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Body, Rhythm and Digital Play in English Language Learning: Outcomes Associated With an Integrated Intervention on Engagement and a Sense of Belonging in Primary School

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Abstract: This study examined the outcomes of an integrated teaching intervention based on body percussion, educational technologies and cooperative gamification in relation to engagement, sense of belonging, self-efficacy and English language learning in primary school. A convergent, quasi-experimental mixed-methods design involved 80 pupils from four Year 4 classes in a comprehensive school in the Naples metropolitan area. The existing classes were assigned at class level to an experimental or comparison condition, with 40 participants each. The ten-week intervention, conducted during school hours, totalled 20 hours. Quantitative data were collected through the School Engagement Scale, Psychological Sense of School Membership Scale, a specific measure of English learning self-efficacy and a language test; qualitative data included pupil focus groups, teacher interviews and reflection sheets. The experimental group showed greater pre-post improvements than the control group in engagement, belonging, linguistic self-efficacy and English performance. Qualitative findings indicated increased participation, communication confidence, constructive error management, collaboration, mutual support and co-regulation. Pupils also showed greater capacity to take active roles, make proposals and contribute to group decisions, suggesting possible development of agency. Positive indications emerged for pupils with special educational needs, although subgroup size and heterogeneity require strictly exploratory interpretation.

Keywords: student engagement; body percussion; gamification; English language learning; primary school.

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1. Introduction

The current media ecosystem is transforming the ways in which children and adolescents learn, communicate and build relationships. However, the growing presence of technologies does not, in itself, lead to greater participation in educational processes. Their value depends on the pedagogical and organisational conditions in which they are embedded and on the ability to support communication, collaboration and active production (Redecker, 2017). Educational innovation therefore does not simply involve the introduction of digital tools, but rather the design of environments in which pupils can participate, exercise agency and recognise themselves as competent members of the school community (Allen et al., 2018; Reeve & Shin, 2020).

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Within this framework, engagement constitutes a central interpretative category. According to Fredricks et al. (2004), it comprises behavioural, emotional and cognitive components, relating respectively to participation and persistence, to the affective reactions associated with the school experience, and to mental investment in the task. Added to these is the agency dimension, through which students make proposals, express preferences and contribute to shaping the learning experience (Reeve & Tseng, 2011; Reeve & Shin, 2020). , the social dimension of engagement is also significant, linked to collaboration, co-regulation and the quality of educational relationships (Kahu & Nelson, 2018). The perception of acceptance by peers is, in fact, associated with motivation, participation and academic outcomes (Wentzel et al., 2021).

Engagement is not a stable characteristic of the pupil, but a situated process that emerges from the interaction between individual dispositions, teaching practices, relationships and the organisation of the environment. The opportunity to participate is influenced by perceived support, a sense of belonging and opportunities to take on a meaningful role (Allen et al., 2018; Kahu & Nelson, 2018). From this perspective, communicative confidence – understood as the ability to express oneself, make mistakes and try again without excessive fear of judgement – and co-regulation, through which pupils mutually support one another's attention, emotions and strategies whilst working together, take on particular importance.

Learning English is a particularly significant context in which to observe these processes. Acquiring a foreign language requires listening, memorisation, oral production and a willingness to interact, but it also involves the ability to tolerate uncertainty and the risk of making mistakes. Motivation, emotions and a willingness to communicate influence young learners' participation, whilst anxiety and fear of assessment can limit oral production in particular (Oga-Baldwin et al., 2017; Dewaele et al., 2018; Teimouri et al., 2019; Botes et al., 2020).

Teaching that focuses predominantly on individual reproduction and formal correction can highlight differences between pupils. Multimodal and collaborative learning environments, on the other hand, can offer diverse modes of access and expression, reducing reliance on immediate verbal performance alone (Jusslin et al., 2022). Language learning can thus be interpreted as a cognitive, bodily, emotional and social experience.

Perspectives on embodied learning emphasise the connection between cognition, perception, action and bodily experience. Gestures and movements can support comprehension and memorisation when they are semantically consistent with the content and do not impose an additional cognitive load (Skulmowski & Rey, 2018; Mavilidi et al., 2018; Castro-Alonso et al., 2024). In language education, embodied approaches include gestures, movement and role-play associated with the learning of vocabulary and communicative structures (Jusslin et al., 2022; Damsgaard et al., 2022).

Within this framework, body percussion can be considered a potential application of the principles of embodied and rhythmic learning. Clapping, body percussion, steps and coordinated movements can be linked to syllabic rhythm, stress, intonation and the reproduction of short linguistic sequences. Although there is as yet no established body of research on its use in teaching English in primary schools, its introduction is supported by broader evidence on the integration of movement,

rhythm, interpersonal coordination and multimodal learning (Jusslin et al., 2022; Barrett & Zhukov, 2022; Nicolaou et al., 2023; del Barrio & Arús, 2024).

Digital technologies can expand these opportunities through quizzes, voice recordings, images and digital storytelling, providing feedback and opportunities to review oral output (Redecker, 2017; Zou et al., 2021). When incorporated into collaborative tasks, they can also support negotiation, role allocation and the collaborative construction of linguistic products, provided they are accompanied by appropriate teacher mediation (Shortt et al., 2023).

These components are complemented by gamification, understood as the intentional use of game design elements in educational contexts. Missions, feedback, narratives and milestones can make objectives more visible and support the perception of competence, but their effects depend on the design (Sailer et al., 2017; Bai et al., 2020; Sailer & Homner, 2020). A cooperative setup can link the achievement of objectives to everyone's participation, mutual support and shared responsibility, in line with the principles of cooperative learning (Gillies, 2016; Buchs et al., 2017).

Quantitative measures, however, when considered in isolation, risk reducing engagement to scores that do not fully capture the complexity of the educational experience (Williamson, 2017; Jarke & Breiter, 2019). For this reason, the present study adopts a mixed-methods approach, integrating quantitative data and qualitative sources.

The available evidence does not yet sufficiently clarify how rhythmic movement, digital technologies and cooperative gamification can be jointly associated with the behavioural, emotional, cognitive, social and agency dimensions of engagement in English language learning in primary school. This study addresses this gap by analysing an intervention that integrates body percussion, digital technologies and cooperative gamification, examining trends in engagement, self-efficacy, sense of belonging and language skills, alongside pupils' and teachers' perceptions regarding communicative confidence, co-regulation and agentic participation.

2. Research objectives, questions and hypotheses

The research aims to examine the outcomes associated with an integrated teaching intervention, based on the combined use of body percussion, educational technologies and cooperative gamification, in English language learning in primary schools. The study focuses both on subject-specific learning and on the processes through which pupils participate in activities, deal with errors, interact with their peers and contribute to the creation of a relational environment conducive to learning. This approach is consistent with a conception of engagement as a multidimensional, dynamic and situated process, emerging from the interaction between individual characteristics, teaching practices, educational relationships and the organisation of the environment (Kahu & Nelson, 2018; Reeve & Shin, 2020). The literature also suggests that learning environments characterised by feedback, choice and active involvement can foster deeper forms of engagement, provided that technology and playful elements are integrated within a pedagogically intentional design (Kahu & Nelson, 2018; Reeve & Shin, 2020; Sailer & Homner, 2020).

The overall aim is to examine whether the changes observed between the pre-test and post-test differ between the experimental group and the comparison condition based on standard teaching practice. Quantitatively, the study considers behav-

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ioural, emotional and cognitive engagement, a sense of belonging at school, perceived self-efficacy in learning English, and linguistic performance. For the purposes of interpretation, overall engagement is taken as the central quantitative outcome and is therefore given priority in the presentation and discussion of the results. The sense of belonging to school, self-efficacy and linguistic performance constitute complementary outcomes, whilst the individual sub-dimensions of engagement are analysed for descriptive and exploratory purposes. The social and agentic dimensions of engagement, which are not directly measured by the School Engagement Scale, are instead examined in greater depth using qualitative sources.

From a qualitative perspective, the research explores emotional and communicative security, co-regulation, mutual support, role-taking, participation in decision-making, and the meanings attributed by pupils and teachers to the various components of the intervention. A further analysis, of a purely exploratory nature, concerns the opportunities for participation and any barriers encountered by pupils with special educational needs. Given the quasi-experimental nature of the study, the allocation of conditions at class level and the limited number of clusters, the results are interpreted as associations consistent with the intervention rather than as definitive causal estimates.

Based on the objectives outlined, the study is guided by the following research questions:

RQ1a. To what extent do pre-post changes in behavioural, emotional and cognitive engagement differ between the experimental group and the comparison condition?

RQ1b. What forms of social and agentic engagement emerge in pupils' experiences, with particular reference to mutual help, role-taking, making proposals and participating in group decisions?

RQ2a. To what extent do pre-post changes in the sense of belonging to the school differ between the experimental group and the comparison condition?

RQ2b. How do pupils and teachers describe collaboration, mutual support, shared management of difficulties and emotional security within the class group?

RQ3a. To what extent do pre-post changes in perceived self-efficacy in learning English differ between the experimental group and the control group?

RQ3b. How do pupils describe their communicative confidence, their willingness to use English orally and their ability to try again after making a mistake?

RQ4. To what extent do pre-post changes in linguistic performance differ between the experimental group and the control condition, characterised by comparable duration, content and subject-specific objectives?

RQ5. Which characteristics of body percussion, cooperative gamification and digital technologies are perceived by pupils and teachers as facilitating or hindering participation, error management and co-regulation?

RQ6. What qualitative findings emerge regarding opportunities for participation and any barriers encountered by pupils with special educational needs during the intervention?

Research questions RQ1a, RQ2a, RQ3a and RQ4 are quantitative in nature and concern the comparison of pre-post changes between the two conditions. Research questions RQ1b, RQ2b, RQ3b and RQ5 are qualitative and interpretative in nature. RQ6 serves an exclusively qualitative and exploratory purpose, given the small size

and heterogeneity of the subgroup of pupils with special educational needs. This structure allows for an explicit correspondence to be maintained between each question, the data source and the relevant level of analysis.

In line with the quantitative research questions, the instruments used and the relevant literature, four directional hypotheses have been formulated:

H1 – Overall engagement. The pre-post change in the overall engagement score will be more favourable in the experimental group than in the control group.

H2 – Sense of belonging at school. The pre-post change in the sense of belonging at school score will be more favourable in the experimental group than in the control group.

H3 – Self-efficacy in learning English. The pre-post change in the score for perceived self-efficacy in learning English will be more favourable in the experimental group than in the control group.

H4 – Language performance. The pre-post change in the overall score on the English language learning test will be more favourable in the experimental group than in the control group.

These hypotheses are based on the possibility that an environment characterised by physical participation, cooperative activities, formative feedback, choice and digital production may broaden opportunities for engagement and support perceptions of competence and belonging. The combination of linguistic content, gestures and rhythmic sequences may also facilitate multimodal encoding and retrieval processes, whilst digital technologies may offer further opportunities for listening, repetition, recording and reviewing oral production (Skulmowski & Rey, 2018; Sailer & Homner, 2020; Zou et al., 2021; Jusslin et al., 2022).

Analyses of the individual sub-dimensions of engagement and of specific components of the language test are considered complementary and exploratory in relation to the overall scores. Similarly, social and agentic engagement, emotional and communicative confidence, co-regulation and accessibility for pupils with special educational needs are not associated with standalone confirmatory hypotheses, but are explored through qualitative and exploratory questions.

The hypotheses indicate the expected direction of change. However, given the allocation of conditions at class level, the clustered structure of the data and the limited number of classes involved, the analyses and related inferences are interpreted in exploratory terms. Any favourable trends are therefore considered consistent with the formulated hypotheses, but are not sufficient, on their own, to definitively attribute the observed changes to the intervention.

3. Data collection tools

Data collection comprised three questionnaires, a language learning test and three qualitative sources: focus groups with pupils, semi-structured interviews with teachers and reflection sheets completed during the experimental period. The combined use of these tools made it possible to assess school engagement, a sense of belonging, perceived self-efficacy in learning English and linguistic performance, whilst also exploring the experiences and meanings attributed by participants to the proposed activities.

No separate corpus of systematic observations was compiled. Dimensions not directly measured through the questionnaires – such as social and agentic participa-

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tion, collaboration, communicative confidence, error management and co-regulation – were therefore explored exclusively through the qualitative sources.

The quantitative instruments were administered on two occasions: one week before the start of the intervention, during the pre-test phase, and at the end of the ten weeks, during the post-test phase. The administration took place during school hours, using standardised procedures and instructions across all four classes.

School engagement was assessed using the School Engagement Scale (SES), in the 15-item version described by Charkhabi et al. (2019). The scale considers engagement as a multidimensional construct, comprising behavioural, emotional and cognitive components.

Behavioural engagement relates to participation in activities, attention, persistence and commitment to completing tasks. Emotional engagement refers to interest, enjoyment, curiosity and the affective reactions associated with the school experience. Cognitive engagement encompasses mental investment, the use of strategies and the effort expended to understand and remember content.

The scale comprises four items relating to the behavioural component, six to the emotional component and five to the cognitive component. Pupils indicated the frequency or degree to which they agreed with each statement using a five-point Likert scale. The response categories were accompanied by simple visual indicators to help the children understand them.

For each participant, an overall engagement score and three separate scores relating to the behavioural, emotional and cognitive components were calculated. Higher scores corresponded to greater engagement with school.

The SES does not directly measure social and agentic engagement. These dimensions were explored in greater depth through focus groups, interviews with teachers and reflection sheets, with particular attention paid to role-taking, mutual support, making suggestions, seeking clarification and participating in group decisions (Reeve & Shin, 2020).

The sense of school membership was assessed using the Psychological Sense of School Membership Scale (PSSM), originally developed by Goodenow (1993).

The scale measures pupils' perception of being accepted, respected, included and recognised as a meaningful member of the school community. The items relate to feeling part of the school, the perception of being supported by teachers and peers, and any experience of exclusion or isolation.

The version used comprises 18 items, formulated in both positive and negative terms. Pupils responded using a five-point Likert scale. The negative items were recoded prior to calculating the overall score. Higher scores indicated a greater sense of school belonging.

The PSSM was used exclusively as a measure of school belonging and membership. It was not considered an overall measure of classroom climate, which encompasses broader dimensions such as safety, fairness, teaching practices, the quality of relationships and the organisational characteristics of the school environment.

Aspects relating to emotional security, collaboration, mutual support and error management were explored in depth using qualitative sources and were not considered to be dimensions directly measured by the PSSM.

Perceived self-efficacy was assessed using a contextual measure developed specifically for this study. The instrument was not considered a standardised or previously validated scale for the Italian primary school population, but rather a specific

measure designed to assess pupils' perceptions of their own ability to tackle simple English language tasks.

The choice of a context-specific measure stems from the specific nature of self-efficacy, which does not equate to a generic sense of self-confidence, but rather concerns the individual's assessment of their own ability to perform certain activities within a specific domain.

The measure comprised a total of 16 items, divided into four areas:

- listening comprehension;
- vocabulary acquisition and retrieval;
- production and pronunciation;
- communicative interaction.

Each area was represented by four items. The statements related, for example, to the perceived ability to understand simple instructions, recognise and remember new words, pronounce short sentences, answer basic questions and speak English with a classmate.

The statements were kept brief, concrete and related to tasks recognisable to the pupils. Responses were rated on a five-point scale, ranging from 'I can't do it yet' to 'I can do it very well'. The overall score was obtained by calculating the average of the responses, with higher values indicating greater perceived self-efficacy.

The measure was reviewed by experts in English language teaching and research methodology and subsequently pilot-tested with a small group of pupils not included in the final sample. This phase enabled us to simplify certain phrasing and to verify that the children distinguished between the perception of being able to perform a task and actually possessing the required knowledge.

Given the contextual nature of the instrument and the size of the sample, the results were interpreted as preliminary evidence relating to the specific research context and not as a definitive validation of the measure.

Language performance was assessed using a test specifically designed for the study and consistent with the content covered in the two teaching conditions.

Two parallel versions were prepared, used for the pre-test and post-test respectively. The two versions had the same general structure, comparable content and a level of difficulty consistent with the skills expected of Year 4 primary school pupils. The equivalence between the versions was assessed by expert teachers and through a preliminary administration to a small group of pupils not included in the final sample.

The test comprised activities involving:

- lexical recognition and association;
- comprehension of short spoken messages;
- reading and completing simple sentences;
- written production;
- oral production and interaction.

Examples of activities included matching words to pictures, selecting the picture corresponding to a short sentence heard, completing functional expressions, describing and guid s of pictures, and answering questions relating to everyday actions, emotions and personal preferences.

The design of the test was guided by the descriptors of the Common European Framework of Reference for Languages: Learning, Teaching, Assessment – Com-

panion Volume, with particular reference to levels Pre-A1 and A1 and to reception, production and interaction activities appropriate for young learners (Council of Europe, 2020). The descriptors were used as guidelines for defining the tasks, without conferring on the test the status of a standardised or certification test.

The oral component was assessed using an analytical rubric that took into account intelligibility, pronunciation, lexical appropriateness, fluency and interactional skills. The rubric enabled marks to be awarded on the basis of common, pre-defined criteria.

A proportion of the oral performances was assessed independently by two assessors, with the aim of verifying consistency in the application of the rubric. Any discrepancies were subsequently discussed until a shared assessment was reached.

The language test made it possible to distinguish between perceived self-efficacy and actual performance. This distinction is methodologically significant, as a pupil may feel more confident without having yet fully consolidated their competence or, conversely, may perform adequately whilst showing limited confidence in their own abilities.

The qualitative component comprised six focus groups with pupils, semi-structured interviews with the four teachers involved in the study, and reflection sheets completed by pupils in the experimental condition.

The focus groups were conducted at the end of the programme and were divided between the two conditions: three involved pupils in the experimental condition and three in the control condition. Each group consisted of six to eight participants, selected to represent different levels of participation, communicative confidence and linguistic performance.

The questions focused on the activities perceived as most engaging, collaboration with classmates, willingness to use English orally, emotions associated with the possibility of making mistakes, and the strategies used to tackle difficulties. In the focus groups for the experimental condition, the role of movement and rhythm, as well as the use of technology, were also explored in greater depth.

The moderator used short questions, concrete examples and age-appropriate visual aids, whilst avoiding leading questions.

The semi-structured interviews involved all four teachers from the participating classes. The questions explored perceived changes in participation, confidence in communication, peer relationships and pupils' willingness to use English. Organisational difficulties, inclusive adaptations, any technical issues and the sustainability of the approach within the curriculum were also explored.

Pupils in the experimental group completed short reflection sheets at the end of the main modules. The prompts included sentences to complete, such as: 'Today I participated when…', 'I felt capable when…', 'I felt supported when…', 'The most difficult part was…' and 'Next time I would like to…'.

The qualitative data were subjected to thematic analysis, following a process of familiarisation with the data, initial coding, theme construction, review and definition (Braun & Clarke, 2021).

To minimise fatigue, the quantitative instruments were administered in two separate sessions. In the first session, the SES and the PSSM were administered; in the second, the self-efficacy measure and the language test. The oral component of the test was administered individually at a separate time.

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The procedures, the order of the instruments and the instructions were kept consistent across the four classes. During administration, the researcher was only permitted to clarify the general instructions, without interpreting the items or suggesting answers.

The SES and the PSSM, originally available in English, were translated and back-translated, peer-reviewed by experts and pilot-tested with a small group of pupils not included in the final sample. Particular attention was paid to the comprehensibility of the wording and to the negative items in the PSSM.

Teachers did not have access to individual responses or the scores obtained by pupils before the study was completed. The questionnaires and tests were identified using pseudonymous codes, so as to allow the pre-test and post-test to be matched without revealing the participants' names.

The internal consistency of the scales was assessed using Cronbach's alpha; the values obtained in the pre-test and post-test are reported in the results section. Given the size of the sample, these analyses were interpreted with caution and were not considered a definitive validation of the instruments adapted or developed for the study.

The combination of questionnaires, language tests, focus groups, interviews and reflection sheets made it possible to distinguish between engagement, a sense of belonging, perceived self-efficacy and language performance, whilst at the same time exploring the meanings participants attributed to the educational experience.

4. Sample selection

The study involved 80 pupils attending four existing Year 4 classes at a comprehensive school located within the Metropolitan City of Naples. The participants were aged between nine and ten, with an average age of approximately 9.4 years. The sample comprised 41 female pupils and 39 male pupils. The four classes belonged to the same school and shared the same general organisational framework, educational provision and core curriculum.

Participants were selected using non-probabilistic convenience sampling applied to existing school classes. The school was selected on the basis of the accessibility of the setting, the availability of the headteacher and teaching staff, the compatibility of the project with the curriculum, and the possibility of implementing and monitoring the intervention for its entire planned duration. The availability of suitable spaces and the presence of the technological equipment necessary to carry out the activities were also taken into account.

The sample size was determined by the four classes available and participating within the school. Given the pilot nature of the study and the limited number of assignment units, no a priori calculation of statistical power was carried out. The sample was therefore not designed to be statistically representative of the school population in Campania or at national level. The use of a single school and convenience sampling limits the generalisability of the results beyond the context examined and requires caution in their interpretation (Cohen et al., 2000; Creswell & Creswell, 2018).

The primary unit of recruitment was the class rather than the individual pupil. This choice was consistent with the nature of the planned activities, which were based on shared rhythmic-bodily sequences, cooperative tasks and interactions directed at the whole group. The involvement of intact classes made it possible to pre-

serve the usual relational and organisational dynamics, avoiding the artificial formation of new groups and reducing the risk of contamination arising from the individual reorganisation of pupils.

Pupils from the four classes involved were included provided that written informed consent from their parents or legal guardians and the pupil's own consent were available. Further conditions for participation were attendance at regular English language lessons and the ability to take part in physical, cooperative and digital activities, including through reasonable adjustments. The presence of special educational needs did not constitute a criterion for exclusion.

Twelve participants had special educational needs attributable to specific learning difficulties, language difficulties, attention difficulties documented in the educational plan or in the available school records, and socio-economic disadvantage. Six of them were in the experimental group and six in the control group.

Pupils with special educational needs were identified on the basis of available school records, any Individual Education Plans, and information formally shared by class councils. No clinical data beyond that necessary for the preparation of teaching adjustments was collected. Given the small sample sizes within each category and the need to protect participants' confidentiality, the relevant characteristics were reported in aggregated form.

For pupils requiring specific support, adjustments were made to the instructions, materials, response times and methods of participation, without altering the overall objectives of the programme. Rhythmic and physical activities could also be adapted by reducing the range of movement, using available body parts or employing sound instruments and digital aids, so as to facilitate safe and meaningful participation.

For the purposes of the study, 40 pupils from two classes took part in the experimental condition, whilst the other 40, from the remaining two classes, formed the control condition. The distribution of participants across the two conditions reflected the composition of the pre-existing school classes and did not result from individual pupil allocation. Information regarding the procedure for assigning classes to the conditions is provided in the section on the research design and procedure.

All 80 pupils initially recruited took part in the pre-test and post-test assessments and were included in the main analyses; there were therefore no losses to follow-up. The procedures for handling any missing data at the individual item level are described in the section on data analysis.

The actual, heterogeneous composition of the classes was maintained throughout the entire programme, enabling the observation of activities under conditions close to those of ordinary school practice and the inclusion of pupils with different levels of language proficiency, modes of participation and educational needs.

5. Educational intervention

The educational intervention took place over ten consecutive weeks, with two 60-minute sessions per week, totalling 20 sessions and 20 hours of activities. The lessons were delivered during the English language curriculum timetable and involved both the experimental condition and the control condition based on standard teaching practice.

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To ensure the comparability of the programmes, the following were kept comparable across both conditions: the total duration, the number of sessions, the period over which they took place, the subject content, the language objectives and the total time of exposure to the English language. The differences mainly concerned the methodological organisation of the activities, the role assigned to movement and technology, the structuring of cooperation, the ways in which errors were managed, and the inclusion of systematic moments of reflection.

Both conditions covered content consistent with the curriculum for Year 4 of primary school. The programme focused on vocabulary relating to the body, emotions, everyday actions, environments, the weather and personal preferences; the use of simple interrogative and descriptive structures; the comprehension and production of practical instructions; and the use of functional expressions to ask for information, express preferences and offer or request help. In both conditions, activities focusing on listening, comprehension, vocabulary acquisition, pronunciation, oral production, reading and writing were included.

In the comparison condition, these topics were addressed in accordance with the methods normally adopted at the school, through activities predominantly structured by the teacher, using the textbook, audio recordings, images, worksheets, written exercises and guided opportunities for oral production. There were opportunities for pair work and peer interaction, but no systematic structuring of positive interdependence, cooperative roles or shared objectives. d technologies were used primarily for the presentation and delivery of content, whilst the collaborative production of multimodal artefacts, independent voice recording or gamified digital missions were not systematically incorporated.

The experimental condition, by contrast, incorporated body percussion, movement semantically linked to linguistic content, educational technologies, cooperative gamification, multimodal production, peer feedback and concluding reflection. The activities involved rotating roles, collective objectives, shared error management, the recording and revision of oral productions, and dedicated moments for raising awareness of participation and collaborative dynamics.

The difference between the two approaches therefore did not concern what the pupils were expected to learn, but the ways in which the same content was presented, practised, reworked and utilised. The control condition was not conceived as a passive one, but as a standard teaching practice characterised by guided language activities and opportunities for interaction not organised according to the experimental protocol. This approach is consistent with the principle that technology, movement and playful elements acquire educational value when they are intentionally integrated into instructional design, rather than simply through their presence in the school environment (Redecker, 2017; Sailer & Homner, 2020; Jusslin et al., 2022).

5.1 Teachers, preliminary training and prevention of carry-over

The four classes were taught by a total of four English language teachers, one for each class. Two teachers worked in the classes assigned to the experimental condition and two in the classes belonging to the control condition. All met the professional requirements for teaching in primary schools and had several years' experience in teaching English. None had previously systematically applied the experimental protocol in the form adopted in the study.

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The teachers continued to teach the classes normally assigned to them by the school and were not randomised to the conditions. The activities were conducted by the respective subject teachers, whilst the research team was responsible for designing the protocol, preparing the materials, providing methodological training and carrying out general monitoring, without systematically taking over from the teachers in delivering the lessons.

This approach allowed the programme to be implemented under conditions close to those of ordinary school practice, but it introduces a potential teacher effect. As each teacher worked exclusively in one of the two conditions, the outcomes associated with the intervention cannot be fully distinguished from those that may be attributable to teaching style, professional experience, the amount of feedback, familiarity with technology and the teachers' expectations. The presence of two teachers per condition reduces the dependence of the results on any single teacher, but does not eliminate the potential confounding between treatment, class and teacher.

Before the programme began, the four teachers took part in a joint meeting to discuss the language objectives, the duration of the activities, the timetable, the assessment procedures and the need to ensure that the subject content and the amount of exposure to the English language remained comparable.

The two teachers from the experimental classes also took part in a four-hour theoretical and practical session led by the research team. The training included a presentation of the protocol, a simulation of the rhythmic-bodily sequences, the organisation of cooperative tasks, the allocation and rotation of roles, the use of digital tools, the management of feedback and the facilitation of reflective sessions. Part of the session was devoted to simulating activities and discussing possible adaptations for pupils with special educational needs.

The participating teachers were provided with an operational manual, an outline of the five modules, lesson plans for each session, the rhythmic-movement sequences, guidelines for forming groups, worksheets relating to cooperative roles and the necessary digital materials. The specific materials for the intervention were not provided to the teachers in the control group during the research' . The latter received only the shared programme setting out the language content, subject-specific objectives and timings.

Teachers were informed of the general aims of the study, relating to the analysis of different ways of organising language learning, but not of the hypotheses regarding specific outcomes. Furthermore, they did not have access to individual pre-test scores before the intervention had concluded. This information was not used to alter the conduct of the activities, school assessment or the allocation of classes to the conditions.

To reduce the risk of contamination, meetings concerning the experimental methodology were held separately from those common to all four classes. The activities were scheduled at different times, and teachers were asked not to introduce, into the comparison classes during the study period, the body percussion sequences, gamified missions, cooperative roles and digital production activities specified in the experimental protocol.

Despite these precautions, it is not possible to completely rule out informal exchanges between teachers or the occasional use, in the control classes, of activities

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that were partially similar to those in the experimental classes. The risk of carry-over was therefore minimised, but not eliminated.

The implementation of the programme was documented through activity logs and lesson plans compiled by the teachers. In the two experimental classes, all 20 scheduled sessions were completed. Any organisational changes or postponements were made up within the planned timeframe and did not result in a reduction in the overall programme load, nor did they alter the language objectives or the essential components of the modules.

Monitoring meetings with the research team provided an opportunity to discuss the progress of activities, organisational difficulties, how the groups functioned, inclusive adaptations and any technical issues. However, no independent and systematic observational assessment of implementation fidelity was carried out for all sessions. It is therefore not possible to rule out differences between the two experimental classes in terms of time management, the amount of feedback and the specific ways in which the sessions were conducted.

5.2 Control condition based on standard teaching practice

In the two classes in the comparison condition, vocabulary and linguistic structures were introduced through explanations, images, worksheets, audio clips, examples provided by the teacher and materials from the textbook. The pupils undertook listening activities, collective and individual repetition, matching images to words, sentence completion, reordering short dialogues, reading, writing and vocabulary consolidation.

Oral production was encouraged through questions posed by the teacher, reading dialogues, guided description of images and short conversations in pairs. The activities could therefore include forms of peer interaction, but did not systematically involve the assignment of rotating roles, individual responsibility within the group, positive interdependence or the achievement of collective goals. Simply carrying out activities in pairs or groups does not, in fact, necessarily equate to cooperative learning, which requires the intentional planning of responsibilities and supportive relationships (Gillies, 2016; Le et al., 2018).

Technology was used to play audio tracks, display images, videos or presentations, and occasionally to carry out group exercises using the interactive whiteboard. The activities did not include planned sequences of body percussion or recurring links between rhythm, movement and linguistic content. Any gestures used by the teachers served to accompany, illustrate or facilitate the activity and did not form a systematic component of the programme.

Formative assessment was carried out through oral questions, marking of exercises, short written tests and feedback from the teacher. Errors were addressed through clarification, repetition of the correct form and further opportunities for practice. The conclusion of lessons might include a summary of the content or collective marking of activities, but did not include a systematic phase dedicated to reflection on engagement, emotions or co-regulation processes.

5.3 Experimental condition

The two experimental classes tackled the same linguistic content through an embodied, digital, playful and cooperative learning environment. The programme

was structured into five progressive modules, spread over a total of 20 hours, designed to integrate language learning, movement, rhythm, digital technologies, collaboration and reflection.

Module 1 – English through the Body

The first module introduced the systematic association between words, gestures and movements. The pupils created movement sequences to represent action verbs, body parts, emotions and simple instructions. Initially, the teacher would say a word or a short phrase and the group would respond with an agreed gesture. Subsequently, the pupils proposed new associations, chose alternative gestures and guided their classmates in reproducing the sequences.

The association between linguistic content and semantically coherent actions can provide additional channels for encoding and retrieval, provided that the movement is closely linked to the learning task (Skulmowski & Rey, 2018; Mavilidi et al., 2018; Jusslin et al., 2022).

Module 2 – Rhythm and Pronunciation

The second module used body percussion to work on syllabic stress, lexical stress, rhythm and intonation. Syllables were represented by clapping, snapping fingers, tapping on the thighs or stepping, whilst the stressed syllable was highlighted by a more pronounced sound.

Words, questions and short answers were transformed into rhythmic patterns and reproduced through call-and-response activities, pair work and small-group exercises. Errors did not necessarily lead to the activity being interrupted, but instead provided an opportunity to slow down, listen, repeat and collectively reconstruct the sequence.

Module 3 – Cooperative Language Missions

The third module introduced a cooperative gamification framework. The class was portrayed as a community of language explorers engaged in completing missions. Pupils worked in mixed-ability groups and took on rotating roles, such as facilitator, rhythm keeper, spokesperson, digital lead and group supporter.

The missions included linguistic treasure hunts, reconstructing dialogues, matching words with audio and images, interactive quizzes, comprehension games and solving simple communication problems. Points were awarded based not only on the correctness of the answers, but also on the participants' engagement, active listening, the help provided, taking turns and constructive handling of errors.

No individual rankings were used. The goals were collective and linked to the progress of the team or class, to minimise the potentially exclusionary effects of competition. Gamification can, in fact, support cognitive, motivational and behavioural outcomes when the elements introduced promote competence, autonomy and relationships (Sailer et al., 2017; Sailer & Homner, 2020).

Module 4 – Digital Rhythmic Storytelling

The fourth module involved the collaborative creation of short digital stories in English. Each group devised characters, settings and simple narrative sequences, incorporating images, written text, voice recordings, sound effects and rhythmic patterns.

Preparing the stories required the allocation of tasks, negotiation of choices and the progressive revision of the work. Pupils were able to record their own sentences, listen back to them, compare them with linguistic models and re-record them before sharing them with the class. Technology thus took on a role in production, feedback

and self-regulation, rather than being used solely to present content (Zou et al., 2021).

Module 5 – Our English Performance

The fifth module culminated in a final performance. The groups presented their stories by combining spoken word, rhythm, movement and digital media. The assessment was not aimed at identifying the most spectacular performance, but took into account the ‘ ’ communicative clarity, balanced participation, collaboration and the ability to support their peers.

Each experimental session concluded with a brief reflective phase. The pupils indicated their level of engagement using a visual scale and discussed the activities, behaviours and ways of collaborating that had facilitated or hindered their participation. This moment linked the physical and playful experience to processes of self-assessment, emotional awareness and co-regulation.

Table 1. Summary of the experimental intervention

Module	Primary linguistic objective	Primary engagement process elicited	Social-affective mechanism	Function of the technology	Effective dose
English through the Body	Vocabulary of the body, actions, emotions and instructions	Behavioural participation and emotional engagement	Shared participation and reduced individual exposure	Visual aids and presentation of models	3 sessions, 3 hours
Rhythm and Pronunciation	Syllabic scanning, stress, rhythm and intonation	Cognitive processing and active participation	Synchronisation, listening and shared error management	Reproduction and comparison with audio models	4 sessions, 4 hours
Cooperative Language Missions	Comprehension and functional production	Social participation and pupil initiative	Positive interdependence, roles and mutual support	Quizzes, matching exercises and interactive missions	5 sessions, 5 hours
Digital Rhythmic Storytelling	Oral expression, writing and narrative construction	Cognitive processing, social participation and initiative	Negotiation, peer feedback and co-regulation	Recording, playback, revision and multimodal production	5 sessions, 5 hours
Our English Performance	Integration of language skills	Emotional engagement, social participation and initiative	A sense of belonging, mutual support and shared responsibility	Presentation of artefacts and support for the performance	3 sessions, 3 hours

6. Results

6.1. Quantitative analyses

The quantitative analyses were designed to describe the trends observed in school engagement, a sense of belonging, perceived self-efficacy in learning English and linguistic performance. Given the quasi-experimental design, the pilot nature of the study and the limited number of classes involved, the results were not interpreted as conclusive evidence of the intervention's effectiveness, but as preliminary indications to be integrated with the qualitative evidence.

The overall SES was defined as the primary quantitative outcome. The sense of belonging measured using the PSSM, self-efficacy in learning English and the overall score on the language test were considered secondary outcomes. The three components of SES, the individual sections of the language test and the trends observed in the subgroup of pupils with special educational needs were examined on an exploratory basis.

The intervention was allocated to four pre-existing classes, two for each condition. The class, rather than the individual pupil, therefore represents the actual unit of allocation. The 80 participants cannot be considered statistically completely independent units, as pupils belonging to the same class share the same teacher, the same social and organisational environment, and a significant part of the learning experience.

With only two classes per condition, it was not possible to estimate a multilevel model reliably, nor to adequately separate the effects of the class, the teacher and the teaching condition. The analyses conducted at the individual level were therefore retained solely as exploratory investigations and do not fully correct for within-class dependence. The corresponding standard errors and significance values may therefore be overly favourable.

No a priori power analysis was carried out. An estimate based solely on the 80 pupils would, in fact, have ignored the cluster structure and provided a potentially misleading indication of the actual power. The interpretation therefore gave priority to means, standard deviations, pre-post differences, differences between the changes observed in the two conditions, and convergence with the qualitative results.

All pupils included in the sample completed the required assessments. The percentage of missing data at the individual item level was less than 2 per cent. Where a response was missing within a scale, the individual score was calculated as the mean of the validly completed items, provided that at least 80 per cent of the expected responses were available. It was not necessary to exclude any participants from the main analyses.

Prior to the exploratory analyses, the distribution of scores, the presence of outliers and the homogeneity of variances were examined. These checks did not reveal any anomalies requiring the exclusion of participants. However, these checks relate to the assumptions underlying the procedures applied to individual data and do not resolve the issue of dependence amongst pupils belonging to the same class.

6.1.2. Description of the groups at the pre test

The initial description of the two conditions was carried out by comparing the means, standard deviations and standardised differences recorded at the pre-test. Initial significance tests were not used to establish the equivalence of the groups, as

the absence of a statistically significant difference does not demonstrate the substantive comparability of the conditions.

Table 2. Scores observed at the pre test

Variable	Experimental condition M (SD)	Comparison condition M (SD)	Cohen's d
Overall SES	3.18 (0.46)	3.21 (0.44)	−0.07
Behavioural engagement	3.31 (0.52)	3.35 (0.50)	−0.08
Emotional engagement	3.14 (0.55)	3.17 (0.53)	−0.06
Cognitive engagement	3.08 (0.49)	3.11 (0.47)	−0.06
PSSM	3.43 (0.48)	3.46 (0.46)	−0.06
Self-efficacy in learning English	3.06 (0.50)	3.10 (0.48)	−0.08
Language test, 0–30	17.20 (3.48)	17.50 (3.35)	−0.09

The standardised differences observed at the pre-test were of modest magnitude, with absolute values ranging from 0.06 to 0.09. The gender distribution and the presence of pupils with special educational needs were also descriptively balanced across the conditions. However, this does not rule out unmeasured differences between classes and teachers, nor does it allow us to assert full initial equivalence.

6.1.3. Trends in the primary outvome and secondary outcomes

Table 3 presents the descriptive statistics relating to the primary outcome and the secondary outcomes. For scales with a range between 1 and 5, percentage changes were not used, as such measures do not have a natural zero point and the percentage increase would depend on the initial value. The mean pre-post differences and the difference between the changes observed in the two conditions were therefore considered.

Table 3. Descriptive statics for the primary and secondary outcomes

Variable	Experimental pre-M (SD)	Experimental post-M (SD)	Experimental ΔM	Pre-M comparison (DS)	Post-M comparison (DS)	Comparison ΔM	Difference between the changes
Overall SES	3.18 (0.46)	3.85 (0.43)	+0.67	3.21 (0.44)	3.34 (0.45)	+0.13	+0.54
PSSM	3.43 (0.48)	3.91 (0.44)	+0.48	3.46 (0.46)	3.52 (0.47)	+0.06	+0.42
Self-efficacy in English	3.06 (0.50)	3.78 (0.46)	+0.72	3.10 (0.48)	3.25 (0.49)	+0.15	+0.57
Language test, 0–30	17.20 (3.48)	23.40 (3.18)	+6.20	17.50 (3.35)	20.10 (3.41)	+2.60	+3.60

For the primary outcome, the overall SES score increased by an average of 0.67 points in the experimental condition and by 0.13 points in the control condition. The descriptive difference between the changes was 0.54 points, indicating a favourable trend in favour of the experimental condition.

The secondary outcomes also showed descriptive trends in the same direction. The PSSM score increased by 0.48 points in the experimental condition and by 0.06 points in the control condition, with a difference between the changes of 0.42 points.

Perceived self-efficacy increased by 0.72 points in the experimental condition and by 0.15 points in the control condition. The difference between the mean increases was 0.57 points.

Improvements were observed in both conditions in the language test. The mean score increased by 6.20 points in the experimental condition and by 2.60 points in the comparison condition, with a descriptive difference between the changes of 3.60 points.

These trends are consistent with a positive association between participation in the experimental programme and the outcomes under consideration. However, they do not allow the differences to be causally attributed to the intervention alone, as treatment, class and teacher cannot be separated in the present design.

6.1.4. Exploratory, inferential analyses at the individual level

To complement the descriptive statistics, 2 × 2 mixed-effects analyses of variance were conducted, considering the measurement time (pre-test and post-test) as a within-subjects factor and the condition as a between-subjects factor. The time × condition interaction was used to examine whether individual change differed between the two programmes.

These analyses use the pupil as the statistical unit and do not adequately correct for intraclass correlation. The results should therefore be interpreted as exploratory. The *p-values* reported are nominal and do not provide a sufficient basis for causal inferences.

For secondary outcomes, Holm's sequential procedure was applied within the relevant family of comparisons, in order to limit the risk of type I error. As all nominal p-values were below .001, the associations remained below the .05 threshold even after correction. Overall SES, defined a priori as the primary outcome, was examined separately.

Table 4. Individual exploratory analyses of the time x condition interaction

Variable	Role of the outcome	F(1, 78)	Nominal p	η^2p
Overall SES	Primary	28.64	< 0.001	.27
PSSM	Secondary	18.92	< 0.001	.20
Self-efficacy in English	Secondary	31.47	< .001	.29
Language test	Secondary	24.83	< .001	.24

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For the overall SES, a time × condition interaction was observed, $F(1, 78) = 28.64$, $p < .001$, $\eta^2p = .27$. The individual pattern favoured the experimental condition, consistent with the mean differences reported in Table 2.

For sense of belonging, an interaction was observed in the same direction, $F(1, 78) = 18.92$, $p < .001$, $\eta^2p = .20$. The data indicate a more substantial mean increase in perceived school membership in the experimental condition, without allowing conclusions to be drawn regarding the overall classroom climate.

A time × condition interaction was also observed for self-efficacy in learning English, $F(1, 78) = 31.47$, $p < .001$, $\eta^2p = .29$. The result provides preliminary evidence of a more favourable trend in efficacy beliefs in the experimental condition.

A similar interaction was observed for the language test, $F(1, 78) = 24.83$, $p < .001$, $\eta^2p = .24$. Both conditions improved performance, but the mean change was greater in the experimental condition.

The effect sizes refer to individual models that have not been adjusted for the cluster structure and may therefore overestimate the precision of the observed association. They were not interpreted as definitive estimates of the intervention's efficacy.

6.1.5. Exploratory of the components of engagement

The behavioural, emotional and cognitive components of the SES were examined as exploratory outcomes. The relevant analyses were not intended to test further confirmatory hypotheses, but to describe which aspects of engagement showed the most pronounced trends.

Table 5. Exploratory trends in the components of engagement

Component	Experimental pre-M (SD)	Experimental post-M (SD)	Experi-mental ΔM	Pre-M (DS) comparison	Post-M com-parison (DS)	Compari-son ΔM	F inter-action	Nominal p	η^2p
Behavioural	3.31 (0.52)	3.90 (0.46)	+0.59	3.35 (0.50)	3.47 (0.48)	+0.12	19.86	< 0.001	.20
Emotiva	3.14 (0.55)	3.91 (0.47)	+0.77	3.17 (0.53)	3.30 (0.52)	+0.13	30.12	< 0.001	.28
Cognitive	3.08 (0.49)	3.73 (0.45)	+0.65	3.11 (0.47)	3.26 (0.46)	+0.15	22.41	< 0.001	.22

The behavioural component increased by an average of 0.59 points in the experimental condition and by 0.12 points in the control condition. A time × condition interaction was observed, $F(1, 78) = 19.86$, $p < .001$, $\eta^2p = .20$.

The emotional component showed the largest average change: +0.77 points in the experimental condition and +0.13 in the control condition. Here too, an interaction was observed, $F(1, 78) = 30.12$, $p < .001$, $\eta^2p = .28$.

Cognitive engagement increased by 0.65 points in the experimental condition and by 0.15 points in the comparison condition. The interaction effect was $F(1, 78) = 22.41$, $p < .001$, $\eta^2p = .22$.

Applying the Holm procedure to the three exploratory analyses, all p-values remained below the .05 threshold. However, this does not eliminate the limitation arising from the failure to correct for the dependency of pupils belonging to the same class.

The SES does not directly measure social and agentic engagement. These components were explored exclusively through focus groups, teacher interviews and reflection sheets, taking into account mutual support, role-taking, the formulation of proposals and participation in group decisions.

6.1.6. Trends in the components of the language test

The individual components of the language test were analysed solely in descriptive terms. No further inferential tests were carried out on the individual areas, in order to limit the proliferation of comparisons and the risk of overly fragmented interpretations.

Table 6. Descriptive analyses of the components of the language test

Component	Maximum score	Experimental pre-M (DS)	Experimental post-M (DS)	Experimental ΔM	Pre-M comparison (DS)	Post-M comparison (DS)	Comparison ΔM	Difference between the changes
Listening comprehension	8	4.62 (1.24)	6.42 (1.05)	+1.80	4.70 (1.19)	5.52 (1.16)	+0.82	+0.98
Vocabulary and structures	10	6.15 (1.42)	8.05 (1.18)	+1.90	6.22 (1.38)	7.10 (1.31)	+0.88	+1.02
Pronunciation and intonation	6	3.18 (1.03)	4.72 (0.89)	+1.54	3.25 (1.00)	3.91 (0.96)	+0.66	+0.88
Production and interaction	6	3.25 (1.10)	4.21 (0.93)	+0.96	3.33 (1.06)	3.57 (1.01)	+0.24	+0.72
Total	30	17.20 (3.48)	23.40 (3.18)	+6.20	17.50 (3.35)	20.10 (3.41)	+2.60	+3.60

All components showed an average increase in both conditions. The descriptive differences between the changes favoured the experimental condition and ranged from 0.72 points for production and interaction to 1.02 points for vocabulary and structures.

The trends regarding pronunciation and intonation are consistent with the inclusion, in the experimental programme, of rhythmic activities, syllabic scanning and work on stress. However, this correlation does not allow us to isolate the specific effect of body percussion, as the intervention simultaneously involved movement, cooperation, technology, feedback and reflective activities.

Oral production and interaction showed a more modest average increase compared with some more structured skills. This finding may be interpreted as a preliminary indication of the greater complexity required by the autonomous and interactive use of language, but it needs to be verified in longer-term studies.

A proportion of the oral productions was assessed independently by two assessors. Agreement in the application of the rubric was found to be adequate; any re-

maining discrepancies were subsequently discussed until a shared assessment was reached.

6.1.7. Descriptive analyses of the subgroup with special educational needs

The analyses relating to pupils with special educational needs were conducted exclusively in descriptive and exploratory terms. The subgroup comprised 12 participants: six in the experimental condition and six in the control condition.

This category encompassed a range of different profiles, including specific learning difficulties, language difficulties, attention difficulties and socio-economic disadvantage. These conditions cannot be considered equivalent in educational or functional terms. The aggregated results were therefore not used to draw conclusions regarding specific types of need.

Table 7. Descriptive profile of pupils with special educational needs

Variable	Experimental pre-M (DS)	Experimental post-M (DS)	Experimental ΔM	Pre-M (DS) comparison	Post-M comparison (DS)	Comparison ΔM
Overall SES	2.87 (0.42)	3.66 (0.39)	+0.79	2.92 (0.40)	3.08 (0.43)	+0.16
PSSM	3.08 (0.45)	3.71 (0.41)	+0.63	3.12 (0.44)	3.22 (0.46)	+0.10
Self-efficacy in English	2.71 (0.47)	3.54 (0.43)	+0.83	2.75 (0.45)	2.96 (0.48)	+0.21
Language test	14.67 (2.73)	20.50 (2.59)	+5.83	14.83 (2.64)	17.33 (2.80)	+2.50

In the experimental subgroup, larger average increases were observed compared with the control subgroup across all variables considered. No statistical comparisons were carried out, given the extremely small sample size and the heterogeneity of the profiles.

Pupils with special educational needs also had, on average, lower baseline levels than the overall sample. Part of the change may therefore be influenced by regression to the mean and the greater statistical likelihood of improvement associated with lower baseline scores.

The descriptive trends suggest that the intervention did not hinder the participation of the subgroup in question and may have provided differentiated ways of accessing the activities. However, the small sample size, the heterogeneity of the profiles, the combination of different conditions and the absence of cluster-adjusted analysis prevent any conclusions being drawn regarding the inclusive effectiveness of the intervention.

Overall, the results for this subgroup should be regarded solely as preliminary indications useful for the design of subsequent studies with larger samples and analyses differentiated by type of need.

6.2. Qualitative analyses

The qualitative analysis explored the meanings attributed by pupils and teachers to the teaching activities, with particular attention to participation, confidence in

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communication, peer relationships and the experience of learning English. The comparison between the two conditions was based primarily on focus groups with pupils and interviews with teachers. The reflection sheets, completed exclusively by pupils in the experimental condition, were used to explore the internal development of that experience and not as a source directly equivalent to the data collected in the control condition.

The analysis identified six main areas: participation and persistence; communicative confidence and error management; collaboration and a sense of belonging; physical and digital mediation; accessibility and differentiation; sustainability and organisational challenges.

-Participation and persistence

Pupils in the experimental group described the activities as varied and dynamic, attaching particular importance to the alternation between listening, movement, oral production, cooperative work and the use of digital devices. Engagement was not associated exclusively with the playful dimension, but also with the opportunity to take on a recognisable role, such as leading a sequence, controlling the pace, using the device or supporting a classmate.

The reflection sheets revealed that participation was frequently linked to the perception that an individual's contribution was necessary to complete the shared task. Teachers also reported greater consistency in participation among certain pupils who, in ordinary activities, tended to become distracted, contribute little or give up when faced with difficulties. Spontaneous requests to repeat the activities were also noted, along with greater initiative in suggesting gestures, rhythms or organisational solutions.

However, not all pupils experienced the activities in the same way. Some found it difficult to coordinate speech, gesture and rhythm simultaneously; in the first few weeks, others tended to focus more on the playful or motor aspects than on the linguistic objective. In such cases, it was necessary to simplify the sequences and make the link between movement and the content to be learnt more explicit.

In the comparative condition, the pupils particularly appreciated the clarity of the instructions, the predictability of the structure, the use of images and audio clips, and the opportunity to consolidate the content through repetition. Participation was generally adequate, but more dependent on the teacher's encouragement and tended to focus on those pupils who were already more confident and willing to contribute.

-Communicative confidence and error management

In the experimental condition, choral, rhythmic and small-group activities were perceived as less daunting than individual responses in front of the whole class. The ability to associate words and phrases with gestures or rhythmic patterns provided a reference point during oral production, whilst voice recordings allowed pupils to listen back to and amend their own output before sharing it.

Errors tended to be treated as a shared challenge. A loss of rhythm or imprecise pronunciation might lead the group to slow down, repeat and reconstruct the sequence. Teachers reported a reduction in immediate reactions of giving up and a greater willingness to try again, whilst noting that some pupils continued to show hesitation during the most high-stakes activities.

Instances of physical embarrassment also emerged. Some participants were uncomfortable making broad gestures in front of their peers and preferred to contribute through their voice, by operating the device or by taking on organisational roles.

The differentiation of roles helped to ensure that movement did not become a compulsory and uniform form of participation.

In the comparison condition, the teacher's immediate correction was considered helpful and reassuring by some pupils, as it provided a clear linguistic model. Others, however – particularly those who were less confident – continued to show hesitation during individual reading or when answering questions in front of the class. The difference between the conditions therefore mainly concerned the way in which errors were incorporated into the activity: predominantly identified and corrected in the standard practice, and more widely shared and reworked in the experimental approach.

-Collaboration and belonging

In the experimental condition, shared objectives and the rotation of roles made the contribution of individual members more visible. Organisational, physical and digital roles also offered opportunities for participation to pupils who were initially less willing to express themselves verbally.

According to the teachers, during the reconstruction of dialogues, the playback of recordings and the preparation of performances, peer support frequently took the form of suggestions, shared repetitions or reminders of the gesture associated with the word, rather than a classmate answering on the other's behalf. The cooperative structure therefore seemed to encourage forms of support aimed at making classmates more independent.

Some difficulties also emerged, particularly regarding the allocation of the most sought-after roles, such as operating the device, acting as spokesperson or leading the rhythmic sequence. Rotation and the prior definition of turns gradually reduced these conflicts, without eliminating them entirely.

In the face-to-face setting, working in pairs was generally appreciated as it allowed pupils to check the answer before speaking. However, collaboration was less formalised and, in some cases, the more competent pupils tended to provide the solution directly, whilst those who were less confident took on a predominantly executive role.

The data therefore suggest that the structuring of roles and shared objectives supported, in some instances, the perception of being part of the group. However, these results do not allow the conclusions to be extended to all aspects of the classroom atmosphere.

-Physical and digital mediation

Several pupils described the body and rhythm as aids for remembering words, segmenting syllables and preparing pronunciation. Teachers also reported that some participants spontaneously reproduced gestures or rhythmic patterns even during subsequent activities, using them as strategies to recall a word or prepare a response.

However, physical mediation did not prove equally effective for everyone. Some pupils reported difficulties in simultaneously coordinating gestures, words and rhythm, whilst increased noise levels could make it harder to maintain concentration or listen to their classmates' pronunciation. More complex sequences therefore required a gradual progression and a breakdown into shorter steps.

Technologies were particularly appreciated when they allowed pupils to record, replay, edit or share their work. Voice recordings and digital storytelling provided opportunities for revision, whilst group quizzes encouraged discussion and immedi-

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ate feedback. However, issues arose regarding the availability of devices, waiting times and occasional technical difficulties.

In the discussion-based condition, images, audio and video were considered useful for understanding new vocabulary and listening to pronunciation models. The difference between the conditions therefore did not concern the mere presence of technology, but the function attributed to the tools: predominantly expository in the standard practice, and more productive, collaborative and reflective in the experimental approach.

-Accessibility and differentiation

The variety of expressive channels enabled some pupils to participate initially through movement, choral performance, images or the use of devices, subsequently taking on more prominent communicative roles. According to the teachers, this gradual approach proved particularly useful for some pupils with low confidence in communication, difficulties in retrieving vocabulary or reduced perseverance with the task.

Rhythmic activities appeared to aid word segmentation and memorisation. For other participants, however, the presence of multiple stimuli could make the task more challenging. In such cases, it was necessary to reduce the complexity of the sequences, introduce a more gradual approach and assign differentiated roles.

In the comparison condition, consistent instructions, repetition and direct guidance from the teacher were forms of support appreciated by some pupils, particularly those who preferred to focus on one element at a time. Some participants also continued to prefer written or individual activities and did not perceive movement as a significant aid.

The results do not allow us to conclude that the experimental programme was equally accessible to all pupils with special educational needs. Rather, they suggest that diversifying the ways in which pupils could participate may have broadened access opportunities for certain groups, whilst requiring specific adaptations for others.

-Sustainability and organisational challenges

Teachers in the experimental group reported a greater preparation workload, linked to the preparation of materials, the organisation of groups and the allocation of roles. The rhythmic-physical activities also required careful management of noise and space, whilst the limited availability of equipment could slow down the work.

In the first few weeks, some pupils tended to focus more on the playful aspect than on the language objective. This challenge was progressively addressed by making explicit the link between gesture, rhythm and the content to be learnt, and by gradually introducing more complex sequences.

Teachers in the control group highlighted, as positive aspects, the greater organisational simplicity, the predictability of progression and the ease with which the activities could be incorporated into the regular curriculum. The textbook, audio tracks and written exercises allowed for more consistent time management, whilst offering fewer opportunities to systematically differentiate roles and forms of participation.

Teachers did not regard the experimental approach as a method that had to be used in every lesson. The solution deemed most sustainable involved the selective integration of physical, cooperative and digital activities at times when they were consistent with the language objectives.

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Overall, the experimental approach offered greater opportunities for distributed participation, collaborative production and shared revision, but required more time, role management and control of stimuli. Routine practice ensured greater predictability and organisational simplicity, whilst offering fewer systematic opportunities for active participation and structured cooperation.

7. Discussion

This study examined the trends associated with a teaching approach that integrated physical and rhythmic activities, educational technologies, cooperative gamification, storytelling and reflective moments into the teaching of English in primary school. Overall, the experimental classes showed more favourable changes in engagement, a sense of belonging, perceived self-efficacy and linguistic performance compared with the control classes. Qualitative evidence helped to interpret these trends, showing that participation was not linked solely to the variety or playful nature of the activities, but above all to the opportunity to take on recognisable roles, receive support, deal with mistakes collaboratively and contribute to the group's work.

The results should be regarded as preliminary. The intervention was assigned to four pre-existing classes, two per condition, rather than to individual pupils; it is therefore not possible to fully separate the contribution of the intervention from that of the teachers, the characteristics of the classes and the existing relational dynamics. Within these limitations, the convergence of quantitative and qualitative data allows the interpretation to be organised around three key areas: engagement and emotional security; belonging, cooperation and agency; and language learning and multimodal mediation.

The first area concerns engagement and emotional security. The trends observed on the School Engagement Scale suggest more consistent and task-oriented participation in the experimental classes. The most significant finding, however, is not that the activities were perceived as more enjoyable, but rather the relational conditions through which participation became possible. Choral activities, small-group work, the allocation of roles and the opportunity to record and review their work appear to have reduced, for some pupils, their immediate individual exposure.

The shared management of errors appears particularly significant. Uncertain pronunciation or a loss of rhythm could be addressed by slowing down, repeating and reconstructing the sequence together. The error thus took on a function that was less exclusively evaluative and more regulatory, becoming an opportunity for peer support and co-regulation. This mechanism is relevant to foreign language learning, where embarrassment, fear of making mistakes and insecurity can reduce a learner's willingness to speak (Dewaele et al., 2018; Teimouri et al., 2019; Botes et al., 2020).

Gradual participation also enabled some pupils to approach oral production through physical, technical, organisational or group tasks, before taking on more exposed communicative roles. From this perspective, confidence does not stem from the elimination of difficulty, but from the creation of an environment in which it can be addressed without being immediately attributed to the individual. This interpretation is consistent with perspectives that view engagement as a multidimensional and situated process, influenced by teaching practices and the quality of the

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educational environment (Fredricks et al., 2004; Kahu & Nelson, 2018; Reeve & Shin, 2020).

The second core theme concerns belonging, cooperation and agency. The change in the PSSM indicates a more favourable perception of belonging to the school in the experimental classes, but cannot be interpreted as evidence of an overall improvement in the classroom climate. The evidence relating to peer support, emotional security and the quality of interactions derives mainly from qualitative data.

Shared objectives and distributed roles appear to have made the contribution of individual participants more visible. Rotation between communicative, physical, organisational and digital roles enabled pupils to be recognised for their different skills and to perceive their own contribution as necessary to the collective outcome. Peer support frequently took the form of suggestions, shared repetitions and cues regarding gestures or rhythm, rather than a classmate answering on behalf of another.

These approaches can be interpreted as forms of scaffolding and co-regulation, in which support does not eliminate the participant's autonomy but creates the conditions for them to contribute. The difference compared with the control condition did not lie in the absolute presence or absence of collaboration. Even in the standard practice, there were pair conversations and moments of interaction, but the experimental cooperation was more structured through interdependence, rotating roles and distributed responsibilities. This is consistent with the literature on cooperative learning, according to which collective work is educational when it involves shared objectives, individual responsibility and intentional teacher mediation (Gillies, 2016; Buchs et al., 2017; Le et al., 2018).

Furthermore, pupils did not merely respond to the teacher's requests; they were able to suggest actions, lead sequences, choose modes of representation and contribute to group decisions. Such behaviours reflect the agentic dimension of engagement, understood as the student's ability to actively participate in shaping the learning environment (Reeve & Tseng, 2011; Reeve & Shin, 2020). However, the presence of conflicts in the distribution of roles shows that cooperation does not develop automatically: rotation, turn-taking and teacher mediation remain essential conditions.

The third area concerns language learning and multimodal mediation. Progress was observed in both areas, confirming the value of standard curricular activities based on listening, explanation, repetition and practice. The experimental classes, however, showed a more favourable trend in overall language scores and across the various components of the test.

The integrated package of activities appears to have provided a variety of cues for language comprehension, recall and production. Words and phrases were associated with images, gestures, rhythms, sounds, narratives and shared actions. This approach is consistent with research on embodied and multimodal learning, which suggests that movement can support processing when it is semantically linked to the content and does not act as an incidental or distracting element (Skulmowski & Rey, 2018; Mavilidi et al., 2018; Jusslin et al., 2022; Castro-Alonso et al., 2024).

Qualitative observations suggest that gestures and rhythmic patterns were used by some pupils to remember words, segment syllables and prepare for pronunciation. Digital recordings, on the other hand, allowed pupils to replay, compare and modify their utterances. Digital technology thus served not only an expository func-

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tion, but also a productive and reflective one, consistent with the idea that the educational value of technologies depends on the pedagogical functions attributed to them (Redecker, 2017; Zou et al., 2021; Shortt et al., 2023).

However, it is not possible to attribute the results to a single component. Body percussion, cooperative learning, gamification, storytelling, recordings, teacher feedback and final reflection were all present simultaneously. Qualitative evidence may suggest possible mechanisms, but the study design does not allow us to determine which element made the greatest contribution. It is therefore more accurate to state that the integrated package created conditions conducive to distributed practice, feedback, multimodal memorisation, gradual exposure and collaborative production.

These varying cases also suggest that a one-size-fits-all approach should be avoided. Some pupils have experienced difficulties in coordinating speech, gestures and rhythm, discomfort with noise, physical self-consciousness, or a preference for more linear and individual activities. Multimodality is not automatically accessible: it requires a gradual approach, the option to simplify sequences, a variety of roles and alternative ways of participating.

Guidance relating to pupils with special educational needs must be interpreted with particular caution. The small sample size and the heterogeneity of the profiles do not allow us to demonstrate inclusive effectiveness, a reduction in inequalities or equivalent outcomes for all. Rather, the data suggest that diversifying channels and roles may reduce certain barriers to participation for specific pupils. It is therefore appropriate to speak of potentially accessible design and the expansion of opportunities for participation, rather than of proven inclusion.

In this context, the choice of a mixed-methods approach takes on significant methodological importance. Quantitative measures have highlighted general trends, whilst qualitative sources have shown that, for pupils, participation meant feeling useful, being able to make mistakes without being isolated, receiving help and contributing to group decisions. This integration helps to avoid reducing engagement to a mere numerical figure, situating it within the relational and socio-emotional processes through which it acquires meaning and providing a more nuanced understanding of school participation.

Alternative explanations must also be considered. Some of the trends may be linked to the novelty effect, the greater attention received by the experimental classes, or the awareness of participating in an innovative programme. Teachers' expectations and teaching styles may have influenced participation, as each class was led by a different teacher and the teacher effect cannot be separated from that of the experimental condition. Pupils and teachers were not blind to the programme being followed, and responses to questionnaires, focus groups and interviews may have been influenced by social desirability. Familiarity with the post-test, regression to the mean among participants with lower initial scores, and possible cross-contamination between classes cannot be completely ruled out.

The study has further limitations. Convenience sampling, the involvement of a single school and the small number of classes limit the generalisability of the results. The unit of allocation did not coincide with that used in the individual analyses, and intraclass correlation could not be reliably estimated with four clusters. The comparison condition was comparable in terms of duration and content, but not equivalent in terms of novelty and methodological intensity.

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The self-report measures were administered to nine- to ten-year-old children and may be affected by item comprehension and social desirability. The PSSM measures a sense of belonging, but does not constitute a comprehensive measure of the climate within an individual class. The self-efficacy instrument does not yet have established external validation, whilst the language test was developed by the researchers. Furthermore, comprehensive indicators of reliability, a systematic observational data set and a follow-up were lacking. Finally, the qualitative component was unbalanced, as the reflection sheets were available only for the experimental condition.

Future studies should involve a larger number of schools and classes, include cluster-level randomisation, longitudinal data collection, blinded assessors and more thoroughly validated instruments. It would also be useful to compare different conditions to better understand the specific contribution of, and interaction between, bodily mediation, cooperation, gamification and digital technologies.

Overall, the study's contribution does not lie in identifying a single effective tool, but in highlighting how engagement can be fostered through an environment in which movement, technology and play are linked to clear language objectives, distributed roles, peer support, feedback and opportunities for revision. The trends observed represent a promising, though still preliminary, indication for the design of language learning environments that are more participatory, relational and potentially accessible.

7. Conclusions

This study enables us to situate the integration of body percussion, educational technologies and cooperative gamification within a broader conception of language teaching as a multimodal, participatory and relational experience. The contribution of this research lies not in defining a rigid methodology or in demonstrating the superiority of a single tool, but in identifying a possible pedagogical framework capable of linking language, bodily expression, interaction and digital production.

From this perspective, engagement can be viewed not merely as an outcome to be measured, but as a criterion through which to design and interpret the quality of the educational experience. Indeed, engaging teaching is not limited to capturing pupils' attention, but creates conditions in which they can understand the meaning of the activities, recognise their own scope for action and contribute responsibly to the collective work. This interpretation appears consistent with models that view engagement as a situated and relational process, linked to the opportunities for participation and agency offered by the school context (Kahu & Nelson, 2018; Reeve & Shin, 2020).

The experience carried out also suggests moving beyond rigid dichotomies between cognitive and bodily learning, between subject-specific activities and the playful dimension, and between the physical and digital environments. These components can contribute to the construction of a single educational space when organised around recognisable linguistic aims and tasks in which pupils are called upon to use the language in practice. The body, rhythm and technology are therefore not merely additional elements to learning, but potential languages of educational mediation, the meaning of which depends on their coherence with the content, the context and the characteristics of the participants (Redecker, 2017; Jusslin et al., 2022).

In pedagogical terms, the model outlined can be interpreted as a flexible framework based on the integration of different modes of expression, the explicit link between activities and subject-specific objectives, shared responsibility, freedom of choice and the promotion of reflection. These principles are more significant than the mere replication of individual activities, as they allow the programme to be adapted to different classes, content and organisational conditions. Gamification, too, thus takes on significance not as an external system of prizes and rewards, but as a way of organising the experience geared towards competence, autonomy and relationships (Sailer et al., 2017; Sailer & Homner, 2020).

Given the quasi-experimental structure of the study and the limited number of classes involved, the proposed model should be regarded as a pedagogical framework requiring further testing, rather than a solution of proven effectiveness. The results offer preliminary insights for the design of multimodal and cooperative language learning environments, but require confirmation through studies conducted on larger samples, in different contexts, and using research designs capable of distinguishing the contribution of individual components with greater precision.

In conclusion, the research suggests that English language learning in primary school should be viewed as a process that simultaneously involves comprehension, expression, embodiment and a sense of belonging. The quality of pedagogical innovation does not depend on the number of tools employed, but on the ability to establish a pedagogically meaningful relationship between them. In this regard, an embodied, digital and cooperative approach offers preliminary insights into the creation of environments in which learning a language means not only acquiring words and communicative structures, but also experiencing conscious forms of participation in classroom life, through mutual support, shared regulation and the responsible assumption of roles and decisions.

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