

## DIGITAL WHITEBOARDS AS A FORM OF EFFECTIVE COMMUNICATION IN BLENDED LEARNING ENVIRONMENT

**Dr. Milena Levunlieva, Assoc. Prof.**  
South-West University "Neofit Rilski" (Bulgaria)

**Abstract.** The present study offers a constructivism-informed answer to the question what to do in post-Covid environment when school-goers share an almost universal assumption that studying does not necessarily mean being at school. To pursue this goal, the survey method is used in exploring students' changed perceptions of learning. These perceptions arguably stem from the past 2 years of lockdowns when blended learning became the only form of reaching both on-ground and online students attending the same classes. The focus is on a technology specifically designed to improve computer-mediated communication and enhance its role in student motivation and the evaluation of both the quality of educational results and the process of their achievement in blended learning environment. The survey, conducted with high school students, gives grounds to optimize electronic courses and encourages a re-conceptualization of the application of blended learning during on-ground classes in the light of students' perceptions for streamlining the educational process in terms of both time and resources.

**Keywords:** knowledge construction; computer mediated communication; communicative strategy; effective communication; blended education

### Introduction

The introduction of e-learning in relation to the safety measures imposed by COVID-19 has confronted educational theory and practice world-wise with questions that still await adequate solutions. The problem is further complicated by the fact that there is "no adequate approach to the specific needs of teachers and education specialists, who have to use information technology to improve and facilitate their work" (Tsankov & Damyanov 2017, p. 23).

Against this backdrop, the question facing any educational establishment in post-Covid conditions is how to get students back into the classrooms?

In the spring of 2022 schools of all types and levels were faced with a problem directly related to what we experienced over the past 2 years. Instead of going back to the classrooms, many students chose to study on-line under the premise that once

they had succeeded, they would pass their tests and exams again without actually being at school. The present study explores students' perspectives on the use of blended, electronic and traditional, forms of education to facilitate effective learning and teaching both for those in class and for those who have chosen to stay at home.

### **1. Research context of the study**

The main issue explored in this study concerns the application of blended teaching techniques (digital whiteboard) to include effectively on-ground and online students in the pedagogical communication.

To uncover students' attitudes and perceptions of blended education in these conditions, it adopts the constructivist understanding of communication as a process of becoming through which reality is constructed, rather than as a here-and-now situation (Zhang 2019). It takes a strand according to which "individual humans are cognitively autonomous beings" and nobody "can be forced to understand something as intended, as it exists or as it should be" (Krippendorf 1993, p. 17) and, drawing on the tenets of social constructivism, makes a distinction between learning and the construction of knowledge, placing both in the context of communication. While learning is an internal, unobservable process leading to re-conceptualizations of beliefs, attitudes, or skills, knowledge construction results in the creation or modification of socially meaningful or relevant knowledge (Scardamalia & Bereiter 2006). If social constructivism defines learning as dependent on the social environment, within which it takes place on the basis of self-organization, self-control and collaboration (Vygotski 1978; Bruner 1962, 1985), then learning and knowledge depend on the social and cultural context of the learning situation (Jha 2017), defined here as a specific communicative situation. In fact, "learning" is a communicational phenomenon ... affected by that cybernetic revolution in thought ... triggered by the engineers and communication theorists" (Bateson 1972). In the above setting, electronic means of teaching and communication are "essential to education and should be considered not as part of the pedagogy but as inseparable from the pedagogical process" (Jha 2017, p. 70).

This conception fully pertains to a time when "[s]piritual spaces have been replaced by the rhythms of technology and telecommunications. A virtual reality has been built, and technology has revolutionized culture" (Penev 2021, p. 115) wherein "the future of the post-Covid-19 society implies the development of new forms of living and new forms of interaction, including teaching and learning" (Doneva & Kiryakova-Dineva 2021, p. 7524).

Against this background, the question arises, what is the role of computer-mediated communication in knowledge construction? In a meta-research on the perceptions of its role in social and pedagogical spaces, L. Nguyen demonstrates that traditionally this form of communication has been interpreted dually. It is seen both as a tool for interaction and as a communication process.

In its instrumental role, computer-mediated communication is viewed as a technological means that provides the environment for interaction. In its role as a communication process, it is actualized in the context of the sociocultural factors that define its elements – message, sender, recipient, etc. (Nguyen 2008, p. 24).

Bringing to the fore its characteristics the researcher offers a thorough application-oriented interpretation, according to which computer-mediated communication, synchronous and asynchronous, functioning as a process, but also as a product, enhances active learning, boosts the role of reflective learning, encourages learner autonomy and creates conditions for learning through collaboration (Nguyen 2008, p. 30). All these characteristics define computer-mediated communication as an opportunity to apply the constructivist approach to knowledge generation, considered as a process of interaction and exchange among individuals in which learners “are given the opportunity to enhance their learning experience” in “purposeful exchanges with other humans (and with on-line databases) both synchronously and asynchronously” (Salaberry 1996, p. 5).

This, however, is only one aspect of the process. Phillips (1995) demonstrates that knowledge construction is achieved in the context of the diverse roles that communicators adopt (the learner, the social learner, the creative learner) specifying that learning is a social construct and knowledge attainable through meaningful interaction with others. This notion forms the foundation of one of the main constructivist conceptions of knowledge as a construct, but also as a product that is created and recreated in the shared universe of the interlocutors. This continuous creation of new knowledge, manifested in communication, requires the active role of the learner in its discovery (Pritchard & Woppard 2010).

In this context, it is possible to assume that a blended teaching technique employing the creation of multimedia presentations in real time while introducing the instructional content to the students, writing down the key relations, dependencies, rules, or exceptions in the form of infographics, tables, diagrams designed in class in front of and together with the students, is a compensatory mechanism in the conditions of blended learning. Compensatory interactional mechanisms are by definition communicative strategies. In this case the strategy fulfills a dual role: 1. it encourages students to take part in the process of transforming the instructional content into a digital product (hereafter digital whiteboard) of the type they use often and with great ease; 2. this digital product can easily be sent to all students in the group, which provides them with both the study materials in the platform for synchronous and asynchronous learning used by the school and with the simplified but interactive version of these materials created in class jointly with the teacher. And by ‘interactive’ I do not mean digital, but created with the students’ help and based on their feedback, questions, and examples.

Santoro (1995) defines computer-mediated communication as “the use of computer systems and networks to transfer, store and retrieve information among people” (Santoro 1995, p. 11). Salaberry elaborates on this definition by highlighting the three categories it includes: computer-assisted learning, information, and communication services. These three categories define the role of computer mediation in the natural interaction between people as a continuum (Salaberry 2001, p. 14). This mutual predication and co-existence of electronic forms of learning – the information field constantly up-dated on the Internet and the communication opportunities it gives – determine the multi-faceted nature of the application of electronic means of communication in the learning process, while at the same time creating a research ‘vacuum’ where the three categories of computer-mediated communication can easily be confused. Electronically submitted assignments, e-mails, and presentations with information on course content are not necessarily a form of e-learning. For this purpose, the approach within which such means are used must be focused and oriented towards the student as the subject and active participant in the classroom interaction. In the absence of such a framework, the use of electronic forms and learning tools is simply a medium for more flexible communication between students and teachers, but it does not necessarily guarantee an effective exchange along the communication channel. More globally, the required combination between learner-centred classrooms and CMC in education will ultimately lead to a new taxonomy of teacher competences (Mata & Suciu 2011, p. 277).

In the post-Covid situation the environment proves conducive to teacher competence development by seeking adequate ways to include all students in the learning process, whether they are in the classrooms or not. The survey was aimed at establishing the effectiveness of the designing of digital whiteboards as didactic products in real time, together with the students, and explores whether these products are useful for people who are not present in the classroom but have access to them. The products include presentations, diagrams, tables, infographics, models demonstrating classification characteristics of the categories included in the instructional content – modal verbs, conditionals, wishes and regrets about the past and present, verb patterns, non-finite verb forms, matrices for the comparison of words from the same thematic field, set of synonyms, words expressing aspects of abstract conceptual categories, such as morality, interpersonal relations, mind and understanding, states and emotions.

## **2. Method**

### *2.1. Participants*

A total of 48 students aged 18 or 19, took part in the study. They were in their 4<sup>th</sup>/5<sup>th</sup> year at the Foreign Languages High School and the High school of Maths and Sciences – Blagoevgrad, preparing for their standardized exams of ESL at the

English Language Institute at the American University in Bulgaria. After a period of online education, on-ground studies were renewed for three months during the spring semester of 2022 (March – May) and for yet another month during the summer school (July 2022). Over these four months some students transferred temporarily to online education for health or other reasons, and others had originally registered for the courses as online students. This variation in the forms of education during the courses necessitated the application of flexible teaching techniques that made it possible for topics discussed in class to be visualized, synthesized and stored in a format equally accessible to all students regardless of their form of education – on-ground or online.

### *2.2. Materials and procedure*

The survey contained 19 statements and invited students to respond saying whether they agree, disagree or cannot decide on their validity. All items were aimed at establishing the effectiveness of designing digital whiteboards as didactic products – in real time, together with the students. The relative shares of students' answers were calculated using the functionalities of Excel. A digital whiteboard is ultimately a file which includes everything that would otherwise be written on the whiteboard. Unlike traditional whiteboards, however, the digital one is composed in collaboration with the students, eliciting examples, relevant information or preferred forms to systematize the instructional content. For the purpose, the classroom computer is used to project the content of the digital whiteboard on the multimedia screen.

### **3. Results and discussion**

The survey conducted at the end of the spring and the summer semesters answers two questions: 1. Is the use of didactic products designed in class with the active participation of students effective in reaching more people in and outside the classroom?; 2. What is the nature of these products – do they contribute to the implementation of effective learner-centred blended learning or do they simply create an environment in which communication with students is more flexible?

This implies an analysis of students' perceptions of the learning opportunities created by the availability of electronic didactic products, designed to enhance educational interaction in class regardless of the form of education. The survey pursues these questions by directing students' reflection to several groups of statements aimed at establishing: 1. commitment to the learning process, the other students and the teacher; 2. motivation and preparation for classes; 3. opportunities to manage time in class and while studying; 4. evaluation of teacher's support; 5. perceptions of the quality of the process and product of learning; 6. students' view of the role of academic integrity.

Students' responses to the 19 statements in the survey gave information on 4 criteria of the quality of education presented in Table 1.

**Table 1.** Criteria for evaluation of digital whiteboard application in blended learning environment

Criteria	1. Motivation	2. Product quality	3. Role of academic integrity	4. Time management
I N D I C A T O R S	1.1. Commit-ment to the process as a whole	2.1. Quality of the process	3.1. Appreciates the role of academic integrity	4.1. level of organization of classwork activities
	1.2. Effective communication with class mates	2.2. Course design		
	1.3. Collaboration and effective communication with the instructor	2.3. Course content 2.4. Support from the instructor	3.2. Does not appreciate the role of academic integrity	4.2. Level of organization of preparation at home

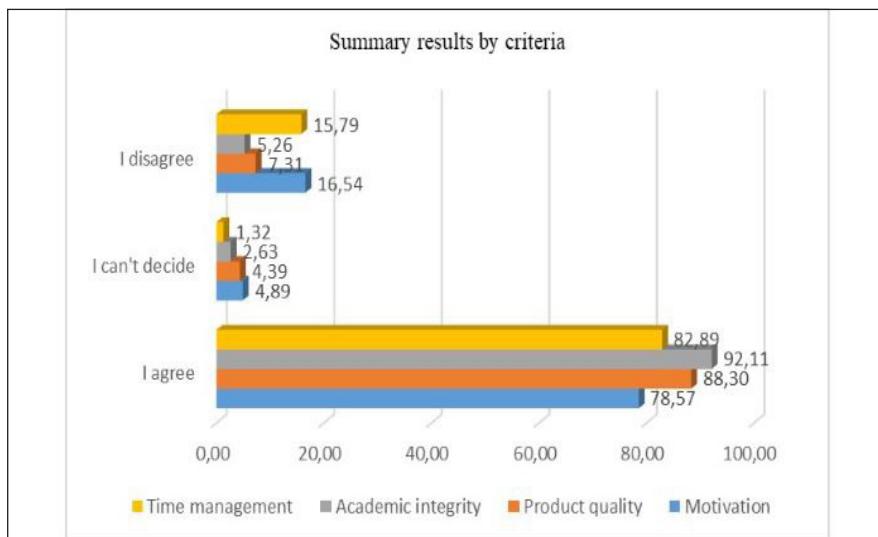
The informants were invited to share views on the function of blended learning techniques used during the post-Covid situation and to confirm/reject the assumption of their role as a compensatory mechanism – a communication strategy contributing to effective learner-centred education. Within the criterion of motivation, 73,68% of the respondents feel more engaged with the learning process when they have materials from classwork activities available as files, and 78,95% believe that this provides them with more opportunities for reflection, indicative of their active role in learning and constructing new knowledge. Another statement, giving evidence of students' commitment to the learning process, deals with increased opportunities to access pertinent and highly structured information – 84,21% of all the respondents believe that they have better access to information vital for the successful completion of the course, with a close relative share of students (89,47%) indicating that they study for classes by familiarizing themselves first with the digital whiteboard prepared in collaboration with the instructor and made available to them by e-mail and/or Messenger. As the analysis shows, this also leads to an increased likelihood for students to ask questions in class (76,32% of the students agree while only 21,05% disagree with the statement).

The same share of students, 76,32%, testify to a pronounced interest in classes providing such digital whiteboards, and 71,05% think that this improves peer communication. The data on the last three aspects of blended learning and digital whiteboards as a communication strategy in combination with those on the overall commitment of students to the process of learning and teaching in mixed, on-ground and online, educational environment indicate the establishment of fruitful and effective communication, between teacher and learners, and among learners. Students' views of these aspects of blended learning demonstrate that a supportive environment has been established, in which they build their own knowledge system at a pace appropriate for everyone with the help of both the instructor and their classmates. Arguably, the opportunity for individual internalization based on personal

experience and prior knowledge stems from the fact that students themselves provide the examples illustrating specific instructional content. This process has a dual function. First, the examples come from students' own areas of interest and knowledge, which makes them easier to retain. Second, the students offering the examples, make actual use of the category presented or the word being introduced, which stimulates heuristic thinking. The above argument is substantiated by the analysis of the results concerning the Quality of Education criterion (with its indicators Process Quality, Course Design, Course Content and Teacher Support), where 84,21 % of the students pointed out that the time for the instructor to answer questions asked electronically was shorter, and only 5,26% found it difficult to decide. 94,74% felt that the teacher answered their questions clearly and quickly. These results give further grounds for the earlier conclusion that the technique of designing digital whiteboards can function as a communication strategy – a compensatory mechanism in the context of blended learning in the post-Covid situation. This conclusion is further substantiated by the fact that for 94,74% of the respondents the learning activities are suited to the achievement of educational results, and 81,58% consider the allocated class time sufficient to master the instructional content. Interestingly, none of the participants gave an "I can't decide" answer to the statement on the relevance and adequate amount of class activities in view of the instructional content, while a whole of 10,53% were unable to make a positive or a negative choice concerning the allocated class time. This considerable difference is attributable to students' undoubted awareness of what they need to achieve educational results, which is apparently not matched by an equally strong persuasion that they also know how this can be effected through their class organization.

The assumption that in the post-Covid situation blended learning can be implemented successfully both as a form of organization of the educational process and as a relevant medium for the use of digital whiteboards as a communication strategy is also confirmed by the fact that 76,32% think the level of organization of classroom activities is conducive to academic success, which correlates with their assessment of their increased level of self-organization during class preparation at home – 89,47% find it to be more effective in the conditions of blended education when a digital whiteboard accompanies the study materials.

The above results suggest a high degree of satisfaction with both course design and teacher support. Within the Quality of Learning criterion, the results for the Course Content indicator are of particular importance for assessing the role of digital whiteboards during blended learning. 94,74% of the respondents rated the digital whiteboards accompanying the classes as significantly empowering the learning process, while 84,21% of them prefer these materials to be available to all students in the course rather than only to those who are actually present in class. Regarding the quality of the learning process within a computer-mediated education wherein the materials created with their help are available after classes, 86,84% of the respondents think that the course meets their expectations, and 92,11% are satisfied with blended learning as a whole.



**Figure 1.** Results of the survey summarized by criteria

Figure 1 demonstrates the results of the survey by criteria. Their interpretation shows that, overall, the degree of student satisfaction with the quality of the product offered is very high – 92,11%, a relative share that is only commensurate with the high percentage of students – 88,30%, who consider the role of academic integrity in blended learning essential – an issue that is yet to be resolved when it comes to conducting exams online.

### Conclusions

The results of the survey on students' perceptions of the role of pedagogical communication mediated through digital whiteboards in the context of blended learning support the conclusion that a feeling of emancipation from the teacher during classes is established, which stimulates students' active participation and allows them to learn at their own pace, increasing the quality of learning. They have more opportunities to build their own system of knowledge in the discipline through collaboration with their peers, self-reflection, and by taking an active role both in the educational process and in the designing of the products that present it dynamically, at the moment of introducing the instructional content. Arguably, one of the corollaries of this transformed role of students is their increased motivation, expressed in an enhanced interest in learning in which they create didactic products together with the teacher, in a desire and opportunity to come to class well prepared and in a persuasion that they have access to adequate information to guarantee educational results, regardless of whether they are present in class or not.

## NOTES

1. A supplementary study with a more specific focus on pedagogical communication in crisis situations was conducted with university students and published in October, 2022: Levunlieva, M., 2022. Smesenoto obuchenie – forma za postigane na obrazovatelni rezultati ili sreda za gavkava komunikatsia". Sbornik dokladi ot nauchno-prakticheskata konferentsia "Pedagogicheskata komunikatsia v uslovia na kriza. Sofia: Faber, pp. 108 – 120. [In Bulgarian]. ISBN 978-619-00-1558-1.

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 **Dr. Milena Levunlieva, Assoc. Prof.**  
ORCID iD: 0000-0002-3532-1141  
Web of Science Researcher ID: E-9240-2014  
South-West University "Neofit Rilski"  
Blagoevgrad, Bulgaria  
E-mail: levunlieva@swu.bg