable of building bridges between them. We are not at all at the dawn of autonomous AI that will become independent of the human being who designed it. We are far from this reality and opinions on whether it will ever happen are not at all convergent among the experts themselves (Alexandre, 2017). But who knows? Let's keep our eyes open. And let's prepare our children... from school onwards.

## 3. Artificial intelligence has its place in schools

Digital, social networks, artificial intelligence, technologies must be present in schools. It is a social imperative (de la Porte, 2017)! Because if the most digitally deprived (and we are not talking here about digital equipment) are not educated in the appropriate uses of the tools, the digital divide of the second degree (the uses of the digital) or of the third degree (the exploitation of the information available from these digital networks) will become more pronounced between the haves and the have-nots, for whom the school will have failed in its mission.

It is therefore essential to integrate these artificial intelligence technologies, as they can help to facilitate all aspects of the teaching and learning process, both in terms of organisation and regulation. From guidance to the provision of targeted content, from interaction management to learning monitoring and assessment, all the many tasks that a teacher can benefit from AI inputs.

### 3.1. To differentiate

Position the student where he/she will be most able to learn effectively in the course. Take account of prior learning and offer challenging situations. Both the teacher and the pupil need such opportunities. The principle of adaptive devices is to have as complete a view as possible of the learner's progress in order to be able to propose relevant tasks in terms of progressiveness. No one is left in difficulty, no one is frustrated by being held back.

The Tacit software[1] developed at the University of Rennes is based on this live adaptation logic. From the results obtained by the learners, the statistical model

[1] https://tacit.univ-rennes2.fr/

(Rasch item response model) establishes a precise correspondence between the level reached (in inferential reading and vocabulary development) and the relative difficulty of the tasks proposed afterwards. The learning environment thus makes it possible to simultaneously differentiate student activity and better manage the heterogeneity of the students in the class. Lalilo[2] is a private version developed by others that adopts the same logic of using AI.

In the same way that social networking algorithms provide us with information or advertising based on our preferences, lessons can be illustrated according to some of our preferences. If a student has a strong interest in the prehistoric period, a series of examples could be provided based on this interest. The content is therefore personalised for each learner in such a way as to motivate them.

Khan Academy[3] is a learning platform that uses these techniques to offer learning paths that are differentiated in terms of the number of exercises, types of cues provided to students according to their personal characteristics.

### 3.2. To interact

To make the learner active, interactive situations are a valuable aid to learning. The conversational mode is an approach that we use on a daily basis. One of the great challenges of AI in education is to create systems that can address learners in natural language. Chatbots, software with which it is possible to have a conversation, often via instant messaging, are increasingly being used. In 2016, Facebook's massive investment in natural language processing increased the popularity of these programs. The interest in these conversation automation devices is all the more important as the number of users of instant messaging software continues to grow. It is estimated that there are over 1 billion users worldwide on smartphones alone in 2018. Asking for help from a technical support service now means being taken care of via a chatbot (conversational robot). The development of software such as Recast or Chatfuel offers the opportunity to develop chatbots quite easily using blocks of instructions to be organised with each other. Di Emidio et al. (2018) have thus developed a chatbot to enable the revision of geometry concepts for the end of primary school. Integrated into Facebook Messenger, the student interacts with the robot. The robot proposes different revision topics. The pupil is asked a question

2 https://www.lalilo.com/
3 https://fr.khanacademy.org/about

on a subject by the bot and formulates his answer. If the answer is correct, the bot moves on to the next question; if the answer is partial, the bot asks for the missing information and encourages the learner to clarify his or her answer. In the event of a wrong answer for which the cause is identified, the bot offers specific help; in the event of an answer for which the cause is not identified, the bot asks the learner to reformulate. The challenge of programming the bot is, of course, to achieve this last situation as little as possible. The exploitation of conversation traces is valuable, as it allows developers to identify frequent errors and improve the conversation algorithm. This communication between a human and software is also possible via the audio channel, like systems such as Siri or Alexa available on smartphones or via connected speakers (Amazon Echo, Google Home, Home Pod).

Hood et al. (2015) had the idea to reverse this process. The aim of the interaction here is to get the students to teach the robot (Nao) what it needs to know. For example, students who are learning to write by hand are then responsible for teaching the robot to form letters correctly. Pupils should therefore focus on the process of writing the letters correctly. The robot can learn from the student's demonstration of the correct process and from the reinforcement it has provided to achieve the goal.

### 3.3 To guide the learner

A factor of success in learning is the regulation of the process implemented by the learner. From a conceptual point of view, regulation can be defined as the process that allows a system to maintain a state of equilibrium (Raynal & Rieunier, 2009). In his work, Piaget (1992, p. 167) already put forward this idea of equilibrium: "the proper function of regulation is, in all domains, to inform a system in action about the results of its actions and to correct them according to the results obtained". This regulation task for a trainer quickly becomes complex in a situation where the number of learners is high (for example in a MOOC[4]) and may involve several thousand participants. To support this regulation, the system must interpret the calibrated values by comparison with a reference model set at the beginning. From this processing, the system then makes the decision as to whether or not to inform individuals in order to regulate their activity. Integrated in a learning context, the Duolingo assistance

[4] Massive Open Online Course https://fr.wikipedia.org/wiki/Massive_Open_Online_Course

tool[5] corresponds to this automatic guidance approach. On the basis of an analysis of learning traces, the system informs learners of their level of progress in learning and of the lexicon not mastered. By means of an e-mail, it delivers an automated notification to the learners with recommendations adapted to remedy the situation. At the psychomotor level, an interesting example is offered by Swimbot, a connected bathing cap[6]. Based on the above-mentioned principle of Deep Learning, the device analyses the activity of swimmers to give them feedback on the quality of their swimming in real time (head position, arm and leg movements, etc.). A sound signal emitted from the box in the swim cap sends information to the swimmers when a movement is not efficient. The task for the swimmer is to make this signal sound as little as possible when training in the pool, indicating that a correction of the movement is necessary.

### 3.4 To assess learning

The processing of open-ended questions in an evaluation is time-consuming and sometimes relies on the evaluator's subjective assessment. This complex task can be supported by applications for intelligent extraction of knowledge from text (text mining[7]). This involves automatic processing of natural language in a text and identifying those that correspond to our evaluation criteria. In education, the Readerbench[8] software (Gutu-Robu & al., 2018) is a good example of this approach. It is able to assess the textual complexity of writing, the degree of social collaboration within a group, and the evaluation of learners' summaries or personal explanations. In the hands of a tutor, this system offers a great opportunity to automatically generate specific feedback and to improve the validity of open-ended answer corrections in parallel.

## 4. Conclusions and perspectives

There are many more examples that could be mentioned here. On the one hand, our aim is to show that Artificial Intelligence can play a role for the benefit of students and their teachers. Whether we like it or not. But, if we, as those responsible for the education of our children, do not take this responsibility of

5 https://fr.duolingo.com/
6 https://www.youtube.com/channel/UCw1neiM8BKVP5vL0fK5NQjQ
7 https://fr.wikipedia.org/wiki/Fouille_de_textes
8 http://readerbench.com/

integrating digital technology into school activities, others will do so... and are already doing so (Facebook for Education[9], Google for Education[10], Apple for Education[11], etc). Education must take up the digital issue.

### 4.1 Tools for Education

These are learning tools that our students must learn to use appropriately to increase their skills in terms of technical mastery, but also and much more in terms of thinking about the issues that these technologies will confront us with.

### 4.2. Human intelligence is unique

Multidisciplinary artificial intelligence, endowed with common sense, critical thinking and autonomy, is not for tomorrow. These characteristics are (still) the prerogative of the human being, who is a being of sensitivity, emotions, and intuitions, capable of making decisions with his heart as well as with his reason. It is therefore these qualities that we must rely on so that intelligent tools are in their place and that we do not try to fight them where they exceed us (speed of calculation, reliability, processing of numerous data, etc.). Let's develop the skills of doctors to build bridges between their patient's data and their life, social, family and emotional context. Let us train carers to accompany patients to ensure their well-being and use the tools to diagnose physical or mental ailments faster and better.

Therefore, the school should focus on the mastery of technological tools (I know, I appropriate, so I make the best use of them) and, at the same time, on the development of soft skills (Mauléon et al., 2014) such as problem solving, empathy, stress management, creativity, etc. These are human assets. It is up to us to capitalise on them with full knowledge of the facts and for an efficient articulation with digital tools. These tools, of which Artificial Intelligence is one of the emanations, must be complementary to the specific and irreplaceable human qualities.

9 https://education.fb.com/
10 https://edu.google.com/intl/fr_fr/?modal_active=none
11 https://www.apple.com/befr/education/

### 4.3. Ethics

Thus trained, today's children, tomorrow's adults, will be able, in an enlightened manner (on the challenges of AI) and equipped (through the development of soft skills) to make the necessary decisions on how (!) to use digital tools and regulate their use. The algorithm that steers an autonomous vehicle is programmed by an individual who must determine, in the event of a dangerous situation, which choice to make: to send the car onto the tree at the side of the road or onto the pedestrian who has suddenly appeared? How will this decision be made? Who will make it? Will insurance companies consider the owner (non-driver) or the designer (of the algorithm) of the car responsible? Which lawyers will decide? On the basis of which laws? The professions of ethics and digital law have a bright future ahead of them. And this is essential if humans are to retain control over cold and rigorous algorithms.

### 4.4. Co-development

It is therefore co-development that must be ensured. That of the collaboration of humans with machines. Working together and jointly will be more profitable than opposing them. That of students and teachers. Because in order to train the students, the teachers must also be trained. It is therefore a simultaneous movement, even if it is asymmetrical. And, from this dynamic, the best possible production must emerge, combining the strengths of all intelligences for the benefit of the pupils.

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# Integration of Digital Technology in the Classroom and Mathematics Project on Twitter

ABSTRACT

Within the framework of a collaborative research, a mathematical project on Twitter was conducted in ten classes of two elementary schools in French-speaking Belgium. In this context, a techno-pedagogical accompaniment of the teachers was implemented. This article describes the effects of this support on the teachers' feeling of digital competence and on their desire to integrate digital technology in their teaching practices. Students' perceptions of this project were also collected.

**Keywords:** technology, Twitter, mathematics, problem solving, math for real

## 1. Introduction

In October 2018, French-speaking Belgium adopted a Digital Strategy for Education. It is part of a reform, the Pact for Excellence in Education, and more specifically, in the framework of the digital transition. The latter aims at integrating digital technology into classroom practices and the acquisition of digital skills by students. This article presents the implementation of a mathematical project on Twitter within the framework of a techno-pedagogical support conducted in ten classes of two elementary schools. On the one hand, we assess the effects of this support on the teachers' feeling of competence in digital technology and their desire to integrate it into their teaching practices. On the other hand, we collect the students' perceptions of this project. The collaborative research explained below was conducted as part of the research

work for the Pacte, where techno-pedagogical support for field practitioners was set up.

## 2. The integration of information and communication technologies in the classroom

Information and communication technologies (ICT) influence the social, technical, and economic dimensions of our society (Redecker, 2009). The educational field is no exception; it is also changing learning and digital education is a necessity (Dohn, 2009). However, the integration of ICT into classrooms is not progressing well (Maddux et al., 2011; Thibert, 2012). As Chaptal (2011) states, technologies are often used by teachers for their professional use and, to a lesser extent, in a pedagogical context. Thus, only a minority of teachers use digital technology to enrich their teaching or as a learning support (Guzman & Nussbaum, 2009; Liu, 2011). This under-use of digital technology is believed to be rooted in teachers' lack of competence with digital technology (Tsai & Chai, 2012; Villeneuve et al., 2012). One of the factors facilitating the integration of ICT is professional development opportunities (Gotkas et al., 2009). Indeed, several authors consider that there is a positive link between the digital pedagogical training teachers undergo and their integration initiatives in their classrooms (Collis & Jung, 2003; Bullock, 2004; Jung, 2005). Support must be provided to teachers so that they can integrate it into their pedagogical practices, while addressing any technical concerns (Cody et al., 2016). We believe that techno-pedagogical training is necessary in order to integrate technologies into classroom practices. The technical aspect of the tools dealt with in the training sessions is not enough to ensure on its own effective and relevant integration of digital technology; pedagogical reflection should not be neglected. A shift is thus taking place from techno-centric training to a pedagogical-centric approach (Charlier, 2010). Not only does digital technology lead to the digitization of actual pedagogical practices, but also to the emergence of new learner-centered practices (Sanchez, 2012), leading to a redefinition of the poles "teacher, student, knowledge" and the relationships that link them (Houssaye, 2015). The system presented in this article is part of this second modality. Our approach is based on individualized support provided to teachers to facilitate the integration of technologies in their teaching-learning situations (Giroux et al., 2013). This coaching takes place within the classes of these teachers in order to allow them to "situate the observations they make

of their own practices, in their classrooms, in a situation of integration of ICT, and to be able to appreciate their progress in this sense" (Coulombe et al., 2017, p. 10). In addition to individualized support in a real classroom context, it is recommended that the teacher actively participate in the development of the techno-pedagogical device (Kumps et al., 2019).

## 3. Context

This research took place during the 2018–2019 school year and took place over a two-month period. This device aims at the development as well as the resolution of mathematical challenges on Twitter by allowing the reinvestment of previously learned mathematical concepts. The objective of this project is to distance itself from the purely abstract approach of mathematics. Ten teachers from two elementary schools took part in this project. The two schools involved are located in the province of Hainaut in French-speaking Belgium. Access to a WiFi connection is available in the classes taking part in our project. The first school has recently been equipped with a set of twelve Android tablets. The teachers told us that they had not had the opportunity to use them before our arrival. As for the second school, it has a mobile interactive whiteboard. The latter is mainly in the class of the CM2 teacher, who is a regular user of this equipment and shows a certain interest in digital technology. This teacher also provides his students with two tablets, obtained with his own funds, during workshops. He offers them applications that he considers beneficial for their learning.

Table 1. Work context of teachers participating in this scheme according to school, grade and number of students

| School A teachers | | | School B teachers | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CE1<br>17<br>students | CM1<br>20<br>students | CM2<br>18<br>students | CP<br>16<br>students | CP<br>18<br>students | CE1<br>17<br>students | CE2<br>21<br>students | CE2<br>18<br>students | CM1<br>19<br>students | CM2<br>17<br>students |

Source: Dragone, Temperman, De Lièvre (UMONS, 2022)

Although the teachers themselves carry out the activities in their respective classrooms, a researcher is involved in the implementation of the project in the field. She ensures the smooth running of the project and accompanies each teacher individually from the design of the to the publication of the Tweets. The

aim of our research is to assess the effects of individualized techno-pedagogical support on the teachers' sense of competence and their desire to integrate digital technology into their classrooms, as well as the relevance of such a system for student learning.

The goals of our project are to promote the professional development of teachers in the use of digital technology through a professionalizing approach (Uwamaryia & Mukamurera, 2005) and to build common knowledge regarding the integration of digital technology in the school context. Thus, we promote a "collaborative research" approach (Desgagné & Larouche, 2010; Morrissette, 2012). In this framework, the teacher becomes a partner from the co-design of the device to the analysis of the data, informed by his or her perspective as a field practitioner. We explain each step of this process according to the model of Desgagné et al. (2001). First, a meeting was organized between the researcher and the teachers to define the expectations of each. On the one hand, the researcher wanted to investigate the effect of techno-pedagogical support on the teachers' sense of competence and, on the other hand, she wondered about the interest of such a project for the students' learning. As for the teachers, they wanted to benefit from techno-pedagogical training in their classes. They also felt it was relevant to participate in this project, which they considered innovative, both in terms of the use of digital tools and the proposed approach (COSITUATION). The next step (COOPERATION) is the experimentation of the device which was co-constructed in partnership with the teachers. On this occasion, questionnaires were submitted to the teachers and their students in order to collect data. The last step (COPRODUCTION) aims at analyzing the data and communicating the results to the teachers. A meeting with all the teachers took place in order to discuss these results and to complete them with their expert view of the field.

## 4. Presentation of the "Math for Real" scheme

Our program is inspired by the "Math for Real" project, which usually takes place around the month of April. For four weeks, a new mathematical theme is proposed every Monday. The teacher carries out a brainstorming with the students, this step allows to reactivate the students' knowledge. The students must then identify elements in the classroom where the concept can be observed and propose a mathematical challenge that they will submit on Twitter to the other classes participating in the project. After presenting their problem to the teacher, students send a tweet with their math challenge. Each day, a few min-

utes are given to check the #MathForReal Twitter feed to try to find answers to questions from other classes also participating in the project. Students must also check the accuracy of the proposed solutions to their problems.


Figure 1. Official "Math For Real" Twitter account.
Source: Dragone, Temperman, De Lièvre (UMONS, 2022)

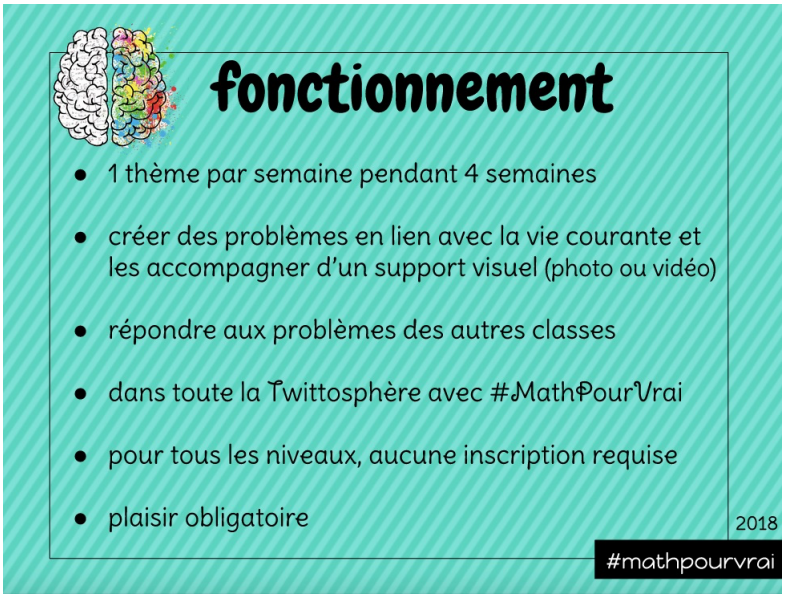


Figure 2. How to participate in the Math for Real project?
Source: Dragone, Temperman, De Lièvre (UMONS, 2022)

The citizen registered in a digital society in constant evolution is led to develop new skills from this digital culture. The school plays a role in the development of these digital skills. The DigComp model (Carretero et al., 2017) is a reference framework of digital competences adopted by a number of European actors. It is composed of 21 competencies divided into five domains: information and data literacy, communication and collaboration, digital content creation, security as well as problem solving. In this project, several skills are solicited such as "interacting through digital technologies", "sharing with digital technologies", "managing digital identity" or "protection of personal data and privacy" (Carretero et al., 2017, p.11). The design of techno-pedagogical devices requires the teacher to master digital skills and to enable the development of these skills in their students (Redecker, 2017). In addition to using digital technology in teaching practices (digital education), it is also about considering it as a learning object (digital education). This project is situated in this dual approach.

### 4.1 Arrangements of the device

We are not aiming for a "simple" implementation of the device in the classes involved. Indeed, we consider it important to consider the difficulties that teachers anticipate in their practices as well as those assumed for their students, thanks to their expertise. We are also attentive to the involvement of teachers in this process, which, in our opinion, also involves adaptations when they take up the device. Therefore, it seems necessary to us to ensure a reflection in collaboration with the researcher on the taking in hand of the device in order to carry out the opportune adjustments taking into account the context of its implementation.

Firstly, the teachers were met with the aim of accompanying them in the creation of a class Twitter account and to prepare an introductory sequence on Twitter as well as on its stakes before the project.

This social-digital network seems relevant to us for several reasons:

1. tweets are limited to 280 characters, which makes the project accessible to first and second graders. The concise nature of the tweets leads the students to synthesize their messages (Deschenes & Parent, 2012);
2. the fun aspect increases motivation to read and write;
3. it raises students' awareness of critical use of the Internet and social networks (Leclerc-Coulmain, 2014);
4. it establishes a real communication framework and that the use of social-digital networks is particularly interesting in social and active learning contexts (Macfarlane, 2015);

5. in addition to the mathematical concepts addressed, handwriting, spelling, conjugation and syntax are worked on (Leclerc-Coulmain, 2014) and take on their full meaning because what the students write will be published and read by others.

The digital social network Twitter is not known – or at best, little known – to students who are not familiar with it. Therefore, it is necessary to prevent risks in the use of Twitter and to define rules that students must respect. To this end, a charter for the use of Twitter was posted in each classroom. It was read, explained and commented by the teacher to the students who then signed it. This step seems necessary to us in order to make them aware of good practices, of the traces left on the Internet and to make them aware of their digital identity (Cardon, 2011). Behind the apparent ease with which students use digital tools and despite the widely conveyed image of "digital natives" (Palfrey & Gasser,

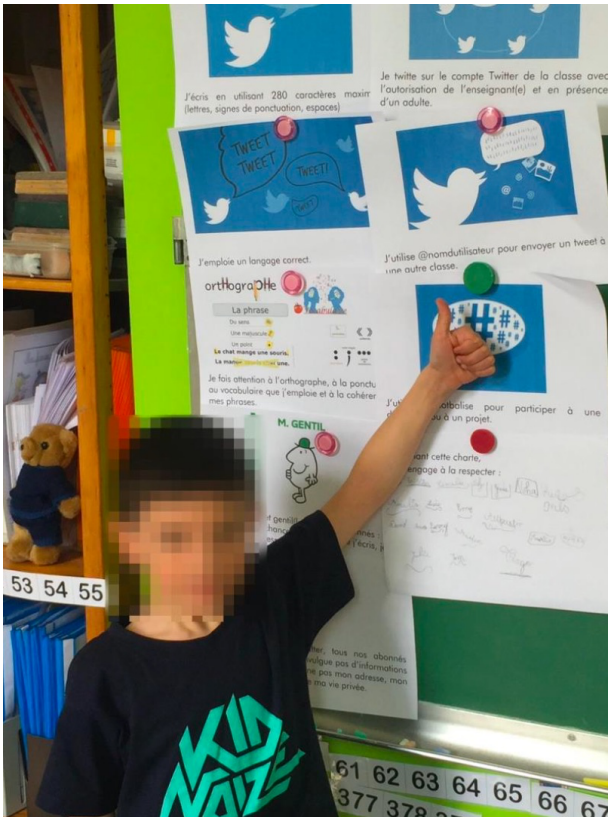


Figure 3. Charter posted in classrooms.
Source: Dragone, Temperman, De Lièvre (UMONS, 2022)

2008; Prensky, 2010) lies a mastery of digital skills that falls short of what is predicted by this theory. Indeed, this mastery depends on other intragenerational variables (Bennett et al., 2008) such as socio-economic background, gender and culture. It should also be noted that students' use of digital tools in the school context differs from their usual use in the private sphere (Dioni, 2008) and their use is generally rather passive. On the other hand, the creation of digital content, sharing, solving technical problems... are uses that concern only a portion of young people (Amadieu & Tricot, 2014). The role of the school is to prepare the students as well as possible in order to integrate this technological society and to develop their critical spirit in their uses of the socionumeric networks (Entraygues, 2017) in order to become aware of their impacts.

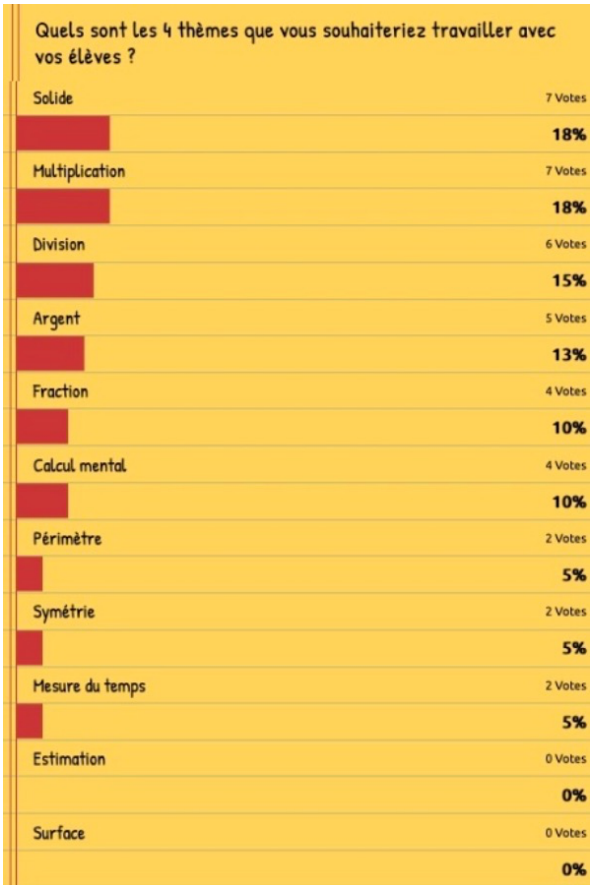


Figure 4. Teacher selection of themes via a StrawPoll.
Source: Dragone, Temperman, De Lièvre (UMONS, 2022)

The ten classes started the project from May 6 until May 30, 2019 and were connected to each other to participate in our project. A hashtag was created for this purpose "#mathdelavie". The mathematical themes for the four weeks were chosen by the teachers from a list of themes from previous years' Math for Real projects through an online survey using the StrawPoll tool.

The four math themes were "solid" (week 1), "multiplication" (week 2), "division" (week 3) and "money" (week 4).

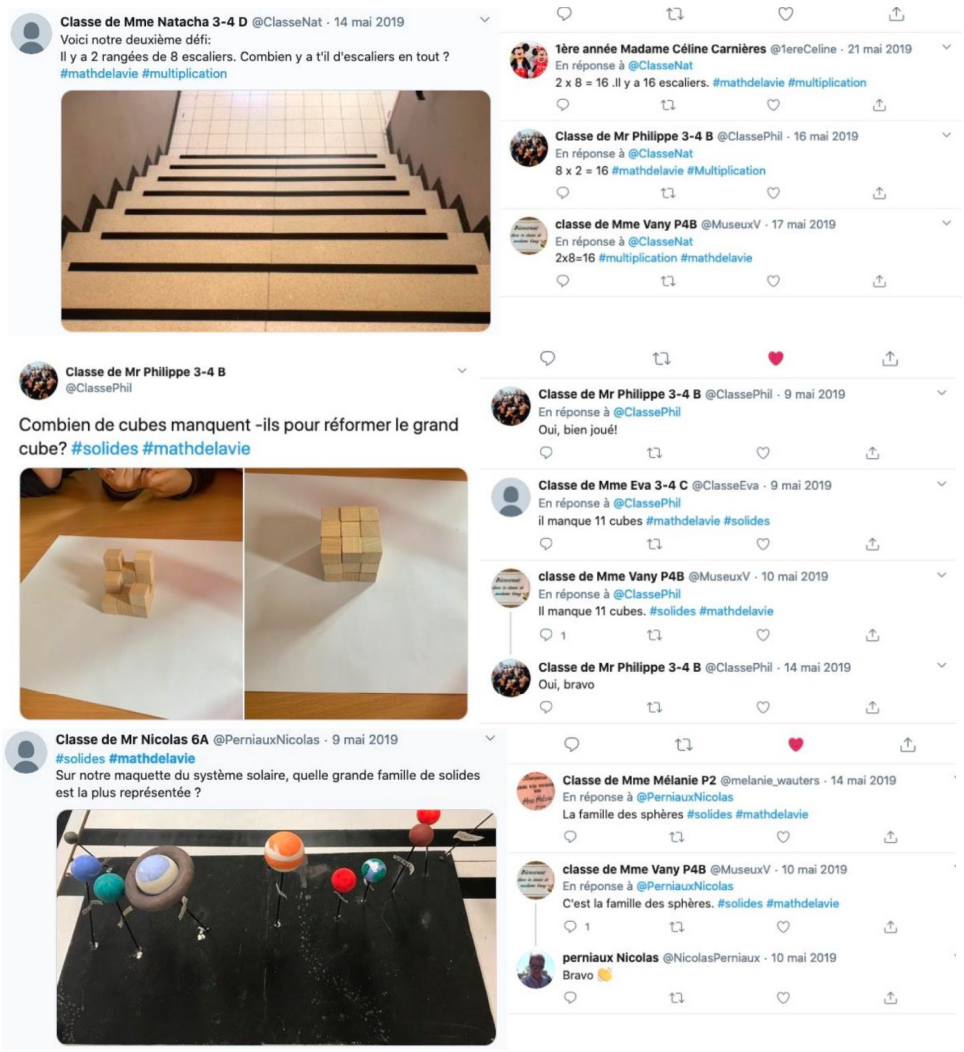


Figure 5. Twitter exchanges between classes participating in the #mathdelavie project.
Source: Dragone, Temperman, De Lièvre (UMONS, 2022)

The researcher was present for every activity throughout the project, from brainstorming to taking problem pictures, posting Tweets on the class Twitter account, and checking the Twitter feed to respond to the mathematical problems of the other classes participating in the project. We used the term "problem" just as we did in the "Math for Real" project (see Figure 2). However, we agree with Glaeser (1973) who distinguishes between a problem, which involves trial and error and research to identify appropriate solution procedures, and an exercise, which involves an algorithmic procedure. The tasks proposed by the students and relayed on Twitter, both in the "Math for Real" project and in our adaptation of it, are more like exercises.

Our support is technical support to allay teachers' fears about technical problems and the use of digital technology in the classroom. If the teachers felt the need, they could ask us for help. So, we never intervened in the activities carried out. Both for the creation of the mathematical challenges and for their resolution, we relied on the expertise of the teachers' professional gestures. Through their interactions with the students, the teacher's guide their thinking by scaffolding.

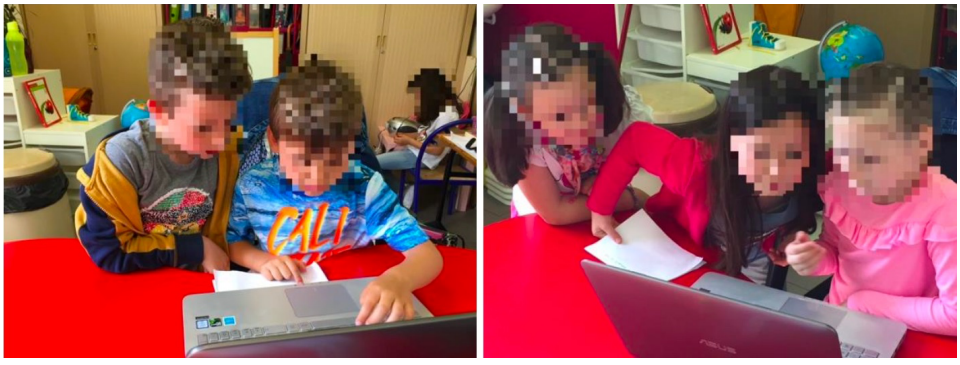

Figure 6. Writing math challenges on Twitter.
Source: Dragone, Temperman, De Lièvre (UMONS, 2022)

### 4.2 Our device with respect to the PST model (Wang, 2009)

A device can be seen as a configuration designed to facilitate a learning process (Blandin, 2002). It constitutes the framework in which different resources are chosen to enable learning. The role of teachers is essential because they are the vectors of pedagogical intentions (Guichon, 2006).

The PST model (Pedagogical, Social and Technological affordances) focuses on the affordance of technologies and their use according to the pedagogical, social and technological dimensions in the design of a learning device (Wang, 2009). Affordances are the properties perceived by the user of the tool. They are inherent to the context of a device. However, they depend on the subject's effectiveness, i.e., what he or she is capable of achieving, which is itself marked out by the affordances of the object (Grassin, 2015). We evaluate the appropriateness of the chosen tool, Twitter, for our device along the three dimensions of the PST model.

#### 4.2.1 Under the pedagogical dimension

The device presented above aims at the elaboration and the resolution of mathematical challenges, resulting from an exchange between classes. A mathematical problem should be concise and structured. We believe that the number of characters allowed in the Tweets leads the students to organize their ideas and to ensure the clarity of their words in order to write their challenge. Furthermore, we want our system to be accessible to first graders. We feel that this tool can help us achieve the learning objectives.

#### 4.2.2 Under the social dimension

Social interaction is an integral part of our system, going beyond the classroom or school setting. Communication, in this case asynchronous, is the sine qua non condition for setting up exchanges of mathematical problems between classes from different schools and for solving challenges. Twitter seems to us to be an appropriate choice to ensure this process.

#### 4.2.3 Under the technological dimension

We chose Twitter as our technology medium for two reasons. First, students as young as 6–7 years old must be able to participate in our learning device. While older students are constrained to be concise, this constraint allows the device to be accessible to younger students. Secondly, we want to establish a real framework for exchange and communication between classes. The technological tool must allow interaction, sharing and publishing of the mathematical problems created by the students.

## 5. An analysis of a project combining mathematical problem solving and Twitter

Given the support teachers need to integrate digital technology into their pedagogical practice (Cody et al., 2016), we are field-testing individualized coaching (Giroux et al., 2013) to allow teachers to assess their evolution in their technology integration practices (Coulombe et al., 2017).

### 5.1 Research questions

We question the effects of our techno-pedagogical support and the value of this project. We also question the learners' perceptions of the device submitted, and the technological tool used. This leads us to construct four research questions:

Q1: Is the proposed device relevant to students' learning?

Q2: Did our techno-pedagogical support have an effect on our teachers' desire to integrate digital technology into the classroom?

Q3: Has our techno-pedagogical support had an effect on our teachers' sense of competence?

Q4: What are the perceptions of the learners subjected to our learning device?

### 5.2 Data collection

The perceptions of the teachers involved in our experiment were collected on different variables. Questionnaires were developed as part of joint research with fellow researchers (De Lièvre et al., 2019). We asked teachers about these dimensions before and after the experimentation. Students' perceptions were also surveyed but post-experimentation. We questioned four variables: ease of use of the digital tool Twitter, gamification, need for external help, and motivation. Given the levels of the classes, it is appropriate to adapt the methods used to question the students according to their age. Indeed, our sample is made up of ten classes of different levels. Two versions of our questionnaire were proposed: an adapted version, for the first to third grades, favoring an oral administration with pictorial answers where we read the questions aloud, and a "standard" version with 4-level Likert scales. The adapted version was designed following the recommendations of the vade mecum of the Institute for Research in Psychological Sciences of the Catholic University of Louvain (IPSY-UCL) for the realization of qualitative surveys with young children.

### 5.3 Data processing methods

For closed-ended questions with one possible answer and ordered variables, we assigned a number to each response modality. This allowed us to convert the textual data into numerical data.

Table 2. Treatment of responses to closed-ended questions.

| | |
|---|---|
| "Strongly disagree" | 0 |
| "Disagree" | 1 |
| "Agree" | 2 |
| "Strongly agree" | 3 |

Source: Dragone, Temperman, De Lièvre (UMONS, 2022)

For the qualitative open-ended questions, we processed them via Voyant Tools by targeting the most cited occurrences in the text as well as the words associated with them.

### 5.4 Results

We present our detailed results, below, according to our four research questions.

***Q1: Is the proposed system relevant to student learning?***
Before experimentation, six of the ten teachers believe that this project is probably relevant from the point of view of student learning. The other subjects are certain of its relevance. Given that these teachers responded positively to participate in this project, we could expect teachers to have a positive representation of this project for their students' learning. After experimentation, our sample was unanimous about the relevance of the project. The post-test analysis of the project by the teachers was carried out in three ways.

Regarding the effectiveness of the digital tool and its usefulness in this activity: 60% of our sample emphasize the usefulness of Twitter to communicate and correspond with other classes: "Useful to communicate with other classes and involve the child more.", "The tool allows to communicate with other schools.", emphasizing the participation of all students: "All children are actors (they came to write several answers each in turn).".

Regarding the effect of the use of this digital tool on the students: four teachers out of ten note an increased motivation: "Motivation++++, interest,

participation of ALL". Three teachers report that students are enthusiastic about taking part in the tasks offered: "Students are curious and interested in working with digital tools.", "Children enjoy using a tool that is usually very little used by them in the classroom.", "Happy to be able to use a tool that only the big kids can use.".

Regarding improvements to this project: two teachers suggest that challenges between classes of the same level with specific themes be introduced: "A sort of challenge between classes. We could even start the challenge in class and select the 3–4 best questions.".

***Q2: Has our techno-pedagogical support had an effect on our teachers' desire to integrate digital technology into the classroom?***

After experimentation, 60% of our teachers said they were "completely in agreement" with integrating digital technology into their classrooms. They were also asked to justify their choices. Three teachers said that digital technology allows for increased motivation in their students: "It helps motivate students (interactivity and diversity).". One teacher out of five believes that it would allow their students to understand the digital world in our society, "To diversify my way of working and to teach my students to use the digital tools that are now an integral part of our lives.".

***Q3: Has our techno-pedagogical support had an effect on our teachers' sense of competence?***

The teachers were asked to evaluate their feeling of competence with regard to the technical mastery of digital tools and the development of activities using digital technology. Regarding the feeling of technical competence, 60% of the teachers surveyed consider themselves "getting by" in the use of digital tools, while the rest of the sample said they "have good knowledge" before the experimentation. We observe a positive evolution of teachers' perceptions after experimentation. Indeed, seven out of ten teachers report good knowledge, and three teachers consider themselves experts. The feeling of competence in the pedagogical uses of digital technology also improved for all teachers. While 60% considered themselves to have no knowledge and 40% had little knowledge, 60% said they had good knowledge and 40% considered themselves to be "experts" after experimentation.

***Q4: What are the perceptions of the learners subjected to our learning device?***
We note that nearly seven out of ten students say they "totally agree" on the motivating nature of the project and 63% of the students interviewed really enjoyed taking part in it. This is in line with what the teachers said: "The children were very motivated, interested and involved.", "They were very happy and looking for something.", "They were motivated by the idea of using digital tools, as they are not used to them, and they were also very enthusiastic about the idea of sharing with other classes.". Regarding the item about the ease of use of the Twitter account, one out of two students agreed with it. Moreover, 80% of our sample stated that they did not need any external help in writing and posting Tweets on their class' Twitter account. The teachers' testimonies also support this, "They really liked it. They were 100% invested in the activities. I was only the resource person in case of questions about the tool (computer). They found a lot of situations, but it was impossible to use them all properly. They were very curious.".

## 6. Conclusion

Although our conclusions cannot be generalized given our sample size, our experimentation allows us to provide several conclusions. First, we can see that our project as well as the chosen digital tool, Twitter, seem to be adapted to students from CP to CM2. The analysis of the perceptions of our sample of students does not reveal any difficulties in using the class Twitter account. Moreover, they recognize the motivating character of this device. As for the teachers involved, they are unanimous about the relevance of this project for their students' learning. The majority of teachers reported the effectiveness and usefulness of Twitter in this project. It should be noted that the perceived ease of use of a tool – or usability – impacts the perceived usefulness of the tool (Davis et al., 1989). Studies indicate that digital practices conducted with Twitter enhance project methodologies, learner creation, and the valuing of student activities (Delesalle & Marquié, 2015).

Finally, we note that the teachers, following our accompaniment throughout the project and after having taken part in it, would like to integrate digital technology into their teaching practices. We also note that they have progressed in their sense of competence, both technical and pedagogical, and that this is one of the explanatory factors of a low use of digital technology by teachers (Tsai and Chai, 2012; Villeneuve et al., 2012). We hypothesize that our techno-pedagogical support positively influenced our teachers' sense of competence.

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# A Humanoid Robot (NAO) as a Child Management Tool in a Kindergarten Classroom

ABSTRACT

Whether it is Bee-Boot or Thymio, education professionals need to be pedagogically creative in order to reinvent their learning strategies to best fit their context. Several studies have shown that these robots are potential educational tools, especially for students with learning difficulties. Among these robots, there are humanoid robots that can induce a different learning experience, moving from an object to be manipulated to the emergence of social situations and interactions with psycho-affective valence.
As part of our reflections on the integration of digital technology in schools, we have chosen to introduce the humanoid robot Nao in several kindergarten classes in order to propose an unusual pedagogical use of the robot.

**Keywords:** humanoid robot, preschool class, classroom management

## 1. Introduction

### 1.1. The humanoid robot NAO

This robot is a social robot with the characteristics of a human figure. It is artificially intelligent, capable of interaction and equipped with a certain physicality. It is equipped with visual sensors, speakers and microphones that allow it to produce and hear sounds while in motion.

Initially created to be a home assistant, it was soon used in schools for its positive impact on the behaviour of pupils. Primarily used with children on

the autism spectrum for its ability to foster interaction and develop social and communication skills, it is beginning to find a place in compulsory education classrooms.

Although it can be used as a learning tool for programming, we have experimented with it more as a classroom management tool.

## 2. Methodology

### 2.1. NAO teacher support tool

#### 2.1.1. Why this public?

In kindergarten, classroom management is not easy insofar as getting learners to work independently remains difficult. The teacher must therefore set up a specific organisation such as group work in order to facilitate his or her pedagogical intervention and to develop the autonomy of his or her pupils. During group work, the teacher takes charge of one workshop while the others are self-managed. However, the pupil remains very dependent. The teacher can be called upon for many tasks that children of this age are not capable of carrying out on their own: reading the instructions, organising and supervising the distribution of the task to be carried out, encouraging, providing feedback, etc. To cope with these demands in a preschool classroom, we hypothesise that the humanoid robot Nao could provide support during learning.

#### 2.1.2. Context of the integration of the Nao robot

The integration of the robot took place in three kindergarten classes in French-speaking Belgium. Fourty-six pupils from 3 to 5 years old carried out the different activities planned in our pedagogical scenario.

The objective of the proposed activities is to approach the comprehension of inferential information through the reading aloud of stories from children's literature enriched by questioning about them. This work is carried out in workshops. In this context, Nao is "responsible" for the "Let's understand the stories" workshop.

#### 2.1.3. Workshop process and help from Nao

The students are grouped in threes or fours and follow each other in the different workshops planned by the teacher. The groups are made up of learners with a heterogeneous level of mastery of the skill, i.e., they are made up of a weaker

student, an average student and a student with a facility for understanding the text. In the end, eleven groups were formed.

When they arrived at the "Let's understand the stories" workshop, several Naomarks (examples can be seen below) were available for the pupils to carry out the proposed activity and to interact with the NAO robot (Figure 1).

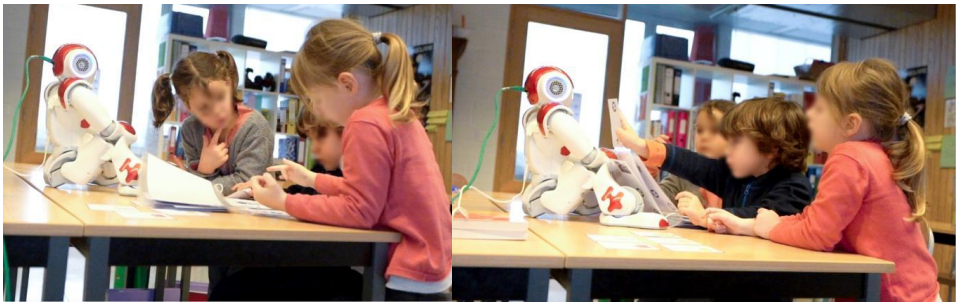

Figure 1. Students interacting with the NAO robot.
Source: Kumps, Temperman, De Lièvre (UMONS)

These Naomarks can handle different categories of interactions (Table 1) with the help of images that symbolise them for ease of use. Before working autonomously with Nao, the students had first manipulated the different Naomarks so that they could understand their usefulness and functioning.

Table 1. The different categories of Naomark.

| | | |
|---|---|---|
| Instructions | Nao gives the instructions | "You are asking me to explain what to do. Listen carefully to the text I am going to tell you and answer the questions by choosing the picture that corresponds to your answer". |
| Reading | Nao reads the story | Reading the book page by page. |
| Objectives | Nao gives the objectives | "You ask me what the activities are for. You are going to learn to understand in groups a text that you are going to listen to and to find information contained in this text". |
| Questions | Nao asks the literal and inferential comprehension questions | "Now that you have listened to the story, try to answer the questions I am going to ask you. Here is the first question: ...." |

| | | |
|---|---|---|
| Procedures | Nao recalls the procedure for validating the answer | "You are asking me to explain how you should validate your answer. Take the image that corresponds to the answer and put it in front of my eyes. I will tell you if you have found the right answer or if you have to continue discussing together to choose another one." |
| Organisation | Nao reminds us of the time remaining before moving on to another workshop | "You ask me how much time you have left to finish your activity. You have... minutes left". |
| Feedback | Nao gives specific feedback – validates or not the answer | "You have just shown me an answer. Congratulations, you have found the right answer. (answer to the question). You can move on to the next question.<br><br>Unfortunately, the answer is not correct. I suggest that you discuss it among yourselves and choose another one. You can also listen to the story again." |

Source: Kumps, Temperman, De Lièvre (UMONS)

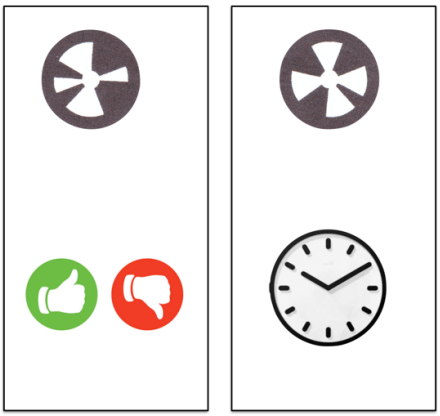

Figure 2. Examples of Naomark "feedback" and "organisation".
Source: Kumps, Temperman, De Lièvre (UMONS)

The students scan the first Naomark to get the instructions for the workshop (Figure 2). Then they ask NAO to read the story they have planned. The book is at their disposal to follow the story read by the robot.

The pupils have the different Naomarks arranged in pockets in order to give a structure to the workshop. A "Beginning of the activity" pocket (reading, objectives, instructions), a pocket with questions about the story heard and a "I ned help" pocket: procedures, organisation, feedback.

Each workshop offers ten different questions of progressive difficulty: five explicit questions and five implicit questions. Pupils took part in three "Let's understand the story" workshops (with three different books) over a period of three weeks, one workshop per week.

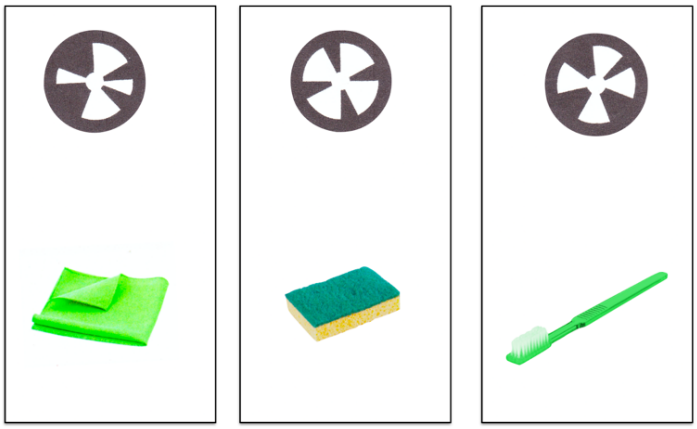

Figure 3. Example of an explicit question asked: What does the little monster use to wash the tap?
Source: Workshop "Comprenons l'histoire: Au lit petit monstre" (Ramos, 1996)

## 3. Results

### 3.1. How do the pupils use Nao?

During these different workshops, we counted the frequency of use of Naomark by the pupils. Our results show a significant but disparate use according to the different categories of intervention provided by the robot. This descriptive analysis (Table 2) of the collected data allows us to note that some of Nao's interventions are more frequent, such as reading the text or stating the question or checking the answer. These three categories come up on average more than once per group and per workshop. Then, the instructions for carrying out the activity as well as the procedure for accessing it is asked on average once in the

first workshop and decreases as the workshops progress. This can be explained by the habit that the pupils have developed during the other workshops. Finally, the objectives of the activity as well as the time remaining for its completion are the two interactions least solicited by the pupils.

However, it seems that Nao is most useful to the students during the verification feedback, given the highest averages in this category.

Table 2. Frequency and average of Nao interventions.

| Intervention by NAO | Workshop 1 | | Workshop 2 | | Workshop 3 | |
|---|---|---|---|---|---|---|
| | Frequency of occurrence | Average per group | Frequency of occurrence | Average per group | Frequency of occurrence | Average per group |
| Reading | 15.00 | 1.36 | 13.00 | 1.18 | 16.00 | 1.45 |
| Gives the objectives | 1.00 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 |
| Gives the instruction | 11.00 | 1.00 | 9.00 | 0.82 | 8.00 | 0.72 |
| Organisation | 4.00 | 0.36 | 4.00 | 0.36 | 2.00 | 0.18 |
| Procedures | 11.00 | 1.00 | 8.00 | 0.73 | 6.00 | 0.54 |
| | Frequency of occurrence | Average per group and per question | Frequency of occurrence | Average per group and per question | Frequency of occurrence | Average per group and per question |
| Feedback for each question | 162.00 | 1.47 | 166.00 | 1.51 | 164.00 | 1.49 |
| Statement of a question | 127.00 | 1.15 | 134.00 | 1.22 | 122.00 | 1.11 |

Source: Kumps, Temperman, De Lièvre (UMONS)

If we count all Nao's interventions in the three workshops, 983 requests, i.e., 29 requests per group and per workshop, were processed by the humanoid robot during the completion of the required work.

## 4. Conclusion

### 4.1. What is the place for Nao in education?

This research adds to the vast field of applications of the humanoid robot the possibility of supporting the task of students in a workshop in order to make them independent in the management of their work. Without ever getting tired and with infinite patience, the Nao robot repeated the instructions and the reading of the story as many times as necessary. Each child can then understand at his or her own pace and ask as many questions as he or she wishes. The possibility of having quick feedback on their answer makes learning fun and all this without direct intervention of the teacher. However, there is a limitation. NAO only responds to the various questions anticipated and it is difficult for the teacher to anticipate everything. Pupils' questions therefore remain unanswered.

Other results from this experiment with Nao are also interesting to report. At the level of the development of the targeted competence, our analyses show that the pedagogical device allows the progression of the pupils in a significant way whatever their starting level as well as for the management of the explicit information as the implicit information.

If its use as a learning tool with children with certain learning disabilities, sometimes with communication difficulties (Karsenti et al., 2017), or to introduce pupils to the field of programming (Romero et al., 2014), has already proved its worth, our experimentation tends to show that it can be a valuable aid for the teacher in supervising learning carried out independently.

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# Analysis of a Learning Process: An Example of the Application of Ethnographic Observation

ABSTRACT

This article proposes a method for evaluating the learning process when using an environment that does not benefit from learning analytics. In the theoretical framework, the reader will find a state of the art of the different methods of evaluation of a computer environment, as well as a presentation of Oppia, the environment used in this study. In the methodology section, the reader will discover the methodology adopted to observe learning in an ethnographic way as well as the research questions we answered thanks to this observation. The results section presents the study of the data to answer these different questions. Finally, the last part outlines the limitations encountered in the use of this ethnographic observation method.

**Keywords:** human learning computer environment, observation, ethnographic, process, evaluation

## 1. Introduction

In order to evaluate the process when using an online learning environment (OLE) used in this study, the researcher and/or designer can use the learning analytics offered by the learning environment used. Peraya (2019) highlights the role that these learning analytics (LAs) can play. They provide information about the entire learning process of the learners. With this data, the designer can improve his or her training, determine learner profiles, discover learner errors, determine the use of resources, etc. For example, Boumazguida et al. (2018) use these data, which we can call learning traces, to better understand

the students' learning experience during a training course. Harrak (2016) uses them to create learner profiles before learning.

LAs are, therefore, interesting for education, but what if a computer environment does not have them? This is the case with Oppia, the OLE used in this study. It is an environment created by Google in which the designer can program different learning tasks that follow one another. For each task, the designer can propose theoretical content, create a question to question the student and create one or more feedbacks that will adapt to the learner's response. This environment is interesting to use from a pedagogical point of view, but should it be abandoned in view of the lack of LA? How can the teacher visualise the learning process? Are there other methods of gathering information of the same nature as that offered by LAs?

In this article, we propose a method for collecting learning traces from which we will create learner profiles.

## 2. Theoretical framework

The nature of the learning data and the method we adopt to collect it depends mainly on the evaluation objective. Indeed, the data collected for process analysis is different from that collected for performance analysis. The methodology used to collect this data is also different. What data can be collected and in what ways?

### 2.1 The different dimensions of an online learning environment evaluation

According to Temperman (2013), an online learning environment (OLE) can be evaluated along three dimensions:

- The product: it is about evaluating individual progress, but also the collaborative progress of the activity. Through this product, the designer can assess progress, equity, transfer or level of mastery.
- The process: this involves evaluating the actions taken during the learning process. In the context of an OLE, this means, for example, analysing and evaluating the interactions between the different members of the groups. Through this process, the designer can evaluate the achievements, uses, (inter)actions and time spent during the learning process.
- Perceptions: this involves understanding how learners perceived the task. In this respect, the designer can assess the usefulness, usability or even the emotions perceived by the learners.

In the early 2000s, research focused on the different ways of evaluating an online learning environment. It recommends that they be evaluated along three dimensions: usefulness, usability and acceptability (Tricot et al., 2003; Nogry et al. 2004; Jamet, 2006).

Evaluating usefulness consists in checking the adequacy between the content of the environment and the learning objective. It involves answering the question if the learner achieves the learning objective with the tasks proposed in the environment. Tricot et al. (2003) distinguish between two ways of assessing usefulness. Empirically, by comparing the performance of groups with each other. For example, a researcher may compare two possible uses of the same OLE, or one use of the OLE with a group not using it. Another way may be to evaluate by inspection. Tricot et al. (2003) propose seven criteria by which the designer can evaluate the environment as useful or not.

Assessing usability consists in checking whether the tasks proposed to learners are adapted to their cognitive abilities. For the designer, it is a question of checking whether the user is able to carry out the proposed tasks (assessing effectiveness), checking whether he/she uses the proposed resources to carry out the tasks (efficiency) and finally determining whether the system is pleasant to use or not (user satisfaction). As with the evaluation of usefulness, usability can be verified in two ways: analytically and empirically.

Evaluating usability analytically consists in studying the interface and the proposed tasks according to certain ergonomic criteria. Nogry et al. (2004) suggest, for example, referring to the typologies of Bastien and Scapin (1993 in Nogry et al., 2004). Another analytical evaluation method consists in imagining the user's behaviour in the interface. Designers can then resort to users from the target audience, or to experts such as teachers or educationalists. This is one of the methods used by Nogry et al. (2007) to evaluate their "Ambre" software. They used pedagogical experts to test and validate the activities proposed in their environment.

Empirical evaluation consists in observing the behaviour of users during their learning. This observation allows us to identify possible technical problems and/or to understand the behaviours that users adopt when using the system.

To observe learners' behaviour empirically, many methods exist (Tricot et al., 2003; Nogry et al., 2004; Jamet, 2006):

- Verbalization collection: this involves asking the learner to say, specify and justify all their actions by speaking out loud throughout the process;

- The ethnographic method: this method consists of observing the process from the student's position. The objective is to observe all the actions that the learner makes throughout the learning process;
- Document collection: some OLEs offer learning analytics to designers. These learning analytics are the learner's data in relation to the task they have just provided. For example, this can represent the number of repetitions of a task, the number of errors, the time spent on each task, etc;
- Recording eye movements: eyes tracking allows the researcher to see where the learner is looking on the interface and with what intensity. The researcher must then interpret this data to understand the difficulties students have in performing the task.

Assessing acceptability consists in checking learners' perceptions of the usefulness and usability of the task. This can be done empirically through the use of questionnaires or interviews, but also by inspection according to specific evaluation criteria (Tricot et al., 2003).

We can summarise the dimensions and methods for evaluating HIEs by comparing those proposed by Tricot et al. (2003), Nogry et al. (2004), and Temperman (2013). Firstly, this comparison allows the designer to benefit from an overview of the dimensions to be evaluated in the use of an HIE. Secondly, to determine which instruments to use to evaluate each of these dimensions. In the Table 1, we propose instruments for evaluating one or more dimensions of HIEs.

In sum, several dimensions of a learning environment can be assessed, each with a specific method. As far as learning analytics are concerned, they can provide a lot of information on the process and usability level. Indeed, they can, for example, allow us to visualise the time it takes the student to solve the tasks, the number of errors he or she makes, the number of times he repeats the task. If an environment does not have them, there are other methods to collect this type of information such as eye-tracking, verbalisation collection or ethnographic observation methods. In this study, we will evaluate the process dimension of the Oppia HIA using ethnographic observation.

### 2.2. Description of the learning environment

Oppia is an e-learning environment in which the designer can create sequential educational activities.

The designer has to create an exploration in which "cards" are present. Each card is organised in the same way: the designer can insert content (written, audio, visual, audio-visual, etc.), and then propose a task to the learner to solve using the

Table 1. Comparison of evaluation dimensions (Temperman, 2013) and evaluation methods (Tricot et al., 2003; Nogry et al., 2006).

| Dimensions Tricot et al. (2003) and Nogry (2004) Dimensions Temperman (2013) | | **Product** | **Process** | **Perceptions** |
|---|---|---|---|---|
| **Usefulness** | Empirical | Pre- and post-test comparison | | |
| | By inspection | Evaluation grid according to seven criteria (Tricot et al., 2003):<br>• Clarification and presentation of objectives,<br>• Adequacy of content/objectives,<br>• Precision of the didactic scenario,<br>• Suitability of scenario/objectives/content,<br>• Implementation of cognitive and meta-cognitive processes,<br>• Regulation,<br>• Evaluation. | | Passing a questionnaire assessing only the usefulness of the OLE |
| **Usability** | Empirical | | Observation of learner during the learning process:<br>• Eye tracking system,<br>• Ethnographic observation,<br>• Collection of verbalization,<br>• Learnings analytics. | |
| | Analytical | | Use of experts or target audiences to evaluate the system | Passing a questionnaire assessing only the usability of the OLE |
| **Acceptability** | Empirical | | | Questionnaires or interviews assessing acceptability, i.e., both the usefulness and usability of the OLE |
| | By inspection | | | Assessing acceptability in terms of suitability for:<br>• Needs or objectives of the institution,<br>• Learners' expectations,<br>• Characteristics of learners.<br><br>Assess acceptability in terms of compatibility with:<br>• The organisation of time,<br>• The organisation of the premises.<br><br>Presence of necessary equipment<br>Legible and coherent planning and monitoring<br>Visibility of results |

content inserted or not. Then, based on the answers that the learner proposes to this task, the latter receives specific feedback adapted to his or her answer.

This organisation is justifiable by the model of regulated action proposed by D'Hainaut (1980). The learner is led to discover theory (information) and then to check through different activities whether he/she understands/masters this theory (simulation). Then, depending on their response (analysis of the response), the learner receives feedback before carrying out another activity.

According to Dessus (2021), Oppia differs from other learning environments by the finesse of the feedback it offers. Indeed, the designer can create feedback by telling the learner what is wrong with his or her answer, for example, but also by proposing useful tools and clues that will enable the learner to complete the task requested. In this sense, feedback can play a mediating role in learning. Segers (2019) has also studied the use of Oppia situations in a remediation context. She wanted to compare a deferred remediation with Oppia with a classical remediation. The result was that learners who used Oppia situations made more progress than those who did not.

Oppia is therefore an interesting environment to use in a teaching context. Its main flaw is that it does not provide any learning analytics. The aim of this study is therefore to counter this lack of LA by ethnographically observing the learning achieved by learners in Oppia situations.

## 3. Methodology

In this study, we want to investigate the implementation of an ethnographic observation method, in order to observe learners' learning in the process. We present the objectives, the context and the research questions we answered through this observation. We also explain the methodology adopted and the instruments used. We conclude by demonstrating the results obtained and stating the limitations of this observation method.

### 3.1. Context

The aim was to create learner profiles from the ethnographic observations made. The sample considered consisted of twelve learners. The experimentation was carried out over a period of three weeks, during which the learners used Oppia situations designed by a teacher. These were based on a theme of the environmental studies course. Through each of these situations, the students

were led to discover knowledge and exercise specific know-how and skills in the discipline.

This ethnographic observation allowed us to answer two research questions about the use of Oppia situations:

Question 1: Which student profiles can be distinguished through the use of Oppia situations?

Question 2: What is the link between the emerging student profiles and their performance?

It should be noted that in order to evaluate performance, we did not use the ethnographic observations made, but rather the comparison between a pre-test and a post-test.

### 3.2. Instrumentation and methodology

The first question concerns the study of the learning process. To arrive at the creation of several profiles, we constructed an observation grid, the construction stages of which we summarise in the Table 2.

#### 3.2.1. Selection of the observation method

First, we selected the observation method best suited to the Oppia environment, in the absence of learning analytics. The method of collecting verbalisations was unsuitable in our case. Indeed, it is impossible for twelve students to detail their learning process at the same time in a classroom. The eye-tracking method requires a lot of resources in terms of equipment. Moreover, it is also difficult to use in a classroom context. We therefore opted for the ethnographic method. As a reminder, this method consists in observing and analysing each action of the learner during the entire learning process. The students were therefore asked to record their screen when they used the Oppia situations. In this way, it was possible to visualise and analyse all the behaviour afterwards.

#### 3.2.2. Creation of an observation grid

Secondly, we created an observation grid to structure our observation of the actions. We created indicators from which it was possible to create learner profiles in relation to the functions offered by Oppia in its system. Each indicator was then translated into an observable ordinal variable in order to structure our observations as suggested by Molinari et al. (2016).

This table lists all the indicators and their respective ordinal observable variables.

Table 2. Observational indicators and their ordinal observable variables.

| Indicators | Observable ordinal variables |
|---|---|
| Number of the attempt to resolve the interaction | |
| Type of error made (Astolfi, 1997) | 1. Errors in understanding work instructions<br>2. Errors due to school habits or misinterpretation of expectations<br>3. Errors related to students' alternative conceptions<br>4. Errors related to the intellectual operations involved<br>5. Errors relating to the approaches taken<br>6. Errors due to cognitive overload<br>7. Errors originating in another discipline (transfer not acquired)<br>8. Errors caused by the difficulty of the content itself |
| Importance given to feedback | 1. The student does not read the affirmation feedback.<br>2. The student reads the affirmation feedback<br>3. The student does not read the error feedback.<br>4. The student reads the error feedback |
| Time to solve the task | |
| Use of documents made available | 1. The student does not use the documents provided<br>2. The pupil makes partial use of the documents provided<br>3. The student uses all the documents provided |
| Resolution of the task | 1. The student does not solve the task<br>2. The student has solved part of the task<br>3. The student has completely solved the task<br>4. The student has solved the task randomly |

#### 3.2.3. The encoding of actions

The observation grid having been created, we then coded each behaviour from this grid. However, we do not have the benefit of all the learners' actions. Indeed, at times, some students were absent, at other times the recording did not work. However, we collected enough data to create the profiles.

#### 3.2.4. Sum of behaviours

We then summed each behaviour, for each observable ordinal variable and for each student.

#### 3.2.5. Creation of cognitive variables

The variables created are said to be behavioural, as they are derived from the observation of the pupil's behaviour. However, behavioural variables do not

make it possible to create profiles. This limitation is also pointed out by Molinari et al. (2016). Indeed, these behavioural traces do not give us any information on the cognitive engagement and the strategies used to perform the tasks. We therefore created cognitive variables, born of relationships between two or more behavioural variables. The Table 3 summarises this creation of cognitive variables:

Table 3. Transformation of behavioural variables into cognitive variables.

| Cognitive variables | Behavioural variables |
|---|---|
| Efficiency/inefficiency | Ratio of the total number of tests to the total number of tasks |
| Rhythm | Ratio of total time to number of tasks completed |
| Feedback | Ratio of the number of times the student read the error feedback to the number of times error feedback was offered. |
| The use of documents | The ratio of the number of times the student used the materials provided to the number of tasks where materials were present. |
| Chance | The ratio of the number of times the student answered randomly to the number of tasks solved. |

#### 3.2.6. Transformation into a Z-note

Since our cognitive variables have different measurement scales, we transformed them into a Z-score.

#### 3.2.7. Creation of profiles based on cognitive variables

Finally, based on these cognitive variables and their Z-scores, we created our learner profiles using the automatic hierarchical classification and k-means methods. Indeed, these classification approaches make it possible to group similar data into a single group and thus create profiles.

The second question examined the link between performance and learner profiles. As the profiles were created in the previous question, we summarise below the approaches used to calculate learner performance which we then compared with the emerging profiles. To calculate it, we used a pr e-test and a post-test.

- The relative gain: this makes it possible to determine the educational added value of the system by comparing the results of a pre-test with those of a post-test. According to Gerard et al. (2006) the relative gain is calculated in two ways: if post-test ≥ pre-test, Gain = 100 x $\frac{Post-Pré}{Max-Pré}$ ; if post-test ≤ pré – test, loss + 100 x $\frac{Post-Pré}{Pré}$ .

- Effect size: According to Hattie (2017, p. 359), this allows us to "identify the impact of our teaching over a period of time". It is calculated according to the following formula: $Effect\ size = \frac{Mean\ (Post-test) - Mean\ (Prétest)}{Standart\ deviation}$. According to Hattie (2017), this effect size must be greater than .40 for the learning to be considered different from normal.

### 3.3. Presentation and analysis of results

Our analysis is structured according to the two research questions previously formulated.

**Question 1**: Which student profiles can be distinguished through the use of Oppia situations?

As a reminder, this research question was answered through analysing of the learners' learning traces (N = 12) collected through screen recording. These traces were then observed ethnographically and each learner's behaviour was then coded in an observation grid. We then created cognitive variables from which we created the profiles. The table below summarises the Z-scores of each user for each cognitive variable:

Table 4. Z-score of each user for each cognitive variable.

| | Variables | | | | |
|---|---|---|---|---|---|
| | **Efficiency** | **Time** | **Feedback** | **Random** | **Use of the docs** |
| User 1 | 0.86567246 | -1.0629968 | -1.3665462 | 0.21809784 | -0.7216728 |
| User 2 | -0.1128712 | 0.12888478 | 0.22695194 | -1.2533239 | -0.1416829 |
| User 3 | -0.3241201 | -0.5527659 | -0.3217733 | -0.4163301 | -0.2233843 |
| User 4 | 0.61012572 | 0.56535253 | -0.4851265 | -0.256166 | 0.20535144 |
| User 5 | -0.116165 | -1.3513881 | -0.5666549 | 2.10358561 | -1.2380808 |
| User 6 | -0.7583943 | 0.78741645 | 0.52908653 | 0.08507263 | 1.04909687 |
| User 7 | -0.966608 | 2.38420824 | -0.3905536 | -0.9075001 | 0.95091558 |
| User 8 | -1.4663209 | -0.1844217 | 1.04472956 | -0.4163301 | 0.95091558 |
| User 9 | 0.0527398 | 0.20206545 | -0.3722492 | 0.43465051 | 0.61955374 |
| User 10 | 0.67337626 | 0.28676394 | 0.78093033 | 0.94434359 | 0.41442498 |
| User 11 | 2.26150223 | -0.9307301 | -1.2312018 | 0.8475342 | -2.2798624 |
| User 12 | -0.7189369 | -0.2723888 | 2.15240719 | -1.3836343 | 0.41442498 |

We then encoded these data in SPSS, then performed a hierarchical classification method and finally a k-means method. This choice to use two classification methods is due to the particularity of the k-means method. Indeed, to establish profiles from this method, the researcher must encode the desired number of profiles before the analysis. In order not to propose a random number of profiles, we first used the hierarchical classification method. This method generates a dendogram that allows us to establish the number of profiles within the same group. By observing this dendogram, we can divide our group of students into three profiles.

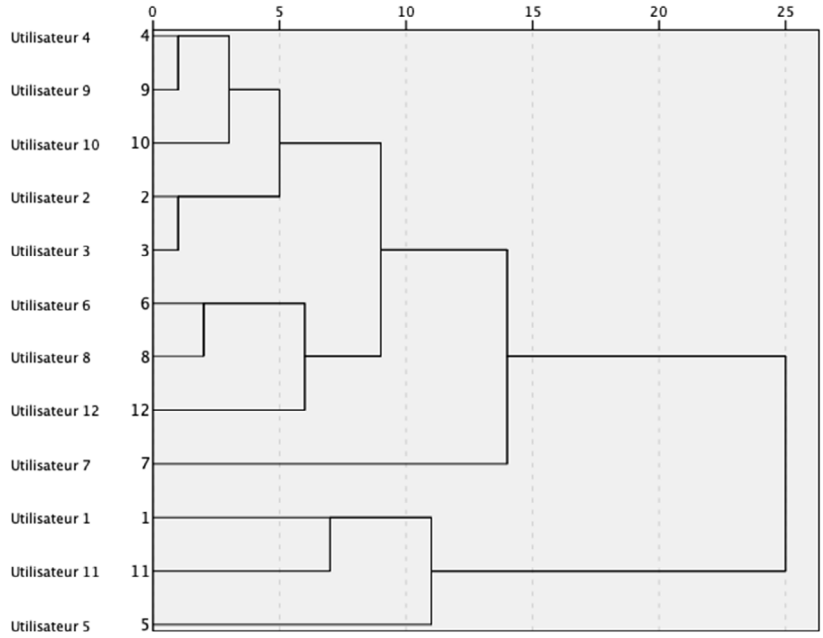


Figure 1. Dendogram obtained from the hierarchical classification.

We then applied the dynamic cloud method to these three profiles. The table below summarises the average Z-scores by variable and for each cluster, as well as the number of staff per cluster.

Table 5. Average Z-score per variable and per cluster.

| | Cluster | | |
|---|---|---|---|
| | **Cluster 1** | **Cluster 2** | **Cluster 3** |
| **Efficiency** | -0.3897746 | -0.2655342 | 1.00366989 |
| **Time** | -0.1187855 | 0.98476067 | -1.1150383 |
| **Feedback** | 0.77664914 | -0.1797107 | -1.054801 |
| **Random** | -0.5050549 | -0.1609857 | 1.05640588 |
| **Use of documents** | 0.28293967 | 0.7062294 | -1.4132053 |
| **N** | 5 | 4 | 3 |

Presenting the average Z-scores in tabular form is difficult to interpret. Therefore, we created a radar graph to further visualise these differences between clusters. This method was used by Boumazguida et al. (2018).

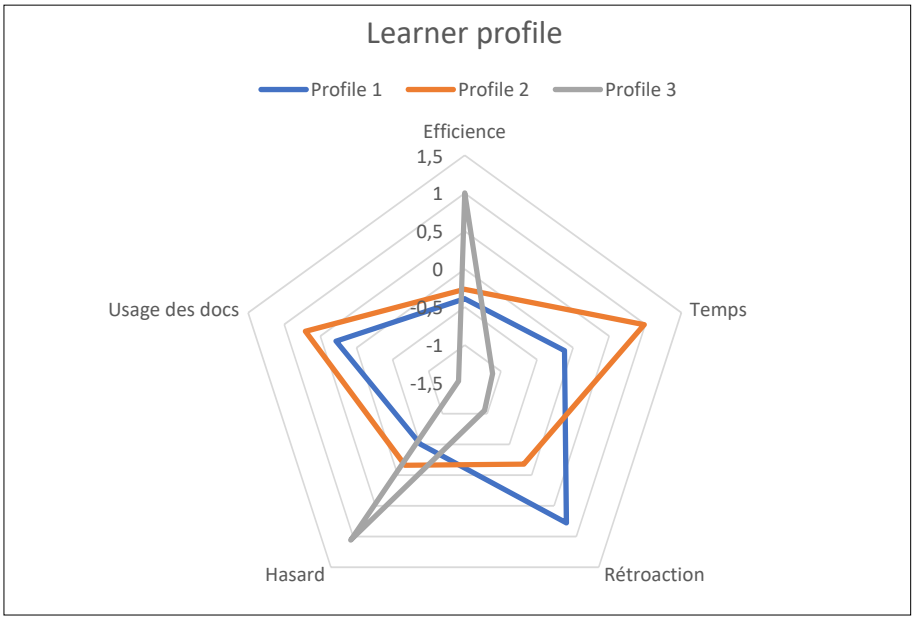


Figure 2. Radar plot showing the profiles and their average Z-scores for each variable.

From this graph we can interpret each of these profiles. A first profile (N = 5) stands out in which the students do not have a high level of efficiency. As a reminder, efficiency is the ratio of the number of trials to the number of tasks performed.

High efficiency means that there is a lot of repetition for the tasks performed, so students regularly fail the questions. In this case, we can talk more about inefficiency. Conversely, low efficiency means that students regularly solve their tasks on the first try. In this profile, students have low efficiency. We also observe a low random response rate, the lowest of the three profiles.

There are two reasons for this low efficiency and random response rate:

- The first concerns the relatively high rate of document use. Indeed, in order to answer the different questions asked of them, students were and should be required to read and understand documents in order to answer the questions correctly. If the students read and understood the documents, they knew how to answer the different questions they were asked.
- The second is the very high rate of reading error feedback. Thus, if students answered the question incorrectly on the first attempt, they read the error feedback which then allowed them to answer the question correctly.

Finally, these students presented a rate close to zero regarding the time taken to solve the tasks. They therefore took the average time to solve the tasks proposed in the situations. From these observations, we can characterise these students as assiduous in relation to the tasks and aids proposed.

A second profile of students (N = 4) stands out. These students also have a low level of efficiency, which is, however, higher than that of profile n°1. This can be explained by two reasons:

- The first concerns the random response rate. This is higher than in profile 1. These students tend to answer the questions more randomly, compared to profile 1 students. They are therefore likely to make more mistakes.
- The second concerns the rate of reading feedback. Indeed, students in this profile do not necessarily read the feedback provided when they make a mistake. The location of the point on the graph (close to zero and therefore to the average) allows us to state that these students read one error feedback out of two. Therefore, if they encounter an error, they do not always read the error feedback offered to them and therefore risk making another mistake.
- Note that even if the feedback rate is high, this does not mean that these students make many mistakes. It means that when they do make one, which does not happen regularly given the low efficiency rate, these students do not necessarily read the feedback offered.

However, despite these two reasons, this level of efficiency remains low, because these students read the proposed documents and understand them. Indeed, we observe a high rate of reading of the documents, more important than that of profile 1.

This behaviour is contradictory: these students read the documents to answer the questions, but do not read all the error feedback that is offered to them.

Finally, concerning the time variable, these students take longer to solve the tasks. This can be explained by the significant amount of time spent reading the various documents to solve the tasks. From these observations, we can characterise these pupils as assiduous with regard to the tasks, but less so with regard to the aids offered.

Finally, the last profile stands out (N = 3), in which these students show little interest in the tasks proposed to them. Indeed, we observe a high rate of efficiency and therefore inefficiency: it is explained by a high rate of random response (the highest of the three profiles), but also by a low rate of feedback reading and document use, also the lowest of the three profiles. In short, these students make a lot of attempts, because they do not use the documents and do not read the feedback provided in case of error. They therefore respond randomly to the different tasks. This is why we observe that they have the lowest time to solve the tasks. From these observations, we can characterise these students as not diligent in relation to the tasks and resources proposed.

**Question 2**: What is the link between the emerging student profiles and their performance?

As we saw earlier, three student profiles emerged from the analysis of their behaviour during learning. Two of these profiles were characterised as assiduous and one as non-assiduous. Does the student's profile matter in terms of his or her performance at the end of the learning process?

This research question was answered in two stages. First, we determined whether the use of Oppia situations allows students to progress or not by comparing the results of the pre-test with those of the post-test. Secondly, we determined whether the student's profile during the learning process has an influence on his or her progress at the end of the learning process by comparing the average scores on the pre-test and post-test for each cluster.

### 3.4. Performance analysis

The table below summarises the average pre-test scores, post-test scores, average relative gain/loss and effect size of the group of learners who used the Oppia situations.

Table 6. Pretest Scores, Posttest Scores, Average Relative Gain/Loss and Effect Size – Experimental Group.

| | Pre-test scores | | | Post-test scores | | | Average relative gain/loss | Effect size |
|---|---|---|---|---|---|---|---|---|
| | m (%) | CV | N | m (%) | CV | N | | |
| Total | **52.58** | **22.08** | **12** | **66.42** | **22.67** | **12** | **29.22** | **1.04** |

When reading Table 6, we observe that the average score increases from 52.58% (pre-test score) to 66.42% (post-test score). This difference allows us to conclude that there is a learning effect due to the Oppia situations used. Moreover, according to Hattie (2017), an effect size greater than .40 allows us to affirm a progress in learning. In our case, this effect size is well above .40 (1.04 > .40). However, the observation of the average relative gain of 29.22% does not allow us to support this learning effect. Indeed, according to Gérard et al. (2006), there is a learning effect when the average relative gain is greater than 30 or 40%.

In conclusion, we can affirm that the use of Oppia situations allows students to progress, the average post-test score being higher than that of the pre-test, and the effect size being well above .40. The average relative gain obtained is at the limit of the progression threshold.

### 3.5. Process analysis – performance

As a reminder, the aim of this question is to determine whether the student's profile and therefore the behaviour he or she adopts during learning has an influence on his or her performance.

During the learning process, we could observe that the students adopted different behaviours. Three profiles were distinguished and differentiated in relation to the diligence and seriousness they gave to the task. In a table, we reported the results of the pre-test and post-test, the rate of progression or regression and the cluster with which each user is associated.

Table 7. Descriptive analysis – pre-test and post-test scores, progression or regression rate and cluster for each user – Experimental group

| | Scores in Pre-test | Scores in Post-test | Relative gains/ losses %. | Cluster |
|---|---|---|---|---|
| User 1 | 8.00 | 13.75 | 31.94 | 3 |
| User 2 | 12.00 | 24.25 | 87.50 | 1 |
| User 3 | 13.00 | 19.00 | 46.15 | 1 |
| User 4 | 14.00 | 11.00 | -21.43 | 2 |
| User 5 | 13.00 | 21.75 | 67.31 | 3 |
| User 6 | 13.50 | 12.50 | -7.41 | 2 |
| User 7 | 16.00 | 20.75 | 47.50 | 2 |
| User 8 | 15.00 | 17.75 | 25.00 | 1 |
| User 9 | 21.00 | 19.00 | -9.52 | 2 |
| User 10 | 13.50 | 15.25 | 14.00 | 1 |
| User 11 | 13.00 | 16.50 | 26.92 | 3 |
| User 12 | 12.00 | 15.75 | 26.79 | 1 |

In a second table, we reported the means and coefficients of variation of the pre-test, post-test scores and the average relative gains/losses for each cluster.

Table 8. Descriptive analysis – mean and coefficient of variation of pre-test, post-test and rate of progression/regression scores for each profile – Experimental group

| | | Pre-test | | Post-test | | Average relative gains/ losses | |
|---|---|---|---|---|---|---|---|
| | N | Average | CV %. | Average | CV | Average | CV |
| **Profile 1** | 5 | 50.38 | 9.5 | **70.77** | 19.58 | **39.89** | **72.76** |
| **Profile 2** | 4 | 62.02 | 21.24 | **60.82** | 30.26 | **2.29** | **1343.61** |
| **Profile 3** | 3 | 43.59 | 25.47 | **66.67** | 23.45 | **42.06** | **52.33** |

We compared these profiles to determine whether the student's behaviour during learning has an influence on post-test results and progression/regression rates.

The first profile of students sometimes made use of the materials provided and regularly read the error feedback. These students placed a great deal of importance on the resources provided to complete the various tasks. Table 8 shows that these students made progress with an average relative gain of 39.89%.

However, with a coefficient of variation of 72.76%, we can state that these pupils do not all progress in the same way, some progressing more than others. Indeed, when reading Table 7 we can see that four pupils show a relative gain of less than 50% and only one pupil shows a relative gain of more than 80%, which illustrates this heterogeneity within this group. However, we draw your attention to the fact that the relative gain reflects the progress of the learners. Looking at the post-test score averages, we observe that this profile has the highest post-test average of the other three profiles (70.77%) and that the coefficient of variation is less than 30% (19.58%). In conclusion, these students show a significant progression, which is moreover higher than the minimum threshold of 30% (Gerard et al., 2006). However, their progress was heterogeneous, with one student making more progress than the others. However, we note that these students show an average of 70.77% in the post-test, which is the highest of the three profiles.

The second profile included students who responded more randomly and did not read all the error feedback. However, they regularly read the proposed documents to solve the tasks. These students took the proposed tasks seriously, but paid less attention to the aids provided. We observe for this profile that the average relative gain is 2.29% and is therefore very low. Moreover, we note that the coefficient of variation is 1343%, which reflects a significant difference in relative gains between these students. This difference can be seen when we look at Table 8 Indeed, three students show a relative loss between -1 and -25% and only one student shows a relative gain of more than 40%. Nevertheless, these students obtained a post-test average of 60.82%, which is therefore above average. However, the coefficient of variation is greater than 30%, which reflects a high degree of heterogeneity, although lower than the relative gain, but still significant. In conclusion, these students had an average post-test score of over 50%. This group is very heterogeneous, both in terms of post-test scores (30.26%) and in terms of average relative gain (1343.61%). The latter is very low (2.29%), as three out of the four students in this group show a relative loss.

Finally, the last profile of students who regularly answered randomly and made many mistakes. Given the time they gave to each question, these students did not take learning very seriously. However, when we look at Table 8 we see that these students made progress with an average relative gain of 42%, which is thus higher than the minimum 30% to guarantee a learning effect (Gerard et al., 2006). However, these pupils do not progress in the same way, given the relatively high percentage of the coefficient of variation (52%). We

observe in Table 22 that two pupils progress with a relative gain between 25 and 35%, while the last pupil shows a relative gain of over 65%. Furthermore, when observing the average scores on the pre-test and post-test, we see that these students go from an average of 43.59% on the pre-test to an average of 66.67% on the post-test. These students thus show the best progression of the three profiles. However, these results are rather contradictory: in fact, these students did not adopt a "school" behaviour by responding randomly and by not using the proposed resources. However, these pupils managed to progress, and when comparing the averages of relative gains between the profiles, they even progressed more than the pupils in the other profiles.

## 4. Conclusion and discussion

In conclusion, based on this ethnographic observation, we were able to answer our two research questions.

Firstly, we distinguished three student profiles that differed in their behaviour during learning. Indeed, two of these profiles showed a certain assiduity to learning while one of the profiles was much less assiduous. The assiduous students showed a relatively low rate of efficiency and took a certain amount of time to complete the learning. They did not solve all their tasks by responding randomly. However, they differed from each other in the way they behaved when they had to use the documents provided and/or read the error feedback provided in the environment. Indeed, one of the profiles made more use of the documents, to the detriment of reading the error feedback, while the other profile acted in the opposite way. The last profile showed a less assiduous behaviour. Indeed, these students showed a higher efficiency rate and a higher rate of random response than the other two profiles. Similarly, they showed a low rate of document use, reading error feedback and time to solve tasks.

Secondly, we also compared the average performance of each of these profiles, in order to determine whether there is a link between the behaviour adopted during learning and progression. We cannot say that there is a link between the student profile (and therefore the behaviour during learning) and the rate of progression between the pre-test and the post-test. Indeed, counter-intuitively, it was the students who were the least assiduous and the least receptive to the resources offered during the learning process who performed best. Therefore, we did not use learning analytics. It is therefore quite possible

to circumvent this lack of LA in the evaluation of an HIE process. However, the use of this method has some limitations which we mention in the next section.

## 5. Limits

This method of ethnographic observation has therefore enabled us to collect a set of data with which we have been able to create learner profiles. However, its use has some limitations.

The first limitation is the subjective nature of the observation. As a reminder, Oppia does not have learning analytics, so it is the designer who, on the basis of screen recordings, encoded each behaviour in the table of observable variables. Even if the approach is intended to be as objective as possible, it is logical to denounce its subjective nature. This limitation is also highlighted by Ciccone (2012, p. 70), "the statement of an observation is always already partly an interpretation". Indeed, when encoding the behaviours, the researcher interpreted each of them from the defined observable variables and according to his own claims. If someone else had observed them, he or she would certainly have encoded them in a different way and might have arrived at a completely different result.

This observation is subjective in the understanding of learners' behaviours but is nevertheless interesting in the edumetric evaluation of proposed tasks. As Depover et al. (2012, p. 5) point out, taking learning traces into account provides the designer with "interesting information about the quality of the learning process implemented". For example, from the encoded behaviours for each question, the designer can judge their difficulty rate, and thus modify questions that are too easy or too difficult.

The second limitation is that the observation grid allows us to measure the learner's behavioural engagement and not cognitive. This limitation is also highlighted by Molinari et al. (2016, p. 7) – "While traces can be considered as objective measures of behavioural engagement, they tell us little about cognitive engagement, i.e. the strategies used or the actual degree of intellectual or emotional investment".

Although we have taken steps to create cognitive variables from behavioural variables, none of these variables truly reflect the intellectual or affective engagement of learners.

Moreover, the actions may well be in contradiction with the student's cognitive process, as we have noticed for the less diligent profile. The learner may

very well pretend to answer incorrectly, as he or she does not care about the process, but cares more about the final result.

A final limitation is that the evaluation of the learning process through ethnographic observation is resource and time intensive. This would not have been possible with, for example, 30 participants. Nielsen (1993 in Nogry et al., 2006), however, indicates that an observation of at least five participants allows for the identification of problems in the system. An assessment of all the behaviours of each learner is therefore not necessary to edumetrically assess all the tasks of the system.

Ethnographic observation differs from learning analytics in that it visualises the learning traces. Indeed, observation allows us to visualise the whole set of traces, whereas LA only gives us access to the sums of the traces. In the end, the number and nature of the data collected are similar to what LA would offer.

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**LAËTITIA DRAGONE**, trained as a Mathematics teacher. Wishing to deepen her pedagogical and techno-pedagogical knowledge, she quickly pursued studies in Education Sciences. She held a position as a Mathematics trainer in a work-study teaching centre. Working since January 2018 at the University of Mons, she has been involved in a project aiming at the digital transition within the schools of the Wallonia Brussels Federation as well as in a pilot study aiming at reinforcing reading learning through differentiation. Currently, she is an assistant in the Pedagogical and Digital Education Engineering Department at the Faculty of Psychology and Sciences of Education (UMONS). Her main research interests are the integration of ICT and the didactics of Mathematics, particularly in the context of adaptive learning.
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**AUDREY KUMPS**, trained as a teacher and taught in a primary classroom for over 10 years. She continued her education by following the MA in education sciences and specialising in educational technology. Working since February 2017 at the University of Mons, she participated in a reflection on the integration of digital in the school context for the Pact for Excellence in Education project of the Wallonia-Brussels Federation. She also worked as a consultant for Engie Tractebel. Currently, Audrey Kumps is an assistant in the Pedagogical Engineering and Digital Education Service where she contributes to the basic teaching of pedagogy, didactics and the integration of digital technology at schools. The acquisition of digital competences, the didactics of French, teacher training and, more specifically, the research and processing of information offline and online are her main areas of research.

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**GWENDYDD PIRET**, from 2019 to 2021, she was a research assistant in the Pedagogical Engineering and Digital Education Service at the University of Mons. She contributed to a project to improve differentiation in reading and writing in cycle 5–8 by accompanying teachers in the implementation of co-teaching. As part of the Pact for Excellence in Education project, Gwendydd Piret has also joined the working group on "Education through Digital Technology" and is a part of the working group on "Education in Mathematics, Science and Physical Geography". She also participat-

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**GAËTAN TEMPERMAN**, associate professor in the Educational Engineering and Digital Education department where he participates in the basic teaching of pedagogy and didactics.
In the first cycle (BA in psychological and educational sciences), he teaches the educational sciences course "Models of teaching and learning". In the MA degree in educational sciences, he holds various teaching units in the field of educational technology (Design of multimedia learning environments, Design and pedagogical scripting, Elaboration of pedagogical materials, Evaluation of interactive environments for human learning, Pedagogical development of computational thinking) as well as in the didactics of disciplines (Didactics of Mathematics). In addition to these various courses, he supervises internships, dissertations and theses carried out within the department. His research activities focus on the effects of pedagogical conditions related to the use of digital technology on learning (design and supervision). In parallel to this technological orientation, his initial experience as a primary school teacher led him

to carry out studies on the didactics and pedagogical scripting of training systems for basic learning. He is co-designer of the MOOC "Educational innovation of which you are the hero" and "Evaluation of digital learning environments" available on https://umooc.umons.ac.be. As a trainer, he is in charge of the "digital transition" part of the pedagogical axis within the framework of the training of primary and secondary school headmasters organised by the methodology and training department of the University of Mons. These multiple experiences give him the possibility to approach and deal with current education and training issues from various and complementary angles.

This collection includes eleven papers on innovative teaching methods. Most authors discuss the application of modern technologies in teaching on different levels. In addition, some of them present the results of questionnaires that were carried out among students. The authors are practitioners of innovative teaching methods, which considerably increases the value of their observations. In the time of a persistent epidemiological crisis that forces the participants of didactic processes to reach for modern technologies to substitute a direct contact between teacher and student, the importance of these sorts of works cannot be overestimated.

*Prof. Lucyna Harmon, Ph.D.*

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