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THE TEACHING OF BILINGUAL EDUCATION THROUGH ROBOTICS AND GAMES IN PRIMARY EDUCATION

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Abstract: This Master Dissertation aims at the teaching of English in Primary Education through Robotics and games by using the Information and Communication Technologies (ICT) as the most important educative innovation model. For that purpose we are going to combine innovative approaches such as Multiple Intelligences, ICT, cooperative work in second languages teaching and game in our classroom, using tools like *Lego WeDo 2.0* and *Scratch 1.4.* The planning presented in that project will be a clear guide so that other teachers can implement it later in their Primary Education classrooms.

1 INTRODUCTION

This Master's Dissertation focuses on using robotics and games in order to teach subjects in Primary Education using CLIL approach. It explores how Information and Communication Technologies (ICT) can be applied to enhance the learning and teaching of second languages, specifically English. The goal is to promote educational innovation in this field.

For this purpose, a brief summary will be made of the main lines that we will develop throughout this dissertation.

With regard to the theoretical framework and related to the educational models and innovation references developed, the following ones are highlighted:

- Howard Gardner's Multiple Intelligences (MI).
- The use of ICT in teaching.
- Cooperative work in the teaching of second languages
- The use of games in the classroom
- The historical context

Using Howard Gardner's Multiple Intelligences (Gardner, 1983) in the classroom helps students learn content from different subjects while focusing on a central theme, which is Educational Robotics. It enables them to develop various skills, including second language proficiency (English), reasoning and math abilities, proper use of technology, and overall motivation for learning. The teaching approach is practical and relevant to the real world, making it engaging for students.

On the other hand, the introduction of games in the classroom along with ICT will allow pupils to learn by playing, using new technologies in an useful and appropriate way. It is absolutely true that it will not be easy, as there must be a clear involvement of all educational skateholders (local and state) and the educational community in general, such as teachers (continuous training in new technologies and methodologies) and families (acceptance of new methods and areas of knowledge).

In this Master Dissertation a planning will be design including all the items previously explained (robotics, games, CLIL). It will be a guide for the educational community for its future didactic development, as its implementation, although not easy, it must be accepted by all the agents involved in Primary Education.

The planning will be developed at three levels and a final project, which will be summarised below:

- *First level*: it will consist of three types of activities. Firstly, the reading of the story *The Golem from Sevilla* (2016); the chairs' game, aimed at reasoned thinking, introducing students to the type of language used in programming; and finally, the use of *Code Learn*, a free online application with which students begin to learn how to program, to later use the *Scratch 1.4* tool.
- *Second level*: it will be dedicated to construction (presentation of the *Lego WeDo 2.0* box and the construction of the chicks), and the programming of the robots using *Scratch 1.4*.
- *Third level*: programming the balloon videogame using *Scratch 1.4*. This is a complete and simple game to introduce students to the use of this tool, based on logic blocks.
- *Final project*: it will be checked how students can apply their creativity and knowledge acquired through the planning model described above, as students will create their own video game or construction, and then present their work to the rest of their classmates.

Finally, the result of this Master Dissertation will be to establish a proposal for classroom work, from a solid theoretical framework, based on sufficiently well-founded pedagogical approaches and put into practice by primary education teachers specialized in CLIL or with solid training in the proposed topic.

2 JUSTIFICATION OF THE SELECTED TOPIC

CLIL (Content and Language Integrated Learning) is defined as a generic or umbrella term used to refer to "a dual-focussed education approach in which an additional language is used for the learning and teaching of both content and language" Marsh & Langé (2000: 2). Robotics and games can be valuable tools in CLIL because they provide engaging and interactive ways for students to learn and apply both content and language skills.

The following are some justifications for my selection of using robotics and games in CLIL:

- *Active Learning*: young students tend to learn best through hands-on and interactive experiences. Robotics and games provide a fun and engaging way for them to actively participate in the learning process. This can help them better retain and understand the content and language being taught.
- *Multimodal Learning*: supporting multimodal learning, which is particularly important for younger students who are still developing their cognitive and motor skills. By engaging with

robotics and games, students can learn through a variety of sensory experiences, including visual, auditory, and tactile.

▪ *Enhanced Engagement:* robotics and games can enhance students' engagement and motivation to learn. This is particularly important for younger students who may struggle to stay focused for long periods of time. By incorporating these technologies into CLIL lessons, teachers create a more stimulating and interactive learning environment.

▪ *Collaborative Learning*: it can also promote collaboration and teamwork among young students. In the proposal that will be explained students will work in groups to solve problems and complete tasks, students will develop important social and communication skills. This will also help them feel more connected to their peers and the learning community.

▪ *Real-World Applications*: providing a context for real-world applications of the content and language being taught. For example, in the planning that will be proposed, students will use robotics to build and program a robot that performs a specific task, and they will play educational games that require critical thinking and problem-solving skills. This help students better understand how the content and language they are learning can be used in practical situations.

Overall, using robotics and games in CLIL for primary education students can provide a fun and engaging way for them to learn and develop important skills. By incorporating these technologies into the classroom, teachers can create a more dynamic and interactive learning environment that supports the diverse needs and learning styles of their students.

3 THEORETICAL FRAMEWORK

To begin with, we will briefly describe the main lines that support the theoretical framework of this dissertation, which will be based on the following points: Howard Gardner's multiple intelligences; cooperative work; the use of ICT in CLIL; and the use of games in the classroom. These aspects will be developed in detail below.

3.1 Howard Gardner's Multiple Intelligences

It is widely known that 21st century education encourages and promotes the application of new methodologies in our classrooms to motivate and stimulate student learning. For this reason Delgado Henríquez (2013, p. 104), says: "Awakening intelligences involves, from my point of view, motivating students to enhance their development". Marina (2011) in his book

"los secretos de la motivación" states that the concept of "motivation" is one of the most confusing in psychology because it includes many things. It is so confusing that, notwithstanding the frequent popular use, it was on the verge of being struck out of psychology in the 1960s. We must therefore consider that we are dealing with a complex fact and that our fundamental objective is to be generators of motivation to foster the growth of creative minds and personalities enriched by the insatiable desire for continuous learning, embracing the frustration that we will never know everything.

As we know, motivation is the fundamental key to teaching any kind of area or skill. For this reason, the appropriate use of ICT (such as the programming of video games, the programming of small-scale robots in Primary Education, and the construction of the latter) allows students to work in a motivated way, developing their creativity and striving to achieve achievable medium or short-term objectives, unconsciously acquiring the improvement of MI.

Howard Gardner's theory of multiple intelligences suggests that intelligence is not a singular, fixed entity but rather a collection of distinct abilities that individuals possess to varying degrees. According to Gardner, there are several types of intelligences, including linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalistic. When it comes to the use of robotics and games in the classroom, Gardner's theory provides a justification for incorporating these technologies by appealing to different intelligences.

- **Spatial Intelligence:** Robotics and games often involve the manipulation and understanding of visual and spatial information. Students can use spatial reasoning to design and program robots or navigate through virtual environments in games. These activities help develop their spatial intelligence by engaging them in tasks that require mental visualization, spatial planning, and problem-solving.
- **Bodily-Kinesthetic Intelligence**: Robotics and games provide hands-on learning experiences that require physical engagement. Students can build, assemble, and control robots, which enhances their bodily-kinesthetic intelligence. Playing games that involve physical movement, such as motion-based games or virtual reality simulations, can also improve their coordination, dexterity, and motor skills.
- **Logical-Mathematical Intelligence**: Robotics and games often involve logical thinking, problem-solving, and algorithmic reasoning. Students can apply logical-mathematical

intelligence to program robots, create game strategies, or solve puzzles within games. These activities promote analytical thinking, critical reasoning, and mathematical understanding.

- **Interpersonal Intelligence**: Collaborative projects involving robotics and games encourage interaction and cooperation among students. Working together to design and build robots or participating in multiplayer games fosters interpersonal intelligence by promoting communication, teamwork, empathy, and understanding of others' perspectives.
- **Intrapersonal Intelligence**: Robotics and games can provide opportunities for self-reflection and self-expression. Students can reflect on their problem-solving strategies, evaluate their performance, and set goals for improvement. In game-based environments, students can create avatars or characters that reflect their personalities and explore their own interests and preferences, fostering intrapersonal intelligence.
- **Linguistic Intelligence**: Robotics and games can incorporate storytelling elements or require written or verbal communication. Students can document their robot-building process, write game reviews, or create narratives within game environments. These activities engage linguistic intelligence by promoting language skills, effective communication, and storytelling abilities.
- **Musical Intelligence**: Although not directly related to robotics, games often incorporate soundtracks and musical elements. Students can engage with the musical aspects of games by analyzing and appreciating game music or creating their own sound effects. This involvement helps develop musical intelligence by enhancing auditory perception, rhythmic understanding, and appreciation of musical patterns.
- **Naturalistic Intelligence:** In some cases, robotics and games can be designed to incorporate naturalistic elements, such as environmental simulations or ecological themes. This approach allows students to explore and understand the natural world through virtual experiences. Engaging with nature-related content in robotics and games can nurture naturalistic intelligence by fostering an appreciation for the environment, observation skills, and ecological understanding.

3.2 The use of ICT in education

Nowadays, the value of the use of Information and Communication Technologies (ICT) in Primary Education is undeniable, due to the fact that in Spain there are autonomous communities (such as Andalusia) in which a great effort has been made in terms of the

implementation of new technologies in the classroom. For this reason, research such as that of Aguaded and Tirado (2008, p. 63) affirms:

The massive and universal implementation of ICT in teaching and learning processes (with real access to equipment for teaching and learning in the same classroom with computers for all students, specifically, one computer for every two students) is having a political, social and educational relevance. Similar experiences have already begun in other autonomous communities and in other countries (in Spain, Extremadura was the pioneer), but it is in Andalusia that we already have one of the most extensive educational telematic networks in the world. It is therefore necessary to have systematic evaluative studies that assess this institutional pedagogical policy in real contexts, establishing development guidelines to guide future didactic programmes, justifying, if necessary, the substantial economic investments and providing institutional guidelines for the near future, because, undoubtedly, computers have also burst into the life of schools.

According to this thought, we can know that in our community the effort on the part of the administration, in terms of the provision of technological material (computers in this case), has been made, but the main obstacle would be the correct pedagogical implementation. Aguaded and Tirado (2008, p. 65) explain the two main difficulties in its implementation, which will be summarised below:

The first difficulty encountered is that of the increase in the ratio in schools, which almost prevents there being an adequate number of computers for each pupil (this research was carried out in Andalusian ICT centres).

On the other hand, with regard to the second difficulty, we must know that there must be a correct implementation of the new technologies in the classroom, because as the authors say "...We should change the idea of "computer classroom" for that of "computer classroom", or differentiate between "accessing the network" and "being part of the network" Newhouse, P. (s. f.); so that the technology is available to teachers when they wish to incorporate it into teaching practice and it is they, relying exclusively on methodological criteria, who decide whether or not to incorporate it". In other words, we should see ICT resources (projectors, computers, etc.) as common elements in the Primary School classroom, just like a notebook or a blackboard.

Finally, it should be noted that if the cost of this type of technological hardware decreases, it will allow the administration to make these elements commonplace in the classroom.

A future implementation of educational robotics in schools would allow the correct use of these materials. Studies by Bravo and Forero (2012, p. 124) ratify that:

> *Through educational robotics, the teacher can develop in a practical and didactic way those theoretical concepts that are usually abstract and confusing for students; using this strategy has the additional advantage of simultaneously awakening the student's interest in those topics, while highlighting the relationship between the technological context in which current life unfolds and the topics being taught. In this sense, a learning environment with educational robotics is an experience that contributes to the development of new skills, new concepts, strengthens the student's systemic, logical, structured and formal thinking, while developing their ability to solve concrete problems, thus giving an efficient response to the changing environments of today's world (Odorico, 2004). A special feature of educational robotics is the ability to hold the student's attention. The fact that the student can manipulate and experiment with these robotics-based learning tools means that they can focus their perceptions and observations on the activity they are doing. A testimony in this sense is given by Pierre Nonnon and Jean Pierre Theil, who state that the use of robotic tools favours the teaching-learning process, as it easily allows the integration of the theoretical with the practical, the development of systemic thinking and the acquisition of scientific notions (Ruiz-Velasco, 2007).*

Therefore, educational robotics is not an isolated subject, but one that integrates different educational disciplines and has positive effects on students. In this sense, Odorico, 2004 (in Bravo and Forero, 2012, p. 124) states that: "...it is an experience that contributes to the development of new skills, new concepts, strengthens the student's systemic, logical, structured and formal thinking, while developing their ability to solve concrete problems, thus providing an efficient response to the changing environments of today's world...", advocating, therefore, its interdisciplinary nature.

I would also like to add the pedagogical bases on which these studies are based, which are, according to Hernández, 2008 (in Bravo and Forero 2012, p. 126):

Educational robotics is strongly linked to the theories of constructivism and active pedagogy. Jean Piaget's (1976) constructivist theory asserts that learning is not the result of a

transfer of knowledge but is an active process of constructing learning based on experiences (Acuña, 2004). Constructivism holds that learning manifests itself as the learner interacts with his or her reality and concretely performs activities on it. From the point of view of constructivist theory, the use of technological tools in the classroom provides an alternative way of learning and creates experiences in students for the construction of knowledge (Hernández, 2008).

The learning environments generated by educational robotics are fundamentally based on student action. Educational robotics projects place students in an active and leading role in their own learning process, as they allow students to think, imagine, decide, plan, anticipate, investigate, make connections with the environment, invent, document and provide feedback to other classmates; in the experience of this whole process, they will develop diverse knowledge and essential skills to develop efficiently in the face of the challenges imposed nowadays (Acuña, 2004).

We can therefore state that educational robotics allows students to develop personal, social and learning to learn competences, one of the basic competences of the LOMLOE, which also places special emphasis on emotional intelligence, as it helps to turn students into active agents, who not only receive information, but are capable of constructing their own knowledge based on motivation.

On the other hand, we must take into account teacher training when teaching educational robotics in the classroom. That is why the recommendation of Sánchez and Forero (2012, p. 128) is:

"...at this stage it is important to carry out different activities with teachers to train them in the handling of these tools to make them aware of their benefits and to make it clear that it is not necessary to be an expert to manipulate them. All of this should take place before dealing with the acquisition of the tools themselves; that is the last step in this stage". It is therefore necessary to raise awareness and train teachers, making them aware of the positives of developing this subject within the school curriculum.

The importance of using ICT in the classroom has been an interesting topic for several authors throughout the history. This TFM has taken some of the research done by them in order to build its theoretical basis. Among the most significant ones I would like to highlight the following authors:

- Marc Prensky: Known for his work on digital natives and digital immigrants, Prensky has written extensively on the integration of technology in education, including his book "*Teaching Digital Natives: Partnering for Real Learning.*"

- Larry Cuban: Cuban is an influential author who has critically examined the role of technology in education. His book *"Oversold and Underused: Computers in the Classroom*" provides insights into the challenges and limitations of ICT implementation.

- Seymour Papert: A prominent figure in educational technology, Papert advocated for the use of computers and technology in education. His book "*Mindstorms: Children, Computers, and Powerful Ideas*" explores the benefits of hands-on learning with technology.

- Punya Mishra and Matthew J. Koehler: These authors have extensively researched and written about the concept of Technological Pedagogical Content Knowledge (TPACK), which emphasizes the integration of technology, pedagogy, and content knowledge in teaching.

- Chris Dede: Dede has focused on the potential of emerging technologies, such as virtual reality and augmented reality, in transforming education. His book "*Learning with Digital Games: A Practical Guide to Engaging Students in Higher Education*" explores the use of games for learning.

- Ian Jukes: Jukes is known for his work on the future of education in the digital age. His books, including "*Teaching the Digital Generation: No More Cookie-Cutter High Scho*ols" and "*Understanding the Digital Generation: Teaching and Learning in the New Digital Landscape*," discuss the challenges and opportunities of ICT integration.

- Punya Mishra and Danah Henriksen: These authors have researched the concept of Technological Pedagogical Content Knowledge (TPACK) and its application in educational contexts. Their work focuses on the effective integration of technology, pedagogy, and content knowledge for meaningful learning experiences.

- Michael Fullan: Fullan has written extensively on educational change and leadership. His book "*The New Meaning of Educational Change*" explores the role of technology in educational reform and the integration of ICT for effective teaching and learning.

- Alan November: November has written about the importance of technology in enhancing student learning and fostering global collaboration. His book "*Who Owns the Learning?: Preparing Students for Success in the Digital Age*" discusses the transformative potential of ICT in education.

- Sherry Turkle: While primarily known for her work on the social and psychological impact of technology, Turkle has also explored the role of technology in education. Her book "*Alone Together: Why We Expect More from Technology and Less from Each Other*" offers insights into the effects of digital technology on education.

3.3 Cooperative work

Another aspect to be taken into account with this type of activity is the progress in cooperative work among students, which encourages direct interaction between students and teachers, among students themselves, content and language teachers as well as between students and computer programmes. Thus, the language to be used by all these agents may be a second language.

First of all, we must be aware of the function of cooperative work, which, as Johnson, Johnson and Holubec (1999, p. 5) state:

> *"Cooperation is about working together to achieve common goals. In a cooperative situation, individuals seek outcomes that are beneficial to themselves and to all other members of the group. Cooperative learning is the didactic use of small groups in which learners work together to maximise their own learning and that of others. This method contrasts with competitive learning, in which each student works against the others to achieve school goals such as a grade of "10" that only one or a few can achieve, and with individualistic learning, in which students work on their own to achieve learning goals detached from those of the other students. In cooperative and individualistic learning, teachers assess students' work according to certain criteria, but in competitive learning, students are graded according to a certain standard. While competitive and individualistic learning have limitations as to when and how to use them appropriately, the teacher can cooperatively organise any teaching task, in any subject and within any curriculum"*

In other words, individual work encourages competition to achieve a maximum mark, whereas co-operative work allows students to work together to achieve common objectives, thus enriching the teaching-learning process.

On the other hand, we must highlight the importance of cooperative work, the development of interculturality and second languages, for which I must highlight the statements of Olivencia (2012, p. 1) who tells us the following with regard to interculturality and cooperative learning, which I will explain in brief:

In the present day, we exist in a society that aims to construct itself based on interculturality. The digital age, along with advancements in science, technology, and telecommunications, among other areas, enables the proper establishment of this societal goal. For this reason, we must take advantage of ICT to bring the school closer to the context that surrounds us, just as these technologies have helped us to implement new teaching methodologies, thus promoting intercultural communication and overcoming cultural conflicts and prejudices.

ICT is a fundamental and essential tool to materialise the concepts of interactivity, interconnection, instantaneousness, exchange, knowledge, enrichment and intercultural citizenship, a methodological strategy based on cooperative, participative and networked learning between centres in different parts of our world is necessary.

In addition to the importance of teaching through ICT, there is a double reinforcement when it is done through a second language, for this reason Montes and Senescyt (2015, p. 27) state:

> *"The United Nations Educational, Scientific and Cultural Organisation (UNESCO) has been at the forefront of the universal right to education since 1948. In this context, the teaching of a second language is an important element in contemporary education due to the potential it offers to individuals on an academic, occupational, cultural and even personal level".*

According to UNESCO, " (Orozco, 2011, p. 25) stresses the importance of the use of Information and Communication Technology (ICT) resources to motivate educational practice, generate interest and strategies for both teaching and learning.

There are international trends that integrate technologies in the processes of teaching and learning foreign languages, these are known by their acronyms in English as CALL (Computer-

Assisted Language Learning) and TELL (Technology Enhanced Language Learning), in both cases groups of researchers and teachers who study and carry out practices of integration of technologies in the teaching of other languages.

- The use of robotics and games in the classroom can significantly contribute to cooperative work among students. After doing some research, different points will be developed related to some ways in which robotics and games foster collaboration and teamwork:

- Shared goals: Robotics projects and educational games often require students to work towards a common objective. They collaborate to solve problems, complete tasks, or achieve specific outcomes. This shared goal encourages students to communicate, plan, and coordinate their efforts, fostering a sense of cooperation.

- Task division and specialization: In robotics and game-based activities, students are often assigned different roles or responsibilities within a team. They divide tasks based on their strengths and interests, allowing them to specialize in different aspects of the project. This promotes cooperation as each team member contributes their expertise towards the collective goal.

- Communication and Interaction: Robotics and games provide opportunities for students to communicate and interact with each other. They need to discuss ideas, exchange information, and provide feedback to ensure the smooth functioning of their projects. Effective communication is essential for successful collaboration and teamwork.

- Problem-solving and Decision-making: Robotics and games frequently present challenges and problems that require collaborative problem-solving. Students work together to analyze the situation, propose solutions, and make decisions collectively. Through this process, they learn to value diverse perspectives, negotiate, and compromise, contributing to cooperative work.

- Peer Learning and Support: Robotics and game-based learning environments create opportunities for peer learning and support. Students can share their knowledge, skills, and experiences with their teammates, helping each other overcome obstacles and improve their

understanding. This collaborative learning dynamic enhances cooperation and fosters a supportive classroom environment.

- Reflection and Iteration: Robotics and games often involve iterative processes where students test, evaluate, and refine their work. During this iterative cycle, students collaborate to assess the effectiveness of their solutions, identify areas for improvement, and make necessary adjustments. This reflective practice encourages teamwork and collective problem-solving.

By engaging in robotics and game-based activities, students develop essential skills for cooperative work, such as effective communication, active listening, division of labor, and collaborative problem-solving. These experiences cultivate a sense of shared responsibility, respect for diverse perspectives, and the ability to work together towards a common goal, fostering a cooperative classroom environment.

3.4 The use of games in the classroom

The way to include this methodology in the classroom would be through the construction of their own games and toys (robots through Lego WeDo) and their programming through Scratch. It is therefore necessary to highlight the need for all children to be allowed to play, but not just for fun, but with the aim of promoting the development of learning, as learning and teaching is done in a motivating way. Packer and Quisenberry (2012, p. 33), warn us that:

> *Children are growing up in a rapidly changing world characterized by dramatic shifts in what all children are expected to know and be able to do. Higher and tougher standards of learning for all populations of students are focusing on a narrow view of learning. Consequently, students have less time and opportunity to play than did children of previous generations. Few would disagree that the primary goal of education is student learning and that all educators, families. And policymakers bear the responsibility of making learning accessible to all children. Decades of research has documented that play has a crucial role in the optimal growth, learning, and development of children from infancy through adolescence. Yet, this need is being challenged, and so children's right to play must be defended by all adults, especially educators and parents. The time has come to advocate strongly in support of play for all children.*

The use of games in the classroom has been recognized as a valuable educational tool, offering various benefits for students' learning and engagement. Several authors and researchers have explored this topic and highlighted its importance. Here are a few authors and aspects related to the use of games, including those related to robotics:

- James Paul Gee: he is a professor of literacy studies, has written extensively about the educational potential of video games. In his book *"What Video Games Have to Teach Us About Learning and Literacy*," he argues that games offer a unique learning environment that promotes problem-solving, critical thinking, collaboration, and deep engagement with complex concepts.

- Jane McGonigal: a game designer and researcher, emphasizes the positive impact of games on motivation and resilience. In her book "*Reality Is Broken: Why Games Make Us Better and How They Can Change the World*," she discusses how games can inspire students to overcome challenges, build perseverance, and develop a growth mindset.

- Seymour Papert: a mathematician and educator, introduced the concept of "constructionism," which emphasizes learning through hands-on experiences and creating tangible artifacts. He believed that robotics and programming can be powerful tools for engaging students in active learning and problem-solving.

Closely realted to the topic of this Master Dissertation I would like to highlight several aspects related to robotics in the classroom:

- STEM Education: Robotics can be a gateway to STEM (Science, Technology, Engineering, and Mathematics) education. By using robotics in the classroom, students can explore and apply concepts from various STEM disciplines, such as physics, mathematics, and computer science. This interdisciplinary approach fosters a deeper understanding of these subjects and encourages students to pursue STEM-related careers.

- Problem-solving and Critical Thinking: Robotics activities often require students to analyze problems, design solutions, and troubleshoot issues. By engaging in hands-on robotics projects, students develop critical thinking skills, learn to break down complex problems into manageable tasks, and enhance their problem-solving abilities.

- Collaboration and Teamwork: Robotics projects often involve teamwork and collaboration. Students work together to design, build, and program robots, requiring effective communication, division of tasks, and cooperation. These collaborative experiences foster social skills, teamwork, and the ability to work collectively towards a common goal.

- Real-world Application: Robotics provides a tangible and practical way for students to apply their knowledge and skills. By working with robots, students can see the direct impact of their programming and engineering decisions, making the learning experience more meaningful and relevant. This connection to real-world applications enhances student engagement and motivation.

In the following, we will discuss the historical context in which this innovation application and its methodological approach is focused.

3.5 Historical background

First of all, we would like to highlight the main characteristic that has marked the greatest structural change in the conception of what we understand today by education, since the 21st century is the century of the information age, of the use and application of new information and communication technologies. Therefore, the current educational context is very different from that of the 20th century; teachers are not merely transmitters of knowledge, nor are students passively acquiring content uncritically.

a) The information society goes hand in hand with globalisation; new technologies have made this a fundamental element in developing aspects such as interculturality and the interaction of different languages, as well as the acquisition of second languages. For this reason, there are authors who warn of the danger of not having access to this information society, as Tedesco, (2011, p. 36) states:

> *The emergence of new technologies has produced a phenomenon comparable to that produced by the invention of the printing press. Everything that does not circulate through the circuits created by these technologies will have a precarious existence, as did all the information and knowledge that was not incorporated into books or written documents after the expansion of the printing press.*

> *This concentration of knowledge and information in the circuits of the new technologies - such as the internet, for example - explains the need to adequately incorporate the technological dimension into democratic educational policies. Failure to do so could condemn to marginalisation all those who remain outside the domain of the codes that enable them to handle these instruments. An eloquent indicator of this danger of social polarisation can be seen in the strong concentration of access to the new information technologies in certain regions of the world and in certain sectors of the population.*

b) Therefore, it can be stated that the democratisation of education in the globalised world and information are linked to the rights of citizens to access new technologies, such as access to the Internet and its correct use. Studies such as Moreira's (2010, p. 40) state that:

> *"... within a few years, close to 5 billion people will have access to the Internet not only from highly developed areas or regions of the planet, but also from practically anywhere in Africa, Asia, Oceania or Latin America [iii]. Telecommunications, digital television, the Internet, mobile telephony and other technological gadgets are a substantial part of the civilisation of our time".*

Therefore, we must also bring society closer to the mere fact of teaching how to use them properly, to know how they are designed, programmed and used. This is why educational robotics allows us to cross the barrier of technological knowledge in its most basic essence.

c) In conclusion, teachers must be prepared for the new challenges of the 21st century in a context that Imbernón, (2011, p. 8) points out in the following points:

- The accelerated increase and dizzying change in scientific knowledge and the products of thought, culture and art of the social community, the basis of any educational curriculum [...].
- The accelerated evolution of society in its material and institutional structures and forms of organisation of coexistence [...].
- [...] The dizzying changes in the media and technology have been accompanied by profound transformations in the institutional life of many organisations and have put the mere transmission of knowledge and, therefore, its institutions in crisis.

- The decline of the trainer-trainee binomial, for a triangle where one vertex is made up of an artefact (audiovisual, printed or computer media).
- Not only analysing professional development as the mastery of scientific or academic disciplines, but also the need to establish new relational and participative models [...].
- Working in a multicultural and multilingual society where dialogue between cultures will be a richness for diversity and where it will be essential to live in equality and coexist with diversity.

In short, we must be very prepared to be teachers in the times we live in; changes are very rapid in social, cultural and scientific contexts, among others. Society is very diverse, which should not be an obstacle, but rather a means of approaching and getting to know, in a more direct way, the different lifestyles, being able to involve the pupils and, of course, also the educational community in this multilingual and multicultural richness, which is completed with the use of new information and communication technologies.

3.5.1 Timeline of the introduction of robotics and games in the classroom

The historical background of using robotics and games in the classroom can be traced back to the emergence of educational technologies and the recognition of their potential for enhancing learning experiences. Here is a brief historical overview:

1. **Emergence of Educational Technologies:**
   - 1950s-1960s: The advent of computers and their integration into education marked the beginning of educational technology. Early computer-based educational programs focused on teaching mathematics and basic programming concepts.
2. **Introduction of Educational Games:**
   - 1970s-1980s: The introduction of video games, such as "Oregon Trail" and "Math Blaster," demonstrated the potential of games for educational purposes. These games aimed to make learning engaging and interactive, focusing on subjects like history, math, and language.
3. **Early Robotics in Education:**
   - 1980s-1990s: Robotics started making its way into educational settings. The LOGO programming language, developed by Seymour Papert, allowed students to program and control robotic turtles, providing hands-on learning experiences.

4. **Growth of Robotics and Game-Based Learning:**

- Late 1990s-2000s: With advancements in technology and the availability of more affordable robotics kits, the use of robotics in education expanded. LEGO Mindstorms, introduced in 1998, became popular for teaching robotics concepts. Simultaneously, educational games continued to evolve, focusing on a wider range of subjects and providing more interactive and immersive experiences.

5. **Integration of Robotics and Games:**

- 2010s-2020s: The integration of robotics and games gained traction in educational settings. Robotics competitions, such as FIRST Robotics, encouraged collaborative problem-solving and showcased the practical application of robotics skills. Serious games and gamification techniques started being used to enhance learning experiences across various disciplines.

6. **Advancements in Technology:**

- Present: The rapid advancement of technology, including the development of more sophisticated robotics platforms, virtual reality (VR), augmented reality (AR), and artificial intelligence (AI), has further expanded the possibilities for using robotics and games in the classroom. These technologies offer immersive, interactive, and personalized learning experiences.

Throughout history, the use of robotics and games in the classroom has evolved, driven by the desire to engage students, promote active learning, and facilitate the development of essential skills. Today, robotics and game-based learning continue to play a vital role in education, providing hands-on experiences, fostering collaboration, and enhancing students' understanding of various subjects.

3.6 Methodological approaches

In the Introduction to this Master's Dissertation, a brief general explanation of the type of methodology to be used has already been given. We will now specify the details of this methodology.

Firstly, we will use Howard Gardner's MI. There are several studies for its implementation, such as those by Gardner Krechevsky, 1995 (in De La Matta and Delgado, 2013, pp. 97-98) because, as we know, sometimes some methodological theories are difficult

to bring to the classroom, to implement their objectives and to evaluate them. This is why these authors state:

From their point of view, "the goal of school should be to develop intelligences and help people achieve the vocational goals and hobbies that match their particular spectrum of intelligences" Gardner (1995, p.12) in De La Matta and Delgado, (2013, p. 97). His model of the school of the future is based on two fundamental premises:

- First: not everyone has the same interests and abilities, and not everyone learns in the same way.
- Second: no one can ever learn everything there is to learn.

Likewise, Gardner et al. (1993) believe that much of the knowledge acquired in school is "pure knowledge" that does not occur in this way in the real world, where most tasks require some sort of combination of knowledge and skills directed towards a specific goal or objective.

For these reasons, the introduction of educational robotics through games and second languages would allow each pupil to work at their own pace, as well as allowing (or rather, favouring) the motivation of primary school pupils to use ICT in an appropriate way and based on good teacher training, which is the basis for a correct implementation in the educational curriculum of schools.

Furthermore, in line with the above, the role of teachers is fundamental for the use of ICT. This is where Gómez (2010, p. 9) states the following about the role of the teacher:

Teachers in this aspect, especially in the Andalusian community, have had at their disposal, different ICT resources for their didactic implementation such as digital whiteboards, laptops, learning application and so on, having an impact on the teaching-learning process, thus favouring active and constructivist methodologies, using new tools for accessing information.

As can be seen, the integration of ICT, as well as creating a new role for the teacher, will favour active teaching in relation to collaborative work and the use of games, which are also key in the didactic model of this dissertation and which, moreover, are already advanced in the conclusions of the study by Gómez (2010, pp. 18-19):

> *[...] The most commonly used applications are reinforcement applications, far ahead of others such as presentations, educational games, collaborative learning projects, tutorials, simulations, webquests and treasure hunts, image-creation programmes and weblogs. [...]*

> *The teaching staff, who state that their teaching-learning processes have been significantly transformed by the massive and systematic presence of ICT, affirm that their classes become more active and participative, facilitating autonomous learning by pupils and acquiring new knowledge through research work in which the teacher becomes a guide in their pupils' learning. [...]*

Finally, with the aim of combining all this through games and second languages (English), we will make our students work through a second language in order to prepare them for their future professional careers and even in their daily lives, as we live in an increasingly globalised world, where knowing and knowing how to get by in a second language such as English is fundamental. Carbonell, A. G. & Watts, F. (2007, pp. 65-67) state in this summary:

The use of games allows students to learn significantly through practice, as they improve the teaching-learning process in a playful way, making students learn without them realising it, with a clear interrelation between students (socioconstructivism).

Thanks to socioconstructivism, it allows pupils to communicate, for which the use of the second language is fundamental, as they acquire a new language in a fun and playful way, as well as learning any related subject in a transversal way, thus improving their competences in a comprehensive way, taking into account the importance of pupils' creativity and freedom.

3.7 Second Language acquisition

CLIL (Content and Language Integrated Learning) is an approach to language learning that combines the teaching of content from various subjects with the teaching of a second language. When implemented effectively, CLIL is a powerful tool for acquiring a second language. In the planning that will be explanained above, the following methodological techniques will be follow in order to guarantee the second language acquisiton:

- Preparing the context: introducing the topic that will be covered in the CLIL lesson,

Set the objectives for both the content learning and language acquisition.

- Language Input: providing explicit language input related to the topic, including key vocabulary, phrases, and sentence structures that will be used throughout the topic. Furthermore visual aids, realia, and multimedia resources will be used to enhance comprehension.
- Content Exploration: facilitating the exploration of the content through investigations. Pupils will be encouraged to interact with the content using the target language.

Furthermore teacher will provide opportunities for collaboration and discussion among students to foster language use and communication.

- Language Output: teacher will provide structured opportunities for students to express themselves using the target language (English).
- Robotics Integration: encouraging students to work in teams, problem-solve, and communicate using the target language during the robotics tasks.
- Reflection and eeview: students will have to reflect on their learning experience and provide feedback on their language development.

4 DESIGN OF THE PLANNING

4.1 Main objectives

When planning, in any area of knowledge or project work, it is essential to set objectives, which are oriented towards their achievement by the students.

This Master Dissertation is aimed at teaching a CLIL subject using robotics and games with a clear focus on cooperative work, using student motivation as a guiding thread.

The main objectives to be highlighted are:

- To develop interest in robotics and video game programming.
- To encourage cooperative work.
- To develop logical-mathematical thinking.
- Develop communication skills (both oral and written) in L2.
- Learn basic vocabulary in the foreign language related to construction and programming.
- To improve students' fine motor skills.
- To ensure that pupils develop the key competences:
    - Linguistic competence
    - Plurilingual competence
    - STEAM
    - Digital competence
    - Personal, social and learning to learn competence
    - Civic competence
    - Enterprising competence
    - Cultural awareness and expressions competence

- To get pupils interested in introductory activities related to science and basic engineering, using English as a vehicle.

4.2 Planning

This planning is aimed at all Primary Education pupils, with or without Special Educational Needs, as the way in which it is carried out is didactic transposition; therefore, all children will benefit from it.

However, it is not only the pupils, but also the educational community in general, as teachers will be involved in an innovative training process through the use of ICT resources and cooperative methodologies..

And finally, it is important to highlight the general impact of this project on society, as many people (families or social institutions, for example) will see in practice that educational robotics and English are areas of knowledge that are easy to reach and not complicated subjects in the teaching-learning process.

4.2.1 Activities

To introduce students to educational robotics, we will carry out three types of activities to encourage their logical thinking, so that they acquire the basic concepts.

4.2.1.1 First level activities

a) The story of the Golem, by Sevillano (2016, p. 6)

The teacher will tell the story of the Golem, which is as follows:

Hebrew legend has it that in mid-16th century Prague, Rabbi Loew, the wisest man in the Jewish quarter (religious teacher, philosopher, astrologer, astronomer, observer of the natural sciences and magician), created life from inert matter. It is said that he moulded the mud of the Vltava River into a human-like figure: the Golem. He then breathed the spark of life into it by inserting a piece of paper with a secret magic word into its mouth. The Golem was an animated puppet with no will: it did not eat, did not drink, did not sleep, could not speak, and yet it possessed extraordinary strength. It was strong but not intelligent. Loew created the Golem with the intention that it would help the Jews of the ghetto in their daily chores (cleaning, carrying water, constructing buildings...) and at the same time protect them from the attacks of their Christian neighbours. The clay man obeyed all of Rabbi Loew's orders. To do this, a small piece of paper with the order or task written on it had to be put into his mouth. It was very

important to write down the precise and correct orders, as the Golem would carry them out literally without questioning them. In fact, there is a famous anecdote in which the rabbi's wife asked the Golem to go "to the river to draw water". The Golem obeyed to the letter: he went to the river, and began to draw water from it without stopping, until he ended up flooding the city.

This story will help students to reflect on the language used by the programmer; short and simple orders, but the goal we want to achieve, which is none other than to get our robot or our video game to work.

To put it into practice, we can make flashcards in English, with commands such as: close the door, throw the paper into the bin, sit on the chair, etc.

Using the story of the Golem by Sevillano in conjunction with robotics education can be valuable for several reasons:

- Historical and Cultural Context: The Golem story, deeply rooted in Jewish folklore and history, provides a historical and cultural context for exploring robotics. It offers an opportunity to discuss the origins of the Golem legend, its significance in Jewish culture, and the historical context in which it emerged. Understanding the historical and cultural background can foster appreciation and respect for diverse narratives, promoting cultural sensitivity in the field of robotics.
- Ethical Considerations: The story of the Golem raises ethical questions about the creation and control of artificial beings. It prompts discussions on the responsibilities of creators, the limits of technological intervention, and the potential consequences of creating autonomous or intelligent robots. By analyzing the ethical dimensions of the Golem story, students can develop a deeper understanding of the ethical considerations in the field of robotics.
- Design and Engineering Challenges: The Golem story can inspire design and engineering challenges for students working on robotics projects. Students can explore the process of designing and constructing a robot that embodies the characteristics of a Golem, such as strength, agility, or the ability to follow instructions. This integration of storytelling and robotics can enhance students' creativity and problem-solving skills.
- Human-Robot Interaction: The Golem story explores the complex relationship between humans and artificial beings. It prompts discussions on human-robot interaction, trust, and the ethical treatment of robots. Students can reflect on how the Golem story relates to contemporary

issues in robotics, such as robot ethics, human-robot collaboration, and the social impact of robots. This connection encourages students to consider the societal implications of robotics technologies.

- Symbolism and Representation: The Golem story carries symbolic meanings and can serve as a metaphor for exploring themes related to robotics. Students can analyze the Golem as a representation of the relationship between humans and machines, the balance between power and control, or the consequences of technological creations. Engaging with symbolism and representation in the Golem story cultivates critical thinking skills and encourages students to think deeply about the implications of robotics.

By using the story of the Golem, students can explore the historical, cultural, and ethical dimensions of robotics. It provides a rich narrative that can inspire design challenges, foster critical thinking, and encourage discussions on the ethical and societal implications of robotics technologies. Integrating storytelling with robotics education adds depth and context to students' learning experiences, nurturing a well-rounded understanding of the field

b) The chair game

This will consist of grouping the class in pairs, one as the robot and the other as the programmer.

As we know, robots are programmed by means of short, easy-to-understand commands; this is why the "programmer" will order the "robot" all the steps it should take, for example: take two steps forward, one to the left, turn 90º, take two steps to the right, turn a quarter turn, etc., and so on, until it sits in the chair.

This type of activity allows the child to become familiar with vocabulary which, of course, will be in English. This should be written down in a dictionary, made by the students, which will be called the Little Engineer's Dictionary. After doing the activity once, the roles will be exchanged.

c) Use of Code Learn

Code Learn, is a simulator of video game programming at very basic levels, therefore our students, in a practical, motivating and intuitive way,

They will be able to create their first programming codes, as well as develop their laterality.

4.2.1.2 Second level activities

This will be dedicated to the construction and programming of robots, using Scratch 1.4 and Lego WeDo 2.0.

- Scratch 1.4: We all know that there is a wide variety of languages in the world; in programming, the language of commands is commands, so that if done correctly, our robot will work.
- Lego WeDo 2.0: With this resource, students will have the tools to build their robot.

Note: The students will also need a computer or tablep, as a computer support to make their robot and programming.

After the explanation of the programme and the Lego box, they will go on to carry out a guided construction, which will be "*The dancing chickens*".

Then, the students will program it so that their robot project comes to life. As for the groupings, there will be groups of three students: programmer, builder and supervisor of the project. Finally, the students will have to explain the whole process on a poster, using the English vocabulary that they have been writing down throughout the process in their Little Engineer's Dictionary.

4.2.1.3 Third level activities

This will be expressly aimed at video game programming.

To do this, we will only use a computer (as a computer support) and the *Scratch 1.4* programme.

The game we will play will be a game of balloons, which will consist of students programming balloons, each with a score and in movement, allowing them to then play with their own creation. To do this, they will be grouped in pairs or groups of a maximum of three pupils.

4.2.1.4 Final Project

After having gone through each of the stages, students will freely choose a project under their own decision, according to their needs and interests, in order to be able to develop their creativity.

To do this, the students will have to make a presentation, with a cardboard as a visual support, to their classmates, about why they have done it, how they have programmed their

video game or robot, what application it has and their personal experience when carrying it out. This part is very important, as the pupils, through the second language (English), will develop their oral competence, which is very important in their education at primary school, making them autonomous agents.

4.3 Learning situation using Lego WeDo 2.0 and Scratch 1.4

EXPLORING THE GOLEM: AN EXCITING JOURNEY

Justification: In this cross-curricular unit, students will embark on an exciting journey to explore the fascinating world of the Golem. They will delve into the concepts of Social Science and Natural Science while utilizing technology tools such as Scratch 1.4, Code Learn, and Lego WeDo 2.0 kits. The unit integrates content from different subject areas while promoting language development in English. Throughout the unit, students will engage in hands-on activities, experiments, and discussions to deepen their understanding of golems and related scientific concepts. The unit integrates language learning through content exploration, language input, language activation through games, and language output through presentations and creative projects.

Content subjects: Social Science (History and Culture) and Natural Science (Robotics)

Language subject: English

Level: 5th grade of Primary Education

Language level: Intermediate

Timing: 6-8 weeks (approximately)

CURRICULAR DEVELOPMENT (LOMLOE)			
Specific Competence	**Evaluation criteria**	**Basic Knowledge**	**Exit profile**
1.To use digital devices and resources safely, responsibly and efficiently, to search for information,	1.1.a. Use digital resources in accordance with the needs of the educational context in a safe and appropriate way, searching for information,	CM.03.B.1.1. Digital devices and resources in accordance with the needs of the educational context. CM.03.B.1.2. Strategies for safe and efficient information searches	CCL3, STEM4, CD1, CD2, CD3, CD4,

communicate and work individually, in teams and in networks, and to rework and create digital content according to the digital needs of the educational context.	communicating and working individually and in teams, starting to carry out network activities, creating simple digital content, interpreting and organising information and increasing productivity and efficiency in their own work.	on the Internet (assessment, discrimination, selection, organisation and intellectual property). CM.03.B.1.3. Strategies for collecting, storing and representing data to facilitate understanding and analysis. CM.03.B.1.4. Basic security and privacy rules for surfing the Internet and for protecting the personal digital learning environment. CM.03.B.1.5. Restricted and secure digital resources and platforms for communicating with others. Digital etiquette, basic rules of courtesy, respect and problem-solving strategies for digital communication. CM.03.B.1.6. Strategies to promote physical and mental digital well-being. Recognition of the risks associated with inappropriate and unsafe use of digital technologies (excessive time of use, cyberbullying, technological dependence, access to inappropriate	CD5, CCEC4.

		content, etc.), and strategies for action.	
3. To solve problems through design projects and the application of computational thinking, to cooperatively generate a creative and innovative product that responds to specific needs.	3.1.a. Present design problems to be solved with the creation of a prototype or digital solution, initiating the assessment of the needs of the environment and establishing specific objectives. 3.2.a. Design in a guided way solutions to the problems posed with simple techniques of design projects and computational thinking, using basic strategies of cooperative project management, taking into account the necessary resources. 3.3.a. Design a final product that provides a solution to a design problem, by means of cooperative strategies, such as prototypes or digital solutions, using appropriate tools, devices, techniques and materials in a safe way.	CM.03.B.2.1 Phases of design projects: identification of needs, design, prototyping, testing, evaluation and communication. CM.03.B.2.2 Phases of computational thinking (decomposition of a task into simpler parts, pattern recognition and creation of simple algorithms for problem solving, etc.). CM.03.B.2.3 Safe and appropriate materials, tools, objects, devices and digital resources (block programming, sensors, motors, simulators, 3D printers, etc.) for the achievement of the project. CM.03.B.2.4 Strategies in situations of uncertainty: adaptation and change of strategy when necessary, valuing own and others' mistakes as a learning opportunity.	STEM3, STEM4, CD5, CPSAA3, CPSAA4, CPSAA5, CE1, CE3, CCEC4.

	3.4.a. Present and communicate the result of design projects, explaining the steps followed, justifying why that prototype or digital solution meets the project requirements and proposing possible challenges for future projects.		
8.To recognise and value diversity and gender equality, showing empathy and respect for other cultures, and reflecting on ethical issues, in order to contribute to the individual and collective well-being of a society in continuous transformation and to the achievement of the values of European integration.	8.1.a. Contribute to individual and collective well-being through the comparative analysis of the geographical, historical and cultural processes that have shaped some of the different territories and societies of the world, valuing ethno-cultural or affective-sexual diversity, social cohesion, and showing empathy and respect for other cultures and gender equality.	CM.03.C.1.4. Migrations and cultural diversity. The main demographic variables and their graphic representation. Population behaviour and its evolution. Migratory movements and the appreciation of cultural diversity. Contrast between urban areas and rural depopulation. CM.03.C.1.5. Active citizenship. Foundations and principles for political organisation and territorial management in Spain. Social and citizen participation.	CP3, CPSAA3, CC1, CC2, CC3, CCEC1. 2

Objectives

- Develop an understanding of the historical and cultural background of the Golem story.
- Enhance computational thinking and problem-solving skills through coding activities.
- Foster collaborative and communication skills through group projects and presentations.
- Develop English language proficiency across all subject areas.

Materials

- Lego WeDo 2.0 kits
- Scratch 1.4 software
- Code Learn
- Computers or tablets
- The Golem story book by Sevillano (2016)
- Worksheets and handouts on the Golem story and robotics

Lesson 1: Introduction to the Golem Story

- Read the story "Golem" by Sevillano as a class.
- Engage students in a group discussion to explore the themes, characters, and historical context of the story.
- Chair game: in pairs one of the pupils pretend to be a robot and the other gives the instruction. The aim of the game is the robot reaches a chair radomly located in the classroom.
- Conduct a vocabulary exercise to introduce and reinforce key terms related to the story and its setting. Pupils write the new words they have learnt in the Little Engineer's Dictionary.

Lesson 2: The historical context

- Introduce students to the historical background of the Golem story.
- Research and discuss the historical significance of the Golem in Jewish folklore and Prague's cultural heritage.
- In groups, pupils have to create a timeline of important events related to the Golem and its origins.

Lesson 3: Comparing cultures

- Engage students in a comparative analysis of different cultures' folklore and mythical creatures. Pupils have to use their laptops or tablets in order to search information.
- Research and compare mythical creatures from different cultures, discussing their origins, characteristics, and cultural significance.
- Create a presentation or poster by using digital applications such as "Canva" showcasing the similarities and differences between the Golem and another mythical creature.

Lesson 4: Coding with Scratch 1.4

- Provide an introduction to coding using Scratch 1.4
- First contact with Scratch 1.4: design a balloon game including a score in each of them
- In groups, students have to create their own interactive stories or games using Scratch 1.4, incorporating characters and elements from the Golem story.

Lesson 5: Lego WeDo2.0

- Introduce Lego WeDo 2.0 kits and their components.
- Guide students through building and programming a model related to the Golem story.
- Explanation of the final task: pupils have to design a robot or a videogame related to the topic (Golem) and using Scratch 1.4 as well as Lego WeDo2.0.

Lesson 6: Final task

- In small groups, students will create a collaborative project based on the Golem story (videogame or robot)
- Oral presentation or their project in which pupils will have to illustrate the journey of the Golem and its impact on the community, It is required that pupils showcase their creativity and understanding of the unit's concepts.

Assessment

- Class participation and engagement in research and group activities
- Completion of worksheets and handouts on the Golem story and robotics

- Successful building and programming of the Golem robot
- Improvement and programming of the Golem robot with sensors and other features
- Presentation and evaluation of the Golem robot

Assessment rubric

CRITERION	Excellent	Good	Needs improvement
Understanding of content			
Demonstrates a clear understanding of the historical and cultural background of the Golem story.			
Provides accurate and relevant information about mythical creatures from different cultures.			
Application of technology tools			
Effectively uses Scratch 1.4 to create interactive stories, games, or animations related to the Golem story or environmental themes.			
Successfully utilizes Code Learn to complete guided coding activities.			
Constructs and programs Lego WeDo 2.0 models related to the Golem story.			
Collaboration and communication			
Actively participates in group discussions, contributing ideas and respecting others' opinions.			
Collaborates effectively with peers during group projects, demonstrating teamwork and cooperation.			

Presents information clearly and confidently during presentations, using appropriate language and engaging visual supports.			

This learning situation provides an opportunity for students to integrate Social and Natural Science concepts with robotics, while promoting language development through vocabulary, discussion, and presentation activities. By using *Lego WeDo and Scratch 1.4*, students can engage in hands-on learning and develop STEM skills, while also learning about important cultural and historical concepts. The Golem story is a unique way to introduce students to Jewish culture and history, while also exploring robotics and engineering.

Throughout the unit, incorporate language learning games, oral presentations, and collaborative activities to activate and reinforce language acquisition. It is essential to provide regular opportunities for students to reflect on their language development and provide feedback on their own progress.

It is important to highlight that the duration and specific activities outlined in this learning situation can be adapted and modified based on the need and resources avaible in the classroom.

5 EXPECTED RESULTS

The results expected to be achieved are as follows:

1) Students develop their interest in robotics and video game programming, through the proposed activities (construction and programming of robots, as well as the proposed video game, along with the final project).

2) Pupils are encouraged to work cooperatively when developing the activities proposed in the planning.

3) Students develop logical-mathematical thinking when programming in *Code Learn* and *Scratch 1.4.*

4) Communication skills are developed (both oral and written), in the foreign language, especially in the final project, when presenting the project carried out.

5) Basic vocabulary is learnt in the foreign language related to construction and programming, using the tools *Code Learn* and *Scratch 1.4* in English, as well as detailing all the vocabulary in the Little Engineer's Dictionary.

6) Improving pupils' fine motor skills through the construction of the robots.

7) It helps pupils to develop the basic competences stated in RD157/2022

- Linguistic competence
- Plurilingual competence
- STEAM
- Digital competence
- Personal, social and learning to learn competence
- Civic competence
- Enterprising competence
- Cultural awareness and expressions competence

8) It gets pupils interested in introductory activities related to science and basic engineering, using second language (English) as a driving force.

In short, using the game as a driving vehicle, pupils will acquire knowledge related to all areas of knowledge and also develop the basic competences that pupils need to achieve at the Primary School stage. Therefore, educational robotics is a transversal area of knowledge that not only focuses on knowing how to use programming or construction tools, but any area of knowledge can benefit from it to make the teaching-learning process a meaningful one, making the students an active agent in the process, being them, at the end of the learning process, the ones who guide and guide their project, being able to acquire all the knowledge used for it.

6 CONCLUSION

After the research that has been done for this Master Dissertation I can state that the use of robotics and games in teaching CLIL (Content and Language Integrated Learning) offers numerous benefits and opportunities for students. By integrating robotics and games into CLIL lessons, teachers enhance student engagement, promote active learning, foster critical thinking and problem-solving skills, and facilitate interdisciplinary connections.

Firstly, robotics provides hands-on experiences that engage students in the learning process. Through activities using robotics kits like *Lego WeDo 2.0,* students apply their knowledge of content areas such as science, technology, engineering, and mathematics (STEM) in a practical and tangible way. They design, build, and program robots to solve problems, encouraging creativity and innovation.

Secondly, games offer an interactive and immersive learning environment. Applications such as *Scratch 1.4* and *Code Learn* enable students to develop coding skills while creating

interactive stories, games related to the CLIL content. This approach not only reinforces subject knowledge but also enhances computational thinking, logical reasoning, and digital literacy.

Additionally, the use of robotics and games in CLIL promotes collaboration and communication among students. Group projects, coding challenges, and collaborative problem-solving tasks encourage teamwork, effective communication, and the exchange of ideas. Students learn to work together, negotiate, and share responsibilities, developing crucial 21st-century skills.

Furthermore, integrating robotics and games in CLIL facilitates the integration of language skills. Students are motivated to use English as a means to communicate and express their ideas in a meaningful context. They engage in authentic language use while discussing concepts, presenting their projects, and collaborating with peers, strengthening their language proficiency across different subject areas.

In conclusion, incorporating robotics and games into CLIL lessons provides a dynamic and interactive learning experience for students. It promotes engagement, critical thinking, collaboration, and language development. By leveraging the power of technology tools like robotics kits and coding platforms, educators can enhance CLIL instruction and prepare students for the challenges of the digital age.

This Master's Dissertation and the support that the inclusion of Educational Robotics in the classroom may have, makes me wonder whether its inclusion and subsequent didactic transposition would be feasible. However, I would also like to highlight other possible points of view focused on other agents in the educational community, in order to facilitate the implementation of innovative educational proposals such as the one proposed in this project. To this end, I focus on teachers, pupils and families, the university and the administration.

- *Teachers*: to demand more training and courses in the "CEP", in order to be able to face this new challenge. As it is widespread known, there may be reluctance when it comes to its implementation due to lack of knowledge and lack of training. For this reason, the administration must make an effort to support it as a transversal area of knowledge and base it on recent studies of each of the methodologies that are carried out through this new subject.

- *Students and families*: we know that today's society is undergoing a dizzying process of transformation. The pace at which society is advancing technologically demands that children learn ICT in a meaningful way.
- *Universities*: these are the first to provide comprehensive training for all future teachers. For this reason, making them aware of the tools they can use and learn about them is a fundamental element. Currently, they learn how to create a WebQuest or blog (both tools are useful in educational centres) but we must not leave aside the use of robotics as, in a transversal way, we can work on all areas, as well as awakening the students' interest in what to study in their professional future.
- *Administration*: local, regional and state administrations should study the use of these innovative methodologies, which are gradually approaching the youngest children, and which also motivate them and train them in a comprehensive way. Therefore, they must be aware of the interests of each of the aforementioned agents in order to gradually transform education as we know it today.

One of the reluctance on the part of the latter could be the cost in terms of training and the purchase of materials (computer support and *Lego WeDo 2.0* kits).

I would like to conclude stating that the integration of robotics and games in the teaching of bilingual education in primary education holds immense potential for promoting language acquisition, cognitive development, and cultural understanding. By embracing these innovative approaches, teachers can create vibrant and engaging learning environments that prepare students for the challenges and opportunities of a globalized world. Through effective implementation and ongoing research, the field of bilingual education can continue to harness the power of robotics and games to cultivate bilingual proficiency, foster critical thinking, and nurture the next generation of global citizens.

Finally, it is of significant importance to point out that this TFM is only the beginning of future research and implementation, as I am sure it would have a very positive impact.

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7.1 Legal references

Instrucción 12/2022, de 23 de junio, de la Dirección General de Ordenación y Evaluación Educativa, por la que se establecen aspectos de organización y funcionamiento para los centros que impartan educación primaria para el curso 2022/2023.

Real Decreto 157/2022, de 1 de marzo, por el que se establecen la ordenación y las enseñanzas mínimas de la Educación Primaria.