

**SIMILARITIES AND DIFFERENCES BETWEEN THE TRADITIONAL
APPROACH AND THE ONLINE APPROACH TO THE TEACHING-
LEARNING-ASSESSMENT PROCESS FOR GEOGRAPHY DURING THE
PANDEMIC**

**SIMILITUDINI ȘI DIFERENȚE ÎNTRE MODELUL TRADIȚIONAL ȘI
MODELUL ONLINE PRIVIND PROCESUL DE PREDARE-ÎNVĂȚARE-
EVALUARE LA DISCIPLINA GEOGRAFIE, ÎN PERIOADĂ PANDEMICĂ**

Florentina TOMA¹, Daniel Constantin DIACONU², Bogdan OLARIU³
10.52846/AUCSG.23.1.04

Abstract: During the COVID-19 pandemic, pre-university education was organized either on a new online model or on a traditional model, carried out on a series of educational learning platforms and using various open educational resources. Taking as a starting point the research published worldwide about the educational process during the pandemic period, we present and discuss the similarities and differences regarding the educational process of learning-assessment at the pre-university level, with reference to the subject of geography. To achieve our goal, we conducted a review of the literature on articles dealing with traditional pre-university education and the online model during the pandemic, taking into account our personal teaching-learning-assessment experience on this topic, as well as the perception of teachers. This study comparatively evaluates the students' learning about the results obtained in the two teaching-learning-assessment models and the perspective of the teachers through a survey of their reflection on the experiences of the pandemic period, identifying the causes, effects and solutions. The observations of the experiment and the analysis of the questionnaire showed significant similarities and differences between the scores obtained by the students and how the learning platforms can facilitate teaching and learning. This study discusses the implications and proposes suggestions for further research on these findings.

Key-words: *educational process, geography, COVID-19, teacher perception, online, traditional.*

Cuvinte cheie: *proces educativ, geografie, COVID-19, percepție cadre didactice, online, tradițional.*

1. INTRODUCTION

The year 2020, the year of the emergence of the pandemic caused by COVID-19, generated the global appearance of the online model in the education system, the

¹ University of Bucharest, Simion Mehedinți "Nature and Sustainable Development" Doctoral School, Faculty of Geography, Bucharest, Romania, florentina.ghersin@drd.unibuc.ro (corresponding author)

² University of Bucharest, Department of Meteorology and Hydrology, Faculty of Geography, Bucharest, Romania, daniel.diaconu@unibuc.ro

³ University of Bucharest, Department of Environmental Sciences, Faculty of Geography, Bucharest, Romania, Departamentul Științele Mediului, bogdanolariu28@gmail.com

interruption of face-to-face teaching and the subsequent development of a special traditional model. It was thus a challenge for all beneficiaries of education.

Studies on online and traditional education during the pandemic period:

There has been a lot of research over the past two years about COVID-19 and its impact on the educational process. **Most studies on online education** focused on the problems and inequalities arising from the impact of the sudden transition to online learning and teaching, because many did not have adequate devices for practical work and had difficulty providing an adequate workspace (Day et.al, 2020). Little research has focused on the practices of creating an optimal online learning environment, in which students manage to take active roles and responsibility for their own learning process, by familiarizing the available educational resources that can facilitate the online learning process" (Jo et.al, 2020). Also, as a result of online learning during the pandemic and the results that are predominantly unsatisfactory for both students and teachers, few researchers have explored "best practices for deep online teacher learning - a course on effective teaching virtually" (Schultz & DeMer, 2020).

Various articles analyzed the assessment process during the pandemic, especially in the online model, lacking the in-depth quantitative and qualitative data for the realization of a general model of objective assessment on an online platform. It is necessary to discover an appropriate methodological assessment plan, related to the teaching and learning practices during the pandemic period. Consequently, we recall how the extent to which differences in the design of the assessment can lead to differences in the way students respond to them is highlighted (Scoular & Care, 2020). Various research presents various assessment models, highlighting the direction of improving the online learning effect: an improved assessment model for the online learning effect, based on the theory of unclear mathematics (Tao, 2020) and a multi-attribute assessment model improved for the effect of online English teaching based on unclear mathematics (Zhang, 2020). A case study examines the assessment of an online teacher professional development workshop in order to reflect critically on the effectiveness of workshop assessment techniques (Ahadi et al, 2021). Also in this regard, a method of evaluating the quality of online teaching is designed - the method of weighting entropy and the analysis of the gray grouping to assess the quality of online teaching of basic education (Li & Su, 2020), a system for assessing the user experience to clarify the shortcomings of the online educational platform (Wang et al., 2021) or the application of the GA-BP neural network algorithm, for optimizing the quality of teaching in the classroom of more scientific online education (Xu & Liu, 2021).

Various studies have provided a number of educational teaching and learning modes experienced by university students: investigating the effectiveness of different modes of online teaching, as well as comparing a proposed combined model of online and inverted learning with other online and traditional models, based on questionnaire learning under COVID-19 (Tang et al., 2020).

Studies have been identified on the similarities and differences between face-to-face and online teaching approaches, such as teaching philosophy on the Internet that provides an appropriate substitute for classroom teaching and is effective in achieving certain significant educational goals (Siess, 2021). Of interest was the approach of exploring teachers' teaching and learning experiences in physical education in K-12 educational environments during COVID-19 in several countries, using photovoices and interviews (Howley, 2021) or assessment on the use of microsoft teams and zoom online platforms and the effects that distance learning has on students' satisfaction and attitudes towards their education (Ismaili, 2021).

Research on improving the teaching-learning-assessment of the previous period and during the pandemic:

The **improvement of the teaching-learning-assessment process of the geography subject** was highlighted by providing evidence on the choice of didactic strategies centered on the learning activity and the teacher-student interaction, based on ICT - the RU-EU game, as a tool for students' learning and leading to the development of ICT skills, encourages curiosity, collaborative learning and critical thinking in the form of a situational simulation that cannot be replicated in the classroom and explores inaccessible environments (Sebastiá-Alcaraz & Tonda-Monllor, 2020) or the 'EU HR?' game, aimed at raising students' awareness of the issue of European identity" (Sim et al., 2020) or game of exploration of the reality of geography (Hill et al., 2018).

There are various concerns regarding the conversational-interrogative study methods, which must be taken into account, because it helps teachers to design the didactic approach - of the dialogue type - the discussions and the reflection (for example, to characterize nature) (Nurkka et al., 2014).

Studies have provided substantial evidence that the effects of using ICT tools in learning motivate students, for example the use of the "Google Forms helps in learning" tool (Glover, 2020), even requiring its use as a learning initiative mixed docent (Murphy, 2018). and it is demonstrated to use the Google Forms tool as a teaching-learning method that allows "the student to be an active agent in the learning process", just like other Google applications (Rejón-Guardia et al., 2019).

Most of the previous research, regarding the type of assessment, the game type on the Kahoot! platform, has shown that it positively affects the dynamics of the class, the learning performance and the perceptions of students and teachers (Wang & Tahir, 2020; Wang & Lieberoth, 2016, Iwamoto et al., 2017; Taylor & Reynolds, 2018, Toma et al., 2021).

Studies on teachers' perception of the online and traditional model in the pandemic period of teaching-learning-assessment:

The weaknesses on teachers' perception of teaching and learning in the **online model** were positive before the pandemic, considering that it was going as well as the face-to-face one, even though few good results were reported, however, the sudden shift in 2020 to online learning showed that it is fundamentally different from what was expected. "it is not regarded with optimism by those in pre-

university education and by those with little teaching experience, even if many adjustments have been made to the teaching procedures" (Moser et al., 2020).

Little research has focused on the shortcomings related to the training of teachers during the COVID-19 pandemic, we note the positive perception of mathematics teachers in middle school about their preparation for remote emergency teaching, but with a demand for thorough training in the future (Rodriguez-Muniz et al., 2021) and the improvement of digital skills and integration this was in the teaching-learning process (Prieto- Ballester et al., 2021).

Although there have been many research studies about this transition, about the way teachers were trained in different ICT tools, few have referred to pre-university education, Romania and the subject of geography. We thus consider this study appropriate, in order to highlight the importance that information and communication technology (ICT) has acquired in the teaching, learning and assessment of geography. This is considered necessary because we are constantly changing, which requires continuous training.

The purpose of our quantitative and qualitative research is to compare the learning process since the onset of the pandemic, by measuring the results obtained by students comparatively and to find out the opinions of teachers about the professional experiences of this period.

2. DATA AND METHODS

2.1 The objectives of the experimental study

The hypothesis proposed to the experimental study research: `If the grades obtained in the formative assessment in the geography discipline show significant similarities and differences between the scores obtained by students between the online and traditional teaching-learning model, then the learning-evaluation platforms can facilitate teaching and learning`.

The overall objective of the research is to evaluate comparatively the students' learning about the results achieved in the two teaching-learning-evaluation models, using various learning-evaluation platforms and the perspective of the teachers through a survey of their reflection on the experiences of the pandemic period, being identified the causes, the effects and the solutions. This objective took into account 2 specific objectives. The first objective: the identification of the results obtained by measuring the level of knowledge of the students acquired in relation to the acquisitions to be formed (based on the results obtained at the formative assessments in the traditional model, compared to those obtained in the online model). Objective 2: correct analysis of the teachers' opinions about the similarities and differences between the 2 models of education and identification of the causes, effects and optimal solutions for a quality teaching-learning-assessment in the classical and online system, adapted to the current pandemic requirements and the curriculum.

The research concerned four main variables (the first three corresponding to specific objective 1 and the fourth variable corresponding to specific objective 2):

The first variable from the first stage is the integration of the Microsoft Power Point presentation into the teaching-learning of geography and the amount of information assimilated following the use of the Kahoot game! as a form of formative pre-test assessment. This will be measured by the pre-test score.

The second variable in the third stage is the integration of the Google form/game Java Script tool and the presentation of Microsoft Power Point in the teaching-learning geography sequence and the amount of information assimilated following the use of the implemented method. The first of these, is the independent variable, since it will be assumed that it can have an effect on the dependent variable. This will be measured by the score obtained in the post-test (with the first variable) and pre-test (with the third variable).

The third variable in stage three is the reintegration of Microsoft Power Point presentation into geography teaching-learning and the amount of information assimilated from the use of the Kahoot game! as a form of formative post-test evaluation. This will be measured by the score obtained at the post-test (with the second variable).

The fourth variable in the third stage is the comparative analysis of the two teaching-learning-evaluation models (online and traditional) by teachers. This will be measured by teachers' comparative perception of the two teaching-learning-evaluation models.

The research design used is observational and experimental type (comparative research design- based on similarity or differences - investigation of causal relationships between variables by analysis of similar cases).

Methods of data collection: Experiment, observation; methods of data processing: Quantitative (statistical methods: Graphical representation of results obtained with students in Excel program); methods of data interpretation (statistics – survey: Interpretation and synthesis of questionnaire answers.

The descriptive analysis of the results was carried out by using graphical tools (by tabulation (perception of teachers on differences between the two teaching models during the pandemic), grouping and graphics of the values of the variables of interest and numeric by calculating the descriptive measures (average obtained on classes).

2.1 Participants

This study was conducted in a high school in Romania and consisted of an action research, by measuring the results of the formative evaluation in the geography discipline, during nine contents from four levels of study, during two school years from the period of the online and traditional teaching-learning model, in grades 5th, 6th, 9th and 10th grades, on a sample of 392 students. For all students, the Kahoot assessment platform was used! for the feedback sequence and questionnaire of Google Forms and JavaScript game as a teaching-learning tool for content about the Hydrosphere. Also, the Google Forms questionnaire regarding their perception of the two teaching-learning models was applied to a number of 340 teachers from different counties and by the geography specialization.

The type of sampling was simple random, as there were similar scores by class obtained at the performance, being divided into two groups: an experimental group (where the teaching-learning method was implemented with the Google forms/JavaScript game tool associated with the PowerPoint presentation) and the control group (where only the teaching-learning method using the PowerPoint presentation was used).

2.3 Tool and methods

The research is quantitative action, which consisted of performing another experiment, to observe whether there is a statistically significant influence on the integration of a teaching-learning method with the Google Forms/Java Script game tool associated with the Power Point presentation.

In the framework of the research were used as methods and research tools: analysis (collection of data on class assessment) - for evaluating the performance and progress of students, the survey method based on the questionnaire, the analysis of the products of the students' activities and the experiment.

The tool used in the assessment of students is the formative test on the Kahoot platform, and the anonymous questionnaire with the Google Forms tool for teachers' perception of the educational process in the two teaching-learning-assessment models, representing quantitative and qualitative data methods of testing. The Google Forms questionnaires were sent by the individual teacher to the institutionalized e-mail address of the students (for the teaching-learning sequence) and the teachers, and after they filled them in, they were automatically sent with their names to the teacher's email address for the collection of all the data. The game using types of computer languages: HTML, CSS and JavaScript, used as a learning tool, can be found on the link, hosted web (hosting) at hostinger.

2.4 Procedure

The study was thus divided into 3 stages of research:

- In the first stage, the results of the formative assessments were analyzed by comparing the average obtained by level (classes) from the nine contents of the online teaching-learning model, from the school year 2020-2021.
- In the second stage, the results of the formative assessments were analyzed by comparing the score obtained per class at the nine contents of the traditional teaching-learning model, from the school year 2021-2022.
- Formative assessment is the assessment of the feedback sequence at the end of the lesson taught, on the Kahoot platform!

At both stages, at the assessment sequence at the end of each class, all students received a Kahoot game! with nine standardised questions on specific competences and formulated according to the operational objectives of the lesson and a feedback question on the lesson taught by the teacher. As teaching-learning methods, the PowerPoint presentation associated with the Google Forms tool for half of the students and only the PowerPoint presentation for the other half of the students for the 2021-2022 school year were used. The PowerPoint presentation associated with the proprietary JavaScript game tool applied for the 2021-2022

school year to the 12 lessons with hydrosphere content and the PowerPoint presentation at the other 24 lessons.

In the third stage, we analyzed the Google Forms questionnaire applied to teachers, which includes 14 items, of which 9 questions are with open answer, 2 multiple answer questions and 3 questions contain the Likert scale.

2.5 Data analysis

The methodology used in testing the hypothesis of the magnitude of the studied effect is the quantitative statistical method of calculating it for school acquisitions of the expected progress of the students per class, during the research period of the two learning models. Other working methods were the teaching-learning method and the survey based on the Google Forms/JavaScript game questionnaire and the graphical method of the results obtained with the students by classes in the Microsoft Excel program. Also, the experiment was conducted for a total number of 392 students from gymnasium (5th and 6th grades) and high school (9th and 10th grades), and the survey based on questionnaires on a number of 340 teachers.

3. RESULTS

The results are presented based on the two specific objectives of the research, namely the performance achieved by the students compared between the two teaching-learning models and the perception of the teachers during the pandemic. All the results of the assessments from the two models of teaching-learning-assessment (class average) are presented in Fig. 1 (5th grade), Fig. 2 (6th grade), Fig. 3 (9th grade) and Fig. 4 (10th grade), reflecting a higher level of knowledge for all classes during the traditional teaching-learning-assessment model, which are the subject of research.

In the 5th grades, in the online model, the average obtained in the 2 classes during 9 learning contents is 6.9, and in the traditional model of 7.89, with a difference of 0.99 points.

In the 6th grades, in the online model, the average obtained in the 2 classes during 9 learning contents is 6.68, and in the traditional model of 7.99, with a difference of 1.31 points.

In the 9th grades, in the online model, the average obtained in the 6 classes during 9 learning contents is 7.29, and in the traditional model of 8.03, with a difference of 0.74 points.

In the 10th grades, in the online model, the average obtained in the 4 classes during 9 learning contents is 6.99, and in the traditional model of 8.03, with a difference of 1.04 points.

Regarding the questionnaire applied to teachers, the first 3 questions are demographic and reflect the age of the respondents (with a maximum value of 47.1% between 41-50 years), the sex (85.3% being the female sex) and the school where they teach (half of them are from Bucharest).

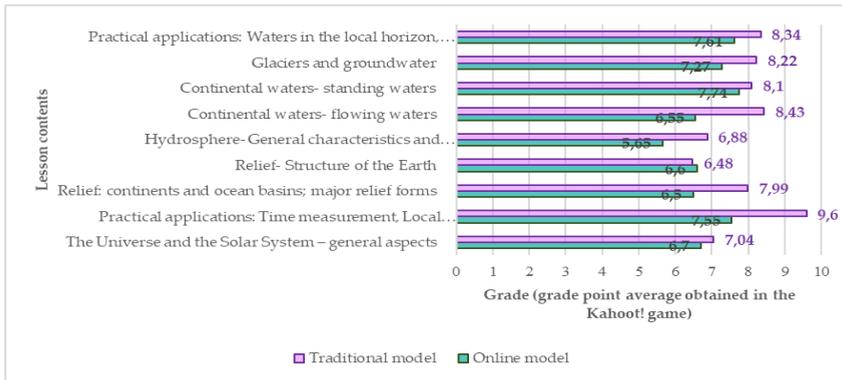


Fig. 1 The results per class obtained at the formative assessment tests on the Kahoot! learning platform, online model and traditional model, fifth grades, school year 2020-2021 and 2021-2022

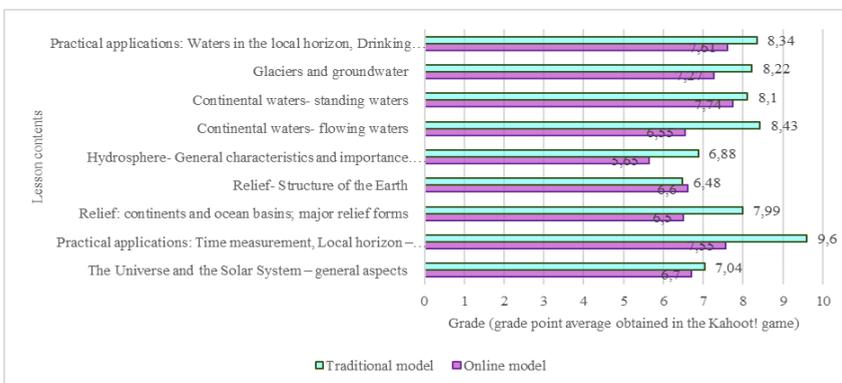


Fig. 2 The results per class obtained in formative assessment tests on the Kahoot! learning platform, online model and traditional model, sixth grades, school year 2020-2021 and 2021-2022

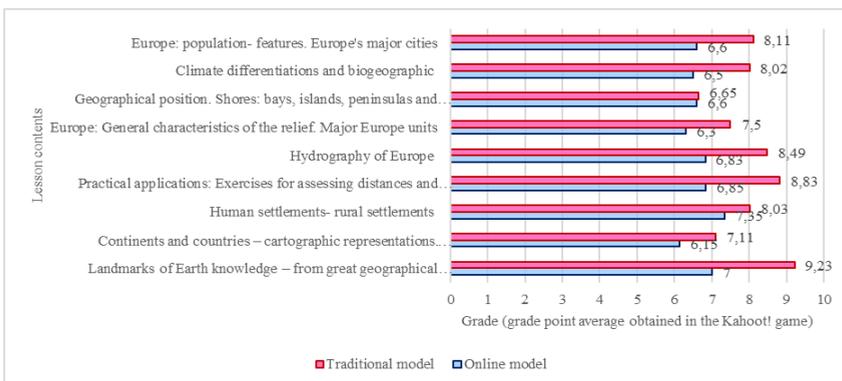


Fig. 3 The results per class obtained at the formative assessment tests on the Kahoot learning platform!, online model and traditional model, 9th grade, school year 2020-2021 and 2021-2022

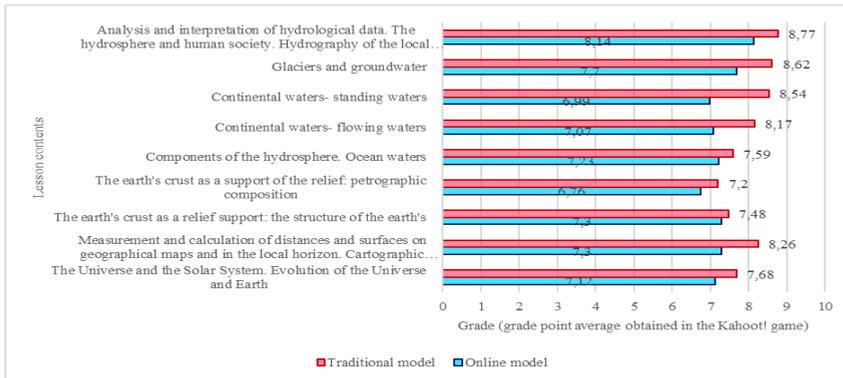


Fig. 4 The results per class obtained at formative assessment tests on the Kahoot learning platform!, online model and traditional model, 10 th grades, school year 2020-2021 and 2021-2022

Regarding the similarities between the online model and the traditional teaching-learning-assessment model during the pandemic, based on classroom experience, teachers consider as joint instructive-educational activities for the two models: the use of the computer to expose graphic and cartographic representations and various ranges of teaching methods; joint efforts of teaching activity; the use of platforms of teaching learning; the same content taught; the same lesson events and specific skills to be formed to the students.

Looking at the differences between the online model and the traditional teaching-learning-assessment model during the pandemic, based on classroom experience, their answers are shown in Table 1.

Teachers' perception of the observed negative effects of the educational process during the development of the traditional pandemic model: the decrease of students' attention and mourning; smaller communities due to compulsory distancing; slowing down the pace of carrying out some activities in the type of time due to the need to comply with sanitary norms; risk of infection; forbidden access to the geography cabinet; lack of using of teaching means due to restrictions; difficult assessment; distorted communication due to the masks.

Regarding the negative effects observed in the educational process during the pandemic online model: through the non-compulsorily of keeping the room permanently open, there is a risk that students will be connected to the class, but carry out other activities or not to be present as a result of the lack of legislation that expressly provides for this; the assessment is deficient, it is not objective, because students can use various sources to cheat; lack of control over the pupils; connecting problems; weaker skills of working with the map; the liability not to participate in classes (by invoking malfunctions, lack of Internet connection, lack of electricity). Also, other specified negative effects are: the willful/forced intervention of some family members; students spending too much time in front of phone/tablet/computer screens; students stop interacting physically and participate

fewer in learning activities; difficulties in organizing conversations, especially brainstorming ones; the necessary equipment that not everyone benefits from.

Table 1 Teachers' perception of the differences between the online model and the traditional teaching-learning-assessment model during the pandemic

The traditional model of teaching-learning-assessment	The online teaching-learning-assessment model
physical contact with students, develops the social component	there is no physical contact between teacher- students, pupils-students
fewer digital techniques and tools that can be used if the school is not properly equipped	more digital techniques and tools that can be used
higher degree of participation of students and their full supervision	lower student participation (not all students open their webcam)
the existence of cooperation in solving work tasks, within the legal limit of physical distancing	fewer collaborative learning activities between students
sufficient time allotted to the class (50 minutes)	diminished time of the class time (40 minutes)
safer assessment, both quantitatively and qualitatively, but more cumbersome for the teacher, involves consumables	inconclusive but quick assessment (students can copy from each other by submitting answers, search for answers on the internet or receive answers from family members)
making practical applications in the field	making practical only virtual applications

Among the causes mentioned by the teachers who determined the negative effects of the teaching activity during the development of the traditional teaching-learning-assessment model during the pandemic: a weaker communication due to masks; the large number of students in the class, which does not allow for proper distancing; uncertainty and chaos of the decisions of the ministry; lack of the technical endowments with the help of the didactic activity contributes to a better performance; restriction of the application of the sheets and tests; the ban on teamwork, the lack of interaction with the school environment as a whole. Other causes specified by this are: the fact that there was no continuity of the "physical" school, created among the students called a state of indifference, the tendency not to take things seriously; the need for socialization, especially in the moments of return, created more inattention and indiscipline during class; the poor quality of the Internet or its interruption of electricity; uncertainty as a negative and stress effect in the didactic activity; the impossibility to schedule assessments in the classroom as planned at the beginning of the year, the establishment of remedial and extracurricular activities.

Regarding the causes that have determined the positive effects of the teaching activity during the development of the traditional teaching-learning-assessment model during the pandemic: the tablets offered from the state; restricted physical contact of the students; various teaching and assessment tools; reteaching of some didactic contents and their fixation; the empathy shown by the teachers to the students, which helped them to overcome frustrating moments; attendance at school; re-examination of extracurricular activities; the joy of returning to school physically helps students mentally and increases their motivation; the teacher can identify certain gaps in learning early and fix them at the right time. Also, other causes mentioned are: the education staff has self-formed in the sense of teaching using modern means (tablets, smart boards, etc.); developing digital skills; reducing the hours lost in traffic and decreasing the interaction with other people, so a low risk of infection (thus the related fatigue was also reduced, time used to upload materials on the platform or to participate in professional development activities).

Among the solutions to improve the instructive-educational process regarding the traditional model of teaching-learning-assessment during the pandemic: the initiation of blending teaching; reducing the number of students in the classroom; relaxation of matter; keeping the work with digital instruments during hours; the existence of the single textbook, so that all students have access to the same information. Other solutions specified by the teachers are: the preparation of the classes with modern technology and of the students with interactive working tools; the formation of the teachers in connection with the modern teaching system, using the new technologies; a stability of the scenario of carrying out the instructive-educational activity; the preservation of the possibility to upload online materials and the online students roll.

Regarding the solutions to improve the instructive-educational process regarding the online model of teaching-learning-assessment during the pandemic: the obligation of keeping the rooms open; the creation of objective assessment platforms; decongestion of matter; organizing free of charge some training courses on online teaching strategies; re-organizing a database in which to find both teaching materials and assessment materials (standardized tests, digital textbooks, etc.); equipping schools with electronic means appropriate to online learning.

Regarding the measure that geography teachers consider that they have made an effort to increase the quality and accessibility of the content taught to the 2 teaching-learning-assessment models during the pandemic: **Very high: 58.8%**; Large: 35.8%; Average: 5.4%.

Regarding the extent to which teachers consider that the competent institutions have made an effort to increase accessibility to the means of training necessary to carry out a qualitative educational process during the pandemic: 1-None=20.6%; 2-Putin=17.6% 3-Moderate=**38.2%**; 4- Very much=17.6%; 5-Extremely much=5.9%.

To the last question, regarding the extent to which they consider that visible learning has been transparent for all beneficiaries of education during the pandemic: 1-None=14.7%; 2-Little=14.7% 3-Moderate=38.2%; 4-Very much=26.5%; 5-Extremely much=5.9%.

4. DISCUSSIONS

The correlation between the two distinct components of the study: (1) comparative analysis, based on personal experience in the classroom and (2) the perception of teachers teaching geography is given by the fact that the results obtained with students based on personal experience in the classroom are positively influenced by the use of the learning-evaluation platforms and the traditional model, analyzed and validated results and teachers' perception of the two teaching-learning-evaluation models.

In the proposed research we investigated the similarities, differences, causes and effects of online and traditional teaching-learning-assessment models during the pandemic, based on the perception of teachers and the scores obtained compared to the students' assessment. Based on the interpretation of their results, we consider the purpose of the study to identify the optimal solutions for the future.

The results showed that the students who benefited from the Google Forms teaching-learning platform and their own javascript game created in the contents about the Hydrosphere (five lessons in the ninth and fifth grades and one lesson in the sixth and ninth grades) obtained **similar results** in the assessment in the two teaching-learning models. Also, for the other contents (four lessons in the ninth and fifth grades and eight lessons in the sixth and ninth grades), the results from the formative assessment on the Kahoot learning platform! from the traditional teaching-learning model compared to those in the online model, it shows us **large differences** in scores obtained, with significant values, highlighting as a result the school progress of the students.

The results obtained reflect that the **positive influence factor** for most classes is the traditional model, since in this model all students take notes under the direct observation of teachers and all carry out the proposed learning activities.

In the online teaching-learning model, the **negative factor** is the non-bindingness of the opening of the rooms, so that not all students can be supervised by teachers, who may have completely different concerns during the teaching-learning conduct sequence, and in the assessment to participate and respond randomly and wrongly, thus highlighting the lower results.

We identify other **as causes** of lower outcomes: the rapidity of students to give answers to the formative Kahoot game assessment! (being a game that achieves a top according to the speed in the first place), the shorter time to some questions, which require critical thinking, especially in middle school students and the degree of difficulty of the contents of the lessons studied (some are easier to learn from the class, others require a longer study time at home as well).

Learning-evaluation platforms and the model these results highlight that the variable that positively influenced the results is the training, so that all students are trained in the educational process and use appropriate teaching-learning-evaluation platforms. Also, the legislation in the online model negatively influenced the results, as those who were careless during teaching-learning, who did not formulate responses to learning activities during class time, but who participated in the Kahoot! Game evaluation test, achieved very poor results.

The results of the research obtained have also demonstrated the criteria for success, by using the Google Forms tool, the Kahoot learning platform! and the game's own JavaScript, which improves the quality of the educational process and provides active participation among all students in a class.

The results **of the research indicate similarities** in the perception of teachers regarding the teaching methods and the means of instruction used in all two models of teaching-learning-assessment.

The effects identified are positive in particular with regard to the traditional teaching-learning model. The perception of teachers is that this type of education cannot be replaced by the online model, only restricted during the pandemic, but only with the support of the institution in providing it training means. Financial problems are also identified in other recent studies (Almaiah et al., 2020).

As a negative effect identified in the online model is that teachers are concerned that practical activities are lacking, as demonstrated by other studies (Peloso et al., 2020; Roy et al., 2020).

Other negative effects of the online teaching-learning model perceived by teachers: technical problems, lack of direct communication, reinforced aspects and the lack of motivation of students (Klapkiv & Dluhopolska, 2020). Also, the non-compulsoriness of opening the cameras during the online course creates repercussions over time: reduced presence in virtual classes than in face-to-face classes (Edelhauser & Lupu-Dima, 2021) and the fact that students develop less oral communication competence and can fraud in tests (Mukhtar et al., 2020).

Through the results of the research on identifying the negative effects of the two teaching-learning-assessment models, it is recommended that **optimal solutions**: teachers should improve in terms of digital pedagogy, a fact also demonstrated by other studies (Mulla et al., 2020) and motivating students not to lose interest in time, as they are presented in other specialized works (Gewin, 2020).

Solutions for all two models of teaching-learning-assessment are also represented by the supervision and involvement of all students in the teaching-learning process, which will lead to ensuring school progress. As optimal solutions for teaching is the use of active-participatory methods and modern IT training means, which include learning activities for all students of the class. Also, as an optimal solution for the assessment, it is the permanent (formative) one, in the form of an interactive game, agreed by the students.

The solutions identified are also apparent from the hypothesis initially delineated. Thus, the quality of teaching depends on vocational training, technological facilities in school, the needs of teachers and students, as other researchers have demonstrated (Ana et al., 2020). Providing teaching materials for teachers and students and obtaining feedback from teachers and students should thus be a priority.

Also, the results obtained showed first of all that the choice of teaching-learning strategies and appropriate assessment tools by the teaching staff, develops a deeper understanding of the Geographical concepts and phenomena by the students (Ruan et al., 2021).

The proposed methodological addition contributes to the completion of the practical approaches of the assessment tools and of the effective teaching-learning methods.

5. CONCLUSIONS

The results of this study will be of interest to the literature on assessment tools and teaching-learning models through new technologies for the pre-university education sector.

The study also has certain limitations that need to be taken into account. One of the main limitations is the one regarding the size and origin of the sample (392 students, of a single Romanian high school and 340 teachers only of the geography specialization).

Another limitation of the study may be the fact that a high school in the study area has been relocated to another premises and still does not have the technology necessary to conduct classes with sufficient teaching means (especially video projector or Smart blackboard), the teacher and students making special efforts to ensure the minimum necessary ICT training means.

Possible lines of future research could be the analysis of studies on larger samples from many geographies and teachers with more specializations.

However, this study provides a list of optimal solutions for carrying out a quality educational process to the current pandemic requirements, following the interpretation of the questionnaire on teacher perception, as well as other researches propose as a solution for teachers to focus on improving the virtual or physical engagement of students (*Nepal & Ann, 2020*). As solutions identified for practice: the permanent use of the formative assessment during a class with the help of an interactive game, in relation to the learning objectives of the lesson, which transforms the student into an active and motivational agent of learning, and for the teacher provides the criteria for success by monitoring the students' progress, thus being able to intervene and quickly remedy their gaps.

We also note the need to complete the results obtained in the permanent assessment, in order to analyze the results, through which teachers can ensure the access of students' learning through the proper implementation of the teaching strategies.

As for the work of all students, the implemented methods of teaching in the study require constant and increased attention, electronic devices, permanent and quality internet connection. At the same time, participatory methods of learning through discovery and assessment through play develop cognitive intelligence skills for students, a responsible and motivational attitude towards learning, and improve students' competences.

In addition, this study examined that google forms tool, Kahoot learning platform!, Powerpoint presentation, Javascript's own game have a positive effect of learning and assessment, especially these four digital technologies energize the students of the class, and for the teacher they are motivating tools of the teaching activity. The use of digital technology is also suitable for measuring and accepting e-learning tools, as demonstrated by various research (Joo et al., 2014; del Barrio-García et al., 2015).

The main contribution of this study also reveals from the application of an effective teaching-learning method for middle and high school students, based on the Google Forms tool and its own JavaScript game, which differentiates it from other teaching-learning methods, in the sense that it facilitates the attention of all students and the students' results are better. In order for such a method to work effectively, it is important to promote and encourage their use among students and teachers.

Although the tools applied as different digital technologies have already existed and have been studied in the literature as assessment tools, this study explains the use with an original approach, centered on the Google Forms tool and its own JavaScript game as an active method of teaching-learning and learning activities for all students of a class.

The results of the study suggest that the test results obtained by students are significantly more valuable in those who have used the two learning tools and may be recommended for ICT analysis applied to e-learning in school education, which allows the student to be an active agent in the learning process, as well as other Google applications (Rejón-Guardia et al., 2019).

This study supports previous research, that standardized assessment of student outcomes using the interactive Kahoot exercise! improves students' motivation for learning and the subject of study, combined with methodological approaches to teaching (Dolezal et al., 2018).

The study evaluates four cause-and-effect relationships (learning – effective teaching - good results in assessment - positive perception in the two models of teaching-learning-assessment), proposing that they have an influence on the concern of the use of ICT in school education. This research makes a major contribution, since, to date, no other study has shown how significant the effect on assessment tests is in the context of the pre-university education system in terms of the interest shown in using a teaching-learning method based on the Google Forms tool/JavaScript game, combined with the PowerPoint presentation.

Author contribution. Writing - preparation of the original project, F.T and D.C.D.; writing - review and editing, F.T, D.C.D. and B.O.; Methodology, F.T and

D.C.D.; Validation D.C.D. and F.T. All authors read and agreed to the published version of the manuscript.

REFERENCES

1. Ana, A., Minghat, A.D., Purnawarman, P., Saripudin, S., Muktiarni, M., Dwiyantri, V. & Mustakim, S.S. (2020). Students' Perceptions of the Twists and Turns of E-learning in the Midst of the Covid 19 Outbreak. *Revista românească pentru educație multidimensională*, 12(1), Suppl. 2, 15-26.
2. Almaiah, M.A., Al-Khasawneh, A. & Althunibat, A. (2020). Exploring the Critical Challenges and Factors Influencing the E-Learning System Usage during COVID-19 Pandemic. *Education and Information Technologies*.
3. Ahadi, A., Bower, M., Singh, A. & Garrett, M. (2021). Online Professional Learning in Response to COVID-19-Towards Robust Assessment. *Future internet*, 13(3),56, doi:10.3390/fi13030056.
4. Day, T., Chang, I.C.C., Chung, C.K.L. Doolittle, W.E., Housel, J. & McDaniel, P.N. (2020). The Immediate Impact of COVID-19 on Postsecondary Teaching and Learning. *Professional Geographer*, 73(1), 1-13. DOI: 10.1080/00330124.2020.1823864.
5. Edelhauser, E. & Lupu-Dima, L. (2021). Is Romania Prepared for eLearning during the COVID-19 Pandemic? *Sustainability*, 12(13), article number: 5438. <https://doi.org/10.3390/su12135438>
6. del Barrio-García, S., Arquero, J. L. & Romero-Frías, E. (2015). Personal learning environments accept ance model: The role of need for cognition, e-learning satisfaction and students' perceptions. *Journal of Educational Technology and Society*,18(3),29–141.
7. Dolezal, D., Posekany, A., Motschnig, R., Kirchweiger, T. & Pucher, R. (2018). Impact of game-based student response systems on factors of learning in a person- centered flipped classroom on C programming. In *EdMedia+ innovate learning*, 1143–1153, *Association for the Advancement of Computing in Education (AACE)*.
8. Gewin, V. (2020). Into the Digital Classroom. Five Tips for Moving Teaching Online as COVID-19 Takes Hold. *Nature*, 580(7802), 295-296. DOI: 10.1038/d41586-020-00896-7
9. Glover, M. J. (2020). Google Forms can stimulate conersations in discussion-based seminars? An activity theory perspective. *South African Journal of Higher Education*34(1), 99-115. <http://dx.doi.org/10.20853/34-1-2814>
10. Hill J., Walkington H. & King H. (2018). Geographers and the scholarship of teaching and learning. *Journal of Geography in Higher Education*, 42(4), 557-572. <https://doi.org/10.1080/03098265.2018.1515188>
11. Howley, D. (2021). Experiences of teaching and learning in K-12 physical education during COVID-19: an international comparative case study. *Physical education and sport pedagogy*, DOI: 10.1080/17408989.2021.1922658

12. Ismaili, Y. (2021). Assessment of students' attitude toward distance learning during the pandemic (Covid-19): a case study of ELTE university. *On the Horizon*, 2021, 29(1),17-30, DOI: 10.1108/OTH-09-2020-0032.
13. Iwamoto, D. H., Hargis, J., Taitano, E. J. & Vuong, K. (2017). Analyzing the efficacy of the testing effect using Kahoot™ on student performance. *The Turkish Online Journal of Distance Education*, 18(2), 80–93.
14. Jo, I., Huh, S., Bannert, A. & Grubb, K. (2020). Beginning the Journey to Creating an Active Online Learning Environment: Recommendations from Graduate Students. *Journal of Geography*, 119(6), 197-205. DOI: 10.1080/00221341.2020.1821085
15. Joo, Y. J., Lee, H. W. & Ham, Y. (2014). Integrating user interface and personal innovativeness into the TAM for mobile learning in Cyber University. *Journal of Computing in Higher Education*,26(2), 143–158. <https://doi.org/10.1007/s12528-014-9081-2>
16. Klapkiv, Y. & Dluhopolska, T. (2020). Changes in the Tertiary Education System in Pandemic Times: Comparison of Ukrainian and Polish Universities. *Revista românească pentru educație multidimensională*, 12, 1, Suppl. 2, 86-91. DOI: <https://doi.org/10.18662/rrem/12.1sup2/250>
17. Li, MY. & Su, YW. (2020). Assessment of Online Teaching Quality of Basic Education Based on Artificial Intelligence. *International journal of emerging technologies in learning*, 15(16), 147-161, DOI: 10.3991/ijet.v15i16.15937.
18. Moser, M.K., Wei, T. & Brenner, D. (2020). Remote teaching during COVID-19: Implications from a national survey of language educators. *System*, 97. <https://doi.org/10.1016/j.system.2020.102431>.
19. Mukhtar, K., Javed, K., Arooj, M. & Sethi, A. (2020). Advantages, Limitations and Recommendations for Online Learning during COVID-19 Pandemic Era. *Pakistan Journal of Medical Sciences*, 36(4), SI, S27-S31.
20. Mulla, Z.D., Osland-Paton, V., Rodriguez, M.A., Vazquez, E. & Plavsic, S.K. (2020). Novel Coronavirus, Novel Faculty Development Programs: Rapid Transition to eLearning during the Pandemic. *Journal of Perinatal Medicine*, 48(5), 446-449. doi: 10.12669/pjms.36.COVID19-S4.2785.
21. Murphy, M.P.A. (2018). "Blending" Docent Learning: Using Google Forms Quizzes to Increase Efficiency in Interpreter Education at Fort Henry. *Journal of Museum Education*, 43(1), 47-54, DOI: 10.1080/10598650.2017.1396435.
22. Nepal, R. & Ann, M.R. (2020). From Theory to Practice of Promoting Student Engagement in Business and Law-Related Subjects: The Case of Undergraduate Economics Education. *Educate. Sci.*,10, 205. <https://doi.org/10.3390/educsci10080205>
23. Nurkka, N., Vineyards, J., Littleton, K. & Lehesvuori, S. (2014). A methodological approach to exploring the rhythm of classroom discourse in a cumulative frame in science teaching. *Learning, Culture and Social Interaction*, 3(1), 54- 63. <https://doi.org/10.1016/j.lcsi.2014.01.002>.

24. Prieto-Ballester, J.M., Revuelta-Dominguez, F.I. & Pedrera-Rodriguez, M.I. (2021). Secondary School Teachers Self-Perception of Digital Teaching Competence in Spain Following COVID-19 Confinement. *Education Science*, 11,8,407, DOI: 10.3390/educsci11080407.

25. Peloso, R.M., Ferruzzi, F., Mori, A.A., Camacho, D.P., da Silva Franzin, L.C., Teston, A.P.M. & Freitas, K.M.S. (2020). Notes from the Field: Concerns of Health-Related Higher Education Students in Brazil Pertaining to Distance Learning During the Coronavirus Pandemic. *Assessment & The Health Professions*, 43(3), 201-203. <https://doi.org/10.1177/0163278720939302>

26. Roy, H., Ray, M., Saha, S. & Ghosal, K.A. (2020). A Study on Students' Perceptions for Online Zoom-app based Flipped Class Sessions on Anatomy Organised during the Lockdown Period of COVID-19 Epoch. *Journal of Clinical and Diagnostic Research*, 14, 6, AC01-AC04.

27. Rejón-Guardia, F., Polo-Peña, A. I. & Maraver-Tarifa, G. (2019). The acceptance of a personal learning environment based on Google apps: the role of subjective norms and social image. *Journal of Computing in Higher Education*, 32(2), 203- 233, DOI: 10.1007/s12528-019-09206-1.

28. Rodriguez-Muniz, L., Buron, D., Aguilar-Gonzalez, A. & Muniz-Rodriguez, L. (2021). Secondary Mathematics Teachers' Perception of Their Readiness for Emergency Remote Teaching during the COVID-19 Pandemic: A Case Study. *Education Sciences*, 11(5), 228.

29. Ruan, L., Long, Y., Zhang, L. & Lv, G. A. (2021). Platform and Its Applied Modes for Geography Fieldwork in Higher Education Based on Location Services. *ISPRS Int. J. Geo-Inf.*, 10, 225. DOI: 10.3390/ijgi10040225.

30. Sebastián-Alcaraz R. & Tonda-Monllor E.M. (2020). Geoinformation for democratic memory. *Cuadernos Geograficos*, 59(2), 129-148, DOI: 10.30827/cuadgeo.v59i2.9632390/educsci11050228.

31. Siess, D. (2021). Teaching philosophy (also) with the network the creative opportunities of digital education. *Comunicazione filosofica*, 46, 54-59.

32. Sim, D., Boyle, E., Leith Murray, S., Williams, A., Jimoyiannis, A. & Tsiotakis, P. (2020). Learning about Europe through educational gaming, *Journal of Geography in Higher Education*, 45(1), 155-161, DOI: 10.1080/03098265.2020.1803816

33. Schultz, R. & DeMer, M. (2020). Transitioning from Emergency Remote Learning to Deep Online Learning Experiences in Geography Education. *Journal of Geography*, 119(5), 142-146. DOI: 10.1080/00221341.2020.1813791

34. Scoular, C. & Care, E. (2020). Monitoring patterns of social and cognitive student behaviors in online collaborative problem solving assessments. *Computers in human behavior*, 104, DOI: 10.1016/j.chb.2019.01.007.

35. Taylor, B. & Reynolds, (2018). E. Building vocabulary skills and classroom engagement with Kahoot!. In *26th Korea TESOL international conference*, 89. Seoul, Korea.

36. Tang, T., Abuhmaid, A.M., Olaimat, M., Oudat, D.M., Aldhaeabi, M. & Bamanger, E. (2020). Efficiency of flipped classroom with online-based teaching

under COVID-19. *Interactive learning environments*, DOI: 10.1080/10494820.2020.1817761.

37. Tao, C. (2020). An Assessment Model of the Online Learning Effect Based on Fuzzy Mathematics. *International journal of emerging technologies in learning*, 16(10), DOI: 10.3991/ijet.v16i10.22749.

38. Toma, F., Diaconu, D.C. & Popescu, C.M. (2021). The Use of the Kahoot! Learning Platform as a Type of Formative Assessment in the Context of Pre-University Education during the COVID-19 Pandemic Period. *Education Science*, 2021, 11, 649, DOI: 10.3390/educsci11100649.

39. Zhang, Y. (2020). The Development of an Assessment Model to Assess the Effect of Online English Teaching Based on Fuzzy Mathematics. *International journal of emerging technologies in learning*, 16(12),186-200, DOI: 10.3991/ijet.v16i12.23325.

40. Wang, A. I. & Lieberoth, A. (2016). The effect of points and audio on concentration, engagement, enjoyment, learning, motivation, and classroom dynamics using Kahoot!, in *Proceedings from the 10th European conference of games based learning*, Academic Conferences and Publishing International Limited.

41. Wang, A.I. & Tahir, R. (2020). The effect of using Kahoot! for learning – A literature review. *Computers & Education*, 149, 103818. <https://doi.org/10.1016/j.compedu.2020.103818>

42. Wang, SR., Liu, Y., Song, FH., Xie, XJ. & Yu, D. (2021). Research on Assessment System of User Experience with Online Live Course Platform. *Ieee access*, 9, 23863-23875, DOI: 10.1109/ACCESS.2021.3054047.

43. Xu, X. & Liu, F. (2021). Optimization of Online Education and Teaching Assessment System Based on GA-BP Neural Network. *Computational intelligence and neuroscience*, 8785127, DOI: 10.1155/2021/8785127.