

## ORGANIZATION OF EDUCATIONAL ACTIVITIES USING DIGITAL TOOLS: CASE STUDY SHOWING THE IMPACT OF E-LEARNING IN TECHNICAL HIGH SCHOOLS, TIMIȘOARA - ROMANIA

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### Abstract

The present study started as a result of the contact with the pre-university educational environment while resuming the physical activity within the educational units. Based on the assessment of elementary and digital skills after the COVID pandemic, the need to deepen and diversify interdisciplinary teaching methods was found. The goal was to develop the capacity of individual analysis, thus encouraging personal initiatives regarding the acquisition of new knowledge within the technical curricula of the Automobile Transportation High School in Timișoara.

If, in the first phase, weak points of the on-line teaching and learning tools were identified, afterwards it proved opportune to review the basic concepts through interactive exercises carried out in a hybrid way, both through classroom interaction and by using available digital tools and resources (smartphones, laptops and digital platforms). The study sample considered was a group of more than 11 classes, starting with the 9<sup>th</sup> grade and ending with the 12<sup>th</sup> grade of high school. It was found necessary to reintroduce educational motivation by using awareness exercises of the time dedicated to the acquisition of domain-specific knowledge within the educational unit, in relation to other extracurricular activities carried out during a day or a week. To collect the data analyzed in this article, the following materials were created:

- Personalized schedule with all the activities carried out in a day, respectively in a week, following their distribution in specific time intervals,
- Summative tables regarding the time dedicated to the various subjects studied during the course hours, the time dedicated to individual study at home,
- As well as other activities complementary to the main subjects, feedback regarding the available time, how it can be optimized in each individual case, according to personal preferences and possibilities.

**Keywords:** Digital tools, e-learning, IT&C, technology, education.

## 1 INTRODUCTION

The current analysis proved necessary because it addresses the deficiencies in terms of elementary skills as a result of the forced digitization of the educational system during the pandemic (Dima & Vargan, 2022). Among the unfortunate consequences of this phenomenon is the dependence on technology, evaluated following elementary questionnaires that show a consistent time allocated to digital tools. As a result, the

pedagogical materials were developed with the aim of creating a balance regarding the distribution of time within a day, respectively a week. The approach aims to optimize the time spent on-line, to develop skills in terms of using digital tools and on-line resources, and to inform about the school curriculum, etc. The final goal refers to the successful promotion of the subjects studied during the school year and to keep up with technology, to be aware of the opportunities of digitization (Jackman & Gentile, 2021), as well as to minimize the risks regarding the acquisition of elementary skills (written and verbal communication, mathematics, basic IT&C skills, etc.).

This initiative comes in response to the deficiencies recorded in terms of organizing the on-line education activity, trying to create a hybrid model that combines the acquisition of digital skills together with notions related to the development of the pedagogical act (Edelhauser & Lupu-Dima, 2021; Molea & Năstăsă, 2020). It was necessary to inform the students regarding the changes that occurred regarding the organization of the school year, as well as the time dedicated to different curricular areas and subjects proposed in class. In the first phase, elementary notions regarding the organization of the educational activity were presented (how to differentiate the theoretical subjects by considering also the practical ones), followed by the way in which they can be adapted to individual interests.

The specificity of the target group consists in the existing internships depending on the specialization of the classes (theoretical or professional profile). In addition to the practical training hours already present in the technical schools curriculum (around 2 hours/week), there is also the dual education form (followed during 3 days/week) that allows the acquisition of a specialization at the end of the 3 years of study with the possibility of continuing the classes in the evening hours for another 2 and a half years. Also, in the curriculum specific for these technological high schools, there is a combined practice period of approximately one month, apart from the training hours already completed during the year.

The present exercise analyzed in this article consisted in the use of different work options (teamwork, the use of digital tools, as well as through direct contact with various on-line educational resources), with the aim of making the educational act more efficient during laboratory hours for the IT&C subject, as well as for other course hours. The prepared materials follow the development of the students' analytical capacity by presenting in a simplified version the subjects and curricular areas specific to each class. The goal was to recreate personal contact with the students after the pandemic period and to restore a new approach regarding the educational process by informing the students in advance.

Alternative didactic materials were created (starting from identified problems such as attention and concentration deficit), but which lack the teacher's personal explanations, the presentation of relevant examples and case studies, respectively the topic debate with other classmates (Holotescu et al., 2020). A new approach was considered necessary to compensate for some of the deficiencies recorded as a result of on-line education. Going through the materials proposed in class, it was considered necessary to continue them as individual study subjects at home. Because of this behaviour, poor results were encountered for the different subjects studied. Therefore, it is necessary to review basic notions in terms of general skills, grouping them around common projects. A reflection exercise was proposed considering the main curricular areas recorded in class and the time judiciously dedicated to them to successfully promote the various disciplines. Also, it is relevant to acknowledge the available time dedicated to other complementary leisure activities (theatre, film, etc.), with a role in the formation and consolidation of already acquired knowledge (Dima & Vargas, 2022).

## **2 METHODOLOGY**

The current analysis took the form of a worksheet that counts the way in which the study subjects are distributed according to the specifics of each class (theoretical profile, professional profile correlated with the form of dual education, etc.). The worksheet is an example of an interdisciplinary activity that involves the correct identification of educational Needs, A Practical Exercise To Acquire Digital Skills In Terms Of Editing, Printing And Distributing A Document, As Well As A Tool For Making Study Time More Efficient According To The Main Subjects Of Interest. Following This Approach, A Dilemma Appeared In Terms Of How To Recover The Existing Gaps And To What Extent Teachers Can Intervene To Help Students Acquire The Basic Notions Related To Other Newly Introduced Subjects (IT&C - Information Technology And Communications.) A Minimum Knowledge Is Required To Ensure The Subsequent Structure Of The Future Subjects Discussed During The Lectures For IT&C, Respectively The Information About The Required Curriculum And Implicitly The Students' Acceptance Of The Future Learning Scenarios.

For A Good Identification Of Educational Needs, Preferences And Individual Possibilities, Additional Columns Have Been Introduced In The Worksheet Regarding All The Activities Carried Out In A Day. The

Resulting Sheet, Similar To A Travel Organizer, Allows Dedication Of Study time according to specific needs. The aim was to identify the activities carried out in a day and in a week, respectively the way in which the time interval dedicated to different studies is distributed within the educational unit, as well as outside of it. As a result, a percentage for the various activities carried out was obtained, with the possibility of modifying them later on, according to individual educational needs. The introduced format allows to identify subjects where learning difficulties or weaker results are registered, while considering additional time when necessary. Thus, the proposed material allows the dynamic correlation of the different subjects and the time allocated to them depending on personal preferences as well. It makes a simple connection between the existing subjects in the curricular area and implicitly the assumption of an effort in order to successfully finish the class with better grades as usual.

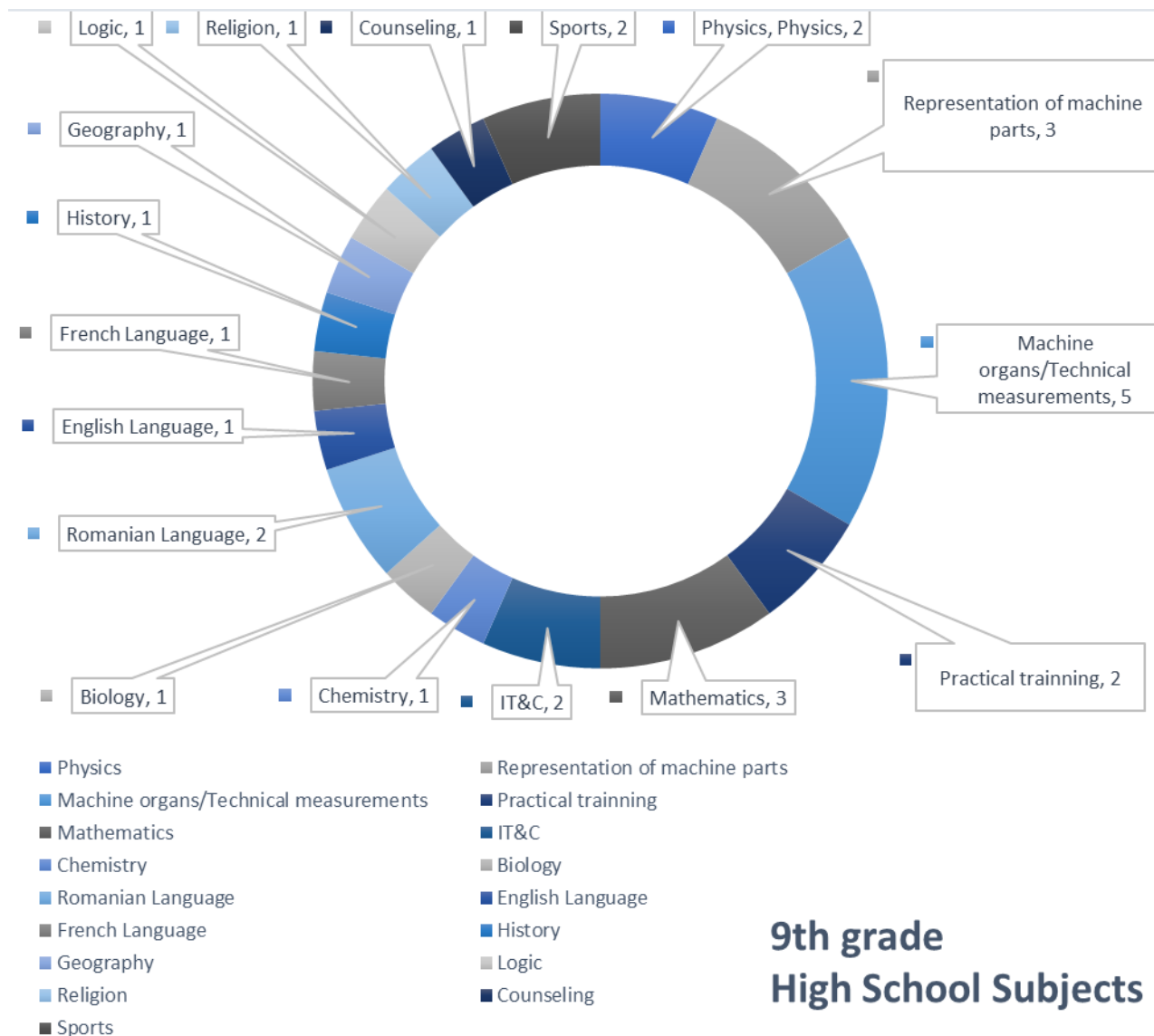


Figure 1. 9<sup>th</sup> grade High School Subjects

In order to realize the importance of allocating a consistent time interval depending on the subject and already acquired skills, a column dedicated to individual study time is represented in hours per week (with the mention that in this case, the compared elements represent didactic units consisting of an interval of 50 minutes to which a 10m break is added between the different hours). Taking into account the poor results recorded in the meantime, respectively the answers according to which the majority of respondents declared that they do not allocate time to study at home, this exercise was considered appropriate for raising awareness and evaluating possible solutions for this issue. For administrative reasons, the simple addition of the columns related to the study time within the educational unit, respectively the study time at home, within the same worksheet, allows the content to be efficiently adapted according to individual needs.

The next stage of the exercise consisted in evaluating the time intervals dedicated to the various activities completed in a day, respectively in a week, resulting the values stated below:

- Rest (6-8h/day, representing a percentage of 33.33% of the total 24h),
- Food (2h/day - a percentage of 4.16% of the total 24h),
- Study time at school (between 5 and 6hours per day),
- Transport: (1-2h/day)

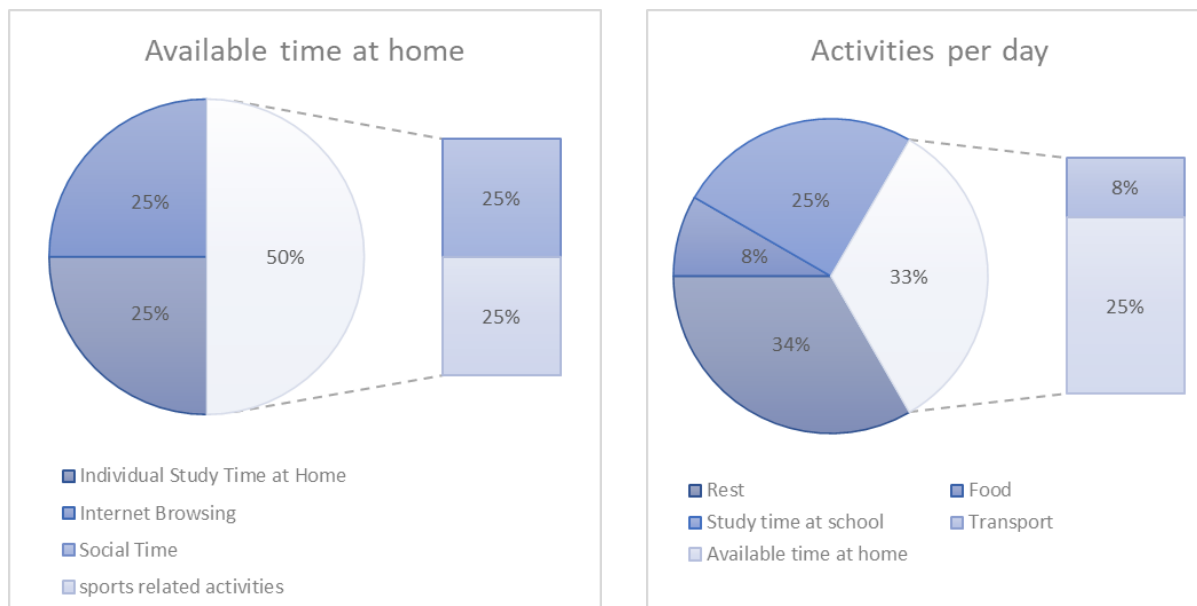


Figure 2. Statistics showing the activities during a day, Figure 3. Available time at home

### 3 RESULTS AND DISCUSSION

In comparison with a theoretical High School, the existence of several practical subjects is observed in close connection with the specifics of the targeted qualification. If in theoretical High Schools with a mathematics-informatics specialization, these subjects constitute a ratio of 45.83% (11 hours out of the 28 hours spent in class, in schools with a technological profile, the number of hours dedicated to specific subjects depends on the chosen specialization - in this case, car tinker, mechanic, electrical technician, etc.). The total number of hours spent at school varies between 27-28h for classes with a science profile, in comparison to values of 30-32h/week in classes with a technological profile. As for example, in the 9<sup>th</sup> grade (automobile mechanic profile specialization), a number of 30 hours per week are included in the school program under a ratio of 14 hours dedicated to theory (46.66%), compared to 16 hours (53, 33%) allocated to practical applications (illustrated in Figure 1. 9<sup>th</sup> grade High School Subjects).

The specific subjects assigned to the targeted specializations, namely, that of car mechanic, add up to a total of 10 hours to which mathematics (3 hours/week) and information and communication technology (2 hours/week) can be added as complementary subjects. Therefore, the previously stated subjects can be considered as belonging to the same common curricula, being able to be developed in parallel with other activities, in the form of projects with a similar theme. As an example, the approach of a common topic would consider all the subjects stated below (Figure 4. Specific subjects studied at school for the 9<sup>th</sup> grade, mechanical profile), thus resulting an exercise that allows making the necessary connections between the theoretical aspects, as well as the practical ones:

- Physics: 2h (1h theory, 1h practice),
- Representation of machine parts: 3h (1h theory - 2h practice),
- Technical measurements: 3h (1h theory - 2h practice),
- Practical training: 2h (2h of practical applications).

Therefore, a similar ratio of hours dedicated to the characteristic subjects is proven, the amount of 10h+5h allocated to the subjects listed above, compared to the total of approximately 30h dedicated to the curricular

areas specific to classes with a technical profile (value considered as the characteristic average of the classes targeted in this study). At least 25% of the total hours studied in class are represented by theoretical common subjects (mathematics, 3 hours out of the 30 hours per week), to which physics is added between 1-2 hours/week, chemistry with 1 hour/week and biology with 1 hour/week, subjects that are also evaluated in the Baccalaureate exam.

In order to realize the importance of allocating a consistent time interval depending on the subject and already acquired skills, a column dedicated to individual study time is represented in hours per week (with the mention that in this case, the compared elements represent didactic units consisting of an interval of 50 minutes to which a 10m break is added between the different hours). Taking into account the poor results recorded in the meantime, respectively the answers according to which the majority of respondents declared that they do not allocate time to study at home, this exercise was considered appropriate for raising awareness and evaluating possible solutions for this issue. For administrative reasons, the simple addition of the columns related to the study time within the educational unit, respectively the study time at home, within the same worksheet, allows the content to be efficiently adapted according to individual needs.

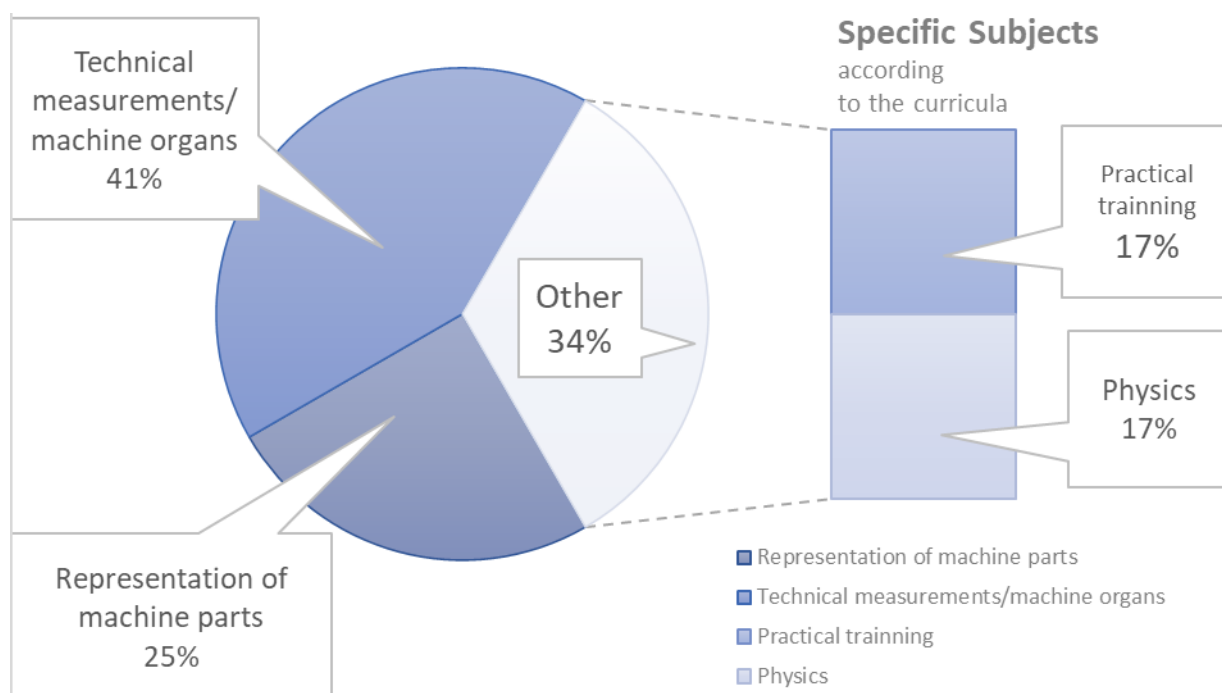


Figure 4. Specific subjects studied at school for the 9th grade, mechanical profile

The next stage of the exercise consisted in evaluating the time intervals dedicated to the various activities completed in a day, respectively in a week, resulting the values stated below (illustrated in Figure 2.: Statistics showing the activities during a day):

- Rest (6-8h/day, representing a percentage of 33.33% of the total 24h),
- Food (2h/day - a percentage of 4.16% of the total 24h),
- Study time at school (between 5 and 6hours per day),
- Transport: (1-2h/day).

Therefore, the total time dedicated to various activities is considered between the values of 16-18h/day (between 66.00-75%), which means an available time interval of 8-6h/day (if the students do not work or have other administrative activities). Also, it was exemplified the way in which the time dedicated to internet browsing, for example, can be fruitful in the form of study through the intelligent use of on-line resources. This time was later subdivided according to individual preferences, which led to the introduction of the following activities with the related time intervals (illustrated in Figure 3. Available time at home):

- Individual study time at home: 2h,
- Internet browsing: 2h,

- Social time: 1.5-2h/day,
- Sports related activities: 1-2h/day.

The current study is based on the worrying statistics regarding the use of digital tools, analysis that reveal consistent intervals dedicated to the time spent on-line or using digital tools. As discussed in the previous article (Sălăgean-Mohora & Florescu Elena-Roxana), the use of digital tools was approximated according to the time intervals previously mentioned, resulting in more than 12h of interaction per day. This time can be reconsidered taking into account the activities undertaken during a day and adapted to the needs of the specific range of high school students (14-19 years old).

Following the forms completed together with the students during the laboratory hours, it was found that the time allocated to the various activities in the interval of a week is around 95-100h, compared to the total of 168h, which represents a value of 56-59.50 %. Therefore, a sufficient time interval of 68-73h can be assimilated with individual study time at home, as well as other activities such as sports, leisure and social time (as illustrated in Figure 5. Time distribution during a week). By carrying out this study, it is highlighted the way in which the existing deficiencies make it difficult to acquire new knowledge, skills, attitudes, etc. It is necessary to guide the students to develop basic competencies reintroducing the direct connection of the teaching staff with the students who were in an on-line learning environment. Based on the growing interest in digital resources and tools, it is important to note the extent to which they facilitate, but at the same time mask educational deficiencies in terms of general knowledge and skills.

In order to establish the causes that determined the low involvement of students in carrying out until completion the presented exercise, as well as in their general school performance, several issues were identified:

- Lack of a conducive environment dedicated to learning,
- Reduced access at home to digital tools for individual study,
  - insufficient number of study hours in class per subject in order to provide specific explanations for each individual student (difficulties in understanding, skills to recover, one-on-one explanations, etc.).

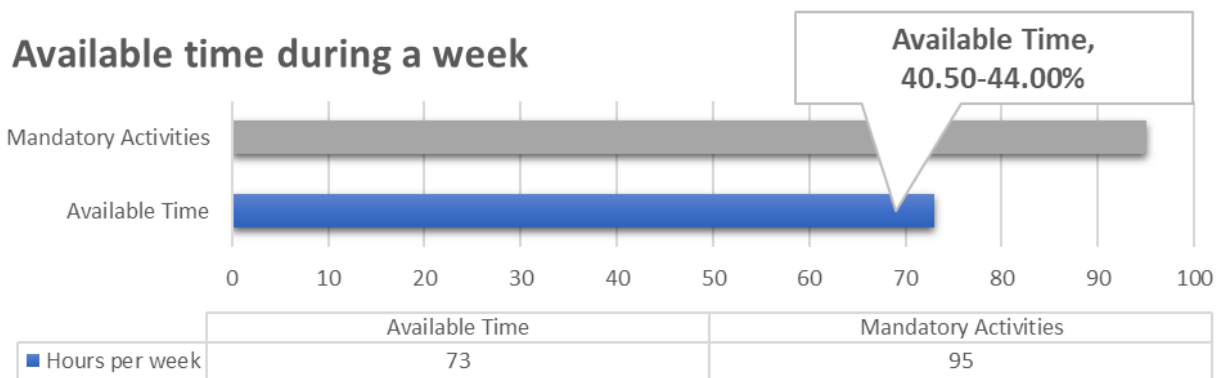


Figure 5. Specific subjects studied at school for the 9<sup>th</sup> grade, mechanical profile

#### 4 CONCLUSION

As a conclusion, starting from some notions related to the organization of the educational act, exercises were introduced to raise awareness of the time resources allocated to the study of different subjects, their relevance within the training course and the extent to which digital tools allow a record of the progress of each individual. By going through some logical stages of classroom debate, individual and teacher-assisted writing and problem solving, elementary notions were introduced, in terms of organizing the educational act and the possibility in which the learning process can be achieved in a hybrid manner through digital tools. As a result, the potential of using interactive educational resources has been proven regarding the efficiency of acquiring skills through available resources in high schools with a technological profile (Florescu E.R. & Osain A.), respectively their capitalization according to individual preferences<sup>1</sup>.

<sup>1</sup> prof. FLORESCU Elena-Roxana, Liceul Tehnologic Transporturi Auto Timișoara , prof. OSAIN Angela, Liceul Tehnologic Transporturi Auto Timișoara "Înșușirea de cunoștințe specifice domeniului utilizând instrumente digitale.

By means of logical explanations, the relevance of different subjects in the educational course is presented by making a logical correlation in order to justify them in front of the students. Thus, the aim was to achieve additional connections, an interdisciplinarity in terms of the didactic process by teaching subjects around projects, exercises that use several skills simultaneously, implicitly several resources (including digital ones). In this way, a better involvement of the students was achieved, a logical understanding of the various educational stages, as well as raising their awareness, self-knowledge and the allocation of appropriate resources for the fulfillment of tasks. Firstly, the aim of this study was not to quantify the resulting quantitative answers, but to make the exercise more efficient in terms of the difficulties encountered in solving it. After providing some explanations regarding the thematic contents and the organization of the educational course, the resulting values were compared both individually and together with the teacher, other classmates and finally, with the parents. The ultimate goal was to provide feedback from teachers and parents, as a result of the personal options presented and to develop an individualized strategy to meet specific educational needs. The result of the study consists in creating an effective material as a pedagogical support, supplemented by explanations and references to other digital resources, thus proving the effectiveness of a hybrid approach during the didactic act.

## REFERENCE LIST

- Dima, A. M., & Vargas, V. M. (2022). The Importance of Digital Education in a Pandemic and Post-Pandemic Context. In *Proceedings of the International Conference on Economics and Social Sciences* (pp. i–iv). <https://doi.org/10.2478/9788367405072-fm>
- Jackman, J.A., Gentile, D.A., Cho, N.J. *et al.* Addressing the digital skills gap for future education. *Nat Hum Behav* **5**, 542–545 (2021). <https://doi.org/10.1038/s41562-021-01074-z>
- Edelhauser, E., & Lupu-Dima, L. (2021). One year of online education in covid-19 age, a challenge for the romanian education system. *International Journal of Environmental Research and Public Health*, *18*(15). <https://doi.org/10.3390/ijerph18158129>
- Molea, R., & Năstasă, A. (2020). How Romanian Higher Education Institutions Have Adapted to Online Learning Process in the COVID-19 Context through a Student's Eye. *Revista Romaneasca Pentru Educatie Multidimensionala*, *12*(2Sup1), 175–181. <https://doi.org/10.18662/rrem/12.2sup1/30>
- Holotescu, C., Grosseck, G., Andone, D., Gunesch, L., Constandache, L., Nedelcu, V. D., Ivanova, M., & Dumbrăveanu, R. (2020). Romanian educational system response during the covid-19 pandemic. *ELearning and Software for Education Conference*, May, 11–19. <https://doi.org/10.12753/2066-026X-20-171u>
- Sălăgean-Mohora, I., Florescu E.-R., (2022). In “Interactive methods of teaching digital skills and presenting professional options for students in pre-university technical education”, INTCESS Conference, 23-25 January, Istanbul, Turkey, <https://www.ocerints.org/intcess23/>
- Florescu, E.-R., Osain A. (2022). In “Însușirea de cunoștințe specifice domeniului utilizând instrumente digitale. Studiu de caz privind evaluarea și organizarea activității educative în cadrul liceelor cu profil tehnologic, Liceul Tehnologic Transporturi Auto Timișoara”, Acces On-Line 2023, ISSN 2810-5419, ISSN-L 2810-5419, <https://www.ccd-timis.ro/index.php/revista-acces>.

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Studiu de caz privind evaluarea și organizarea activității educative în cadrul liceelor cu profil tehnologic, Liceul Tehnologic Transporturi Auto Timișoara”

To further develop this exercise, the proposed sequences can be assimilated to the interconnected way of allocating resources and how the subsequent allocation of time, carried out according to preferences, develops a chain reaction. This results in the need to be aware of how personal choices change the distribution of time presented in the initial phase. From the first stages of solving this exercise, it follows the need to create an algorithm for dynamic calculation of the way in which distribution of hours offers different hourly distribution options:

- The dedication of several hours of individual study at home time for different subjects of interest,
- Assigning an additional number of study hours for the subjects in which weaker results were recorded,
- The possibility of consulting and reporting the various options expressed in a direct and simple way to students, tutors/parents.