IL NUOVO CIMENTO **45 C** (2022) 220
DOI 10.1393/ncc/i2022-22220-7

COMMUNICATIONS: SIF Congress 2021

The usage of Kahoot! during activities for schools on physics

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received 15 February 2022

Summary. — The transition of many educational activities from in-presence to online, due to the Covid-19 emergency, has caused various difficulties to students, especially with regards to maintaining concentration. Even and especially in online mode, it is thus important to pay attention to the interaction with participants. In this context, the Department of Mathematics and Physics of Roma Tre University has proposed a series of activities dedicated to schools that have proven to be able to guarantee the engagement of the participants, also thanks to the game-based learning platform Kahoot!.

1. – Introduction

The Covid-19 emergency led to the development of remote teaching proposals. This caused multiple obstacles to the learning process, especially in terms of motivation, stress and academic progress of students [1]. Emblematic is the fact that it is not uncommon to see students logging on and, after a while, walking away from the computer. For these reasons, it is important to find a way to engage all participants as much as possible and to actively involve students [2-4] avoiding teaching activities structured as mere frontal lessons. This not only applies to educational activities carried out in schools or universities, but also to all initiatives that aim to bring students closer to the world of science, such as, for example, the activities that universities offer to high school students.

It is in this context that at the Department of Mathematics and Physics of the Rome Tre University we have developed activities for high school students that have ensured a strong interaction with the participants. In particular, we used different approaches such as discussions, questioning, inquiry-based exercises, interactive use of technology, software and also playful quizzes that made use of Kahoot![1], a tool that allowed us to keep students' concentration high also thanks to its competitive factor [5].

([1]) Kahoot! is a game-based learning platform: `kahoot.com`

In this paper, we will describe the online activities for high school students proposed by the Department, the ways of engagement we have found and the feedback we have received.

2. – Our online interactive proposal

The online activities for students proposed by the Department involved 8 groups of students, including 7 classes and a mixed group of students from different schools, for a total of 170 high school students, and lasted from September 2020 to May 2021. A dedicated course was created for each group: the aim was to bring participants closer to physics and mathematics through topics they do not deal with at school or to deepen those topics that already known from a university point of view.

Each course lasted from 20 to 30 hours and was organized in two-hour afternoon meetings through the Zoom platform, which school teachers were also invited to attend to as auditors. To facilitate students' intervention during the meetings, we opted for the meeting mode and avoided the webinar one, to allow them to turn on the microphone and the webcam at any time. Then, during the meetings, students were often questioned about their impressions on a given activity. Furthermore, to ensure active involvement of introverted students as well, we also proposed some simple exercises through special software or platforms to discover knowledge through direct experience.

Another way we used to keep students' attention high and get them involved was playing with them using Kahoot!, a point-based quiz, where students have limited time to answer and, after each question, can see a partial leaderboard [5]. During the game, students can use nicknames, which empowers the interaction of all students, even if not particularly outgoing; moreover, scoring depends not only on correct answers, but also on how fast they are given.

Meetings with each group, albeit on different topics, all followed the same structure: after a first part dedicated to greetings, questions and curiosities, we introduced the topic that we would have dealt with that day. Then the lesson was structured through theoretical and practical activities carried out through web platforms or recorded videos([2]). All the activities were designed to be divided into blocks of about 15 minutes; in order to intersperse these blocks, we thus opened a short discussion on the topics just treated starting from the students' questions and then providing a deeper insight with specific reflections. At the end of each block, we used Kahoot!. Specifically, students had to answer three or four multiple-choice questions, by clicking the selected option directly from their mobile phone. Usually, we used three blocks and eleven Kahoot! questions for each meeting.

The questions we asked through Kahoot! were asked in such a way as to require an immediate answer from students (sometimes the right answer exactly reported the same words or phrases used by the teacher). In fact, we chose to set 30 seconds as the maximum time to answer the question; this also ensured greater competition among participants.

After each question, we briefly showed and discussed the correct answer and commented on the wrong one. In an informal and playful atmosphere, partial ranking was shown, and those who answered well and faster were praised, while the others were en-

([2]) The YouTube playlist created by the Department can be found at `https://www.youtube.com/channel/UCl3bqukQQ-VEpJBGERfbEoQ/playlists?view=50&sort=dd&shelf_id=4`.

couraged to do better and climb the ranking. In this way, we supported competition between participants in a friendly way in Kahoot! style. At the end of the match, the final leaderboard was shown and the winner was acclaimed, and a new challenge opened up to all peers for the next meeting.

In the final meeting of the course, an anonymous evaluation questionnaire about the entire proposal was presented to participants.

3. – Feedback we received

147 students out of 170 students who participated in our courses answered the anonymous evaluation questionnaire proposed at the end. Overall, the feedback we received was very positive.

In fact, as regards the questions relating to satisfaction about the proposed course, almost all participants (91.16%) reported that it was worth taking part in it ("*Do you think it was worth participating?*" 49 answered "*absolutely yes*", 52 "*yes*", 33 "*yes rather than no*", 10 "*no*", 3 "*absolutely not*"). The same percentage of students (91.16%) even claimed they would recommend it to their peers ("*Would you recommend the course to a peer of your age?*" 96 answered "*yes*", 22 "*absolutely yes*", 16 "*yes rather than no*", 5 "*maybe*", 7 "*no*" and 1 student did not answer).

The active participation of the students during the course is also demonstrated by the answers given to the Kahoot! quizzes proposed during the lessons, which show that most of the participants stayed active during the whole meeting. For example, taking into consideration the analysis of a lesson common to all courses, it can be seen that 89.7% of the students (139 out of 155 participants) answered all the questions asked, and the 70.7% of their answers was correct.

In addition to these results, we also had positive feedback from the teachers of the classes involved. They told us not only that their students had a lot of fun and enjoyed the whole course, but also that themselves were satisfied, so much that they would have used both the materials we have proposed during our course and Kahoot! with their pupils.

4. – Conclusions

Distance lessons have become an important part of school activities due to the Covid-19 emergency, but this modality puts a strain on maintaining attention from students. In this paper, we described a series of online activities aimed at 8 different groups of students dealing with topics of physics and mathematics, in which participants showed to remain effectively active and engaged also thanks to the use of Kahoot!.

We indeed have seen that more than 91% of the participants not only appreciated our activity but also would recommend it to a peer. Moreover, we received positive feedback also from their teachers.

In particular, in our case, the use of Kahoot! has been very useful for many reasons. It helped students to maintain concentration, since they knew that there would have been a quiz after each part of the lesson. Then, the existence of a final ranking increased the attention of the participants pushing them to note even the most detailed insights. Furthermore, Kahoot! helped to enhance involvement and interaction among students, as anonymity made it easier also for the shyest to get involved and allowed us to repeat and highlight the main concepts covered during our lessons. Moreover, Kahoot! also gave us the possibility of receiving feedback about students behaviour in real-time and

checking if students paid attention for the full duration of the lesson. Specifically, it allowed us to keep track of the degree of participation: for example, from the analysis of a typical activity (the lesson common to all courses), we observed that about 90% of participants answered all the questions asked with about 70% of correct answers, despite the short time allowed to respond. These results are particularly important if taking into account that online mode could lead students to log in and then not really follow the lesson.

Furthermore, since our data also give us a clue as to the understanding of the treated topics in the short term, we think that the usage of Kahoot! could be considered as a valuable tool to study students' comprehension also during ordinary lessons in presence. It could be interesting to deepen this aspect in the future also thanks to the feedback we could receive from school teachers who will adopt Kahoot! in their lessons.

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This work was supported by the Italian Project Piano "Lauree Scientifiche". The authors also want to thank Simonetta Pieroni, film-maker, for the excellent production of the videos used during the described activity.

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