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INTEGRATION OF TECHNOLOGICAL TOOLS IN PHYSICAL EDUCATION

A PRACTICAL PROPOSAL USING MICRO:BIT



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1.Introduction and justification

In recent years, the integration of technology in education has gained increasing relevance, becoming an important element for pedagogical innovation and the improvement of teaching and learning processes. Digital tools are now widely used to support communication, collaboration and access to information in most school subjects. However, the presence of technology is not equally distributed across the curriculum, and some areas, such as Physical Education, have traditionally incorporated fewer digital resources due to their practical and movement-based nature (Abd Rahman et al., 2026).

Physical Education is a subject centred on bodily movement, physical interaction and real-time performance. For this reason, it has often been perceived as difficult to combine with digital tools, which are usually associated with screen based or classroom based activities. As a result, PE has sometimes been left behind in the process of digitalisation of education, despite the fact that students increasingly live and learn in environments that are technology rich. This gap raises important questions about how Physical Education can evolve in order to remain relevant, motivating and connected to the skills that students need in today's society.

Despite these challenges, several studies indicate that the appropriate use of technology in Physical Education can have significant educational benefits. Digital tools can support students' motivation, autonomy and engagement, as well as contribute to the development of digital competence and to a better understanding of physical performance and movement (Casey & Goodyear, 2015; Sentance et al., 2017). When technology is used to collect, visualise and analyse data related to movement, students become physically active and also encouraged to reflect on their actions, set goals and evaluate their own progress. In this context, it is necessary to explore technological tools that do not replace physical activity, but rather complement and enrich it.

One of these tools is micro:bit, a small programmable device designed and developed by the BBC and the Micro:bit Educational Foundation for educational purposes. It was originally created as part of the BBC's *Make It Digital* initiative with the aim of inspiring young people to become digital creators rather than passive consumers of technology. The BBC intended the device to be affordable, easy to use and intuitive, so that students with little prior experience could start programming and building real world projects and also developing digital skills. These goals were guided by an educational philosophy that aimed to prepare students to live and learn in a world where digital technology is part of everyday life. (Austin et al., 2020).

The micro:bit allows students to collect simple movement data, such as steps, reaction times or distance, using its built in sensors and display. This makes it possible to design Physical Education activities in which students move, receive feedback and use digital information at the same time. In this way, the micro:bit does not replace physical activity, but adds a layer of reflection and understanding, helping students connect what they do with what they see on the device. This supports important learning goals such as digital competence, learning to learn and active participation, and also makes the activities accessible to students with different levels of technological experience. (Austin et al., 2020).

For this reason, this Final Degree Project focuses on analysing the integration of technology in Physical Education through the use of micro:bit and on designing a practical proposal that can be implemented in a real educational context. Through the combination of different micro:bit based activities along with a structured methodology for data collection and analysis, this project aims to explore how this type of technology can influence students' motivation and digital competence, while also maintaining the central role of physical activity in PE lessons.

2.Objectives of the project

General objective

1. To analyse how technology, specifically the use of micro:bit, can be integrated in a practical and meaningful way into Physical Education lessons.

Specific objectives

1. To analyse the impact of the use of micro:bit on students' motivation and engagement in PE lessons.

2. To examine how the use of micro:bit contributes to the development of students' digital competence.

3. To explore how sensor-based data collected during lap counting and jump activities can support reflection and self-assessment in PE.

4. To design and implement a set of PE activities integrating micro:bit in a meaningful way.

3.Theoretical Framework

3.1 Technology in Physical Education

Digital technology in Physical Education (PE) has expanded considerably in the last decade, although its educational value depends more on how it is used than on the presence of devices. In this context, digital technology includes tools such as wearable devices, mobile applications, video feedback and sensor based systems that collect movement data. The key issue is how these tools are integrated to support learning, assessment, inclusion and engagement, while maintaining sufficient time for physical activity (Casey & Goodyear, 2015).

Research shows that technology in PE can contribute to different learning domains, including physical, cognitive, social and affective outcomes (Jastrow, 2022). However, its

effectiveness is strongly influenced by how it is implemented, the role it plays in the lesson and contextual factors such as teacher training and access to resources (Jastrow, 2022). This suggests that technology is not inherently beneficial and that it becomes meaningful when it is clearly linked to learning objectives.

One of the main advantages of digital tools in PE is their ability to support feedback and reflection, because by making performance visible through data, students can better understand their actions, compare results, set goals and adjust their performance (Potdevin et al., 2018). In this sense, the value of technology does not lie in the data itself, but in how it is used to support learning processes.

At the same time, PE presents specific challenges for technology integration because lessons are often active, fast-paced and dependent on space, and this makes it difficult to use tools that require complex setup or constant attention. These practical constraints help explain why technology has been less widely adopted in PE compared to other subjects (Casey & Goodyear, 2015). As a result, research stresses the importance of using simple, reliable tools that do not interrupt the flow of the lesson (Jastrow, 2022).

Teacher competence is also a key factor. Studies show that teachers' confidence and digital skills influence if technology is used effectively in PE (Wallace et al., 2023). This means that, without proper training and support, there is a risk that technology is used in a superficial way or not used at all (Jastrow, 2022).

Overall, research suggests that technology in PE is most effective when it supports feedback, reflection and learning in a simple and practical way, without reducing time for physical activity (Casey & Goodyear, 2015).

3.2 Motivation and engagement in PE with technology

Motivation and engagement are essential in Physical Education, as they directly influence students' participation and effort. In this context, technology has been explored as a way to make learning more interactive and meaningful. However, its impact depends largely on how it is integrated into teaching (Goodyear & Armour, 2019).

Self-Determination Theory (SDT) provides a useful framework to understand motivation in PE. According to Deci and Ryan, students are more motivated when their needs for autonomy, competence and relatedness are satisfied (Deci & Ryan, 2000). It has been observed that technology can support these needs by allowing students to track their performance, receive feedback and participate in interactive or collaborative activities.

Research indicates that digital tools can increase motivation, especially when they make learning more engaging. For example, game based approaches and interactive technologies have been associated with higher levels of enjoyment and participation (Papastergiou, 2009; Gao et al., 2013). Similarly, tools that provide immediate feedback can support self monitoring and goal setting, helping students stay engaged (Sun, 2013).

However, motivation is not automatically improved by the presence of technology, because if digital tools are used without a clear purpose or disrupt the flow of the lesson, they can reduce engagement (Casey & Goodyear, 2015). In addition, the motivational effect of technology may decrease over time if activities are not meaningful, overused or well designed (Goodyear & Armour, 2019).

In primary education, motivation is closely linked to enjoyment and active participation. It has been proved that simple and accessible technologies are especially effective, as they allow students to interact with digital tools without reducing movement time. Moreover, when students can see a clear connection between their actions and the feedback they receive, this can strengthen both engagement and understanding (Sun, 2013).

In summary, technology can support motivation in PE when it is easy to use, clearly linked to learning goals and integrated into active and meaningful tasks (Goodyear & Armour, 2019).

3.3 Digital competence and physical computing

Digital competence is an important educational objective, as students are expected not only to use technology but also to understand, interpret and create with it. This includes skills such as information literacy, problem solving and the ability to interpret digital data (European Commission, 2018).

Physical Education offers a different approach to digital competence, because students can interact with technology through movement. Instead of focusing only on screen based activities, PE enables students to generate and interpret data through their own physical actions. This helps them understand how data is produced and used in real situations.

In this context, physical computing is particularly relevant, as it refers to the use of programmable devices that can sense and respond to the physical environment through inputs and outputs. Tools such as micro:bit allow students to create simple programs that connect movement with digital responses, and this makes learning more tangible and interactive for them (Sentance et al., 2017).

Studies show that physical computing can support both digital competence and engagement. Students can develop technical skills, data literacy and problem-solving abilities by interacting with devices and interpreting the information they generate (Sentance et al., 2017; Fritz et al., 2021). At the same time, this approach encourages active learning because students experiment, test and modify their ideas.

An important advantage of physical computing is that it promotes a more active role for students. Instead of being passive users of technology, they become creators and participants in the learning process (Sentance et al., 2017). This is particularly important in PE, where learning is based on action and experience.

However, as mentioned before its effectiveness depends on how it is implemented. Activities need to be simple, clearly structured and directly connected to learning objectives. In PE, it

is especially important that technology supports movement and does not interrupt it (Fritz et al., 2021).

In conclusion, physical computing provides a valuable way to develop digital competence in PE as it connects movement, data and technology in a practical and meaningful way.

3.4 Micro:bit as an educational tool

The micro:bit is a programmable device designed for educational use, with the aim of introducing students to programming and digital creation in an accessible way. It was developed as part of the BBC's Make It Digital initiative and has been widely adopted in schools due to its simplicity and affordability (Austin et al., 2020).

One of its main strengths is its ability to connect digital processes with real world interaction. The device includes built-in sensors, such as an accelerometer and buttons, which allow students to collect data and receive immediate feedback. This makes it especially suitable for physical computing and hands-on learning (Sentance et al., 2017).

Research highlights that the micro:bit can support motivation, engagement and creativity, as students can create their own projects and see tangible results (Sentance et al., 2017; Waite et al., 2020). It also supports the development of computational thinking, because students need to apply problem-solving and logical reasoning when designing their programs (Sentance et al., 2017).

In addition, the micro:bit has potential for use in Physical Education. Its sensors allow the collection of simple movement data, such as steps or reaction times, which can be used to support feedback and reflection and this helps students connect their physical actions with measurable outcomes, improving their understanding of performance (Avci et al., 2024).

Another advantage is its adaptability. The micro:bit can be used in simple activities or in more complex tasks, depending on the level of the students. Its portability and ease of use also make it suitable for PE lessons, where time and space are often limited (Austin et al., 2020).

However, as with other technologies, its effectiveness depends on its pedagogical use. Without clear objectives, there is a risk that it becomes a novelty rather than a meaningful learning tool (Austin et al., 2020). For this reason, it is important to design activities where the micro:bit supports learning without reducing physical activity.

Overall, the micro:bit is a versatile tool that can support digital competence, motivation and active learning. Its use in PE offers an opportunity to connect movement, data and technology (Sentance et al., 2017).

4. Context of the group

The intervention of this project is carried out in a 5th grade Primary Education group composed of 25 students, including 10 boys and 15 girls, aged between 10 and 11 years old. This group has experienced some recent changes, as two students have been incorporated during the current academic year, one at the beginning of September and another at the end of January. These incorporations mean that, although the group is generally stable, there are still some ongoing adaptation processes, particularly in terms of social integration and classroom routines.

Most of the students have shared schooling together since the early years of Primary Education. However, at the beginning of 5th grade, the school reorganised the groups by mixing two previously parallel classes. This reorganisation had an initial impact, as students had to adapt to new classmates and rebuild their social relationships. Even though they already knew each other from previous years, they were not used to working together on a daily basis. Over time, the group has developed a positive classroom climate, although this previous change still helps explain some current behaviours, such as the tendency to maintain fixed pairings or friendship groups.

From a linguistic perspective, Catalan is the main language used in the classroom, especially in formal learning situations. However, students tend to communicate in Spanish among themselves during informal interactions. All students show a good level of comprehension in Catalan, although using it orally requires more effort, particularly in spontaneous communication. This aspect is relevant for the intervention, as it may influence participation in activities that require verbal interaction or explanation. Even so, students are aware of the linguistic norms of the school and generally respect the use of Catalan in academic contexts.

Regarding the academic level, the group presents a generally low-medium performance for their grade. According to the tutor, some contents that should have been consolidated in previous years were not fully acquired at the beginning of the course. For example, students showed difficulties with basic aspects such as multiplication tables or identifying grammatical categories. Although these contents have been reinforced during the year and some improvement has been observed, learning is still not fully consolidated. This suggests that students may require more time, repetition and structured guidance when facing new learning situations.

In addition, students initially showed limited study strategies, which has affected their ability to learn autonomously. They have recently started to work with tools such as concept maps, which represents an important step towards developing learning-to-learn competence. However, this process is still recent, and many students continue to rely on teacher guidance to organise information and understand tasks.

A key characteristic of this group is its high level of diversity, both in terms of academic performance and personal situations. There are significant differences between students, which requires continuous adaptation of teaching strategies. For instance, one student presents a moderate intellectual disability and works at a level closer to early Primary Education. This student receives specific support from specialised staff, and her tasks are highly adapted. Another student has a language disorder (TEL), showing high motivation

and effort but requiring simplified instructions, reduced content and adapted assessment criteria.

Moreover, there is a student with significant learning difficulties without a formal diagnosis, who has been in the country for only two years and this situation may affect both her academic performance and her linguistic development. In addition, two students are currently under institutional care and live in a residential centre, which adds an important social and emotional dimension to the group context. These factors highlight the need to design inclusive activities that allow participation at different levels and do not rely exclusively on academic performance.

In terms of classroom climate, the group shows a generally positive and respectful dynamic, because students have developed a sense of belonging and understand the importance of coexistence, even if not all of them are close friends. This is especially relevant in a group that has experienced recent reorganisation, as it reflects a successful adaptation process. Compared to the parallel group, this class is described as calmer and easier to manage, which facilitates the implementation of structured activities.

Conflicts in this group do occur, mainly during less structured times such as recess or lunchtime, but they are usually minor and part of daily coexistence. These conflicts tend to be situational rather than persistent and are often related to play or misunderstandings. However, it is observed that some students are more frequently involved in these situations, while others tend to avoid them, and this variability should be taken into account when organising group activities.

Socially, there are some fixed pairings between certain students, which can make it more difficult to create flexible groupings. Some students tend to always work with the same partner and show resistance when this dynamic is changed. Although this does not represent a major problem, it may affect cooperative learning situations, where flexibility and openness are required.

Regarding working activities, students are generally more comfortable with individual tasks or pair work. Group work represents a greater challenge, especially when it comes to distributing roles and making shared decisions, because It is common for one student to assume a dominant role and impose their ideas, which can lead to disagreements within the group. This indicates that students are still developing cooperative skills such as negotiation, role distribution and collective decision-making.

For this reason, teacher guidance is essential when implementing group activities. Some students need support to understand that the objective is not only the final product, but also the collaborative process. When roles are clearly defined and aligned with students' strengths, group work becomes more effective and balanced.

At an individual level, the group is relatively autonomous and shows a good disposition towards work. However, some students require frequent positive reinforcement and confirmation to feel confident about their performance. This need for validation suggests that motivation is partly dependent on external feedback, which should be considered when designing activities that aim to promote autonomy and self-confidence.

Finally, in relation to technology, students are familiar with its use in the classroom. Each student has access to a digital device, and technology is regularly used across different subjects through platforms such as Google Classroom. They have also participated in activities related to digital competence, including programming tasks and the use of micro:bit devices through a STEAM project. Their attitude towards digital tools is generally positive, and they show interest and motivation when using them. This creates favourable conditions for the integration of micro:bit in Physical Education, as students are likely to engage with the activities and understand the basic functioning of the device without requiring extensive prior instruction.

5. Methodology

This project follows a mixed-methods approach combining quantitative and qualitative data collection techniques. This methodological design was selected because the integration of technology in Physical Education cannot be fully understood through numerical data alone. While questionnaires provide information about students' perceptions and attitudes, classroom observation makes it possible to identify behaviours, interactions and reactions that may not be reflected in written responses. The combination of both approaches allows for a more complete understanding of students' experiences during technology integrated PE activities, which is consistent with previous research highlighting the importance of analysing both measurable outcomes and students' perceptions when evaluating the educational use of technology (Casey & Goodyear, 2015; Goodyear & Armour, 2019).

The intervention was implemented in a 5th grade Primary Education class composed of 25 students at Escola Can Salvi (Sant Andreu de la Barca). The implementation took place during two different PE lessons conducted on separate days. The first session included the administration of the pre-questionnaire, the collective programming of the micro:bit devices and the implementation of the first activity. The second session included the implementation of the second activity and the administration of the post-questionnaire.

The researcher took an active role throughout the intervention by introducing the project, explaining the objectives of the activities, guiding students during the sessions and collecting all the data. The classroom tutor supported the organisation and supervision of the activities. However, all observations, field notes and data collection procedures were carried out by the researcher.

Before each practical activity, approximately thirty minutes were dedicated to programming the micro:bit devices that would later be used during the session. Although students already had previous experience with programming and using micro:bit devices through previous school projects, the code required for each activity was projected on the classroom screen and programmed collectively by the students. The researcher guided the process and explained the function of each programming block while students replicated the code on their own devices.

This programming phase served a dual purpose. On the one hand, it ensured that all devices were correctly configured before the implementation of the activities. On the other hand, it encouraged students to actively participate in the creation of the technological tool they would later use during Physical Education. Previous studies have highlighted that

physical computing activities can promote active learning and increase students' engagement by positioning them as creators rather than passive users of technology (Sentance et al., 2017).

The intervention consisted of two Physical Education activities implemented over two different sessions. Both activities integrated the use of micro:bit technology and were designed to combine physical activity, data collection and the development of digital competence.

Session	Activity	Duration	Main Objective
Session 1	Relay Lap Counter	Approximately 10 minutes	To compare lap counting using a micro:bit and manual counting methods during a running task.
Session 2	Jump Airtime Challenge	Approximately 10 minutes	To compare jump airtime measurement using a micro:bit and manual estimation methods.

The intervention was designed to allow students to experience both traditional and technology-supported approaches to movement data collection. Across the two sessions, students had the opportunity to use the micro:bit while also performing equivalent tasks through manual recording and estimation procedures. This design ensured that all participants experienced both conditions and allowed the researcher to observe differences in participation, motivation and engagement.

Further information regarding the educational rationale, organisation and implementation of each activity is provided in Section 6.

5.1 Data Collection

Data were collected using two complementary instruments: student questionnaires and classroom observation. The combination of these instruments allowed the collection of both quantitative and qualitative information, providing a broader understanding of students' experiences during the intervention.

5.1.1 Classroom Observation

Classroom observation was conducted throughout both sessions using a structured observation rubric specifically designed for this project. The observation focused on four dimensions directly related to the objectives of the study: involvement, use of the micro:bit, collaboration and motivation.

Dimension	Indicators Observed
Involvement	Participation in the activity, attention to instructions and respect for turns.
Use of the micro:bit	Understanding of the device, autonomous use and interpretation of the information displayed.
Collaboration	Cooperation, peer support and respectful interaction with classmates.
Motivation	Interest, enthusiasm and positive attitude towards the activity.

Each dimension was evaluated using a three-point scale:

- **1 (Low):** The behaviour was rarely observed and required continuous support.
- **2 (Medium):** The behaviour was observed inconsistently or only during certain moments of the activity.
- **3 (High):** The behaviour was consistently observed throughout the activity and demonstrated independently.

In addition to the rubric scores, qualitative field notes were recorded during both sessions. These notes documented relevant situations that could not be adequately represented through numerical values alone, including expressions of motivation, frustration, collaborative interactions, reactions towards the use of the device and technical difficulties encountered during the activities.

5.1.2 Student Questionnaires

Two questionnaires were administered during the intervention. The first questionnaire was completed before the implementation of the activities and aimed to explore students' initial attitudes towards Physical Education, technology and digital devices. The second questionnaire was administered after the intervention and focused specifically on students' perceptions of the activities carried out using the micro:bit.

All items were answered using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaires were completed anonymously in order to encourage honest responses and minimise social desirability bias.

5.2 Data Analysis

Data analysis combined quantitative and qualitative procedures.

Questionnaire responses were analysed descriptively through frequency counts for each response category. This made it possible to identify general trends regarding students' perceptions of Physical Education, technology and the use of the micro:bit during the intervention.

Observation data were analysed through the rubric scores and the qualitative field notes collected during the sessions. Particular attention was paid to recurring patterns related to

motivation, participation, collaboration, autonomy and students' reactions towards the technological component of the activities.

The combination of questionnaire results and classroom observations allowed the triangulation of data from different sources, providing a broader understanding of students' experiences throughout the intervention.

6. Implemented Activities

The intervention implemented in this project was based on the integration of micro:bit technology into regular Physical Education activities. The aim was not to replace movement practice, but to complement it through data collection, immediate feedback and opportunities for reflection on performance.

The intervention was carried out with a 5th grade Primary Education class. This educational stage was considered particularly appropriate due to students' increasing autonomy, their developing digital competence and their ability to interpret simple data generated through sensors and digital devices. Previous studies have highlighted that physical computing activities can support both computational thinking and active learning when integrated into meaningful educational contexts (Sentance et al., 2017; Fritz et al., 2021).

The activities were selected according to three main criteria. First, they addressed movement skills already present in the Physical Education curriculum, ensuring that technology complemented rather than replaced physical activity. Second, they allowed students to obtain immediate feedback through the micro:bit, facilitating reflection and comparison on their own performance. Finally, they required students to actively participate in both the programming and implementation phases of the activities, promoting a more active role in the learning process.

Prior to each activity, approximately thirty minutes were dedicated to programming the micro:bit devices. The researcher projected the code and guided students through the programming process, while students replicated the code on their own devices. This stage ensured that all participants understood how the technology worked and increased their engagement before the practical component of the lesson.

6.1 Activity 1: Relay Lap Counter

6.1.1 Educational Rationale

This activity was designed to explore how a micro:bit can support data collection during continuous movement tasks. Running activities are commonly used in Physical Education and provide an accessible context in which students can compare traditional counting methods with digital data collection. The activity also promotes cooperation, participation and self-monitoring.

Research has shown that wearable and sensor-based technologies can support monitoring and reflection processes in Physical Education settings, helping students become more aware of their own performance (Arif et al., 2015; Avci et al., 2024).

6.1.2 Implementation

Students were organised into three groups in order to reduce waiting times and maximise participation.

The activity was timed to last 10 min. Each student completed a running task consisting of five laps around a marked circuit. Some students initially performed the activity using a micro:bit programmed as a lap counter, while others counted their laps manually. Students alternated roles throughout the activity so that all participants experienced both conditions.

Participants using the micro:bit carried the device while running and pressed button A each time they completed a lap. The device displayed the total number of laps completed. Students who were not using the device recorded their laps manually and later compared both methods.

At the end of the activity, students had to count the total number of laps of their group and discussed whether the micro:bit made lap counting easier and whether the technological approach offered any advantages compared to manual counting.

6.2 Activity 2: Jump Airtime

6.2.1 Educational Rationale

This activity focused on analysing jump performance through the measurement of airtime. The objective was to help students understand how technology can be used to collect movement-related data and to encourage reflection on the relationship between movement execution and measurable outcomes.

Previous research suggests that sensor-based technologies can improve students' understanding of movement concepts while simultaneously increasing engagement and curiosity towards physical activity (Sentance et al., 2017; Fritz et al., 2021).

6.2.2 Implementation

For this activity, the class was divided into two groups. This arrangement facilitated classroom management and allowed closer observation of students' behaviour and participation throughout the session.

Students performed a series of vertical jumps attempting to remain in the air for as long as possible. Some students initially completed the activity using a micro:bit programmed to detect take-off and landing, while others performed the same task without technological support.

The micro:bit automatically recorded the airtime of each jump and displayed the result on the screen immediately after landing. Students who were not using the device estimated jump duration manually and later compared their estimations with the measurements provided by the technology.

After several rounds, students exchanged roles so that all participants experienced both conditions.

Following the activity, students discussed whether the technological measurements corresponded with their expectations and reflected on the advantages and limitations of manual estimation compared to digital measurement.

7. Results and Discussion

The intervention was carried out in a 5th grade Primary Education class composed of 25 students and took place over two different sessions at Escola Can Salvi, with one activity conducted each day. During both sessions, data were collected through student questionnaires and systematic classroom observation using an observation rubric designed specifically for this project.

The observation rubric assessed four dimensions: student involvement, use of the micro:bit, collaboration and motivation. In addition, qualitative notes were taken during the implementation in order to identify behaviours, interactions and possible difficulties that could not be captured through the questionnaires alone.

7.1 Questionnaire results

The pre-questionnaire showed that students already had very positive attitudes towards both Physical Education and technology before the intervention.

Question	Positive responses (4-5)	Neutral (3)	Negative responses (1-2)
Enjoy PE lessons	80%	8%	8%
Feel motivated in PE	80%	12%	8%
Like using technology at school	76%	12%	12%

Feel comfortable using digital devices	72%	24%	4%
Technology makes PE more interesting	16%	28%	56%

Most students reported enjoying Physical Education lessons and feeling motivated during class. Similarly, most participants indicated that they liked using technology at school and felt comfortable using digital devices. These results suggest that the group presented favourable initial conditions for the implementation of technology integrated PE activities.

Regarding the belief that technology could make Physical Education lessons more interesting, responses were more varied. In fact, negative responses were more frequent than positive ones, suggesting that not all students initially expected technology to improve their Physical Education experience. This result highlights the importance of analysing how students' perceptions evolved after participating in the intervention.

The post-questionnaire focused specifically on students' perceptions of the activities carried out with the micro:bit.

Question	**Positive responses (4-5)**	**Neutral (3)**	**Negative responses (1-2)**
Activity was motivating	20%	36%	44%
Activity was interesting	44%	24%	32%
Activity was easy to understand	16%	56%	28%
Technology helped me during the activity	52%	28%	20%

I would like more activities with micro:bit	72%	12%	16%

Results showed a mixed pattern of responses. While some questionnaire items received predominantly positive evaluations, others generated more neutral or even negative responses. Overall, students appeared to value certain aspects of the activities, particularly those related to the use of the micro:bit and their willingness to participate in similar experiences in the future. However, not all students perceived the activities as equally motivating or engaging.

Responses related to understanding the activities were generally favourable, with most students selecting neutral or positive options. This suggests that the instructions and organisation of the sessions were appropriate for the age group and that students were able to follow the activities without major difficulties.

The strongest positive responses were observed in the final question regarding participation in future micro:bit-based Physical Education activities. This indicates that, despite some mixed evaluations of specific aspects of the intervention, students were generally open to continuing to use this type of technology in Physical Education lessons.

Although the post-questionnaire revealed some mixed perceptions regarding motivation and engagement, students generally remained open to the use of technological resources in Physical Education, particularly when asked whether they would like to participate in similar activities in the future.

7.2 Observation results

The observation data provided valuable information that complemented the questionnaire results.

During the first activity, which involved lap counting while running, students generally participated actively and respected the established turns. Collaboration between group members was particularly evident when students had to verify and compare the number of laps completed. Most students showed an appropriate understanding of how the micro:bit worked and were able to use it autonomously after the initial programming phase.

One of the most notable observations throughout the intervention was that students appeared particularly motivated during the programming stage. The opportunity to create and upload their own code generated considerable interest and engagement. In fact, students frequently asked questions about the operation of the device and demonstrated curiosity about the technological aspects of the activity.

However, it was also observed that the motivational impact of the micro:bit seemed to be linked partly to its novelty. While students showed high levels of enthusiasm when first using the device, this excitement tended to decrease slightly after repeated rounds of the same activity. Some students expressed a desire to move on to new Physical Education tasks rather than repeating the same exercise multiple times. This suggests that technology can be an effective motivational element, although its effect may diminish when activities become repetitive.

The second activity, focused on jump measurement, provided particularly interesting observations. During this activity, only some students initially had access to the micro:bit, while others performed the task without it. Students who did not have access to the device often appeared less engaged and frequently expressed a desire to use the micro:bit themselves. This behaviour suggests that the device attracted students' attention and generated interest beyond the physical activity itself.

Furthermore, some students became frustrated when they had to estimate or manually count jump times while their classmates obtained more precise measurements through the micro:bit. The device provided immediate numerical feedback, including decimal values, which students perceived as more accurate and reliable than manual estimation.

Another relevant observation was related to students' willingness to share the device. When the time came to exchange the micro:bit with classmates, several students showed reluctance to give it up. This behaviour indicates that the device had a strong appeal and was perceived as a desirable resource within the activity.

Despite these situations, collaboration levels remained high throughout the intervention. Students frequently helped each other interpret results, count measurements and solve difficulties related to the activities. In several cases, students using the micro:bit supported classmates who were performing manual measurements, demonstrating cooperative behaviour and mutual support.

Based on the observation rubric, the use of the micro:bit and collaboration were evaluated positively. Students quickly learned how to operate the device and generally used it correctly and independently. Collaboration was consistently observed across groups, particularly during data collection and result verification tasks.

In contrast, involvement was assessed as moderate and high. This was mainly due to the differences observed between students who had immediate access to the micro:bit and those who did not. Students waiting for their turn occasionally appeared less attentive and less actively engaged in the task.

Motivation appeared to fluctuate depending on students' access to the device and the stage of the activity. While many students showed enthusiasm when interacting directly with the micro:bit, lower levels of engagement were occasionally observed among students waiting for their turn or completing the task without technological support. Nevertheless, motivation generally increased when students knew that they would eventually have the opportunity to use the device themselves.

Finally, several technical issues were identified during the jump measurement activity. Some micro:bit devices occasionally failed to register measurements correctly or displayed results too quickly for students to read. In these cases, devices had to be restarted and some jumps repeated. Although these incidents did not prevent the implementation of the activity, they highlight some of the practical challenges associated with integrating technological tools into Physical Education contexts, as previously identified in the literature (Casey & Goodyear, 2015; Jastrow et al., 2022).

Overall, the combined analysis of questionnaire and observation data suggests that micro:bit can be successfully integrated into Physical Education lessons. The device promoted curiosity, collaboration and engagement while also providing opportunities to develop digital competence. Nevertheless, the results also indicate the importance of carefully designing activities so that all students remain actively involved, regardless of whether they are directly using the technological resource at a given moment.

These findings are consistent with Goodyear and Armour (2019), who argue that technology can support motivation and engagement when integrated into meaningful activities, although its motivational impact may decrease when the novelty effect disappears or when activities become repetitive.

8. Conclusion

The aim of this project was to analyse how micro:bit technology could be integrated into Physical Education lessons in a practical and meaningful way while promoting students' motivation, engagement and digital competence. To achieve this objective, two Physical Education activities were designed and implemented with a 5th grade Primary Education class, combining movement, programming and data collection through micro:bit devices.

The results obtained suggest that micro:bit can be successfully integrated into Physical Education contexts and can provide valuable opportunities for developing digital competence, promoting collaboration and encouraging students to engage with movement-related data. Students showed a high level of curiosity towards the device and demonstrated that they were capable of programming and using the micro:bit with a considerable degree of autonomy. This finding is consistent with previous research highlighting the educational potential of physical computing and the role of micro:bit in promoting active and meaningful learning experiences (Sentance et al., 2017; Fritz et al., 2021).

However, the findings also indicate that the relationship between technology and motivation is more complex than initially expected. Although observation data revealed high levels of curiosity and enthusiasm towards the micro:bit, particularly during the programming phase and the first moments of the activities, questionnaire responses showed a more mixed picture. This suggests that students' immediate behaviour during the activities did not always coincide with the perceptions they later reported in the questionnaires.

For this reason, classroom observation proved to be an essential component of the study. Being physically present during the implementation allowed the researcher to identify behaviours, reactions and interactions that would not have been captured through questionnaires alone, which highlights the importance of combining quantitative and qualitative methods when analysing educational interventions.

One of the most interesting findings was that students appeared to be highly motivated by the technology itself, particularly by learning how the micro:bit worked, programming the device and exploring its functions. In several cases, the technological component generated even more interest than the physical activity itself. This observation raises an important reflection regarding the role of technology in Physical Education. Rather than acting exclusively as a complement to movement, technology sometimes appeared to compete for students' attention.

Several students verbally expressed that they enjoyed using the micro:bit and learning about programming, but at the same time considered that Physical Education should primarily be a space for movement and sport. One student even wrote in the questionnaire that Physical Education should focus mainly on physical activity. Although she did not express a negative attitude towards the use of micro:bit, she felt that Physical Education lessons should remain focused on sport and movement. These comments suggest that, even though students value both technology and Physical Education, they do not necessarily perceive the combination of both elements as automatically beneficial. In some cases, students seemed to prefer enjoying each experience independently rather than simultaneously.

The implementation also highlighted the importance of meaningful technology integration. While the micro:bit attracted students' attention and increased their curiosity, the motivational effect appeared to decrease as activities became repetitive. This observation is consistent with previous research suggesting that the positive impact of technology may be partially linked to novelty and can diminish when activities are repeated or when the technological component is not clearly connected to students' learning goals (Goodyear & Armour, 2019). Consequently, simply introducing technology into a lesson is not enough to guarantee increased motivation or engagement.

Another relevant finding concerns the practical limitations of educational technology. Although the activities were successfully completed, several technical issues emerged during the jump airtime activity. Some devices occasionally failed to register measurements correctly or displayed results too quickly for students to read. While these difficulties did not prevent the implementation of the activity, they served as a reminder that technology does not always function as expected. Teachers who wish to integrate digital tools into Physical Education must therefore be prepared to adapt activities and respond to unexpected technical problems.

This project also highlighted the importance of teacher preparation. Although the activities were designed following recommendations found in the literature, the implementation process revealed that integrating technology meaningfully into Physical Education requires specific pedagogical knowledge and experience. The results obtained suggest that future interventions could benefit from a deeper understanding of technology-enhanced Physical Education methodologies and from designing activities in which the technological component

contributes more directly to learning objectives rather than functioning primarily as a motivational element.

Several limitations should also be acknowledged. The intervention involved only one class group and consisted of two activities implemented over a short period of time. Consequently, the findings cannot be generalised to all educational contexts. Furthermore, some questionnaire responses appeared inconsistent with behaviours observed during the activities, which may be related to students completing the questionnaires quickly or interpreting the questions differently.

Despite these limitations, the project suggests that micro:bit offers considerable educational potential within Physical Education. Its value lies not only in the collection of movement data but also in its ability to connect programming, digital competence and physical activity within the same learning experience. Nevertheless, successful integration depends less on the technology itself and more on the pedagogical decisions that guide its use.

In conclusion, the findings support the idea that technology can enrich Physical Education when it is integrated thoughtfully, purposefully and in a way that respects the central role of movement within the subject. The project reinforces the need to view technology not as an objective in itself, but as a tool whose educational value depends on how, why and when it is used.

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10. Annexes

10.1 Pre- and Post- Questionnaires

PRE- QUESTIONARI TFG

Marca la resposta que millor et representi.

Molt en desacord = 1
En desacord = 2
Ni d'acord ni en desacord = 3
D'acord = 4
Molt d'acord =5

1. M'agrada participar a les classes d'Educació Física.

Marca solo un óvalo.

- ◯ 1
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2. Em sento motivat/da durant les classes d'Educació Física.

Marca solo un óvalo.

- ◯ 1
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- ⊗ 5

3. M'agrada utilitzar tecnologia a l'escola.

Marca solo un óvalo.

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4. Em sento còmode utilitzant dispositius digitals.

Marca solo un óvalo.

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5. Crec que la tecnologia pot fer les classes d'Educació Física més interessants.

Marca solo un óvalo.

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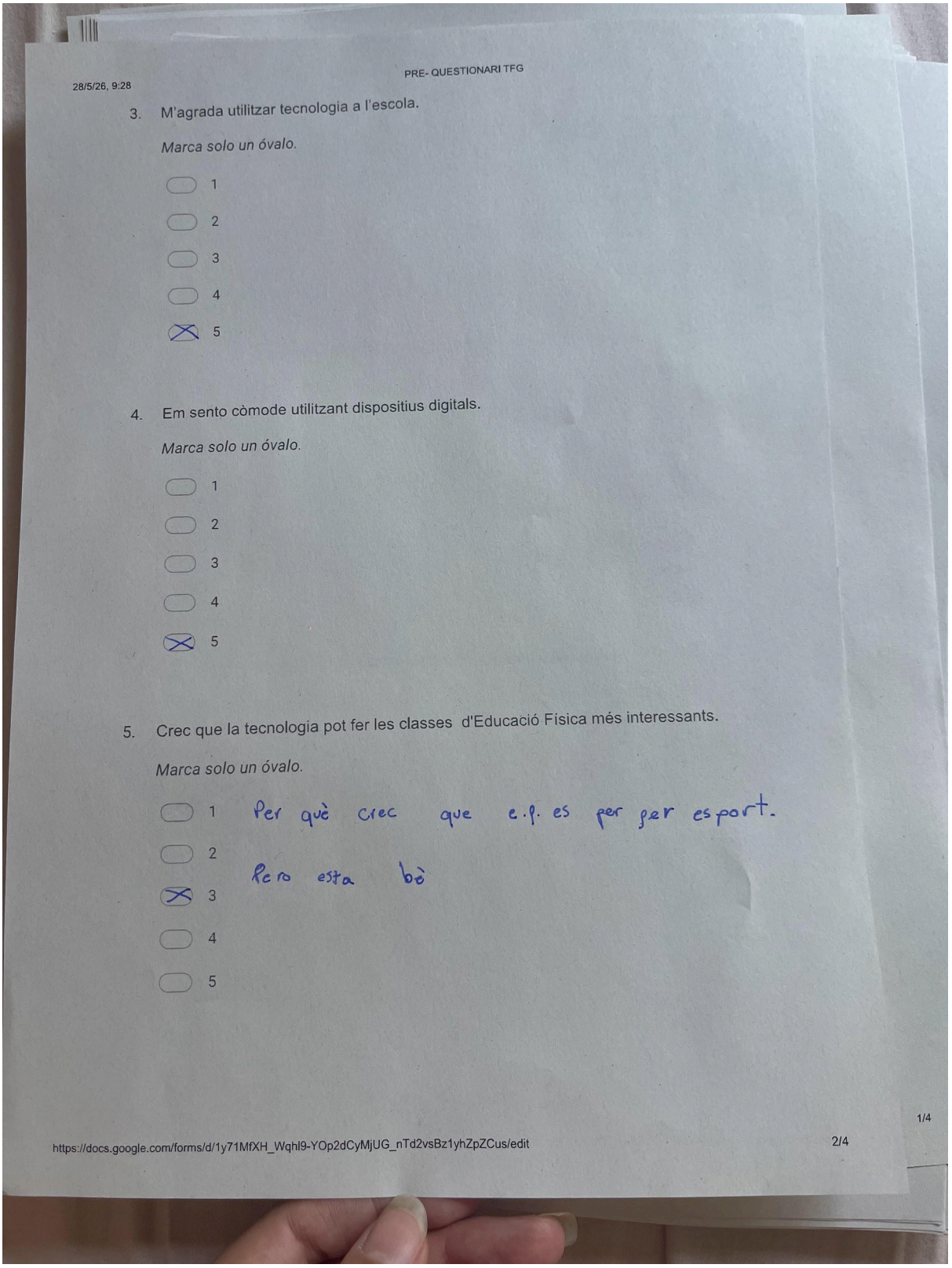

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3. M'agrada utilitzar tecnologia a l'escola.

Marca solo un óvalo.

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4. Em sento còmode utilitzant dispositius digitals.

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5. Crec que la tecnologia pot fer les classes d'Educació Física més interessants.

Marca solo un óvalo.

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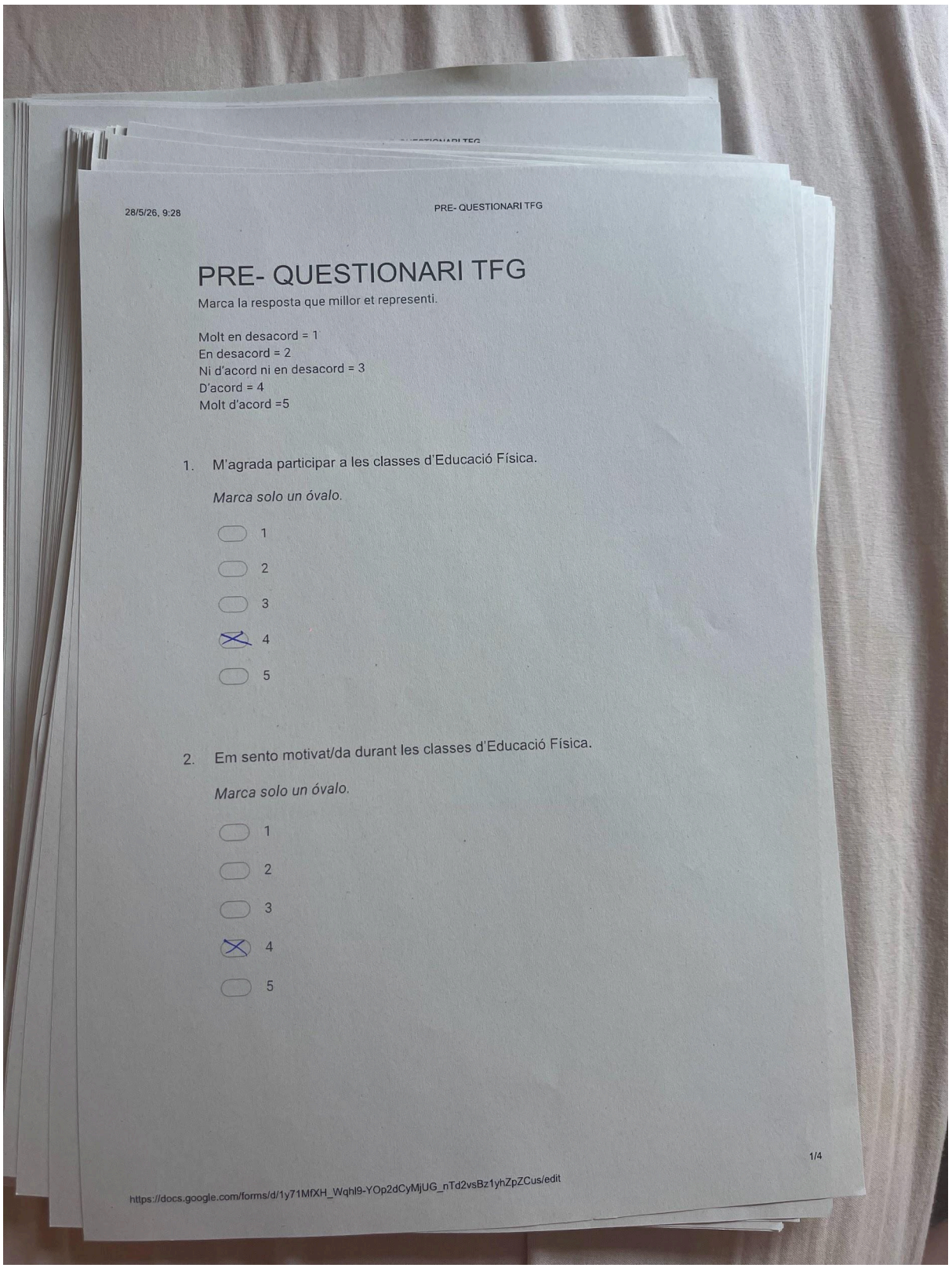

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   - ◯ 2
   - ⊗ 3
   - ◯ 4
   - ◯ 5

2. Em sento motivat/da durant les classes d'Educació Física.

   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ⊗ 4
   - ◯ 5

3. M'agrada utilitzar tecnologia a l'escola.

Marca solo un óvalo.

- ( ) 1
- ( ) 2
- ( ) 3
- (X) 4
- ( ) 5

4. Em sento còmode utilitzant dispositius digitals.

Marca solo un óvalo.

- ( ) 1
- ( ) 2
- ( ) 3
- (X) 4
- ( ) 5

5. Crec que la tecnologia pot fer les classes d'Educació Física més interessants.

Marca solo un óvalo.

- ( ) 1
- ( ) 2
- (X) 3
- ( ) 4
- ( ) 5

PRE- QUESTIONARI TFG

Marca la resposta que millor et representi.

Molt en desacord = 1
En desacord = 2
Ni d'acord ni en desacord = 3
D'acord = 4
Molt d'acord =5

1. M'agrada participar a les classes d'Educació Física.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ⊗ 5

2. Em sento motivat/da durant les classes d'Educació Física.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ⊗ 4
- ◯ 5

PRE- QUESTIONARI TFG

Marca la resposta que millor et representi.

Molt en desacord = 1
En desacord = 2
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1. M'agrada participar a les classes d'Educació Física.

   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ◯ 4
   - ⊗ 5

2. Em sento motivat/da durant les classes d'Educació Física.

   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ◯ 4
   - ⊗ 5

3. M'agrada utilitzar tecnologia a l'escola.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ⊗ 4
- ◯ 5

4. Em sento còmode utilitzant dispositius digitals.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ⊗ 5

5. Crec que la tecnologia pot fer les classes d'Educació Física més interessants.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ⊗ 4
- ◯ 5

28/5/26, 9:28 PRE- QUESTIONARI TFG

PRE- QUESTIONARI TFG

Marca la resposta que millor et representi.

Molt en desacord = 1
En desacord = 2
Ni d'acord ni en desacord = 3
D'acord = 4
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1. M'agrada participar a les classes d'Educació Física.

   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ◯ 4
   - ⊗ 5

2. Em sento motivat/da durant les classes d'Educació Física.

   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ◯ 4
   - ⊗ 5

3. M'agrada utilitzar tecnologia a l'escola.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ⊗ 4
- ◯ 5

4. Em sento còmode utilitzant dispositius digitals.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ⊗ 4
- ◯ 5

5. Crec que la tecnologia pot fer les classes d'Educació Física més interessants.

Marca solo un óvalo.

- ⊗ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5

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PRE- QUESTIONARI TFG

Marca la resposta que millor et representi.

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En desacord = 2
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   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ◯ 4
   - ⊗ 5

2. Em sento motivat/da durant les classes d'Educació Física.

   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ◯ 4
   - ⊗ 5

3. M'agrada utilitzar tecnologia a l'escola.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ⊗ 3
- ◯ 4
- ◯ 5

4. Em sento còmode utilitzant dispositius digitals.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ⊗ 4
- ◯ 5

5. Crec que la tecnologia pot fer les classes d'Educació Física més interessants.

Marca solo un óvalo.

- ⊗ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5

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2. Em sento motivat/da durant les classes d'Educació Física.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ⊗ 4
- ◯ 5

3. M'agrada utilitzar tecnologia a l'escola.

Marca solo un óvalo.

- 1
- 2
- [x] 3
- 4
- 5

4. Em sento còmode utilitzant dispositius digitals.

Marca solo un óvalo.

- 1
- 2
- [x] 3
- 4
- 5

5. Crec que la tecnologia pot fer les classes d'Educació Física més interessants.

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- 2
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- ⊗ 4
- ◯ 5

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- 5

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Marca solo un óvalo.

- 1
- 2
- 3
- 4
- 5

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3. M'agrada utilitzar tecnologia a l'escola.

Marca solo un óvalo.

- 1
- 2
- 3
- 4
- 5

4. Em sento còmode utilitzant dispositius digitals.

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- 1
- 2
- 3
- 4
- 5

5. Crec que la tecnologia pot fer les classes d'Educació Física més interessants.

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- 3
- 4
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- ◯ 2
- ◯ 3
- ⊗ 4
- ◯ 5

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Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ⊗ 5

3. M'agrada utilitzar tecnologia a l'escola.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ⊗ 4
- ◯ 5

4. Em sento còmode utilitzant dispositius digitals.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ⊗ 4
- ◯ 5

5. Crec que la tecnologia pot fer les classes d'Educació Física més interessants.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ⊗ 3
- ◯ 4
- ◯ 5

3. M'agrada utilitzar tecnologia a l'escola.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ⊗ 5

4. Em sento còmode utilitzant dispositius digitals.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ⊗ 5

5. Crec que la tecnologia pot fer les classes d'Educació Física més interessants.

Marca solo un óvalo.

- ⊗ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5

PRE- QUESTIONARI TFG

Marca la resposta que millor et representi.

Molt en desacord = 1
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Molt d'acord =5

1. M'agrada participar a les classes d'Educació Física.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ⊗ 5

2. Em sento motivat/da durant les classes d'Educació Física.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ⊗ 5

6. M'agradaria que hi hagués més activitats amb la micro:bit a Educació Física.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ⊗ 3
- ◯ 4
- ◯ 5

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POST- QUESTIONARI TFG

Marca la resposta que millor et representi.

Molt en desacord = 1
En desacord = 2
Ni d'acord ni en desacord = 3
D'acord = 4
Molt d'acord =5

1. M'ha agradat més participar en les activitats amb la micro:bit que en les activitats sense.

   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ⊗ 4
   - ◯ 5

2. La micro:bit ha fet les activitats més motivadores.

   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ◯ 4
   - ⊗ 5

3. Les activitats amb la micro:bit m'han semblat més interessants.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ⊗ 4
- ◯ 5

4. M'he sentit còmode utilitzant la micro:bit.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ⊗ 3
- ◯ 4
- ◯ 5

5. He entès fàcilment com funcionaven les activitats amb la micro:bit

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ⊗ 5

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6. M'agradaria que hi hagués més activitats amb la micro:bit a Educació Física.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ⊗ 4
- ◯ 5

Este contenido no ha sido creado ni aprobado por Google.

Google Formularios

3. Les activitats amb la micro:bit m'han semblat més interessants.

Marca solo un óvalo.

- [x] 1
- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5

4. M'he sentit còmode utilitzant la micro:bit.

Marca solo un óvalo.

- [x] 1
- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5

5. He entès fàcilment com funcionaven les activitats amb la micro:bit

Marca solo un óvalo.

- [ ] 1
- [ ] 2
- [ ] 3
- [ ] 4
- [x] 5

POST- QUESTIONARI TFG

Marca la resposta que millor et representi.

Molt en desacord = 1
En desacord = 2
Ni d'acord ni en desacord = 3
D'acord = 4
Molt d'acord =5

1. M'ha agradat més participar en les activitats amb la micro:bit que en les activitats sense.

   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2
   - ◯ 3 X
   - ◯ 4
   - ◯ 5

2. La micro:bit ha fet les activitats més motivadores.

   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2 X
   - ◯ 3
   - ◯ 4
   - ◯ 5

3. Les activitats amb la micro:bit m'han semblat més interessants.

Marca solo un óvalo.

- ( ) 1
- ( ) 2
- (X) 3
- ( ) 4
- ( ) 5

4. M'he sentit còmode utilitzant la micro:bit.

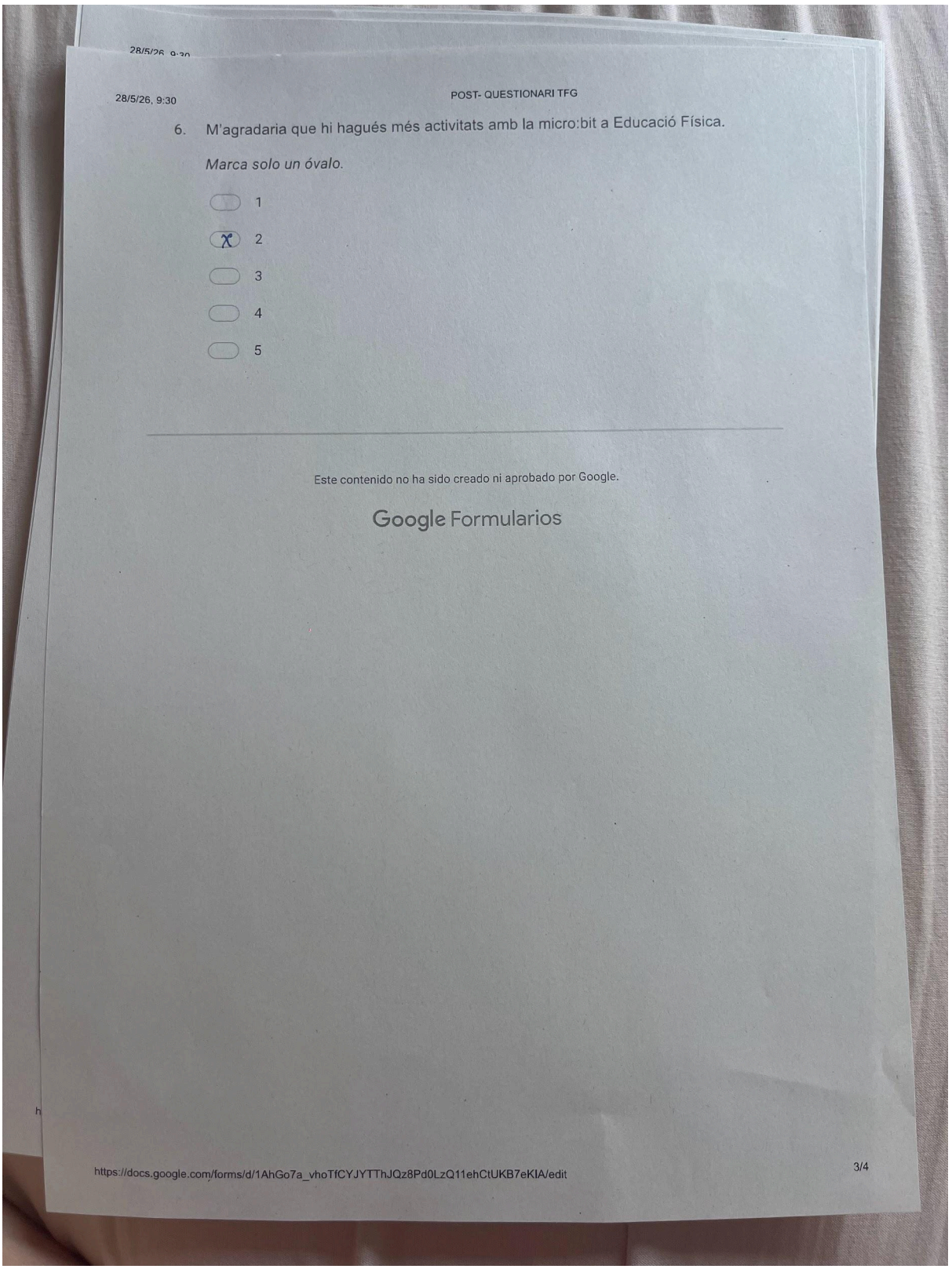
Marca solo un óvalo.

- ( ) 1
- ( ) 2
- ( ) 3
- ( ) 4
- (X) 5

5. He entès fàcilment com funcionaven les activitats amb la micro:bit

Marca solo un óvalo.

- ( ) 1
- ( ) 2
- ( ) 3
- ( ) 4
- (X) 5



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6. M'agradaria que hi hagués més activitats amb la micro:bit a Educació Física.

Marca solo un óvalo.

- 1
- 2
- 3
- 4
- 5

Este contenido no ha sido creado ni aprobado por Google.

Google Formularios

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POST- QUESTIONARI TFG

Marca la resposta que millor et representi.

Molt en desacord = 1
En desacord = 2
Ni d'acord ni en desacord = 3
D'acord = 4
Molt d'acord =5

1. M'ha agradat més participar en les activitats amb la micro:bit que en les activitats sense.

   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2
   - ⊗ 3
   - ◯ 4
   - ◯ 5

2. La micro:bit ha fet les activitats més motivadores.

   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ⊗ 4
   - ◯ 5

3. Les activitats amb la micro:bit m'han semblat més interessants.

Marca solo un óvalo.

- 1
- 2
- 3 (X)
- 4
- 5

4. M'he sentit còmode utilitzant la micro:bit.

Marca solo un óvalo.

- 1
- 2
- 3
- 4 (X)
- 5

5. He entès fàcilment com funcionaven les activitats amb la micro:bit

Marca solo un óvalo.

- 1
- 2
- 3
- 4 (X)
- 5

6. M'agradaria que hi hagués més activitats amb la micro:bit a Educació Física.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ⊗ 5

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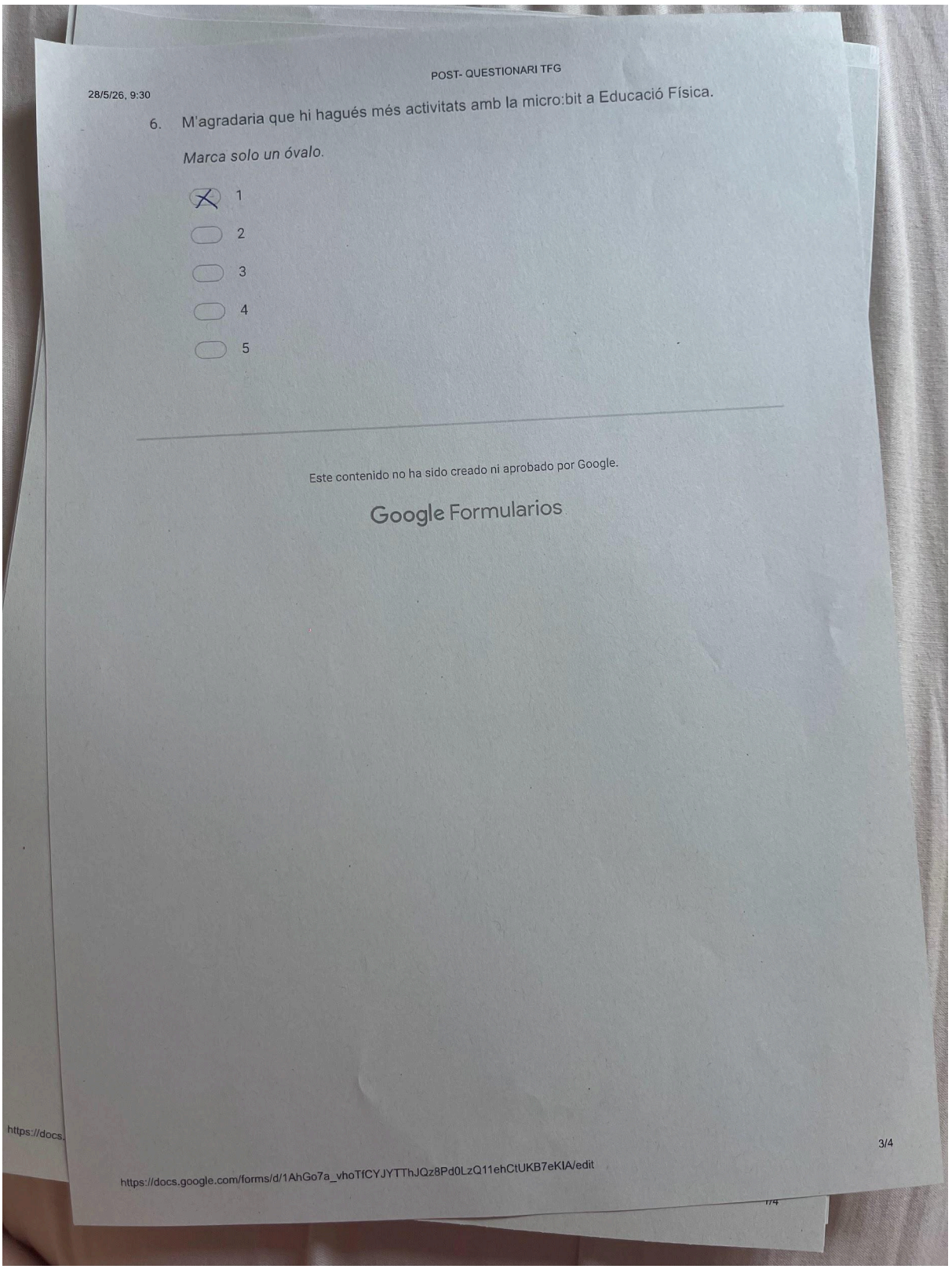

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6. M'agradaria que hi hagués més activitats amb la micro:bit a Educació Física.

Marca solo un óvalo.

- [x] 1
- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5

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POST- QUESTIONARI TFG

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Marca solo un óvalo.

- 1
- 2
- 3
- 4
- 5

2. La micro:bit ha fet les activitats més motivadores.

Marca solo un óvalo.

- 1
- 2
- 3
- 4
- 5

3. Les activitats amb la micro:bit m'han semblat més interessants.

Marca solo un óvalo.

- 1
- 2
- ★ 3
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- 5

4. M'he sentit còmode utilitzant la micro:bit.

Marca solo un óvalo.

- 1
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- 5

5. He entès fàcilment com funcionaven les activitats amb la micro:bit

Marca solo un óvalo.

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   - [x] 1
   - [ ] 2
   - [ ] 3
   - [ ] 4
   - [ ] 5

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   - [ ] 1
   - [x] 2
   - [ ] 3
   - [ ] 4
   - [ ] 5

3. Les activitats amb la micro:bit m'han semblat més interessants.

Marca solo un óvalo.

- ◯ 1
- ⊗ 2
- ◯ 3
- ◯ 4
- ◯ 5

itats

4. M'he sentit còmode utilitzant la micro:bit.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
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- ◯ 4
- ◯ 5

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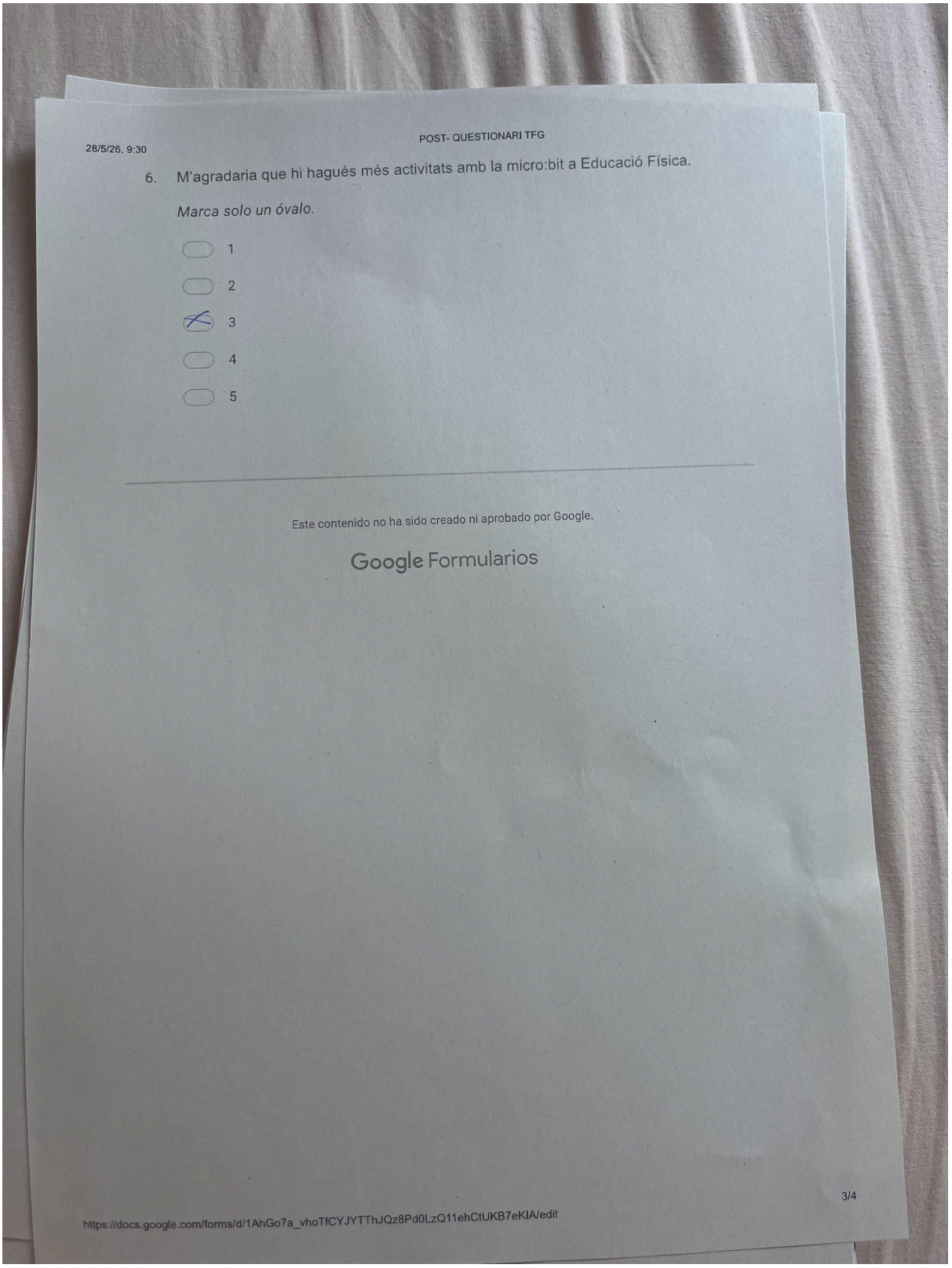
Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ⊗ 4
- ◯ 5



6. M'agradaria que hi hagués més activitats amb la micro:bit a Educació Física.

Marca solo un óvalo.

- 1
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   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2
   - ⊗ 3
   - ◯ 4
   - ◯ 5

2. La micro:bit ha fet les activitats més motivadores.

   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ⊗ 4
   - ◯ 5

3. Les activitats amb la micro:bit m'han semblat més interessants.

Marca solo un óvalo.

- ◯ 1
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4. M'he sentit còmode utilitzant la micro:bit.

Marca solo un óvalo.

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- ◯ 2
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- ◯ 5

5. He entès fàcilment com funcionaven les activitats amb la micro:bit

Marca solo un óvalo.

- ◯ 1
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- ⊗ 3
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- ◯ 5

6. M'agradaria que hi hagués més activitats amb la micro:bit a Educació Física.

Marca solo un óvalo.

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- ◯ 2
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POST- QUESTIONARI TFG

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En desacord = 2
Ni d'acord ni en desacord = 3
D'acord = 4
Molt d'acord =5

1. M'ha agradat més participar en les activitats amb la micro:bit que en les activitats sense.

   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2
   - ◯ 3
   - ⊗ 4
   - ◯ 5

2. La micro:bit ha fet les activitats més motivadores.

   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2
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3. Les activitats amb la micro:bit m'han semblat més interessants.

Marca solo un óvalo.

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4. M'he sentit còmode utilitzant la micro:bit.

Marca solo un óvalo.

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5. He entès fàcilment com funcionaven les activitats amb la micro:bit

Marca solo un óvalo.

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Marca solo un óvalo.

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Marca solo un óvalo.

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Marca solo un óvalo.

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5. He entès fàcilment com funcionaven les activitats amb la micro:bit

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   Marca solo un óvalo.

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   - ◯ 5

2. La micro:bit ha fet les activitats més motivadores.

   Marca solo un óvalo.

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3. Les activitats amb la micro:bit m'han semblat més interessants.

Marca solo un óvalo.

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Marca solo un óvalo.

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4. M'he sentit còmode utilitzant la micro:bit.

Marca solo un óvalo.

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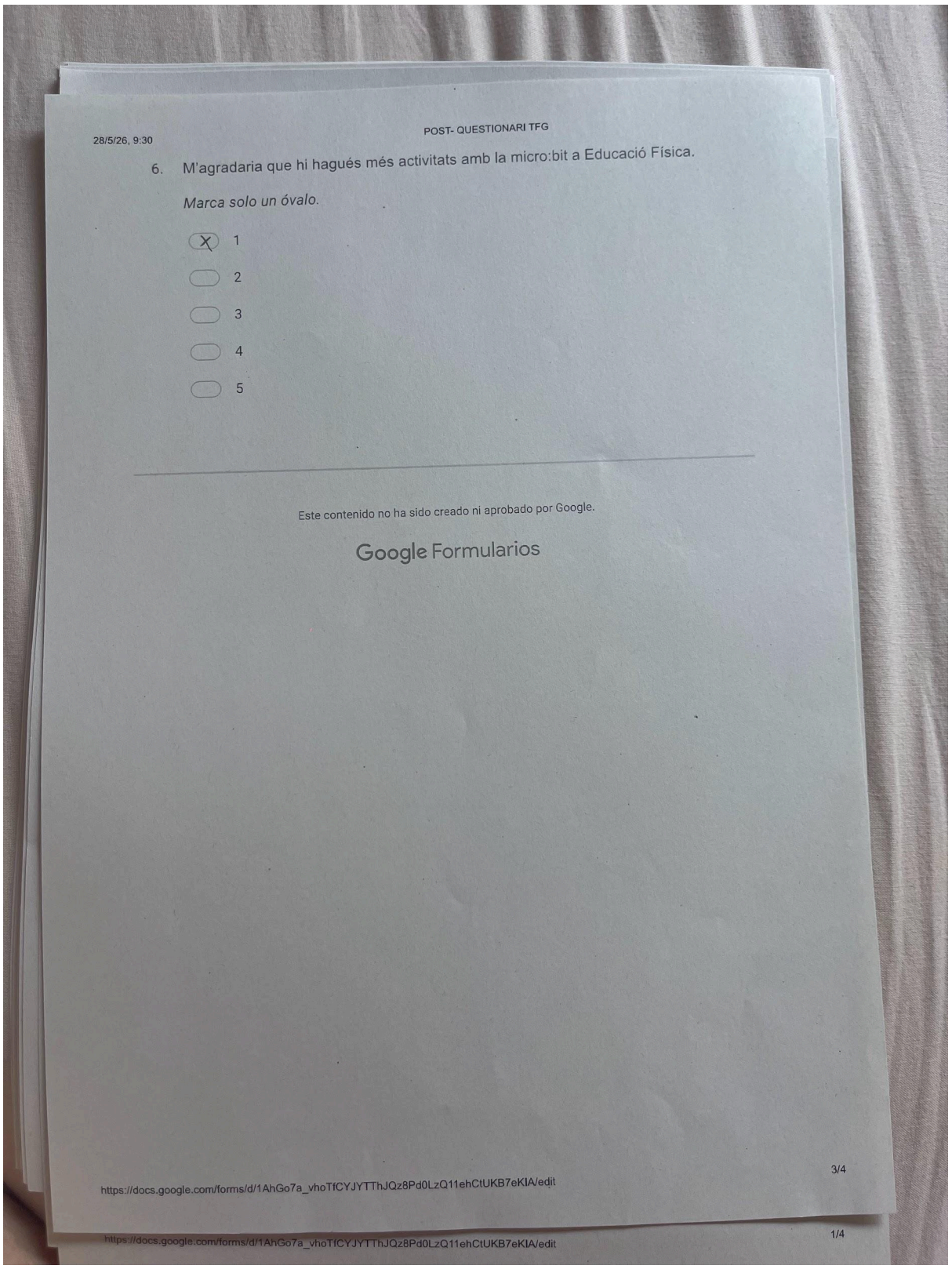

6. M'agradaria que hi hagués més activitats amb la micro:bit a Educació Física.

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POST- QUESTIONARI TFG

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1. M'ha agradat més participar en les activitats amb la micro:bit que en les activitats sense.

   Marca solo un óvalo.

   - ◯ 1
   - ◯ 2
   - ⊗ 3
   - ◯ 4
   - ◯ 5

2. La micro:bit ha fet les activitats més motivadores.

   Marca solo un óvalo.

   - ◯ 1
   - ⊗ 2
   - ◯ 3
   - ◯ 4
   - ◯ 5

3. Les activitats amb la micro:bit m'han semblat més interessants.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ⊗ 3
- ◯ 4
- ◯ 5

4. M'he sentit còmode utilitzant la micro:bit.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ⊗ 4
- ◯ 5

5. He entès fàcilment com funcionaven les activitats amb la micro:bit

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ⊗ 5

6. M'agradaria que hi hagués més activitats amb la micro:bit a Educació Física.

Marca solo un óvalo.

- ◯ 1
- ◯ 2
- ⊗ 3
- ◯ 4
- ◯ 5

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POST- QUESTIONARI TFG

Marca la resposta que millor et representi.

Molt en desacord = 1
En desacord = 2
Ni d'acord ni en desacord = 3
D'acord = 4
Molt d'acord =5

1. M'ha agradat més participar en les activitats amb la micro:bit que en les activitats sense.

   Marca solo un óvalo.

   - [x] 1
   - [ ] 2
   - [ ] 3
   - [ ] 4
   - [ ] 5

2. La micro:bit ha fet les activitats més motivadores.

   Marca solo un óvalo.

   - [x] 1
   - [ ] 2
   - [ ] 3
   - [ ] 4
   - [ ] 5

6. M'agradaria que hi hagués més activitats amb la micro:bit a Educació Física.

Marca solo un óvalo.

- [x] 1
- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5

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10.2 Observation Rubric

OBSERVATION RUBRIC

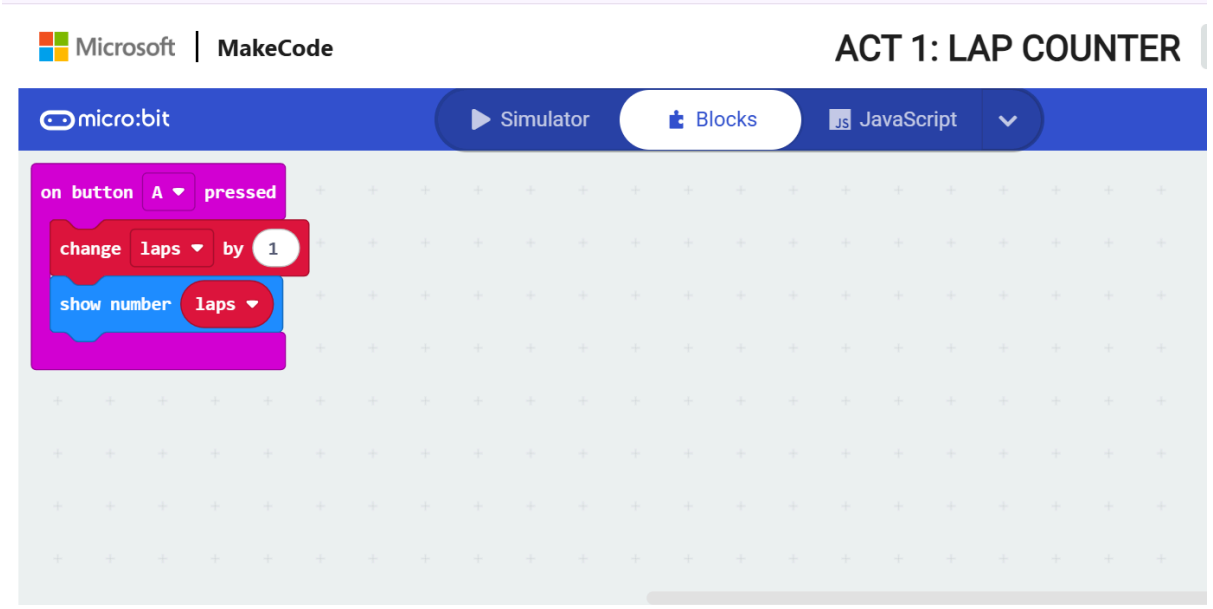
ACTIVITY: 1					
Group	**Involvement**	**Use of the micro:bit**	**Collaboration**	**Motivation**	**Observations of students without micro:bit and additional comments**
Group 1	1 **2** 3	1 2 **3**	1 2 **3**	1 2 **3**	-Several students appeared frustrated when manually estimating lap counts or jump airtime, as they perceived the micro:bit measurements as more accurate and reliable.
ACTIVITY: 1					
Group 2	1 2 **3**	1 2 **3**	1 2 **3**	1 2 **3**	-Collaboration was frequently observed, particularly when students helped classmates interpret results and count the total number of laps.
ACTIVITY: 1					
Group 3	1 2 **3**	1 2 **3**	1 2 **3**	1 2 **3**	-During the lap counting activity, students using the micro:bit relied less on memory and manual counting, allowing them to focus more on the running task itself.
ACTIVITY:2					
Group 1	1 **2** 3	1 2 **3**	1 2 **3**	1 2 **3**	-Students without immediate access to the

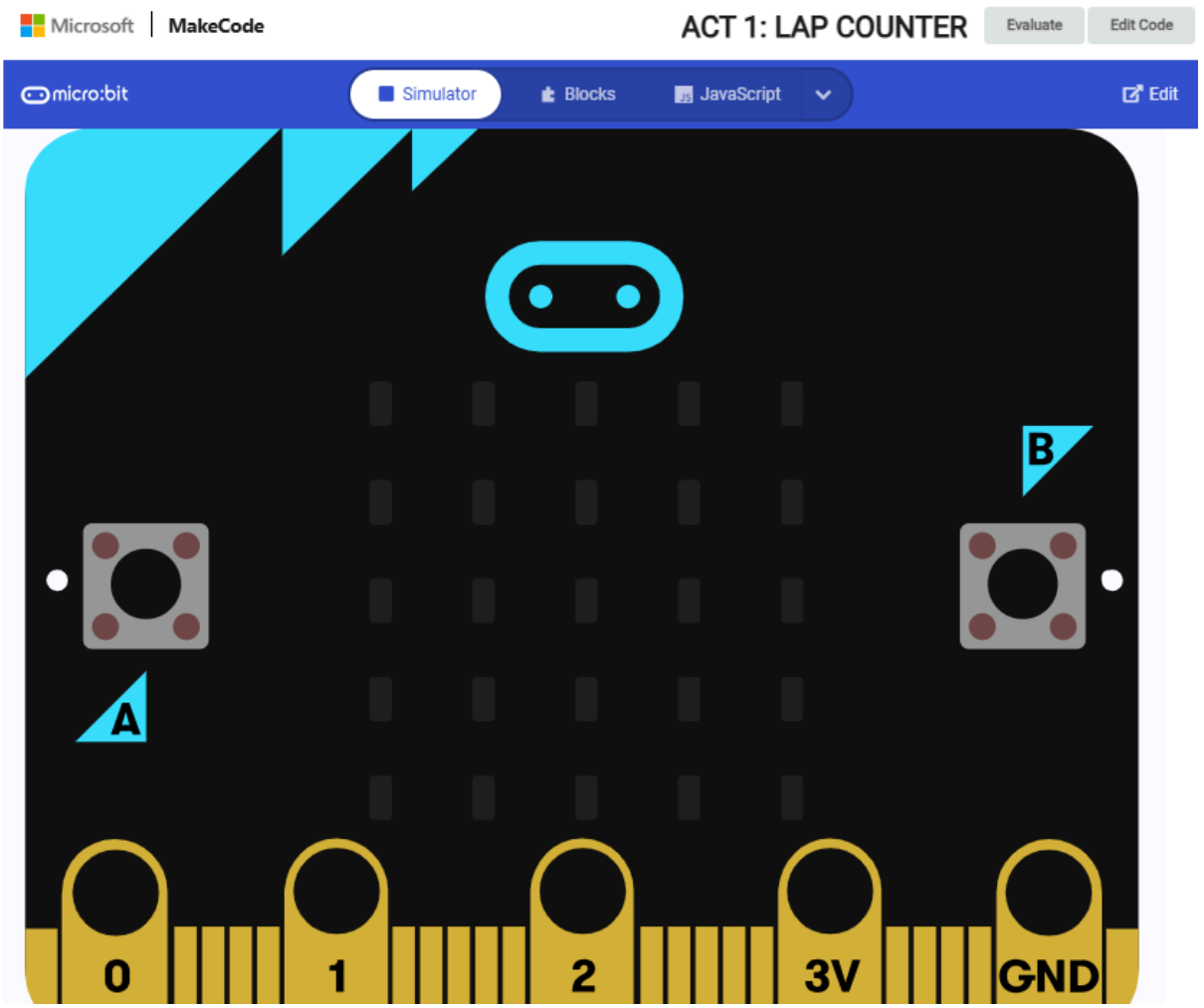
					micro:bit occasionally showed lower levels of involvement and frequently expressed a desire to use the device themselves. - Minor technical difficulties occurred during the Jump Airtime Challenge, requiring some devices to be restarted and certain jumps to be repeated.
ACTIVITY: 2					
Group 2	**1 2 3**	**1 2 3**	**1 2 3**	**1 2 3**	-Motivation appeared to decrease slightly during repeated rounds of the same activity, suggesting a possible novelty effect.

Criteria	**What is observed?**
Involvement	Active participation, respect for turns and attention during the activity.
Use of the micro:bit	Understanding how the micro:bit works and autonomy in its use.
Collaboration	Help between classmates, respect and cooperation within the group.
Motivation	Interest, enthusiasm and positive attitude during the activity.

Value	**1**= Low, **2**= Medium and **3**=High

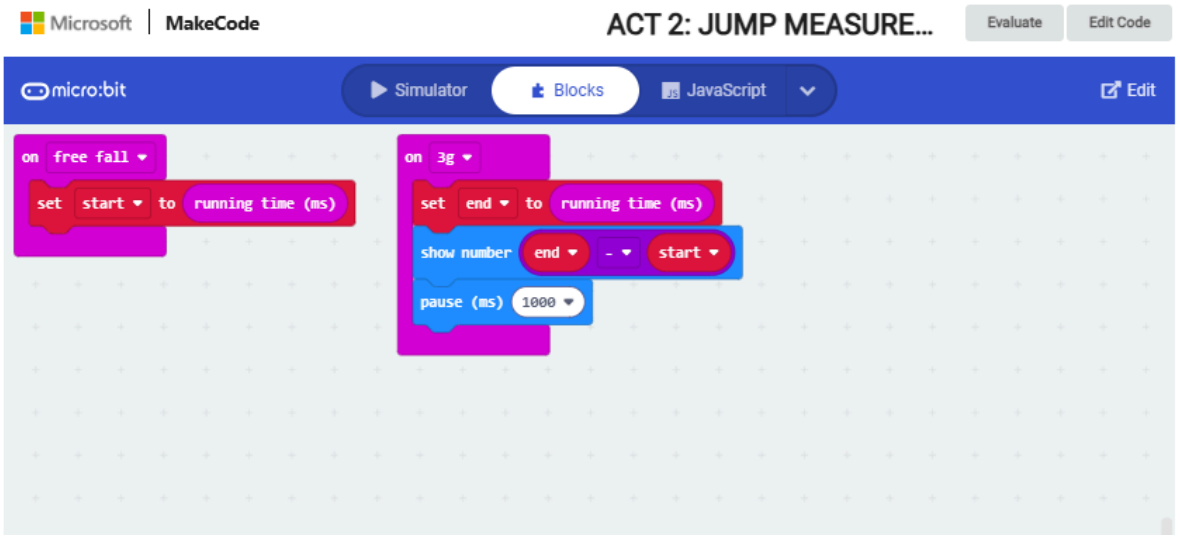
10.3 Relay lap counter code

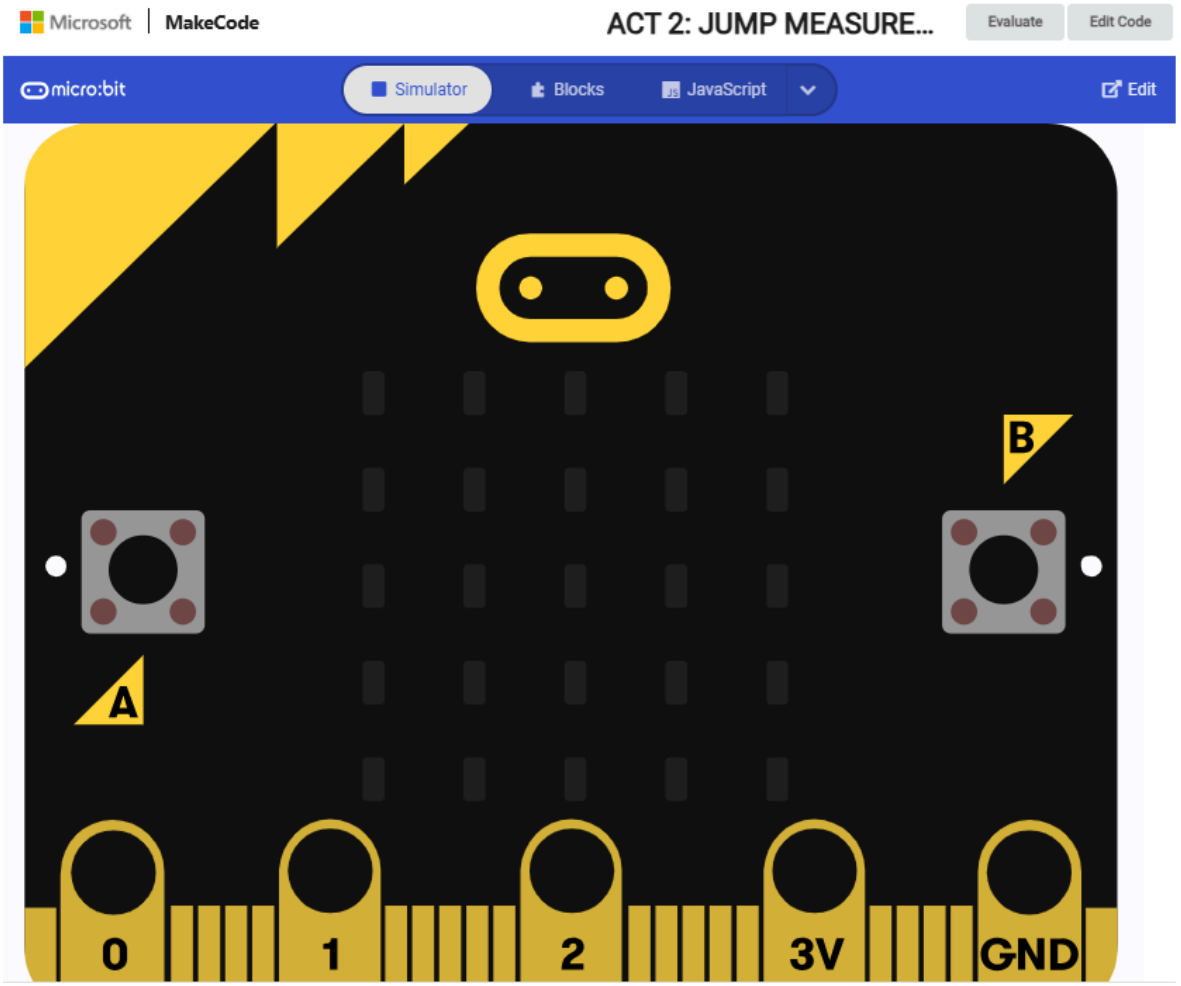




Program available at:
https://makecode.microbit.org/S53929-77500-19390-53428

10.4 Jump airtime code





Program available at:
https://makecode.microbit.org/S81452-00532-23941-66553

10.5 Implementation Photography

