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TÍTULO: El impacto de la nueva era tecnológica de la Inteligencia Artificial (IA) en niños en edad escolar de 5 a 10 años.

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RESUMEN: En este artículo, buscamos reconocer y analizar el desarrollo cognitivo y las interacciones sociales derivadas del uso de la Inteligencia artificial en estudiantes de 5 a 11 años. Enfatizamos como la integración de la tecnología de la Inteligencia artificial (Al) se ha convertido en parte integral del sistema de educación primaria australiana, su impacto positivo y negativo en el desarrollo físico y socioemocional y tambien abordamos las nuevas y complejas dinámicas sociales que introduce la Inteligencia artificia (Al) en las aulas. Asimismo, analizamos el rol de los padres y educadores para enseñar la responsabilidad digital del uso de AI, crear un enfoque equilibrado para gestionar correctamente las políticas educativas y abordar los posibles dilemas académicos, físicos y sociales que surgen del uso de la Inteligencia artificial.

PALABRAS CLAVES: inteligencia artificial, era tecnológica, niños en edad escolar de 5 a 11 años.

TITLE: The impact of the new Artificial Intelligence (AI) technological era in 5- to 11-year-old school age students.

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ABSTRACT: In this article, we seek to recognize and analyze the cognitive development and social interactions derived from the use of Artificial Intelligence in students aged 5 to 11. We emphasize how the

integration of Artificial Intelligence (AI) technology has become an integral part of the Australian primary education system, its positive and negative impact on physical and socio-emotional development, and we also address the new and complex social dynamics that Artificial Intelligence (AI) introduces in the classroom. We also analyze the role of parents and educators in teaching digital responsibility for the use of AI, creating a balanced approach to properly managing educational policies, and addressing potential academic, physical, and social dilemmas arising from the use of Artificial Intelligence.

KEY WORDS: artificial intelligence, technological era, 5- to 10-year-old school age children.

INTRODUCTION.

As we stand on a brink of a rapid pace evolving AI technological era, the integration on Artificial Intelligence (AI) continue to shape the daily life of 5- to 11-year-old primary students at school and at home in Australia. During these years of critical cognitive development, the students brain undergoes rapid neural developments laying the foundations for future academic learning, memory, critical thinking skills, and emotional self-regulations skills. While AI technology offers diverse opportunities, this article aims to explore the profound positive and negative impacts and consider a more holistic balanced approach to manage effectively the critical role of educators and parents in this new digital era.

DEVELOPMENT.

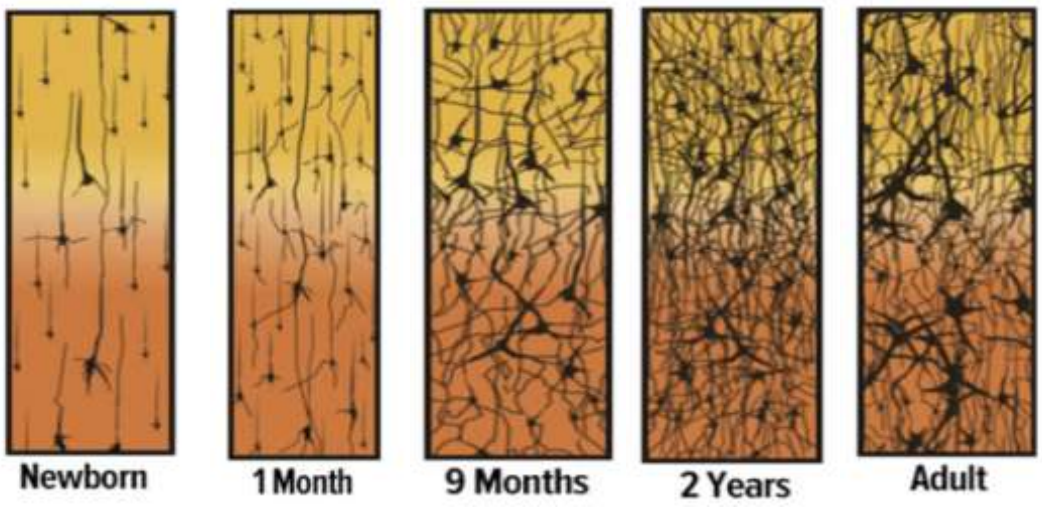
The impact of the new AI technological era in 5- to 10-year-old school age children.

As a humankind, we are mentally prepared to learn and thrive since the moment we are born, and when we reach the first few years of our life, we start to understand where we are and the role we play in the society. Primary school age children, in the other hand, begin to make friendship with peers of the same sex through play, especially if they have the same interests in life, they become more independent, resilient, create different friendship groups and get increasingly concern to be like other children.

As they navigate the primary years, the school environment creates new challenges around their learning, not only on an academic level but on technological and social level as well, which increases the impact of emotional challenges that make the child more resilient and develop coping mechanisms to deal easily with the new emotional rollercoaster they encounter.

If we take into consideration the brain volume development of a child, when the child's brain volume reaches 6 years old will grow to about 95% of an adult size (published by Supporting Brain development in the first three years Feb 2025 https://www.zerotothree.org/resource/supporting-brain-development-first-three-years/#:~:text=At%203%20months%E2%80%94Brain%20is,the%20brain%20develops%20and%20functions) with an estimate of synapses in the adult brain being 1000 trillion and reduces through the next ten years to settle around 500 trillion in adolescence; (published by the University of Queensland Australia Brain magazine https://stories.uq.edu.au/the-brain/2022/brain-development-by-numbers/index.html) we can begin to appreciate how a primary student's brain is developing to a stage of refinement of neural connections and networks.

Neural connexions of the brain.



Source: Corel, JL. (1975) The postnatal development of the human cerebral cortex. Cambridge, MA: Harvard University.

These connections or pathways of the brain give the child the ability to focus for longer periods of time, which let them develop further their short-term and long-term memory skills efficiently.

The brain connections or synapses carry the knowledge they have acquired throughout the years and send them to different areas of the brain, the brain then put behind in the subconscious the information that isn't using and the information that is being kept will determine and allows them to think, reason, and use logic to solve problems ultimately improving the skill to regulate and control their emotions.

A humankind is a tool user that have developed the need to keep up to date with the society, that's the reason why, we as Australian have started to use technology as a tool that needs to be updated constantly with the new emerging technology to become more efficient and knowledgeable in all the academic and social areas from a very early age.

At primary school level in Australia, for example, the school becomes a controlled and safe environment providing clear rules and limitations to the students in a control and safe space; therefore, the children can begin to use technology on a more regular basis.

In this new revolutionized Technological Era, due to how advance the technology is evolving, the Australian primary students are required to adapt and learn to prioritize technology as an indispensable requirement that really matters in their daily life.

But are our children well-prepared to be able to use technology appropriately while their undeveloped minds are still learning to use their creativity, their undeveloped spatial reasoning, fluid reasoning, critical thinking and problem-solving skills to their full potential?

Firstly, we need to take into consideration a more holistic approach to manage effectively the impact of the students' physical skills, mental health and social skills though regular exposure to diverse environment

particularly nature and an effective approach to manage students spending time using any device during school hours and at home enhancing their holistic development.

If we take into consideration Western Australian learning curriculum, we noticed how the primary students use of AI technology is very prominent and well promoted. Students from a variety of schools have access to educational applications platforms online free of charge provided by the school to review their academic knowledge at home and keep up to date with the educational curriculum information while the teacher review their progress accessing their results via online to further report it to the parents with the purpose to create strategies to work on those difficulties during the class.

Some of the Educational application currently used are Teach Your Monster How to Read, Prodigy, Minecraft Education, Kahoot, Google earth, Motific, Sketch book, Office 365, etc.

These Educational AI platforms provide the students with the technology competency to use appropriate computer vocabulary, strategies, navigation skills and planning to then focus better on the focused educational learning process; once this basic learning process is being archived, the students then can begin to use other educational application platforms provided by the school that enhance their creativity, fluid reasoning critical thinking and problem-solving skills to their full potential.

If we take Educational Minecraft online platform; for example, we can appreciate the compelling future of education, because the school provides personal information privacy of the student information, it is inclusive for all the students at the school, provide a safe space for media literacy learning opportunity, as well as a safe space for the students to learn to manage conflict in a controlled environment.

Furthermore, students can develop core competencies such as the ability to use Strategic thinking in collaboration with their peers while sharing the same virtual space at school; moreover, students can improve mathematical problem-solving skills, and promote the ability to proactively engage with the virtual world tools while creating virtual structures using the tools provided, therefore expanding their adaptability to extrapolate to a virtual space taking proactive steps to archive their proposed goal.

Personalised learning.

Personalised learning experiences through AI educational platforms have impacted positively the learning experience for students in and out of the school, because Educational AI technology uses algorithms to follow or perceive the learning experience online in real time on every student account and react almost instantly; therefore, can memorise and pinpoint the specific targeted area where the student is lacking proficient knowledge and create different pathways of teaching strategies within the game to help the student accomplish a better understanding of an specific area of learning.

Furthermore, provides feedback to the educator of what area the student needs to improve on, giving the educator time to prepare diverse teaching strategies for the classroom and create targeted homework for those specific students that need to be extended or consolidating their knowledge.

In the other hand, educators can also retro feed the parents through a personalised report explaining the new teaching plan approach and guidance of what activity can be done at home and at school to improve that specific learning area.

Overall, personalised AI learning experiences have elevated the traditional education to a new improved level using personalised teaching experiences via AI platforms where the student become the centre of the learning and teaching process.

Role of educators and Parents. AI technology new education trends ripple effect.

Educators and parents must work together and take into consideration how these educational platforms can have a Ripple Effect on the education of our primary students, because the more access the students have to computer technology, the more they want to explore and master other educational and noneducational platforms controlled and not controlled by the school as they navigate the later years of primary school and begin to look at new ways to reflect on their progress and begin to create.

If we take into consideration the impact of AI learning experiences on the social interaction competency level in every student, we can appreciate the social and mental repercussion or dilemmas the students come across when they access these platforms that involve their school peers or other people.

It is necessary for parents to be involved on the learning and playing process; firstly, because as a parent it is important to experience and supervise all the characteristics of the game, follow their improvement, spend quality time with the children on a learning game where the student feels safe while their creativity flourish to their full potential and capabilities.

Furthermore, can have a conversation about how to be aware of the possible negative impact and social dilemmas the game can attract such as Cyber-bullying, be mindful to never provide personal information or sensitive information of their family members and the importance of being patient and kind towards others before allowing other children to participate on the game.

Most of all, have a meaningful conversation about potential grooming, sexual harassment (providing inappropriate photos) and how to react to inappropriate content such as pop-up ads, etc.

It is important that we ensure that primary students adapt from a very early age to be conscious of the negative and positive potential impact of AI technology to develop a sense of self awareness, assess critical thinking skill and an understanding of the possible implications of their actions, specially to be aware of who they can rely on if necessary.

Us parents should also take into consideration any school policy that include cyberbullying, and what internal network is the school using for these programs the students are taking on from the school to the house. A policy that clearly state towards parents how much screen time the children are already having at school and what plans the school is taking into consideration to counteract the screen time. A policy that shows the level of responsibility the school is taking towards the extensive use of technology and how parents can replicate a similar outcome at home; for example, providing a Bilateral Fusion of the use of technology and daily access to a space with a diversity of games, reading areas, board games areas, writing,

drawing, arts and craft areas, musical area, Lego or Making block areas, etc. Areas where the students can be creative, feel free to be themselves and have the option to choose if they want to play on their own or with the company of their peers without being judge or controlled. The time spent in these areas should not relate to the lunch and recess period.

This fusion could potentially enhance the student creativity, improve their critical thinking skills, social interactions problem solving skills, encourage the children to use brainstorming ideas towards a specific topic that matters to them, reduce the level of emotional anxiety and academic stress the student might be experiencing at home or at school, a neutral space where the students can communicate freely with the teacher if they are concern about an specific topic. Provide a safe space where the students can join new friendship circles with the same interests, and most importantly, the teacher can take notes and use these interests toward creating a more conductive teaching plans that can aid the teaching experience where the student becomes the centre of the teaching and learning process.

This bilateral fusion can provide feedback and guidance to the parents and teacher, so eventually, they can learn how to master and reduce the impact of the physical wellbeing and mental wellbeing of the students.

Text Neck Syndrome negative impact.

The precocious and inappropriate use of personal computers and especially cell phones might be related to the development of a complex cluster of clinical symptoms commonly defined as “text neck syndrome” (Daniela David, Cosimo Giannini, Francesco Chiarelli, Angelika Mohn, Published by Department of Paediatrics (2021) University of Chieti, Italy https://pmc.ncbi.nlm.nih.gov/articles/PMC7914771/)

Studies have shown the significant effect technological devices such as computers, iPad, or small devices have impacted primary school age children’s physical bodies as an emerging 21st- century syndrome.

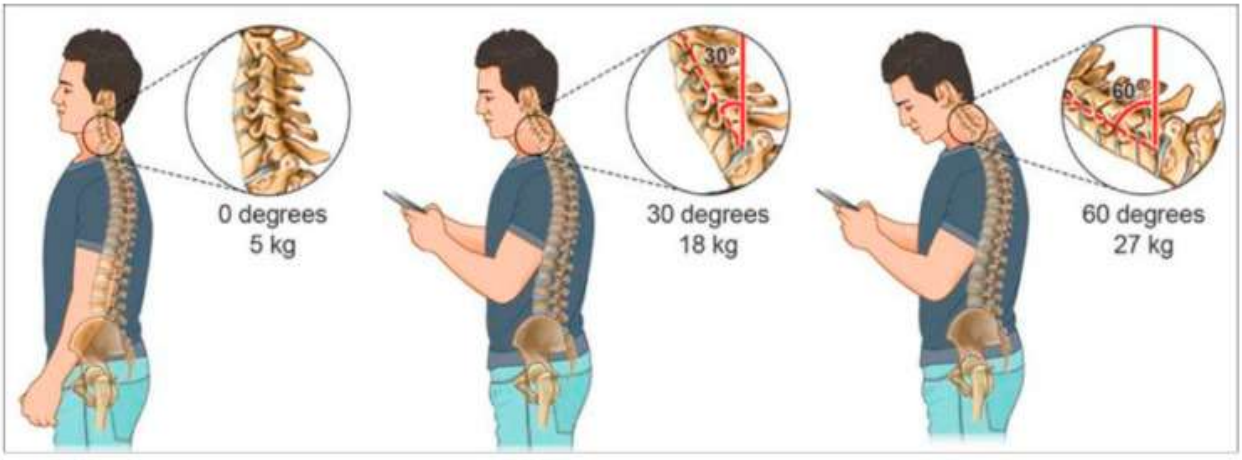
If we compare the traditional computer classrooms with the nowadays use of iPad in regular classrooms, we can appreciate, that the desktop computers at the computer rooms had an immobile screen located at a

safe distance from children's eyes which enhance a better posture and an ergonomic chair suitable for computer usage that didn't affect or enhanced the Neck syndrome.

As technology changes and primary school in Australia updates their learning technology introducing iPad for every student in the classroom, Neck syndrome has become a relatable health issue.

Students in primary school head weight around 2 to up to 5 kilograms in a neutral position so, as the head leans forward for prolonged periods of time, the weight of the neck increases to 18 kgs at 30 degrees and 27 kgs at 60 degrees, as a consequence the muscles around the neck, shoulder and back bone area stiffens and the students may experience poor posture discomfort, and lead to cervical degeneration; consequently, it is important to provide the right environment or ergonomics where the iPad is located within an arm reach visual length and adequate seating postured is properly supervised.

A scientific study undertaking by Fares J, Mohamad Y Fares and Youssef Fares (2017) have shown how participants from 8 to 11 years olds primary students have engaged in prolonged used of smart phone and handheld devices. The following image provides a visual support of how the prolonged posture of the student head leaning forward induce the Text Neck Syndrome.



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This chart shows the stress and weight put on the neck and spine as a result of hunching over a smartphone and handheld devices at varying degrees. The neck flexion angle is the angle between the global vertical and the vector pointing from C7 to the occipitocervical joint. Image Published by Fares J., Fares M.Y.,

Fares Y. Musculoskeletal neck pain in children and adolescents: Risk factors and complications. Surg. Neurol. Int. 2017 https://pmc.ncbi.nlm.nih.gov/articles/PMC5445652/

Critical AI thinking skills per age group in Australia.

If we take into consideration every primary school age AI technology critical thinking skill, we can focus on what approach educators and parents should take, so student can navigate through AI technology in a more profound and significant way while using competency-based education, for example,

- **5-year-old student.**

A 5-year-old student in Pre-primary has a very small attention span while resolving challenging academic activities on an iPad and can pay attention for about 4 to 6 minutes during a challenging activity and will engage in something interesting on their own for 10 – 15 minutes (Hutton, Natalie. may 2020); moreover, at this age 90% of a child's brain develops and pruning of brain synapses becomes more relevant therefore, students can play key roles and are able to learn the basic manoeuvre of the iPad and begin to recognise simple pathways to further make connexions using their previously acquired knowledge; therefore, expecting a child to finish an academic task on an iPad on time at this developmental age can be very challenging for educators and students themselves. In addition, we should then explain and introduced AI as a tool that can be used to do things, but it needs a human to make decisions and complete tasks.

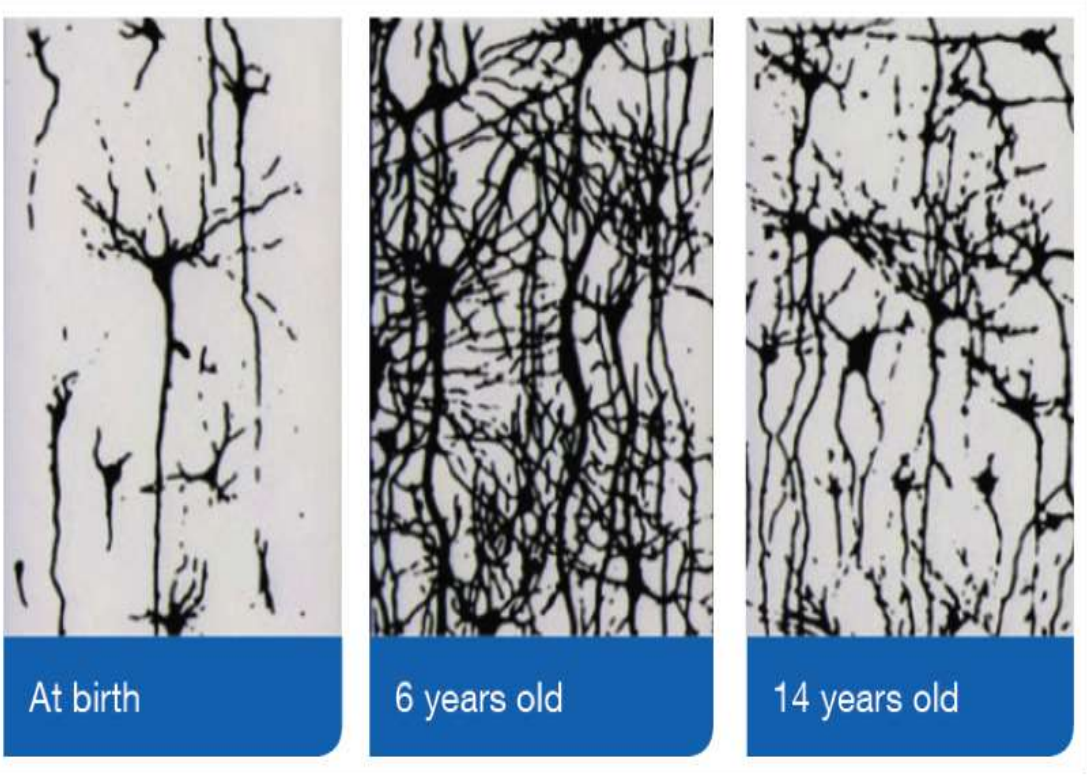
- **6-year-old student.**

A 6-year-old student in year 1 in Australia has already begun to make intrinsics cognitive growth because they began to understand various concepts through synaptic pruning neural connexions. The pruning of brain synapses indicates the tremendous influence experience and environment play in shaping a young brain, published by Australian Children's Education & care Quality Authority (ACECQA) updated on March 2024. Brain development in children. https://startingblocks.gov.au/resources/parenting-and-home/your-childs-development/brain-development-in-children and is capable to follow multistep instructions with the aid of their new improved fine motor skills.

At this point in time, students can commence to manoeuvre devices more efficiently and an introduction of simple coding can begin; furthermore, educators can explain how AI technology applications can be used for different purposes and projects through fun and engaging games using their own designs and scenarios.

A child's brain architecture of neural circuits is built in hierarchical bottom-up sequence. The foundation is paramount, as higher level of circuit are built on lowers level one.

The following image outlines the key features of the pruning trajectory of brain synapses from the antenatal period to adolescence.



The pruning trajectory of brain synapses published by Australian Children's Education & Care Quality Authority (ACECQA) updated on March 2024. Brain development in children https://startingblocks.gov.au/resources/parenting-and-home/your-childs-development/brain-development-in-children

- **7-year-old student.**

A 7-year-old student year 2 in Australia have developed the tools to use school AI technology programs in a more creative and engaging way; that is why, educators and parents need to identify daily life problems that can be solved by using AI and empower their curiosity, creativity and critical thinking through interactive programs.

Some primary schools in Australia begin giving access codes to include their peers in the same AI games to introduce collaboration and problem-solving skills while using the right manners and social skills in an appropriate and controlled environment to play at school and at home.

This new interactive approach intensifies the idea of development for a new sophisticated way of communication where the children don't have to necessarily be on the same room to interact with each other at the same virtual word.

At this stage, it is crucial the intervention of parents and educator to explain the importance of paying attention to their abilities to organize their thoughts while communicating with others, the appropriate use of figurative languages as it can create multiple meanings, the importance of reading and writing at a faster pace to foster better interaction play opportunities as they begin to form better friendships circles and increase their digital independence.

- **8-year-old student.**

An 8-year-old student in year 3 in Australia is experiencing a significant brain and emotional development and begin to think in a more complex and advance way since they have acquired a better sense of time, become more reasonable and think more logically, have better sense of context and rules for their games.

At the same time, a big surge of testosterone is being acquired so they begin to be more competitive while logical skills can take over and reduce their impulses; furthermore, they start to realise how the intend behind their actions and words can change the perceptions of their peers and demonstrate a less sense of compassion an empathy towards their new forming relationship.

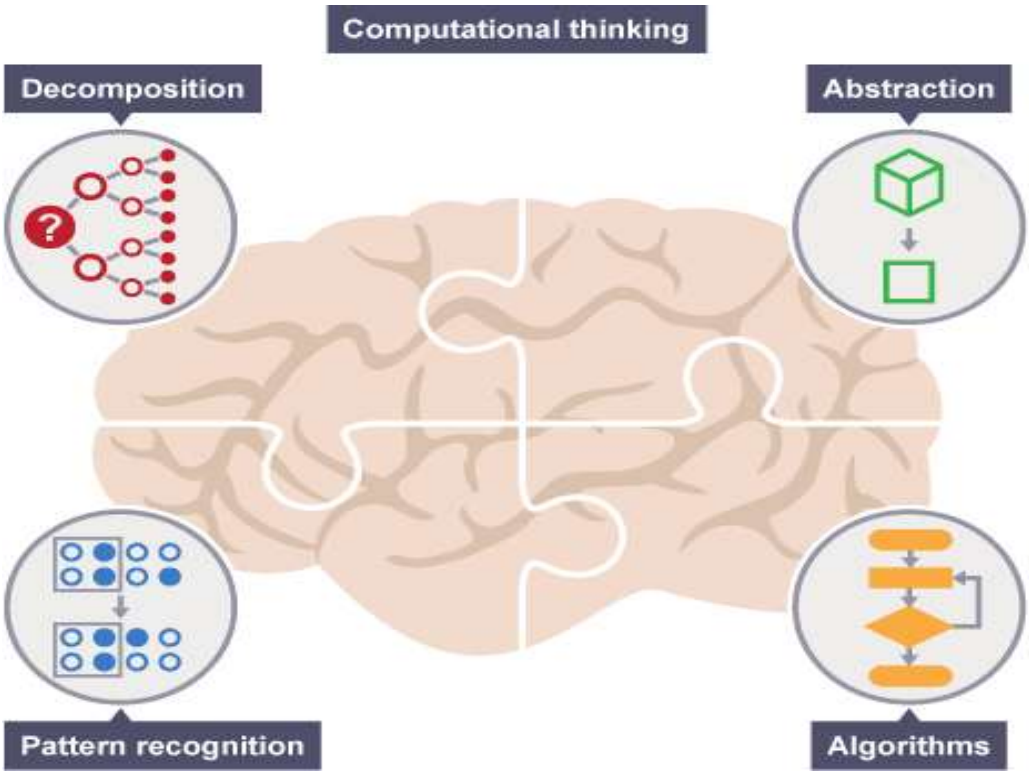
In additions, 8-year-old students can use their new AI technology skills and develop their own sequence of codes to improve their game performance because they have developed a better sense of their weaknesses and AI capabilities and begin to research through a variety of resources to seek better outcomes.

- **9-year-old student.**

A 9-year-old year 4 student in Australia is becoming more social aware and it has become more intrinsic of their feelings about specific topics because they have developed the ability to verbalized feelings and emotions clearly to others.

But excessive reliance of AI technology at this age may have a negative impact in how children can critically analyse different scenarios and circumstances. Disproportionate use of AI technology could lead to reduced time spent on genuine social interactions, potentially contributing to feelings of loneliness and low self-esteem; therefore, encourage personalised learning and time limit AI experiences can trigger independent thinking, full creativity potential, longer attention span and hypothesis evaluation skills to thrive in this new peer pressure stage of development.

Year 4 students in Australia begin to understand more complicated algorithms and digital concepts, recognise misinformation and second guess the legitimacy of the source, develop a new interest in robotics due to their brain reached deeper developed four cornerstones of computational thinking components (BBC Bitesize). Decomposition - breaking down a complex problem or system into smaller, more manageable parts, algorithms - developing a step-by-step solution to the problem, or the rules to follow to solve the problem, abstraction - focusing on the important information only, ignoring irrelevant detail, patter recognition - looking for similarities among and within problems, use of models simulation, experimentation with their spatial reasoning in a more complicated and sophisticated level and begin to rely heavily on data, therefore at this age have developed better skills for computational thinking.



Computational thinking brain image. Introduction to computational thinking (Year unknown) https://www.bbc.co.uk/bitesize/guides/zp92mp3/revision/1#:~:text=decomposition,similarities%20among%20and%20within%20problems

If we put Computationally thinking in a more practical language, we can perceive how students while playing using technology develop the know how to what? Where? and how to look for information to find better strategies to complete a level?

In year 4 in Australia, students also had the opportunity to demonstrate their socio-emotional and academic potential. So, towards the end of the year, Gifted and Talented program assessments begin. At this stage, students begin to realise their potential around music, technology activities, sports, language, etc., that is why they might use diverse AI technology platforms to mimic the information they are trying to improve and navigated efficiently and appropriately, providing systemic learning opportunities and an extended horizon for new learning avenues.

- **10-year-old student.**

A 10-year-old student in year 5 in Australia has already gained the skills to utilized advance AI technology platforms and devices, has recognized their strengths and weaknesses, interests and passions; therefore, they begin to use AI to foster their imagination due to their new sophisticated ability to learn from the physical and virtual environment around them.

They begin to show independence and a new grade of emotional, academic and digital maturity, this is why they can develop multiple plans to resolve a specific problem.

Close friends' opinions begin to take more impact and influence in their decision comparing to their parents. Consequently, it is important to advice the students to stay true to their values, morals and intuitions.

10-year old child also begin to use social platforms of communications to stay in touch with their peers; at the same time, they are going through the beginning of their puberty developmental stage bringing with it the possibility of encountering body shapes and sizes shaming, religion and cultural shaming, race and skin colour shaming, that's why, a special attention of these aspects should be taking into consideration, be supervise or be aware of through the AI digital world at school and at home.

It is important, at this age, to explain the complexity and repercussions of what is being said or posted on these platforms; moreover, it is important to encourage students to advance their critical thinking skills, manage their emotions and make plans before acting or reacting throughout their conversations.

- **11-year-old student.**

An 11-year-old student in year 6 in Australia have had evolve a drastic cognitive development as they can formulate theories and develop their own sense of justice according to their set values and experiences.

According to Piaget 4 stages of development, Sensorimotor stage (birth to 2 years), Preoperational stage (ages 2 to 7), Concrete operational stage (ages 7 to 11) and Formal operational stages (ages 11 and up) written by PhD. Alicia Nortje May 2021 and scientifically reviewed by PhD. Melissa Mandeson, years 6 students can begin to experience how to think about moral, philosophical, ethical, social and political issues

in a more sophisticated way and use logic like reversibility; where the brain reverse an action and return to the original stage. These newfound cognitive abilities reduce the chances of unintentional cyberbullying and the ability to use better way to express their ideas as they assimilate their logic in a more equilibrated mechanism with their emotions.

Learning AI technology by primary students overall can aid to solve specific problems and foreseen situations. So, is imperative firstly to understand that Artificial Intelligence (AI) technology extract information or behaviours using sensory devices like iPad, phones and robotics; then, that data travel through different algorithms to project meaning to further create new concepts and behaviours and in this Technological era known as Broad AI, in general, AI technology still struggles to understand nonliteral modes of expression such as metaphor, humour, sarcasm and experience emotions unless is programmed by humans.

Therefore, it is important to develop the appropriate learning competences, encourage students to explore realistic life issues of their life and their society; hence, they can learn to develop efficient critical thinking skills, develop theories, hypothesis, create new perspectives to how they can improve that issue or solve the problem, apply logic and advance reasoning skills to further design new strategies and applications with the help or assistance of AI technology.

If we appreciate AI technology through the Department of Education Australian framework for generative AI in schools, it seeks to guide the responsible and ethical use of generative AI tools in the way that benefit students, schools and society.

It is vital to recognise all level of cognitive, social an emotional development of every student in every school year level of primary school, enable opportunities for students to take risks while being creative, think critically while taking in consideration the potential variety of consequences, give every student a fundamental equal opportunity to embrace AI technology with the goal to create more and consume less while the school takes cybersecurity measures.

Taking all ideas into a viewpoint and continue with the perspective of no kids are left behind in this AI technology era, we should then develop an educational school program with the same school personal private privacy characteristics online where kids can train a device to create or design a model and learn about how they can improve or develop their own specific project or idea at school. A project that is completely flexible and oriented to each student preference where they can put into practice all the coding knowledge, they have acquired over the school years.

Projects of these dimensions can help students experiment, create their own robots with their own favourite characteristics, understand how the AI algorithms systems of input, steps to change input and output work, improve their communications skills, create their own projects using gestures and sounds, follow up their improvement and develop new concepts.

Understand how AI uses specific contexts and technical system to operate and recognise the specific user and their creation will teach students how their creations can develop a new frame of mind of how their capabilities and skills can directly impact and change the society way of life.

CONCLUSIONS.

In summary, while the integration of AI technology can positively impact primary school students' learning experiences is imperative that parents and educators must analyse and take into consideration the developmental characteristics of our primary school students. Emphasize the continuity to review and recreate those AI technology skills to adapt to this new fasting developing AI technological era along with understanding ethical and physical implications and master learning enabled by AI from a new exciting, engaging, consistent and effective approach using motivation from an educator to grow healthy and mindful tech-use students.

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