THE HORSE RACE WORKSHOP ADJUSTED TO THE REMOTE FORMAT: TEACHERS AND UNDERGRADUATES' WEIGHING

EL MINICURSO CARRERA DE CABALLOS ADAPTADO AL FORMATO A DISTANCIA: SALDOS DE PROFESORES Y LICENCIADOS

O MINICURSO CORRIDA DE CAVALOS ADAPTADO PARA O FORMATO REMOTO: PONDERAÇÕES DE PROFESSORES E LICENCIANDOS

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Abstract
One of the first pandemic outcomes in Brazil was academic calendar suspension. Teachers and undergraduates saw themselves in need of thinking about alternatives to access and share the valued historically and socially accumulated knowledge. Once stopped by this situation, and by being aware of the existing demand by the Mathematics field for the production of knowledge related to Probability teaching, we adjusted and provided the workshop in remote format. It was made available on a communication platform at a time when such a format was not yet popular. We were guided by the following enquiry: how could participation in the workshop, and made possible by the cyberspace, echo on a group of teachers and undergraduates? Thus, the herein reported investigation is methodologically based on assumptions of a qualitative research aimed at analyzing the material resulting from audio and video recordings, based on participant speeches' transcriptions, as well as on answers in the workshop evaluation form. The analysis was theoretically supported by concepts found in the Historical-Cultural tradition. It has shown that participation echoed differently on distinct participants - this finding shows lack of consensus among them about whether is feasible, or not, if one has in mind Mathematics remote classroom. It has also shown that such differences are related to non-appropriation of some artifacts by several participants. Nevertheless, we have noticed that participants started seeing possibilities of actions right at the beginning of the remote classes, and it has pointed towards the fact that this appropriation could actually come true.

Keywords: Remote Mathematics' Classroom. Cyberspace. COVID-19. Historical-Cultural Theory of the Activity. Digital Technologies.

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Resumen

En Brasil, uno de los desarrollos iniciales de la pandemia de COVID-19 fue la suspensión del calendario académico. En este contexto, docentes y estudiantes de pregrado se vieron enfrentados a la necesidad de pensar alternativas para acceder y compartir el conocimiento escolar. Impulsados por esta situación, hicimos adaptaciones y ofrecimos el curso corto, en formato remoto, a través de una plataforma de comunicación en un momento en que aún no se había popularizado. Teniendo esta experiencia como objeto de reflexión, y haciendo uso del diálogo sobre tecnologías y ciberespacio, elaboramos este trabajo, guiados por la siguiente pregunta: ¿cómo se adapta la participación en el minicurso al formato a distancia, e hizo posible por el ciberespacio, reverberar en un grupo de profesores y estudiantes? Así, llevamos a cabo una investigación cualitativa cuyo material empírico consistió en la grabación de audio y video del minicurso, las transcripciones de los discursos de los participantes, así como las respuestas al formulario de evaluación. El análisis, anclado en la tradición Histórico-Cultural, reveló que la participación repercutió de diferente manera en los participantes, indicando que no hubo consenso entre ellos sobre si el minicurso era viable frente a la Aula a distancia de Matemáticas. También mostró que tales diferencias estaban relacionadas con la no apropiación, por parte de la mayoría de los profesores y estudiantes universitarios, de algunos artefactos presentados. Además, notamos que los participantes comenzaron a vislumbrar posibilidades de acciones, en un momento inicial del contexto remoto, señalando direcciones para que esa apropiación pudiera ocurrir.

Palabras-clave: Clase de Matemáticas a Distancia; Ciberespacio; COVID-19; Teoría de la Actividad Histórico-Cultural; Tecnologías digitales.

Resumo

No Brasil, um dos desdobramentos iniciais da pandemia de COVID-19 foi a suspensão do calendário acadêmico. Nesse contexto, professores e licenciandos se viram diante da necessidade de pensar em alternativas para acessar e compartilhar o conhecimento escolar. Impelidos por essa situação, realizamos adaptações e oferecemos um minicurso, em formato remoto, por meio de uma plataforma de comunicação, em um momento em que ela ainda não havia se popularizado. Tendo essa experiência como objeto de reflexão, e valendo-nos do diálogo quanto às tecnologias e ao ciberespaço, produzimos este trabalho, norteados pela seguinte indagação: como a participação no minicurso Corrida de Cavalos adaptado ao formato remoto, e possibilitado pelo ciberespaço, reverbera em um grupo de professores e licenciandos? Assim, realizamos uma pesquisa qualitativa cujo material empírico se constituiu da gravação em áudio e vídeo do minicurso realizado, das transcrições de falas dos participantes, bem como das respostas ao formulário de avaliação. A análise, ancorada na tradição Histórico-Cultural, nos revelou que a participação no minicurso reverberou de modos distintos nos participantes, indicando que não houve consenso entre eles sobre se o minicurso Corrida de Cavalos se mostrava exequível tendo em vista a sala de aula remota de Matemática na educação básica. Mostrou também que tais diferenças se relacionavam com a não apropriação, por grande parte dos professores e licenciandos, de alguns artefatos caracterizados no minicurso. Além disso, notamos que os participantes passaram a vislumbrar possibilidades de ações, em um momento inicial do contexto remoto, sinalizando direcionamentos para que essa apropriação pudesse ocorrer.

Palavras-chave: Aula Remota de Matemática; Ciberespaço; COVID-19; Teoria Histórico-Cultural da Atividade; Tecnologias Digitais.

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Introduction

We herein share an experience moored on the assumption that processes are more valuable when they are taken as outcomes that really matter. Such an assumption is referenced by the ideas of the artist Lygia Clark, from Minas Gerais State, Brazil, according to whom:

> If the person, after doing this series of things I provide, gets to live in a freer way, to use the body in a more sensual way, to express oneself better, to love better, to eat better, actually, it matters much more for me as outcome than as the very thing, itself, that I propose to you3.

Thus, once being aware of the human incompleteness and of desire to contribute to humanization processes, we have headed our sight back to 2020. At that time, the outspread of the new virus reached global scale and the World Health Organization declared state of COVID-19 pandemic on March 11, 2020. One of the outcomes from this pandemic context in Brazil lied on the suspension of the academic calendar, both for basic and higher education. Teachers saw themselves in need of thinking about alternatives to share the valued historically and socially accumulated knowledge, in both scenarios. Furthermore, they also saw themselves holding the demand for creating a support network – didactic, pedagogical, and emotional, among others – for students and teachers, themselves.

Boosted by such a situation and by being aware of the existing demand by the Mathematics' Education field for the production of knowledge related to Probability teaching, we started to lean over the resources available, given the social distancing context that demanded workshops to be available in remote format. This statement about the aforementioned demand finds echo on Junior and Oliveira (2022, p.14), according to whom, it is important:

> (…) mentioning lack of research related to methodologies to teach Probability in remote mode or in hybrid teaching modality, either for contents' absorption by dissidents or for something heading to teachers' training (…) (JUNIOR; OLIVEIRA, 2022, p.14)

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3 Cf. O Mundo de Lygia Clark,1973, movie recorded by Eduardo Clark, PLUG Produções.

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Thus, we (re)elaborated a workshop based on understanding that its availability could fulfill teachers and undergraduates' (distant from face-to-face classrooms) need of building their practical qualification on the Mathematics' Education field to collaborate with alternatives for Mathematics' remote teaching.

Therefore, we decided to provide the workshop called "Horse Race: is winning a matter of luck?" On the one hand, this workshop thought about a dialogue with official documents (MINAS GERAIS, 1995; BRASIL, 1998; 2017) and studies related to Probability teaching (SKOVSMOSE, 2000; CARVALHO, 2004; LOPES, 2004; SANTOS; GOMIDE, 2011; DEODATO; DAVID, 2015). On the other hand, the remote context demanded reasoning about Digital technologies, mainly when it comes to "virtual space", where the workshop would take place. Thus, we emphasize, from the perspective assumed in the workshop's (re)elaboration process, whose material will be herein analyzed, that this process took us away from any analysis focused on subjects and media. Our focus goes in a different direction, namely: outcomes from association understood as dynamic and dialectical (PENTEADO; BORBA; SOUZA, 1998; BORBA; PENTEADO, 2002; BORBA; MALHEIROS; ZULATTO, 2007; BAIRRAL, 2009; BORBA; SILVA; GADANIDIS, 2014; COSTA, 2016; BICUDO, 2014).

Accordingly, the provided workshop was based on these potentials and experienced challenges, since, at the time, the use of communication platforms was not popular. We also had in mind the literature in this field and we were teased to report the aspects of this experience; moreover, we were guided by the following enquiry: *how can the Horse Race workshop adjusted to the remote format, and made possible by the cyberspace, echo on a group of teachers and undergraduates?* We adopted some weighs by the teachers and undergraduates who have participated in the workshop as our analysis focus; it was done in order to produce reasoning about the aforementioned enquiry.

We have organized this article into seven sections to answer for the assessed enquiry. After the present introduction – where we have introduced the study's context, justification and question -, we feature the notions we have taken as relevant to elucidate aspects of the herein assessed scenario: cyberspace, cyber-

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culture, remote teaching, among others. Subsequently, we adopted the notion of cyberspace and shone light on the adjustments we have done to make the workshop's development feasible. Thus, after building this background, we start addressing theoretical-methodological aspects to support the analysis. Then, we describe how the empirical material was produced and transcribe excerpts of the used recordings, and share the analysis applied to this material. The article ends with the final considerations.

Cyberspace: remote classroom space

If one takes into account the impositions set by the pandemic and the need of social distancing, it can be said that digital technologies emerged from the remote teaching context as the way likely applicable to maintain education activities running. Accordingly, the present study somehow dialogues with discussions regarding "Mathematics Education Digital Technologies"; thus, we paid close attention to historicity and to its philosophical dimension (BORBA; PENTEADO, 2010; BORBA; SILVA; GADANIDIS, 2014; BICUDO, 2014).

The internet and access to the web, even before the pandemic, allowed amplifying content and information outspread at educational scope, as well as teaching and learning possibilities. The internet emerged as likely "space" for remote teaching through educational actions and interactions. However, after all, what is the space we are talking about?

Bicudo and Rosa (2010) discussed cyberspace and reality, and they enquired: what is virtual reality? They introduced a philosophical study based on thinkers such as Granger, Deleuze and Levy, among others, and argued that the virtual sphere is a reality modality; in other words, the virtual is a real way of being. Accordingly, the cyberspace provides and makes available the materiality and the structure that, altogether, allow expression modes to expand in the internet's common ground and, although it is not fixed in any time and space coordinate, the internet is real, perhaps *deterritorialized,* but we have access to it through computers, which are taken as virtualization operators.

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If we have such understanding in mind, it is possible adding that the internet, the interactions that take place in it, and the inter-subjective relationships made possible by it, are not separated from each other. They may exist in a world that is away from reality, because they are part of, and covered by, the total of our existence. They are intended and signified by subjects who keep and change themselves, based on constant rebuilding.

Accordingly, these interactions and relationships gained new dimensions and contours due to the pandemic and remote teaching, given the assumed impossibility of having teaching happening in a place other than the internet or the cyberspace (BICUDO, 2014). Simultaneously to doubts and uncertainties - that not only brought along insecurity about what and how to act in order to remotely teach mathematics -, they also entered this experience (almost as an imposition) and led to the need of reorganizing teaching deeds and spaces.

By making an analogy to the geographic spaces featured by Milton Santos (2006), we can think about cyberspace in terms of its "inseparability from the human action that recreates and modifies it". According to this author, the geographic space is a form-content thing, i.e., it is a form that does not have empirical and philosophical existence if it is taken into consideration in separate from the content, as well as a content that would not exist without the form covering it (SANTOS, 2006). The remote teaching space forced by the pandemic experience was molded and adjusted through a process that changed several human actions, as well as relationships and interactions, based on dynamic reconstruction.

Teaching in the space enabled by the internet has mobilized deeds both for those used to navigating in it and for those who are not fans of these technologies, mainly when it comes to teaching. Personal experiences with remote teaching were remarkable in terms of resources available, of tools' management and of actions aimed at learning. It is worth highlighting that some terms were adopted to identify a whole generation of individuals who are more "naturalized" with technologies, such as the Digital Natives, proposed by Prensky (2001). Besides pointing out such individuals, the whole set of ways of being in the cyberspace and of entering its possibilities is outstanding.

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Thus, it is possible observing that relationships and interactions on, and with, the internet point toward the ways each individual experiences it, as well as towards the relationships set, towards values and knowledge joining each other, towards the highlighted attitudes and concepts, and towards the formed collectives.

Accordingly, Levy (2009) identifies a community (or communities) that emerges in the cyberspace environment. He uses the term "cyber-culture" to point out the set of techniques (materials and intellectual), practices, attitudes, modes of thinking and values that have developed along with cyberspace growth (LÉVY, 2009, p.17). According to him, cyberspace is not just a material infrastructure of digital communication, but also a set of information held by it, as well as the group of human beings that navigate in and feed this universe.

By having in mind that technologies open room for new constitutions about to take place at educational scope, we enter the concept of their use in teaching, based on the idea that they change and reorganize the modes of awareness; consequently, they change and reorganize the ways of both thinking and producing knowledge (BICUDO, 2014). Accordingly, we can conceive not just Mathematics, but also its teaching and learning, through technologies such as a human *construct* that cannot be separately crossed by the media (LÉVY, 2009; BORBA; VILLARREAL, 2005).

Thus, the insertion of Mathematics' teaching technologies has supports that extrapolate the mere motivation presented by these resources; they gained cognitive, epistemological and philosophical contours, within a vast series of problems concerning research on the educational field, mainly in the post-pandemic scenario, wherein individual and collective experiences were marked by the needs pointed by them.

Therefore, the concept of 'human-beings-with-media' substantiates the assumptions we advocated for during the workshop's reorganization, when it comes to the likely production of the mathematical knowledge expected to be achieved from that (BORBA; VILLARREAL, 2005; BORBA; SILVA; GADANIDIS 2014). Based on such a concept, we were interested in highlighting that this process foresees a dialectical sight over the relationship between human beings and the media available. It allows thinking this relationship by taking into account the emergence of new

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technologies capable of rising new mathematical issues and situations linked to mathematical knowledge yet to be explored. Because there is no neutral technology, the current scenario evidences a reciprocal modeling between technology and thinking. More specifically, it shows that technologies change, and are not just changed by, mathematics, but also by people who make mathematics along with them.

It is also necessary explaining the term "remote teaching", which became popular during the pandemic. It is essential clarifying that we see differences between "distance education" and "remote teaching". Based on education and distance, as discussed in several research, it is possible predicting planning, intentionality, previous organization, aware choices and methodologies; whereas, "remote teaching" is linked to ideas of urgency, novelty and improvisation. We agree with Behar (2020)4, according to whom:

> The word "remote" means to be far from the space and it refers to geographical distancing. The teaching process is considered remote because teachers and students are stopped by decrees from going to education institutions to avoid virus outspreading.

These considerations emerge as important; they take into account the scenario where one seeks ordinance, solutions and adjustments. The workshop took place in this scenario due to the emergency imposed by the pandemic, at that moment. Accordingly, the impact of this context, itself, influenced actions and was influenced by them: the need of acting allowed us seeing possibilities to adjust the workshop and, simultaneously, to open up ourselves to new interactions on the internet, or in the cyberspace.

The marks of this experience take back to the potential of new reflections about resources we had in hand due to the return of teaching activities in the classroom, mainly mathematical education technologies. Hybrid teaching (FROZZA et al, 2020) and its discussions, for example, have been (re)signified due to evidences provided by the remote teaching; they boosted new understanding and possibilities

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4 Text published in "Jornal da Universidade" (UFRGS) on July 02, 2020. Available at: <https://www.ufrgs.br/jornal/o-ensino-remoto-emergencial-e-a-educacao-a-distancia/>. Accessed on October 10, 2022.

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of action. Therefore, it is essential having a retrospective sight, according to which, the remote teaching experience is taken back based on reflection.

Thus, we herein take back the analysis of teachers and undergraduates' impressions by taking into account an experience that has happened in a geographically distant mode. The high-speed internet and communication applications made it possible being synchronically together and debating about both this topic and mathematical teaching. We mainly focused on the probability involved in the approached workshop's game, a fact that took us to the production of knowledge about the COVID-19 pandemic context.

Adjustments in the workshop at cyberspace scope

Workshop adjustments to the remote format, although covered by insecurity and uncertainties put at place by the quite recent pandemic scenario, allowed experiencing the dynamism and the cyberspace opened to us. It pointed towards several ways of working with the mathematical content and of producing knowledge in this space. It was possible highlighting several interaction possibilities and exchanges among the involved subjects, either among those who teach or among those who got mobilized to participate in the workshop.

Among teaching and learning interactions that have happened - as for those who aimed at adjusting the workshop, based on the resources available -, we highlight participants' concern with the playability of this game board type and the access to it, with data using (they were labeled from 1 to 6), and with the establishment of "honesty deals". Thus, we highlighted demands, annoyances and dilemma set by those who elaborated, or who made available, contents for mathematical teaching in the internet in terms of quality and the possibility of successfully understanding ideas and concepts (SANTOS, 2020).

Another aspect to be highlighted lies on the target public and on those who were effectively reached. Simultaneously, the room opened in the internet to greater and more diverse interactions also impaired the attempt to design the profile of the reached participants.

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Thus, based on the workshop's (re)elaboration, if one takes into account remote teaching and the cyberspace scope, we can highlight that "being together" – although far from each other – also became a complex factor, mainly when it comes to promoting interaction to each other. On the one hand, we highlight the difficulty in capturing actions on the other side of the screen, or in mediating actions and dialogues. However, the adjustments in the workshop allowed creating interaction types other than the face-to-face ones. Therefore, it was necessary using a dynamic resource, according to which, all individuals had access to a common game board; it was also necessary thinking about how to make moves involving all players. Weighing about the way to share participants' individual conclusions was a large collective demand of workshop participants. Briefly, connecting people from different locations in the country also meant the challenge of reflecting about ways to capture (and share) interaction and exchange diversity, even if it comes from the screen of each individual.

Thus, we infer that the adjustments in the workshop have allowed experiencing a space that provided the chance to take actions potentially diverse from those made possible by face-to-face teaching and learning spaces, namely: cyberspace. It makes us reason about the nature of each one of these likely teaching spaces; it took us to mediation by thinking them as different, or as having different natures, just as the previous discussion about the virtual and real spaces. Differently, we can think them as integrated to different experiences, mainly to the teaching ones, a fact that can boost new possibilities for the educative practice and for integration among different teaching modalities.

Accordingly, from the perspective of ways of teaching in the cyberspace, it is possible relating it to digital technologies, based on the dilemma faced by the emerging changes and adjustments. We chose a specific aspect of the experience lived in the workshop when we produced more systematic reflections. In order to do so, we focused on dialogues produced by the remote workshop dynamics that, somehow, was marked by participants' face-to-face teaching experiences.

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However, we started following features of a theoretical-methodological referential to support future analyses.

Methodological trajectory and analysis lens

We developed a qualitative study (ALVES-MAZZOTTI, 2001) based on observation as main logics for empirical material production to help answering the question guiding the present investigation: *how can participation in the Horse Race workshop adjusted to the remote format, and made possible by the cyberspace, echo on a group of teachers and undergraduates?*

We embodied the role of researcher/teacher that, according to Garcia (2009), "starts from questions related to its practice, in order to enhance it" (GARCIA, 2009, p.177) to produce the herein assessed empirical material: workshop audio and video records, speech transcriptions and evaluation form filled out by participants about their experience.

Based on more specific terms, our observation focused on workshop recordings carried out in a communication platform, and on an evaluation register to be filled out by workshop participants, after its end. Therefore, participants' speech transcriptions were the herein analyzed empirical material – transcriptions also resulted from recordings in the aforementioned registers.

It is worth highlighting that we used codes to refer to participants in order to preserve their secrecy (P1 = Teacher 1, P2 = Teacher 2, and so on). Participants have authorized the reflection we have made about their experience.

Accordingly, it has also delimited the *corpus* of our analysis; we elected two historical-cultural tradition concepts to set our statements about the search for elements to help adjusting the production of answers to the aforementioned driving questions. We refer to the notions of 'rules' and 'community' composing the components of the triangular model by Engestöm (2001).

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From a more general viewpoint, such a model is substantiated by the notion of activity mediated by Vigotski. According to it, the Finnish researcher, and his collaborators, use the activity as analysis unit; they feature a social basis for the subject-artifact-object relationship in order to interpret different situations. This process shines light on other components that dialogue with them, namely: rules, communities and division of labor. Model appropriation uses the understanding that it is not leak-proof (ARAÚJO; KAWASAKI, 2013), but that it is moored on assumptions of the Historical-Cultural Theory of Activity. It emerges as the way to operationalize the analysis of daily human-life phenomena.

Given the scope of the present study, it is essential clarifying that, similarly to Engeström and Sannino (2010, p.6), we assumed that component 'rules' refers to implicit and explicit regulations, to standards, conventions and patterns that limit actions, since they compose the community by understanding individuals and sub-groups that share the same goal.

Finally, from a more specific viewpoint, we see the importance of informing that this "operation" mode, which is based on the announced concepts, has been carried out by other researchers in Mathematics' Education. David, Tomaz and Ferreira (2014), for example, focused on subjects (teachers and students) relationship with mathematical concepts mediated by a visual artifact; it showed the power of the "shower" agency during a class about the distributive multiplication property of addition. Deodato, Batista and Amancio (2023) used the artifact component to analyze mediations of materials that can be manipulated by elementary school students during problem solving. Deodato and Santos (2023) focused on the triad "subject, rules and object" to analyze subjects' (undergraduates) relationships with the object (teachers' training) in the Activity (stage).

The remote workshop

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In the very beginning of the end of the face-to-face activities due to both the pandemic and the imposed social distancing, the academic calendar was canceled and the demand for actions focused on welcoming students enrolled in the Mathematics Major, as well as on basic education teachers. Therefore, we had the idea of likely providing a workshop capable of contributing to the formation of the involved ones, based on conversations during a meeting of the faculty we belong to.

This conversation was the very basis for a search in our personal inventory; then, we decided to think about alternatives to adjust the course's material we had used in face-to-face classes, based on a Masters' Degree Dissertation and on teachers' training (DEODATO 2012; DEODATO; DAVID, 2015).

The aforementioned search led to the elaboration of a workshop whose main task was to develop a game inspired by the investigation scenarios developed by Skovsmose (2000). After attending some remote meetings to plan the availability of the material in the internet, we decided to develop a workshop with limited participation - given the insecurity about using the available resources - to ensure the qualified participation of attendees.

Thus, less than two months before the implementation of social distancing due to the COVID-19 pandemic, on May 07, 2020, we offered the workshop named "Horse Race: is winning a matter of luck?", which was available in a communication platform. In total, 21 individuals subscribed to the workshop, among them: Mathematics teachers and professors (they were experienced in basic and higher education), as well as undergraduates in Mathematics who were already acting in some institutions, in several states in the country.

The workshop lasted 2 hours and happened in synchronous meeting. It was based on three stages: i) introducing the attendees, ii) game playing and iii) reasoning about game playing.

Participants were oriented to provide the following information, after the introduction procedure: name, profession, place where they have stayed during the social distancing period and the reason for having subscribed to the workshop. Besides creating closer bonds among attendees, we tested the microphones and the

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camera, as well as set some combinations related to *netqueta*[5]. Among other things, we asked participants to turn off their mikes to avoid buzz; they should only open them when they wanted to say something.

Subsequently – at the beginning of the game playing -, we explained the theoretical basis inspiring the game, informed that it was already played in the face-to-face format, in the classroom (with 5th to 9th grade students) and during teachers' training (in Belo Horizonte municipal network). The group was aware of the fact that it was the first time it was offered in virtual environment.

After that, we recommended participants to think about the following questions during the game: i) is there any mathematics in this game? ii) If yes, what mathematics is this? Iii) in case this mathematics exists, does it dialogue with discipline matrix documents (PCN and BNCC)? iv) what would be the age of students capable of likely playing this game? Why?

Then, we started playing the game. The first great adjustment in it lied on using "virtual data"[6], to the detriment of physical data used in board games. We explained that, in order to adjust the proposition's functioning, we had to set a "honesty deal", since we would not check the virtual data informed by each participant, we would only trust the results presented by them. It is important highlighting that this deal was not necessary in the face-to-face version of the game. We also informed that all participants would need to have two virtual dices, but we did not provide more details about how to use them, before the game.

Subsequently, attendees could choose a racing lane (figure 1). It was necessary allocating more than one participant to the same lane, since the number of participants exceeded the limit of 12 lanes.

The chosen horse would be on the lane and it would move in it after dices were rolled. We only explained the main rule of the game after the lane was chosen: each player would roll two dices (6-side dice). The player whose lane was labeled by

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5 Based on Paiva (2008, p.19), netqueta are "…behavioral standards adopted in specific virtual environments".
6 Data were tested before the game and the way to use them was explained to the group. In order to use them all you have to google "virtual data".

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a number equal to the number on the front side of the dice would move onwards one position. The one whose horse would first get to the 'end' of the lane on would win the game.

Figure 01 – Board game (10 x 12)

Source: Authors' inventory (2020)

Once the rule was clear, we set a deal with all participants that they would roll the digital dice one after the other, in alfabetic order (as it would pop up in the platform's chat); then, we would mark on the board what was shared with all participants. It is important highlighting that it was essential spliting the tasks between two teachers who would conduct the activity, so that it would not be impaired. One of them would organize the chat and get the results from participants, and the other would take care of the shared board and of moving the "horses" in the lanes, as the results were informed.

The game was expected to be played twice. The first round would allow participants to test experimental situations and to make comments, in case they would observe that "lane 1", for example, would never be opened and that the chance of lane 2 (or 12) to be opened would be smaller than that of lanes 6 and 8.

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During the first round, we teased players in the platform's chat, so that they would be forced to argue about terms such as "luck", "bad luck" and "chance". As for the second round, we expected to confirm some dice rolling trends; however, it was not possible during the time we had availbale for the workshop. The experience with the 10x12 board evidenced the need of a longer time for game conclusion; it is so, because of its remote version, and it should be taken into account.

Thus, when we finished the first round, we started weighing – based on terms often used in school mathematics – about contents and subjects involved in game playing: sampling space, events (more or lesser likely), impossible events and other initial "probability notions". We also designed the understandings about these terms along with participants, and highlighted that we did so based on what was previously experienced with the game.

Subsequently, we shared some ways of systematizing the discussion (figure 2), and it focused on participants' teaching practices in the classroom with the students. Thus, we discussed the ways of presenting and systematizing results in the charts in order to shine light on eventual considerations by students, based on their experimentation.

Figure 02 – Systematization strategies

Source: author's inventory (2020)

Later on, we got to the end of the workshop, when we went back to the questions introduced at the beginning of the development; hence, we decided to reason about answers given by participants, based on the empirical experience with the game. Among the recorded answers, we highlight:

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It is very fun… and after the second round, you have an idea… It is much better… Because it leads to competition… it is still luck, but not 100% it (P1) This game, now that I fell in love with it, unfortunately [due to the pandemic] we do not have a classroom to take it to … I wanted it now, I think that [it is] very cool, interesting (P2)

Hey, André, I will answer this question here 'how old the students must be to play this game?', [the answer] any one… because small children are able to… To… Understand summing… the little about summing they know… They can, perhaps, take longer to figure this out, but I believe that by the third round they will start realizing that… That there is a number that will be added more often them others… I don't know… It will be quite intuitive than inside the concept… I have even seen that even BNCC suggests it… My youngest boy, who is eight years old, sees probability analysis in the grade he is in now… In a simple way, but it is probability (…) Thus, I think that anyone can, it depends on the approach you will take to it… Of course that in high school we will introduce the concepts… Technical… of Mathematics… we will formalize it all to them (…) I will ask each one to by M&M's [chocolate] and each one will make its own probability analysis of its M&M's pack (P3)

This horse race game, I think that it is also possible… To go on… If the teacher wants to make the students "travel" a little farther and… After all, go a little deeper in this idea, in this horse race situation, yet, there is, this horse race is quite common in those bet agencies, for example… Who would bet higher in horse 1? In horse 2? Horse 3? And so on… Because it is quite common in horse races, right? Then I think that it would be good to make this race scheme… Betting… because it would then involve a bunch of things… It involves money, it can involve Financial mathematics, perhaps… Any ways… And the logics of betting (P4)

I was thinking, by observing the race board, if it would have any association, for example, based on the number of vertical squares [referring to the number of spots on the race lane], with the student's chance to win? Because if we have more squares assumingly number 7 [sum of seven] would, somehow, pop up less than the six… and if, maybe, there were more chances, more squares, seven would pop up more often (…) What I have thought about working with elementary and high school students, I don't know if it would work… I mean… To gradually increase the number of squares, based on the rounds, right? The number of lanes, so that they could observe this sequence, this pattern (P5)

In this virtual dice you have the option to work with twelve-side dice… Then, it would be interesting to also change the game in order to show that probability can change… change depending on the dice (P6)

If it is a sum, even with different dices, it would always be on the middle (P7)

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After listening to the weighs by undergraduates and teachers, we suggested a collective reflection about whether the workshop proposition would dialogue with discipline matrix documents, mainly with BNCC (BRASIL, 2017) – if one takes into account that, at that time, several teachers were under pressure by the State to articulate the topics of their classes, and it was demand from the basis.

We ended up introducing suggestions about problems whose topic dialogued with the game and with material sharing. It was done to deepen what was addressed in the workshop.

After the workshop, participants were asked to evaluate it, based on four questions – which were made available in an application for research management. Only 17 of the 21 attendees answered the questionnaire. The first three questions were of the multiple-choice type; they were mandatory. They provided the following response alternatives: little satisfactory, satisfactory and very satisfactory. The answers are shown in the three graphics below (figure 03).

Figure 03 – Record of answers to the evaluation form (multiple-choice answers)
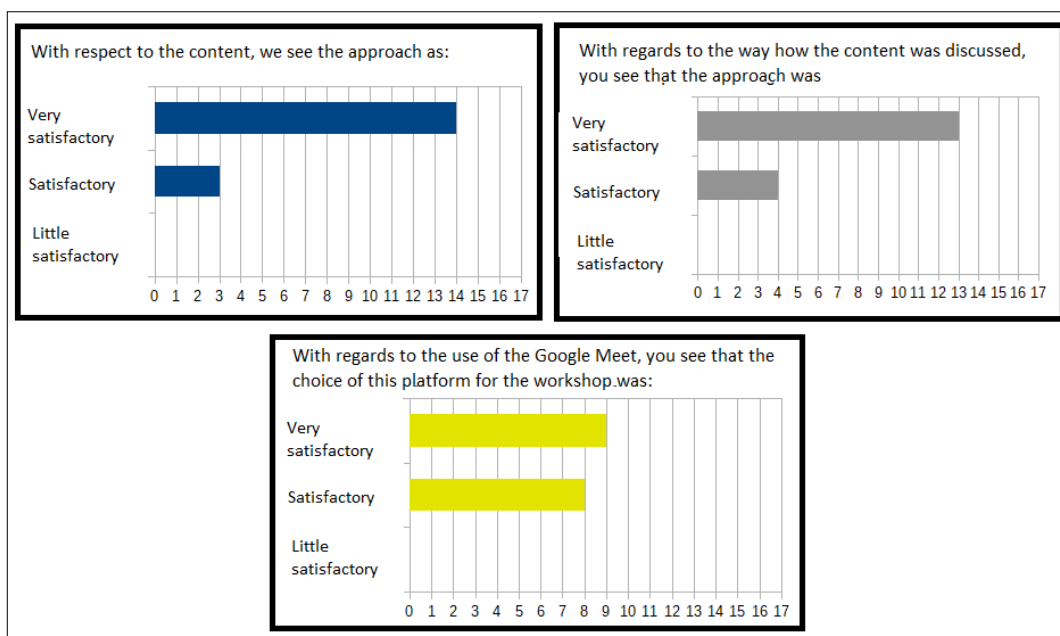
Source: Author's inventory (2020)

The fourth question was open and it had non-mandatory profile. In total, 7 of the 17 respondents introduced the following responses (chart 01).

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Chart 01 – Record of answers to the evaluation form (open question)

Write down suggestions to improve this workshop based on a likely re-offer
There are no improvement suggestions. It was a great experience.
Developing two workshops a month at different dates (other than Thursday)
Based on the target public, Mathematics teachers and undergraduates, the workshop was satisfactory. Based on a classroom, the approach and the development would be different. The workshop gave us a good idea about the topics to be worked on in the classroom. Congratulations!
I believe that if it were face-to-face, the game would be faster. Online, you could ask each person to roll the dice twice, in order to save time to wait for one's turn.
Maybe it would be possible extending the time a little, in order to get to repeat the activity a second time
Using a time prior to the initial time set for everybody's sound test in order to avoid problems, such as return, buzz and feedback, which impair the activity development.
First, we apologize for the delay to make the evaluation. Honestly, I see no need of improvement. One suggestion, perhaps, it would lie on talking a little longer about the article by Ole Skovsmose, Scenarios for investigation, which was used as reference for thinking about the game. Thanks for the workshop.

Source: Author's inventory (2020)

Thus, after participants' answered to the evaluation form and its detailing was presented, this process helped understanding how the workshop was carried out. Moreover, it seems essential understanding arguments we have used in our analysis, and they will be introduced below.

After all, is it possible using the Horse Race in remote Mathematics classroom?

We made an analysis about one of the aspects emerging from the empirical material, based on workshop's audio and video recordings, on the excerpts of teachers' speeches and on workshop evaluation, namely: tensions caused by the reasoning about whether the Horse Race game would be feasible in basic Mathematics classroom, mainly in remote classroom.

In more specific terms, we highlight that there were differences in the ways teachers observed the feasibility (or not) of the "Horse Race" game in Mathematics' remote classroom – the reference was the face-to-face class. It is important highlighting that, despite the remote condition – which was imposed by the pandemic, mainly because such a scenario was quite recent, we (suppliers) and teachers, who were present at that occasion, did not reach consensus about the understanding of what would be a remote Mathematics class.

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Accordingly, teachers' speeches during the workshop allowed stating that, within the pandemic context, on the one hand, there were those who, although acknowledged the game's pedagogical potential, did not present the possibility of using this game with basic education students (*this game now, I fell in love with it, unfortunately [due to the pandemic]...*). On the other hand, there were those who saw the possibility of adjusting the game to be applied in school (*because each [student] is in its own house... I will ask each one of them to buy m&m's [product brand] and each one will use the probability analysis of the m&m's pack*). Accordingly, we understand that different answers to the game's experience, which are evidenced in these speeches, are a trace of tension (figure 4) caused by the pandemic – or the pandemic has at least collaborated to it – during the 'mathematics' teaching' activity (ENGESTRÖM and SANNINO, 2010).

Figure 04 – Tension during Mathematics' Teaching Activities
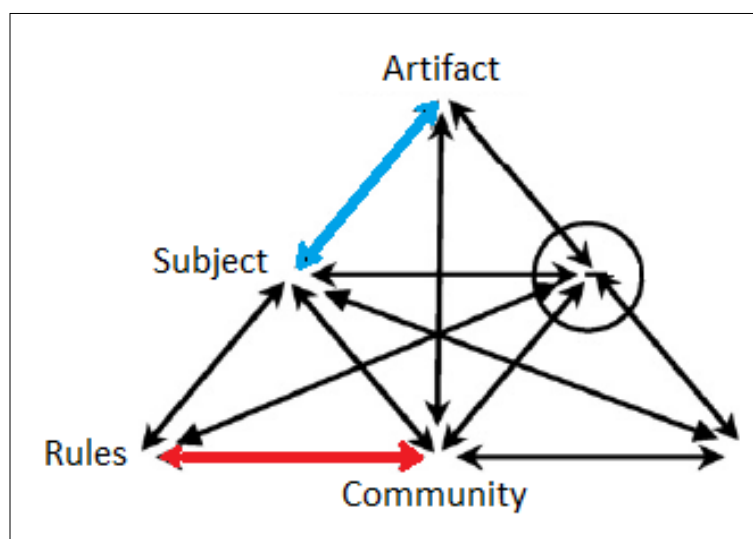
Source: Adapted from Engeström 2001, p.135.

The first identified tension (highlighted in red in figure 04) was located between components 'rules' and 'community'. Teacher P3, for example, did not seem to see the demand by a teacher to students to buy materials to be used in the classroom as a problem, but P2 seemed to understand that such a demand to students was a complicating factor, since teachers are in charge of providing these materials, or of at least thinking about tasks that do not demand such a move by

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students. Based on THCA, P3 seemed to replicate, within the remote context, the traditionally acceptable rules for certain social groups of students, within the face-to-face scenario (*I will ask for each one of the students to buy m&m's*), whereas P2 seemed to have in mind that the remote context imposed more restrictive rules regarding the face-to-face class (*… we do not have a classroom to be able to use in the classroom*).

Another tension was observed between components 'subject' and 'artifact' (COSTA, 2016), when we observed that some teachers have faced limitations related to artifacts' appropriation, such as the used communication platform and virtual data. This tension was observed when we accessed information produced from the evaluation questionnaire, which did not present participants' identification. Based on this instrument, it was possible observing that teachers pointed out specific adjustments they saw as essential in the used artifacts; they were related to the need of improving the understanding about the communication platform (*using a time prior to the initial one to test the sound of all participants in order to avoid issues such as return, buzz and feedback, which impair the activity developed*) and about the use of remote environment data (*Online, you could ask each person to roll the dice twice, in order to save time while you wait for one's turn*). Similarly, overall, a third teacher synthesized that adjustments in the artifacts would demand conducting a workshop with its students (*For a classroom, the approach and development can be different*).

Thus, we understand that adjustments, required by participants, point towards the fact that the artifacts used in the workshop were not yet fully held by us, suppliers, or by participants. Such an understanding allowed stating that, based on the proposed reasoning and on the analysis of its practices, there was a critical sight over the Horse Race game, and that it could encourage such an appropriation. The development of a reflexive sight over the experience, which is bond to teachers' deeds, pointed out likely actions at cyberspace scope (BICUDO, 2014). Accordingly, remote teaching, and the very need of thinking about its practice, based on the sense that it came to stay, has potentiated actions at cyberspace scope – it has also echoed on them.

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It is important highlighting that the "communication platform" artifact, in particular, was critically seen by participants. Of the three closed questions in the evaluation form (figure 3), that questioning the degree of satisfaction with the use of the aforementioned platform was the one mostly evidencing participants' annoyance. Almost half of participants mentioned not to be fully satisfied with its use.

Thus, we understand that having participants seeing the possibilities and potentials of actions in the cyberspace, within the remote context, emerged as ultimate factor for the game's feasibility (or not) in the classroom. This understating could make take possession of different artifacts and actions at cyberspace scope.

This understanding is mostly substantiated because, when teachers thought about the game in the face-to-face context, most of them supported the statement that the proposition was adequate to be carried out in basic education. One of the answers mainly highlighted the viewpoint of a teacher who sees the possibility of using it at basic education levels, as long it is done after certain adjustments.

> How old are the students this game can be developed for?, [the answer is] any one (...) My youngest boy, who is eight years old, sees probability analysis in the grade he is in... In a simple way, but it is probability (...) Then, I think that anyone can, depending on the given approach... Of course, in high school we start with the concepts... Technical, of Mathematics... We will formalize it all for them (P3)

It is important highlighting that, based on this excerpt, the two closed questions in the valuation form (Figure 3) were related to the content approach. They evidenced that respondents – at rate higher than 76% - were fully satisfied with such an approach, and it pointed out compliance with its feasibility in basic education.

Therefore, briefly, we used the expression by Melillo (2011) to bring up one more explanation layer to clarify the featured tension conditions. This author aimed at "identifying and analyzing TIC's mediating role in Mathematics Teachers' actions due to their experience in face-to-face teaching when they, all of a sudden, become teachers of the distance modality in UAB system (MELILLO, 2011, p.33). It is also possible observing that the EaD/UAB activity is seen, within a given context, from

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criteria typical of the face-to-face teaching. In order to put such a perception in the mainstream, the aforementioned author states that an activity is 'haunted' by another.

Similarly, we can observe that teachers, oftentimes, use common rules/artifacts mediations in face-to-face activities, even if, as subjects seeking the 'teaching Math' object, they face demands to be remotely applied. In other words, we consider that the remote 'Math Teaching' activity in the cyberspace was 'haunted' (MELILLO, 2011) by rules and artifacts of the 'Math Teaching' activity within the face-to-face context.

Considerations

This context synthesizes an experience lived right at the beginning of the COVID-19 pandemic, when schools and universities were closed due to the need of social distancing. At that time, there was no expectation about how Mathematics classes would happen in remote environment.

Thus, the specific focus on the (re)elaboration of the workshop – which was adjusted to a communication platform - aimed at reaching different subjects. We made the attempt to promote learning processes focused on welcoming practices forced by a moment of crisis and insecurity. Accordingly, the workshop was made available and we produced the current study based on the following enquire: "how can participation in the workshop 'Horse Race', adjusted to the remote format, and made possible by the cyberspace, echo on a group of teachers and undergraduates?

Overall, it is essential highlighting that the transition of methodological actions applied to the face-to-face proposition to its remote version, based on the cyberspace approach, included a whole series of actions, adjustments, changes and discussions to enter formative possibilities provided by the workshop. Thus, we paid closer attention to strategies that could contribute to participants' success in concept learning, due to the technological resources available and to their potentials.

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We could observe that there were several challenges to be faced (they go beyond the aesthetic and interactive aspect), if one takes into account language and particularities of the mathematical knowledge to be adjusted to a (likely) target public – in its diversity. They regard concern with accessibility to what is made available, to attention to the expected formalization, to adjustment to intuition levels and to desired deductions, to search for contextualization and applicability possibilities, among other care actions encompassing intentions observed in the (re)elaboration process.

Based on such an experience, it is important pointing out the need of not mimicking, in a thoughtless way, what is presented or proposed for the face-to-face version, as a copy that does not explore the possibilities likely opened by technologies. Therefore, it concerns exploring and advancing in possibilities brought up by technologies and by the cyberspace. One must pay close attention to different ways of acting outside the face-to-face context. Thus, assisting teachers and undergraduates from different cities in Minas Gerais State, as well as from other states in the federation (Bahia and São Paulo), was one of the possibilities we could see during the workshop. This understanding, at workshop scope, shone light not just on the existence of a new way of presence, but also pointed out the need of research to help better understanding the outcomes of this new way of being in the classroom.

It is also important highlighting, in a more specific way, and focused on the carried out micro-analysis, that the workshop development, based on THCA lens, highlighted tension related to the recent need of using artifacts that are not yet appropriate for most teachers and undergraduates. Therefore, the empirical material showed that participation in the workshop echoed differently on distinct participants. Thus, there was no consensus among them about whether the adjusted Horse Race game was feasible (or not), if one has in mind the basic-education remote Mathematics classroom.

We point out that, despite the herein designed scenario, it was possible introducing the possibility of actions at this teaching level, to teachers and undergraduates, at a time when there was no sign by the State about the

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implementation of a remote teaching that would meet the demands, mainly those by public schools.

When it comes to even more specific terms, when we put on the lens of THCA, we can observe localized tension when we focus on components 'rules' and 'community', namely: part of participants seemed to carry the rules – which are already pacified in the face-to-face community -, to the remote classroom; whereas other started a move to (re)signify such rules based on remote-context features.

Another tension was observed when we headed our sight to components 'subject' and 'artifact'. We observed, based on the association among these components, that there was a move to (re)interpret the times (mainly time management) in remote classroom. In other words, we observed that there was disarray between the time thought during the planning stage and that demanded during the workshop, be it because of unawareness about the communication platform's resources, or because there was a specific mode (and new for us) to measure participants' actions in that space.

Thus, we highlight that - by taking back the experience of the workshop in remote format -, if from one side of the teaching/learning interface in the cyberspace one finds the participant and its ways of interacting and learning, on the other side of it, there are also those who propose the availability and (re)elaboration of resources for teaching in the cyberspace (SANTOS, 2020). This reelaboration process shows desires, expectations and demands, in a two-way manner, according to which, both involved parts focused on a common goal: mathematical knowledge.

We also point out that it is paramount stating that this experience would not have grown without the contradictions of the system it was inserted in. We experienced work overload, we did not have the due support to provide the workshop – several planning meetings, the organization of attendee lists, the elaboration of certificates, test equipment, among others -, but we experienced a way to boost our amusement with the process of forming people – it is so, because of the possibility of creating a space for teachers and undergraduates to share experiences, doubts, anguish, teaching practices and insecurity in public university.

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Thus, in order to finish the present section, we go back to the assumption by Lygia Clark, which shows our interest in the effects of this process on those who joined the experience. This resumption, which aims at conducting a synthesis, highlights our divergence with those who, by undermining the "real outcome", remain leak-proof. In our opinion, the fear of the unknown, although sometimes painful, is part of the beauty of the path to be taken, i.e., the remote classroom situation was imposed on us, and the artifacts, the rules and the community were unknown; we were afraid, but we took the path, anyways. Finally, according to Rosa (2018, p.608), we see what "There is the human man. The crossing".

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