DIGITALEDUCATIONREVIEW

Teaching AI to the Next Generation: A Humanistic Approach

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ABSTRACT

This article proposes a comprehensive AI curriculum tailored for young learners aged 11 to 14, emphasizing a humanistic approach. We review other AI curricula proposals for children and young people and underline that they focus primarily on AI's technological benefits and on learning coding and logic. Our curriculum explores human cognition that is often overlooked in existing AI curriculum. Our proposal combines learning through construction, reflective discussions and project-based learning in order to approach AI from variety of angles. Implemented by CreaTIC Academy during 2023/24 school year as an out-of-school activity in a secondary (middle) school in Barcelona, Spain, this curriculum integrates technological, philosophical, cognitive, and cultural dimensions. It draws from diverse fields, including Philosophy of Mind, Cognitive Psychology and Philosophy of Children, and includes practical coding with tools like Scratch and AppInventor, as well as Machine Learning for Kids. Designed to be adaptable across various socio-economic contexts, our approach aims to promote a broader liberal education for children and help teachers implement AI activities in their classrooms

KEYWORDS: Curriculum Design, Artificial Intelligence Education, Humanistic

1. INTRODUCTION

In recent years, and especially with the introduction of ChatGPT in 2022, the importance of artificial intelligence (AI) has been made obvious to everyone. AI is in the News daily, it is incorporated in many applications we use routinely, it is revolutionizing industries. Education is not an exception. The rapidly evolving AI field and its significant potential to transform education has been noticed long before the mass heap. And now it is already changing the Education in all its levels. Studies show high rates of use of AI-based tools in higher education for a wide variety of tasks. In Germany almost two-thirds of the respondents in a large survey with university-level students reported to have used IA-based tools (von Garrel and Mayer, 2023). Dempere et al. (2023) reveal through a systematic survey that notable benefits of AI usage in higher education include research support, automated grading, and enhanced human-computer interaction. The same study also reveals concerns such as online testing security, plagiarism, and broader societal and economic impacts like job displacement, the digital literacy gap, and AI-induced anxiety.

The impact on schools is closely following. In 2021 a European survey on K-12 level concluded that it is expected a “powerful and immersive use of AI in education in near future” (European Schoolnet, 2021). More recently, Zhang & Tur (2023) discuss the potential of ChatGPT to enhance the work of educators by aiding in curriculum design, lesson planning, creating materials, differentiating instruction, and improving the student learning experience through tailored education, but also leaves many issues to tackle. AI learning could bring learning opportunities and foster children’s AI literacy in terms of AI concepts, practices and perspectives. (Su & Yang 2023). Mogavi at al. 2024 report about 22% usage of ChatGPT in K-12 and report that early adopters “are concerned that the widespread use of such tools may promote superficial learning habits and erode students' social and critical thinking skills” (p. 12). And there are several further challenges in this field, including the lack of teachers’ AI knowledge, skills, and confidence, the lack of teaching guidelines, and the lack of good curriculum design.

Luckin & Cukurova (2019) and Cukurova (2024) suggest the implications of AI for education can be grouped into three main areas: a) design and use of AI technologies to support teaching and learning; b) educating people about AI so they can use it effectively and ethically and c) innovation in education to prepare people for an AI-driven world. While the first area is to be treated by the tech industry, the second two are purely educational and can be approached through curriculum design. We consider that there are at least two ways of thinking about AI curriculum for children. One way would be to emphasize the technological benefits that AI offers to human societies and most of the curricula are organized around this matter. A different way would be to take AI as an opportunity to rethink about human cognition and condition and certainly, this focus is absent in the current curricula (Yim and Du 2023, 27).

In this paper we will present a comprehensive curriculum on the AI topic for young learners aged 11 to 14 emphasizing a humanistic approach. This proposal is based on developments from the Philosophy of Mind, Philosophy of Cognitive Sciences, and Philosophy of Children among other philosophical disciplines and offers a contribution to education in AI. The humanistic nature of this curriculum lies in the fact that the pedagogical content related to AI is closely guided by developments in the Philosophy. We intend to address a comprehensive course that encompasses not only the technological aspect of AI, but also the human cognitive capacities and the social and aspects related to it (Williams et al 2019; Su and Yang 2022, Yang 2022).

During the 2023/24 school year, a multidimensional curriculum was introduced as an extracurricular activity at a secondary school in Barcelona, Spain proposed by CreaTIC Academy. It covers technological, philosophical, cognitive, and cultural dimensions as

it draws on various fields, including the Philosophy of Mind, the Philosophy of Children, Cognitive and Developmental Psychology, and coding tools like Scratch and App Inventor, as well as Machine Learning for Kids. This curriculum pretends to be universal as it could be applied in different social context regardless the economic situation. Moreover, the holistic approach to AI education for children aligns this proposal with current trends in digital education. It not only promotes AI literacy but also provides a broader liberal education for children.

The paper is structured as follows. In the next section we discuss existing proposals on AI for children. We analyse both guidelines and curricula, including courses that integrate AI and those courses specifically focused on AI. We provide a short note about the shortcomings and limitations observed in existing proposals and how our proposal fills the gap. In the third section we will introduce our humanistic curriculum which is a course about AI that pursues a human centred AI literacy. In the fourth section we will expose some details about its implementation and finally we will conclude with evaluative and programmatic comments, followed by references.

2. STATE OF THE ART OF AI CURRICULA

The Association for the Advancement of Artificial Intelligence (AAAI) identified five key central concepts to any AI curriculum AI4K12 (2020). These overarching concepts are: (i) perception, as the process of extracting meaning from sensory signals; (ii) representation and reasoning, as the capacity to solve complex problems using information of the worlds; (iii) learning, as the implementation of statistical inferences that finds patterns in data; (iv) natural interaction, as the knowledge to collaborate and interact with humans; and (v) social impact, the way in which AI technologies are changing the ways we work, travel communicate etc. These five guiding ideas are considered essential in any AI curriculum. For this reason, our proposed AI curriculum and in general all curricula include these fundamental concepts within its contents.

However, our analysis of various scoping reviews highlights significant deficiencies in current AI curricula for children. Su and Yang (2022) conducted a review of 17 studies spanning the years of 1995 to 2021, finding that AI curricula enhance understanding of AI and related fields. Such curricula also boost skills like creativity, emotional and behavioral control, and soft skills in general (Ali et al.2019). Despite their advantages, the reviewed curricula have three main drawbacks. First, they are predominantly focused on understanding the technology and learning coding, often overlooking a reflective use of the learning tools.

The literature indicates that many learning tools, such as intelligent agents and applications (e.g., Machine Learning for Kids, Teachable Machine, AI Chatbot, Cognimates), are introduced to facilitate children's acquisition of computational thinking (Yim and Su, 2024, Touretzky et al, 2019). However, these tools are primarily focused on technology and coding, neglecting other domains of thinking. As Yim and Su (2024) note, there is a lack of rigorous, theory-based research on the effectiveness of AI educational tools in meeting diverse learning needs. AI curricula tend to be technology-centered, diminishing the importance of non-technological aspects, including the development of general critical thinking.

Second, the curricula are primarily tailored towards primary and high school education, and there is a lower offer of curricula for middle school (Sanusi et al. 2022, p. 5980), which we consider to be the best educational level to introduce critical thinking tools. On the one hand, primary education involves ages at which AI-based educational activities can stimulate the logic and computational thinking of the children involved, but are not adequate for critical analysis of AI and its implications. Focusing on these early ages makes it difficult to boost the humanistic component that we aim to incorporate into the proposed curriculum. On the other hand, high school students are generally not involved in non-formal educational activities given that they have enough independence to pursue their own interests and research in informal contexts. Students from 11 to 14 years old (late primary and middle education) are in optimal conditions to benefit from non-formal educational contexts, having developed the conceptual capacities needed to think philosophically (Artidiello Moreno 2018).

Third, many studies utilize robots such as Pop-Bots, Bee-Bots, LEGO Mindstorms NXT, Cubelets – usually costly products with limited relevance to genuine AI. The incorporation of these resources limits the general accessibility of AI for more children and impedes the development of a universal and transversal curriculum that can be implemented across diverse social and economic contexts. Currently, the proposed curricula are implemented in Europe, Asia, and the USA (Yim and Su 2024, table 3). The low expenses required to include and maintain robotic technology suggest a grater potential for applying the AI course globally.

Yim and Su (2024) reviewed 46 studies in academic conferences and journals in order to investigate pedagogical strategies, learning tools, assessment methods in AI literacy education in K-12 contexts. Their research indicates that project-based, human–computer collaborative learning and play-and-game-based approaches, utilising constructionist methodologies, are frequently applied in AI literacy education. However, none of these studies showed how learning about AI could foster critical thinking about humanity and its evolving technological environment. For instances, humans are primarily considered within the context of their interface with machines, serving as a source of digital information for the artificial systems.

Although human-computing collaborative learning plays an important role in the current curricula, there are no serious reflections on this relationship, particularly regarding the debate over AI systems as cognitive artifacts (Cassinadri 2024). AI could be conceived as a constitutive cognitive artifact (one that is necessary for completing a cognitive task), a complementary cognitive artifact (one that complements brain-based cognitive processes), or substitutive (minimising brain-based cognitive agency) cognitive artifact (Fasoli, 2017). None of these conceptual categories have been introduced and discussed in the current curricula.

Besides, the issue of the biases in translating signals to meaningful abstract features is primarily treated as a technical challenge to ensure the effective functioning of computer perception systems across diverse groups (AI4K12, 2020). Few of the revised curricula delve deeply into these problems from a comprehensive perspective. While there have been efforts to address gender bias explicitly (Melsión et al., 2012) and the societal impacts of errors in AI training datasets (Lin et al., 2020), these initiatives remain isolated and do not sufficiently explore other humanistic and social dimensions that warrant discussion. A more inclusive approach is necessary to address these complexities

Sanusi et al. (2023) identified several gaps in existing AI curricula based on an analysis of 43 conferences and journal articles specifically focused on the teaching and learning of Machine Learning (ML) for kids. The findings of their study revealed that there is a scarcity of AI teaching tools for middle school because the resources are more prevalent in high school. This encompasses with the findings of Yim and Su (2024). Furthermore, Sanusi et al. (2023) also highlights a lack of content related to the societal and ethical aspects in the AI teaching in secondary school. More specifically, they found a lack of proposal in the context of informal and non-formal education. Most of the programs are conceived as part of the formal school, neglecting non-formal educational contexts such as summer programs, after school programs, etc. These contexts are important because they offer flexible schedules, formats, and locations, making learning more creative and accessible to children. This flexibility allows learners to balance education with school homework, family needs, or other life circumstances.

In summary, most of current curricula are technology-centered, tailored for primary and secondary school education, and prominently feature robotics as a central tool. Based on a comprehensive review of the literature and as far as we are aware, there are currently no curricular proposals that encompass all four distinctive characteristics of our proposal: (i) a human-centered approach, (ii) specific focus on young learners aged 11 to 14, (iii) designed as an after-school program adaptable to diverse socio-economic contexts, and (iv) with a strong emphasis on creation and reflection through project-based learning.

3. A HUMANISTIC AI CURRICULUM PROPOSAL

The curriculum outlined below focuses on developing a comprehensive understanding of AI through a humanistic lens. Echoing the perspectives of traditional authors (Sartre (1973; Dreyfus (1992), who underscore the importance of grounding technology in humanistic values, our approach to AI education emphasizes a liberal vision of AI developments. We are convinced that this vision opens up the possibility to learn and discuss most of the universal human concerns in the context of contemporary technological advancements

The curriculum is thoughtfully organized into four structured parts, each including its own learning goals, thematic units, and tools and designed to progressively deepen students' understanding of AI from foundational concepts to practical applications:

Part 1: Introduction to AI: Establishes the foundational knowledge about AI, its uses, and its impact on daily life.

Part 2: AI and the Human Mind: Delves into intellectual and creative comparisons between human cognitive abilities and AI capacities.

Part 3: Understanding the Human-AI Interface: Examines interactions between humans and AI, focusing on ethical and social implications.

Part 4: Creating an Intelligent App: Encourages students to apply their knowledge by developing a practical AI-based app, enhancing their learning through hands-on experience.

This structured approach ensures a comprehensive exploration of AI, blending theoretical knowledge with practical skills and philosophical considerations.

3.1 Overall learning goals

The curriculum aims to:

1. Initiate a critical dialogue with and among students about various philosophical questions surrounding AI:
    a. What is a mind?
    b. Does the mind need a physical realization?
    c. What is the difference between human minds and cognitive artifacts?
    d. What kinds of cognitive capacities are there?
    e. How can we characterize different digital societies?
    f. How can we analyze the good and bad aspects of digital societies?
    g. How can we understand the workforce in digital societies?
    h. What is the difference between public and private data?
    i. What are gender and skin-type biases?
    j. What is a social experiment?
    k. How do we conduct social research?
2. Familiarize students with technological and didactic materials pertinent to AI education.
3. Encourage students to apply reflective thinking to diverse aspects of these philosophical issues and their own lives.

3.2 The AI curriculum

Part 1: Introduction to AI:

This section lays the groundwork by introducing students to the fundamentals of AI. Its objectives are to help students grasp the essential characteristics of AI, understand its various applications, and acquire basic skills needed to interact with AI systems. Thematic units cover an introduction to AI, its practical applications, and its integration into everyday life. Tools such as ChatGPT, X degrees of separation, and Quick Draw are employed to facilitate practical learning experience. Key topics addressed include the understanding of cognitive abilities and AI's problem-solving capacities. We tried to introduce conceptual knowledge step by step by using a gaming methodology always enhancing their dialogical capacities. Early observations indicated that students initially struggled with engaging in dialogue and reflection, suggesting a learning curve in articulating their thoughts on AI.

Part 2: AI and the Human Mind

Going deeper into the intellectual comparisons between human and AI, this part explores concepts such as intelligence and creativity, how both AI and humans follow instructions, and compares their learning processes. Thematic units include intelligence, creativity, instruction adherence, and learning processes. Tools used in this section include ChatGPT, DALL-E 2[1],

[1] https://openai.com/dall-e-2 (last accessed 01/04/2024)

Midjourney[2], Scratch[3], LearnML games[4], and Teachable Machines[5]. Discussions in this part tackle subjects like the Turing test, AI-generated art, and algorithm biases. Some students perceived AI as potentially smarter than humans, highlighting the significant impact AI has in specific areas. We discovered that common sense in young people is committed to the idea that humans are less clever even knowing the distinction between weak and strong AI. While the former AI systems emulate certain aspects of human intelligence, the later intend to imitate human intelligence *in toto* (Taye et al 2023). Even considering that a system has a weak AI the students assessed them as cognitive artifacts smarter than humans. Thus, we tried to promote a critical reconsideration of these ideas in order to make them understand the reasons behind them.

Part 3: Understanding the Human-AI Interface:

Focusing on the dynamics of human and AI interaction, this part aims to investigate how humans interact with AI technologies, the reconfiguration of work in the AI era, responsible AI usage, and ethical dimensions from a technological viewpoint. Thematic units covered include the ethical implications and the social impact of AI. Tools such as Copilot[6], GitHub[7], and PictoBlox[8] support these explorations. Key discussions revolve around the social implications of technologies like facial recognition and the hypothetical rights of robots.

They also analyzed the case of Tong Tong an AI robot child specially programmed to show emotional responses. Designed in Beijing, this robot sparked discussions about the feasibility of artificial emotions. They also examine a social experiment involving AI interaction with children in South Korea. The experiment explores how children perceive and engage with AI technologies, highlighting their reactions and the potential implications for future educational and social development. It aims to understand the impact of AI on young minds and how it might shape their learning and behavior in a technologically advanced society. Students actively debated the advantages and disadvantages of AI in social contexts, reflecting deeply on issues of privacy, childcare, and ethics, among others.

Part 4: Creating an Intelligent App:

The curriculum culminates with a personalized project to develop a practical application based on the knowledge gained in previous sections. Students are tasked with identifying community issues, evaluating technological solutions, differentiating between web and mobile apps, and creating an original mobile app using machine learning. Thematic units focus on conducting social research, training AI models, and app development.

[2] https://www.midjourney.com/home (last accessed 01/04/2024)
[3] https://scratch.mit.edu/ (last accessed 01/04/2024)
[4] https://learnml.eu/games.php (last accessed 01/04/2024)
[5]https://teachablemachine.withgoogle.com/ (last accessed 01/04/2024)
[6] https://copilot.microsoft.com/ (last accessed 01/04/2024)
[7] https://github.com/ (last accessed 01/04/2024)
[8] https://pictoblox.ai/ (last accessed 01/04/2024)

Table 1. AI curriculum for 32 weeks of 1h per week activities

PART 1: INTRODUCTION (3 sessions)	**PART 2: AI AND THE HUMAN MIND** (7 sessions)	**PART 3: UNDERSTANDING THE HUMAN-AI INTERFACE** (10 sessions)	**PART 4: CREATING AN INTELLIGENT APP** (12 sessions)
		SPECIFIC OBJECTIVES	
• Elucidate the central characteristics of AI as a field in computer science • Present and evaluate some of the problems solved with AI • Acquire minimal skills as users of AI systems.	• Discuss what human intelligence is in comparison to AI. • Debate whether generative AIs are creative in the same sense as humans. • Determine what it means to follow instructions and how machines would do so. • Scrutinize the issue of inductive learning in both human and artificial minds.	• Examine the different ways humans interact with AIs. • Dialogue on how human work is reconfigured in the era of AIs. • Analyze the issue of responsible AI use. • Reconfigure what is good and bad from a technological perspective. • Debate the question of privacy.	• Identify the features and problems of our communities • Evaluate the best technological solution • Introduce the difference between Web App and Mobile App • Create an original Mobile App using Machine Learning
		THEMATIC UNITS	
• What is AI? • What is it used for? • AI in everyday life	• Being intelligent • Being creative • Following instructions • Learning	• Ethical implications of AI • Social impact of AI	• Doing social research • Training your model • The App
		TOOLS	
Chat GPT X degrees of separation Quick Draw	Chat GPT Dall-E2 Midjourney Scratch LearnML games Teachables Machines	Microsoft 365 Copilot GitHub PictoBlox	Picto Blox ChatGPT Gemini App Inventor Machine Learning for kids
		ISSUES ADDRESSED	
What cognitive abilities are, how they can be non-human, what kinds of problems AI can solve, how to generate prompts.	Turing test, AI generated art, artificial images and deepfakes, chatbots, algorithms, neural networks, ML, detection and classification models, supervised and unsupervised models, algorithmic biases, data governance	Social implications of face recognition, robots with emotions in the interface human-IA, science fiction and AI, human workforce and robot work.	The methodology of scientific research, the observation, the 17 Goals of the ONU, a healthy dataset, how to train a model

Tools used include PictoBlox, ChatGPT, Gemini[9], App Inventor[10], and Machine Learning for Kids[11]. A notable challenge for the students was to devise an original app concept. Initially proposing a clothing detection app, they ultimately settled on developing a food-related app called NEVERITA, which aims to deliver recipes using pictures of the ingredients in the fridge as prompts. The project highlights the importance of creativity and practical application in technology.

4. IMPLEMENTATION AND METHODOLOGY

The proposed curriculum was implemented by CreaTIC Academy during the school year 2023/24 with an experimental group of students aged 11 to 14, as an out-of-school activity in a secondary school in Barcelona (Spain). We believe that this age range represents an optimal stage where students possess both the conceptual capacity and the motivation to actively engage in reflective and critical activities, including debates on conceptually complex issued, such as bias, societal implications, global trends, etc. as an afterschool activity. Indeed, younger children lack maturity and need more conceptual development and a closer guidance. On the other hand, those that are older often lack the motivation to consistently engage in such topics in an afterschool course.

[9] https://gemini.google.com/ (last accessed 01/04/2024)
[10] https://appinventor.mit.edu/ (last accessed 01/04/2024)
[11] https://machinelearningforkids.co.uk/ (last accessed 01/04/2024)

The course last a total 32 weeks with a one-hour class per week starting in September 2023. It was conceived as a pilot program in which we tried to develop a social and humanistic perspective on AI through a project-based and constructionist pedagogy in the classes (Papert 1980). Constructionism considers that activities involving the creation of artifacts—whether designing a product, building a sandcastle, or writing a computer program—facilitate learning processes. It proposes that individuals, by being active while learning, also construct their own knowledge structures in parallel with the construction of objects. It also asserts that individuals will learn better when they build objects that personally interest them, while the constructed objects provide the possibility of making abstract or theoretical concepts more concrete and tangible, and therefore, more easily understandable. Adopting this pedagogy, we encouraged students to work most of the time in pairs, although some activities that required experimentation were done individually.

The curriculum incorporates a diverse range of materials to foster learning and engagement. Utilizing Youtube videos such as "Test of Turing" to introduce foundational concepts[12], "Creativity and AI"[13] to inspire imagination, "Following Instructions" to promote critical thinking skills[14], and "Algorithmic Bias"[15] to raise awareness of societal impacts. Complemented by web pages like "Looking for Patterns" and "Data Governance"[16],[17] along with articles on innovative AI applications such as "Food Model", "Face Recognition", “A child bot with emotion”, and “a social experiment with AI”[18,19,20,21]. Additionally, we use resources from the United Nations' Sustainable Development Goals[22] to provide context and relevance. Slides, questionnaires, and further exploration through activities like "Brainstorming"[23], understanding apps like "Yummly"[24], and exploring sensor technology in smartphones[25] and different datasets[26], really enhanced the learning journey.

During the introduction phase of the AI curriculum, students initially found it challenging to engage in dialogue and reflective thinking. This difficulty stemmed from their unfamiliarity with being asked to express personal opinions on philosophical topics. As they progressed to the second part, which focused on AI and the Human Mind, some students began to perceive AI as more intelligent than humans. They were impressed by its ability to solve problems that they themselves found challenging. We extensively discussed about the reasons to hold this idea. We also discussed different ways to understand the Turing test and the degree of creativity in artificial system compared with human´s performance.

In the third part of the curriculum, Understanding the Human-AI Interface, students engaged in vigorous debates about the ethical implications of AI in society. They explored complex topics such as whether robots should have rights similar to humans, including the right to earn a salary. Moreover, they discussed the impact of technologies like facial recognition, ultimately asserting that while these AI systems may present challenges, their overall societal benefits outweigh the drawbacks. They also expressed their displeasure with the very idea that their own facial pictures were part of a dataset used to train a model. All these topics came to light while they were training various AI models using basic machine learning tools.

The final part of the curriculum, Creating an Intelligent App, presented practical challenges, particularly in the ideation phase. Students initially struggled to find an original concept for the app, first considering a clothes detection application before discovering it already existed. Ultimately, they shifted their focus and decided to develop a food-related app, showcasing ability to innovate within the constraints of existing technology. They decided to create an app called NEVERITA that delivers recipes from food pictures and they considered that its main public would be young people without enough time and with poor cook skills. We advocated for the use of PictoBlox, alongside object recognition and ChatGPT extensions, in creating the program.

We utilized qualitative measures for analysis, particularly through questionnaires, focus groups centered on student reflections, and observations. Through these methods, we successfully achieved a comprehensive understanding of the curriculum’s impact.

[12] The importance of Turing Test / (in Spanish) La importancia del Test de Turing https://www.youtube.com/watch?v=AuvHr0OSIvg (last accessed 01/04/2024)

[13] AI wins a drawing contest / (in Spanish) IA (Inteligencia Artificial) GANA un CONCURSO DE PINTURA. Arte, https://www.youtube.com/watch?v=PUJFyst8tzA&ab_channel=AntonioGarc%C3%ADaVillar%C3%A1n (last accessed 01/04/2024)

[14] Exact Instructions Challenge PB&J Classroom Friendly | Josh Darnit https://www.youtube.com/watch?v=FN2RM-CHkuI&ab_channel=JoshDarnit (01/04/2024)

[15]Gender Shades https://www.youtube.com/watch?v=TWWsW1w-BVo (01/04/2024)

[16]Looking for patterns: https://studio.code.org/s/aiml-2023/lessons/3/levels/1?login_required=true (last accessed 01/04/2024)

[17] Have I Been Trained? Search for your images in the most popular AI image dataset, LAION-5B, https://spawning.ai/have-i-been-trained#content (last accessed 01/04/2024)

[18] Japan presents Foodly, a robot that classifies noodles / (in Spanish), En Japón presentan a Foodly, robot que clasifica fideos https://www.tvazteca.com/aztecanoticias/japon-foodly-robot-fideos-ead (last accessed 01/04/2024)

[19] The Dangerous Business of China's Facial Recognition Technology / (news article originally in Spanish) El peligroso negocio de la tecnología de reconocimiento facial de China https://es.wired.com/articulos/china-mayor-exportador-de-tecnologia-de-reconocimiento-facial (last accessed 01/04/2024)

[20] This is Tong Tong, the robot girl with AI that has 'emotions' and advanced intelligence / (news article originally in Spanish) Así es Tong Tong, la niña robot con IA que tiene ‘emociones’ e inteligencia avanzada (last accessed 01/04/2024)

[21]Artificial Intelligence Experiment with Children in South Korea / (in Spanish) Experimiento de Inteligencia Artificial con Niños en Corea del Sur https://www.youtube.com/watch?v=2z3DgaqcI1I (last accessed 01/04/2024)

[22] United Nations: THE 17 GOALS https://sdgs.un.org/goals (last accessed 01/04/2024)

[23]Brainstorming at the d.school: https://www.youtube.com/watch?v=cmoWCSyujPY (last accessed 01/04/2024)

[24] LA MEJOR APP PARA COCINAR | Yummly https://bit.ly/3PhNmf8 (01/04/2024)

[25] What Sensors Are in a Smartphone? https://www.youtube.com/watch?v=CxC1KCoGbIM (last accessed 01/04/2024)

[26] Kaggle repository of community-published models, data & code: https://www.kaggle.com/ (last accessed 01/04/2024)

During the final phase of the course, students were completed a questionnaire regarding their learning experiences and perceptions of AI. The questionnaire included the following items:

1. After what we have seen throughout the course, how do you perceive AI?
2. Is it useful or not useful for you? Do you feel like using it or not?
3. What impact does it have on your life and on society?
4. Do you discuss this topic with your friends and parents?

Through this assessment, we evaluated the course effectiveness and observed a positive reception among students. In the final class session, we conducted a reflective discussion and noted an increased awareness among students regarding AI technology. It is important to acknowledge that this assessment, from a qualitative educational research approach, represents an initial exploration rather than a comprehensive evaluation of the curriculum's learning objectives.

5. DISCUSSION, CONCLUSIONS AND FURTHER RESEARCH

In this paper we propose a holistic curriculum on AI for young students emphasizing a humanistic perspective on technology. Through this curriculum, we aim to foster not only practical proficiency in current technology but also critical thinking regarding its implications in human life.

The proposed curriculum is multidimensional as it includes a:

- Constructionist Dimension: The curriculum is practical and teaches students to create and use AI engines through block-based coding. Students engage in learning experiences, constructing their understanding and problem-solving skills through digital solutions.
- Philosophical Dimension: This human-centered curriculum emphasizes the importance of understanding AI through a critical comparison with human intelligence. It aligns with the Beijing Consensus on AI and Education (UNESCO 2019), stressing that AI should be developed with human control and consideration of human intelligence's features.
- Cognitive Dimension: The curriculum fosters critical reflection and enhances children's executive functions, combining critical thinking with creative problem-solving skills.
- Social Dimension: This multilingual curriculum caters to the specific needs of secondary students.

The curriculum is designed with a project-based approach, as we believe this method effectively promotes dialogue and collaboration among students. The projects developed not only required students to work in groups, but also addressed the social needs of a community. This approach aligns with a humanistic perspective in AI education that we are trying to enhance. We understand that there is currently a growing interest in the area of philosophy of artificial intelligence, which critically evaluates the ethical, political, and social implications of this new technology. The proposed curriculum strives to address this gap by incorporating humanistic values and perspectives into AI education.

To achieve this goal, this paper provides four primary recommendations for researchers and educators interested in the proposed approach:

- Integrative Methodologies: When teaching AI to secondary students, evidence demonstrates the positive impact of combining multiple pedagogical approaches (Heinze et al. 2010, Williams et al. 2019). As mentioned earlier, constructionist methodologies and project-based learning offer a challenging environment and hands-on opportunities to create new products using AI technologies. To achieve a critical consideration of AI technologies, reflective pedagogies are needed to allow students to think about their lives and their social context. We don't recommend combining these reflective pedagogies with unplugged pedagogies, which intend to teach AI concepts without employing any digital tools and devices (Battal et al. 2021). The reason is that we believe that, in the case of children, critical thinking is best developed while performing practical activities with AI tools.
- Reviewing Tools and Activities: Technology in general, and AI in particular, are fields that constantly evolve and incorporate new advances. Educational resources in AI similarly evolve, presenting an opportunity for researchers and educators to effectively implement the proposed curriculum. For instance, educators could design engaging AI activities using new machine learning tools that continuously appear and are especially designed for young learners.
- Updating Your Knowledge of AI: To address teaching challenges, educators should engage in acquiring new content related to AI and strive to establish connections with the humanistic field. For instance, leveraging new AI technologies to develop a class on human and artificial consciousness. This approach not only enhances AI knowledge acquisition but also applies it meaningfully to philosophical inquiries into consciousness. This endeavor is particularly crucial given the limited number of educators trained in AI literacy (Su et al. 2023).
- Begin with Students' Digital Common Sense: Always start by inquiring about their pre-theoretical conceptions of AI. This inquiry will bootstrap the subsequent dialogic exercise while they are involved in practical activities.

Further research involves new implementations (engaging other institutions and professionals), enhancing and extending the application of the curriculum, including a second implementation planned for the school year 2024-2025. This phase will complement the so far qualitative evaluation (i.e. the focus groups centered on student reflections and the observations) with quantitative research methods to achieve objective results. Specifically, quantitative assessments will be developed to evaluate children's learning outcomes using pre- and post-knowledge tests.

Additionally, we are planning to adapt the curriculum to fit for the formal education in Spain, and to extend its application in Latin America, particularly in Argentina. These different instances of application can aid in evaluating the effectiveness of the curriculum across diverse educational contexts and student profiles.

In conclusion, the curriculum as presented is adaptable to students from diverse regional backgrounds, aiming to be inclusive in several dimensions. By utilizing free versions of the described tools, the course can be implemented in various socio-economic contexts without requiring specific funding. Moreover, our curriculum not only promotes social sensitivity but also explores universal topics relevant to young students worldwide. For these reasons, we consider this curriculum innovative and plan to expand its application to additional students and contexts.

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ENSENYAR IA A LA PROPERA GENERACIÓ: UN ENFOCAMENT HUMANISTA

Aquest article proposa un currículum d'IA complet adaptat per a joves aprenents d'entre 11 i 14 anys, fent èmfasi en un enfocament humanístic. Revisem altres propostes de currículum d'IA per a nens i joves i subratllem que se centren principalment en els beneficis tecnològics de la IA i en l'aprenentatge de la programació i la lògica. El nostre currículum explora la cognició humana, que sovint es passa per alt en els currículums d'IA existents. La nostra proposta combina l'aprenentatge a través de la construcció, discussions reflexives i l'aprenentatge basat en projectes per abordar la IA des de diverses perspectives. Implementat per l'Acadèmia CreaTIC durant el curs escolar 2023/24 com una activitat extracurricular en una escola secundària (d'educació mitjana) a Barcelona, Espanya, aquest currículum integra dimensions tecnològiques, filosòfiques, cognitives i culturals. Es basa en camps diversos, incloent-hi la Filosofia de la Ment, la Psicologia Cognitiva i la Filosofia dels Nens, i inclou programació pràctica amb eines com Scratch i AppInventor, així com Machine Learning for Kids. Dissenyat per ser adaptable a diferents contextos socioeconòmics, el nostre enfocament té com a objectiu promoure una educació liberal més àmplia per als nens i ajudar els mestres a implementar activitats d'IA a les seves aules

PARAULES CLAU: Disseny Curricular, Educació en Intel·ligència Artificial, Humanística

ENSEÑAR IA A LA PRÓXIMA GENERACIÓN: UN ENFOQUE HUMANISTA

Este artículo propone un currículum de IA completo adaptado para jóvenes aprendices de entre 11 y 14 años, haciendo énfasis en un enfoque humanístico. Revisamos otras propuestas de currículum de IA para niños y jóvenes y subrayamos que se centran principalmente en los beneficios tecnológicos de la IA y en el aprendizaje de la programación y la lógica. Nuestro currículum explora la cognición humana, que a menudo se pasa por alto en los currículos de IA existentes. Nuestra propuesta combina el aprendizaje a través de la construcción, discusiones reflexivas y el aprendizaje basado en proyectos para abordar la IA desde diversas perspectivas. Implementado por la Academia CreaTIC durante el curso escolar 2023/24 como actividad extracurricular en una escuela secundaria (de educación media) en Barcelona, España, este currículo integra dimensiones tecnológicas, filosóficas, cognitivas y culturales. Se basa en diversos campos, incluyendo la Filosofía de la Mente, la Psicología Cognitiva y la Filosofía de los Niños, e incluye programación práctica con herramientas como Scratch y AppInventor, así como Machine Learning for Kids. Diseñado para ser adaptable a diferentes contextos socioeconómicos, nuestro enfoque tiene como objetivo promover una educación liberal más amplia para los niños y ayudar a los maestros a implementar actividades de IA en sus aulas.

PALABRAS CLAVE: Diseño curricular, Eduación en Inteligencia Artificial, Humanísticas