

Challenges in Child-Robot Interaction in low-resource and middle-resource income countries

CRITTER: Child-Robot Interaction and Interdisciplinary Research
Workshop @HRI2023, Stockholm, Sweden

Miguel Xochicale on behalf of air4children

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Get source of this slide and see further references from <https://github.com/air4children/critter-hri2023>

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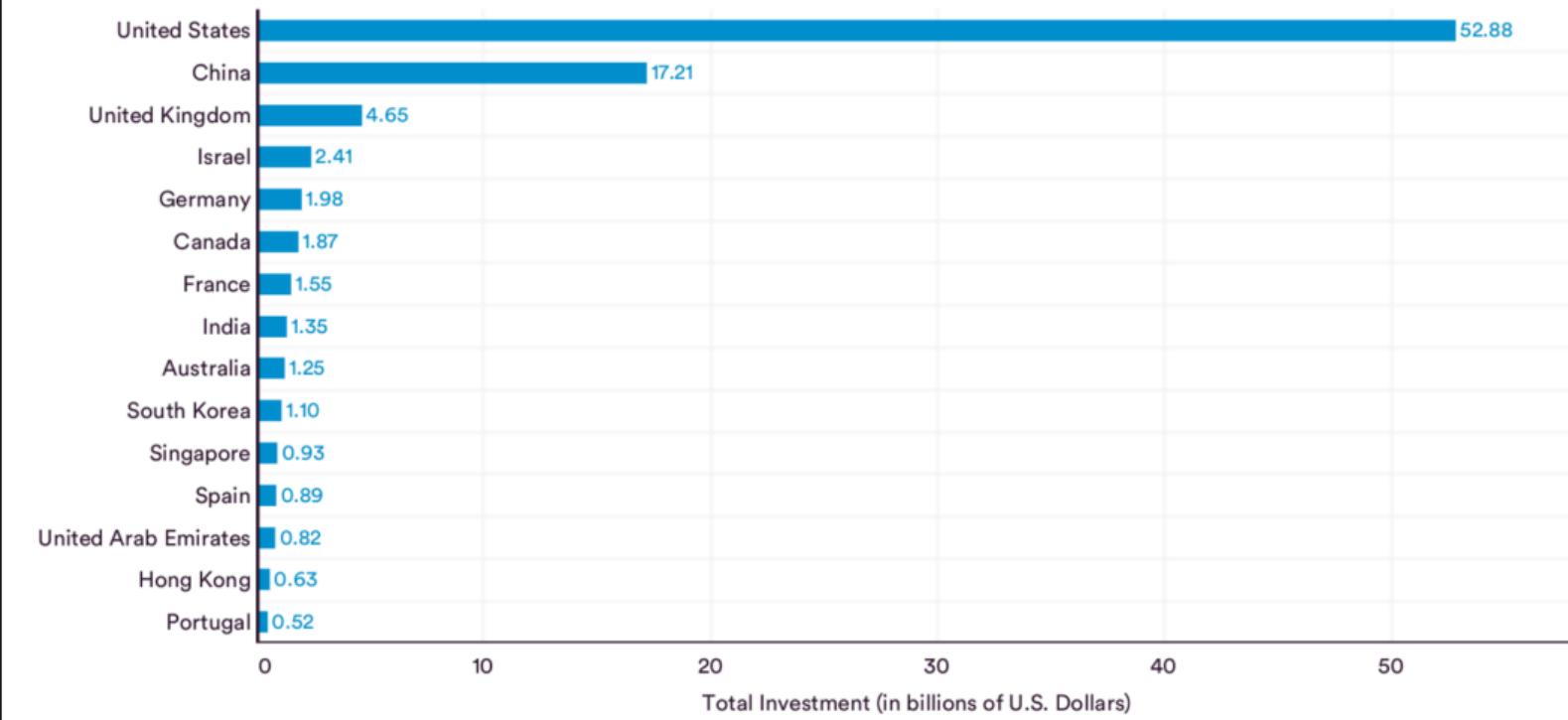
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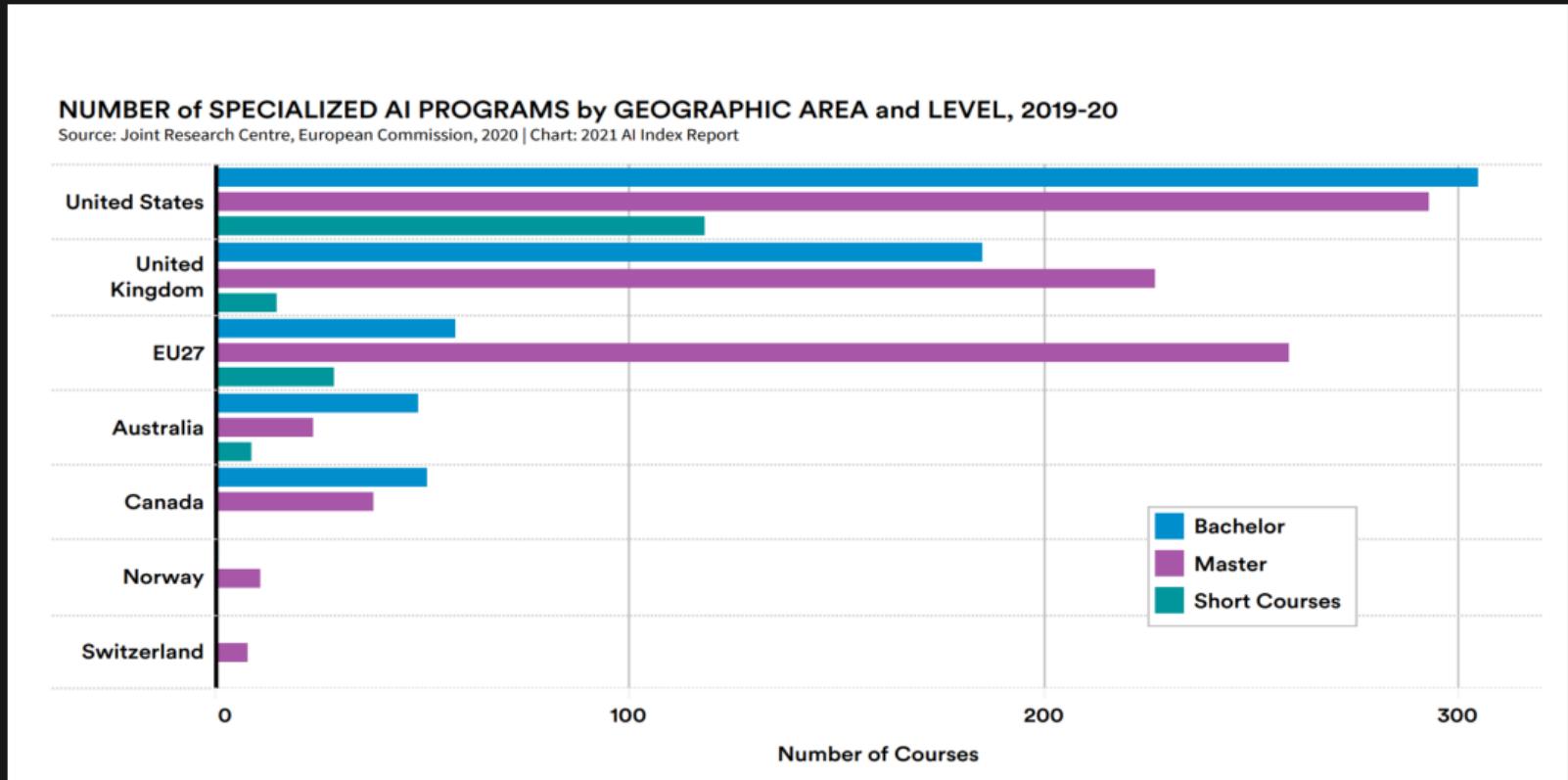
Private investment in AI by Geographic area

PRIVATE INVESTMENT in AI by GEOGRAPHIC AREA, 2021

Source: NetBase Quid, 2021 | Chart: 2022 AI Index Report



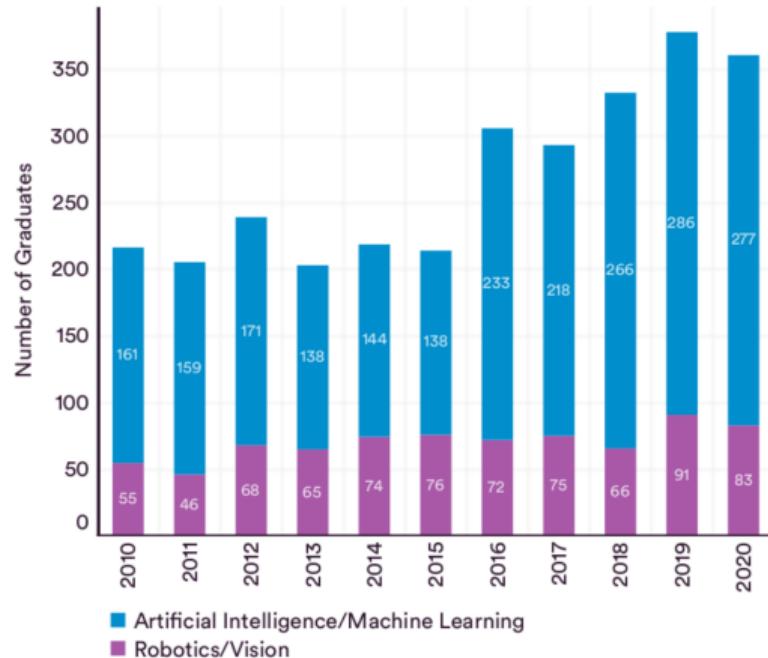
Specialised AI programs by Geographic Area and level



New CS PhDs with AI/ML and Robotics/Vision Specialties

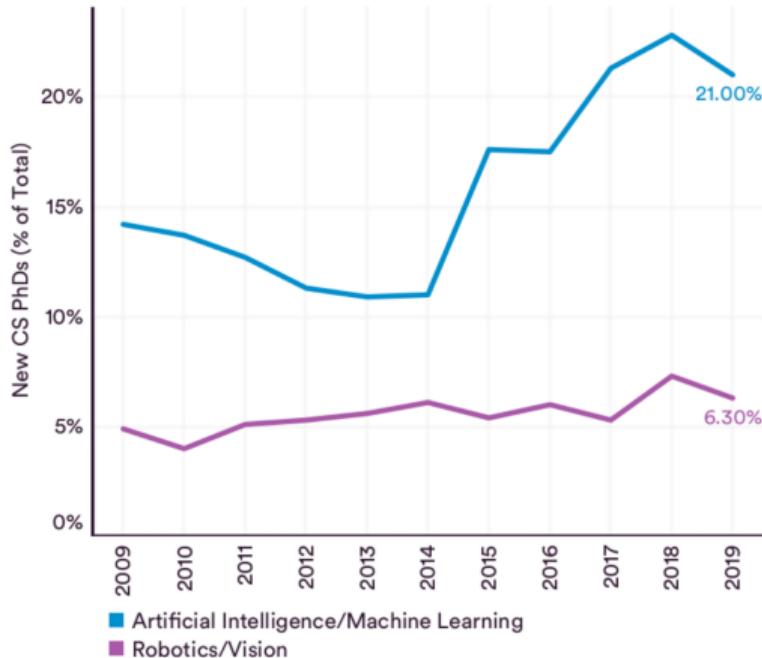
NEW CS PHDS with AI/ML and ROBOTICS/VISION SPECIALTY in the UNITED STATES, 2010–20

Source: CRA Taulbee Survey, 2021 | Chart: 2022 AI Index Report



NEW CS PHDS (% of TOTAL) with AI/ML and ROBOTICS/VISION SPECIALTY in the UNITED STATES, 2010–20

Source: CRA Taulbee Survey, 2021 | Chart: 2022 AI Index Report

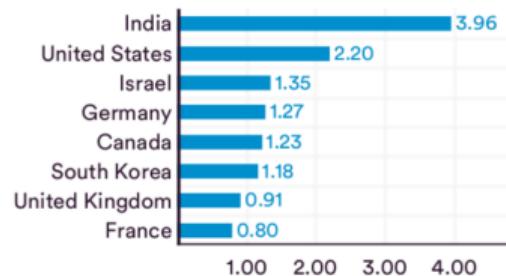


Relative AI skill penetration rate by industry across geographic Area

RELATIVE AI SKILL PENETRATION RATE by INDUSTRY across GEOGRAPHIC AREA, 2015–21

Source: LinkedIn, 2021 | Chart: 2022 AI Index Report

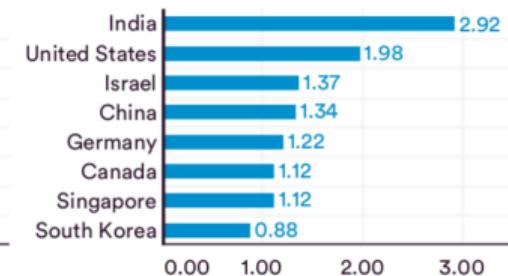
Education



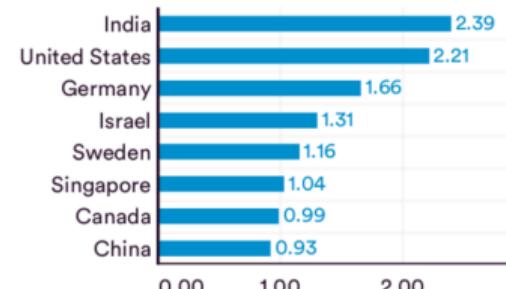
Finance



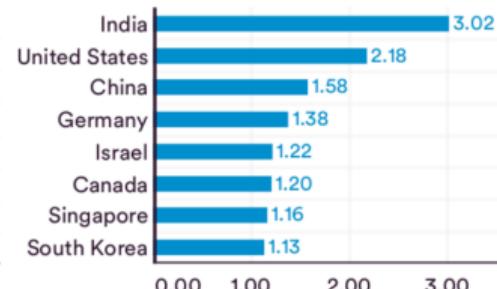
Hardware



Manufacturing



Software



Relative AI Skill Penetration Rate

Relative AI skill penetration rate by gender, 2015-2021

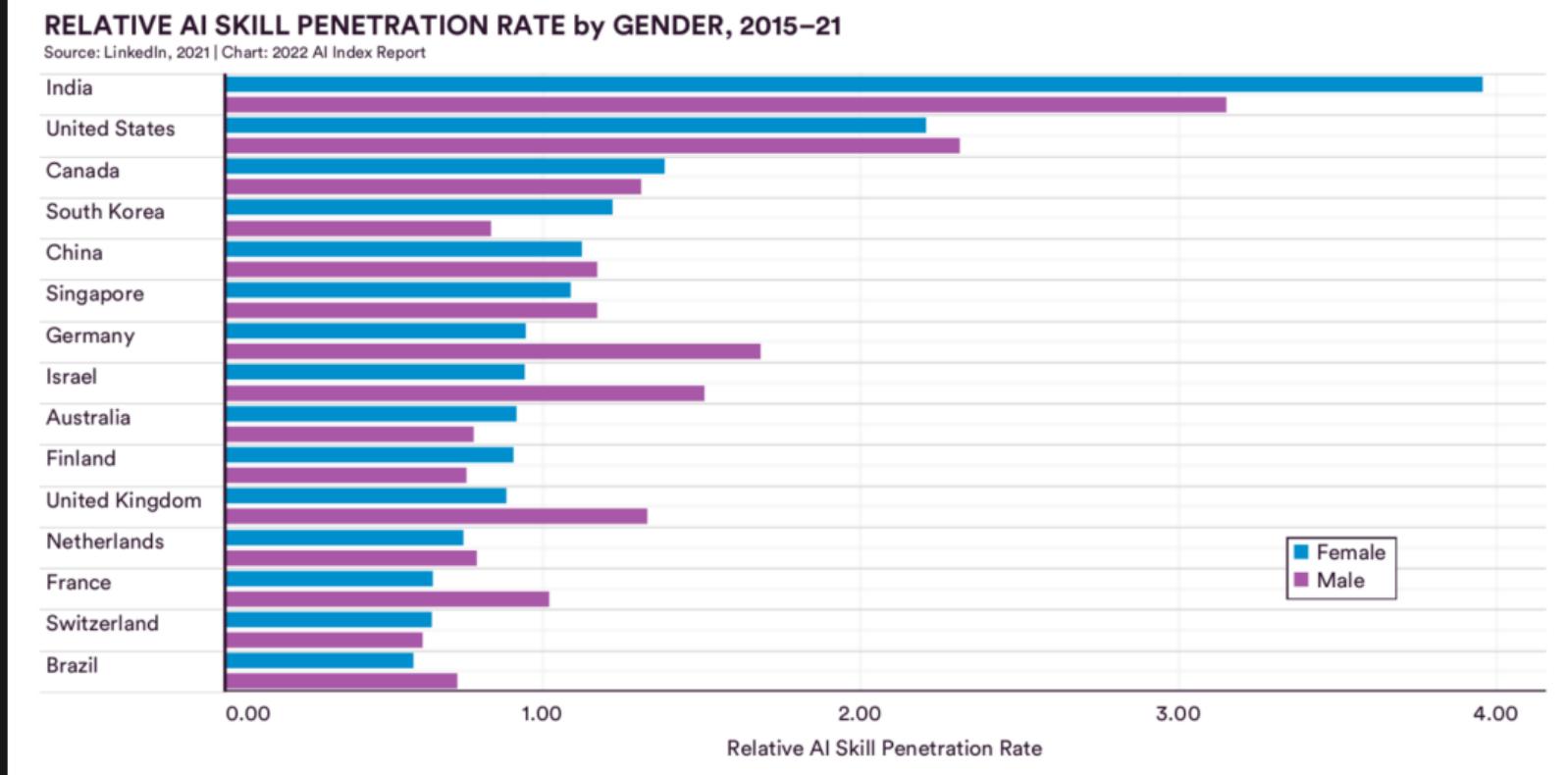


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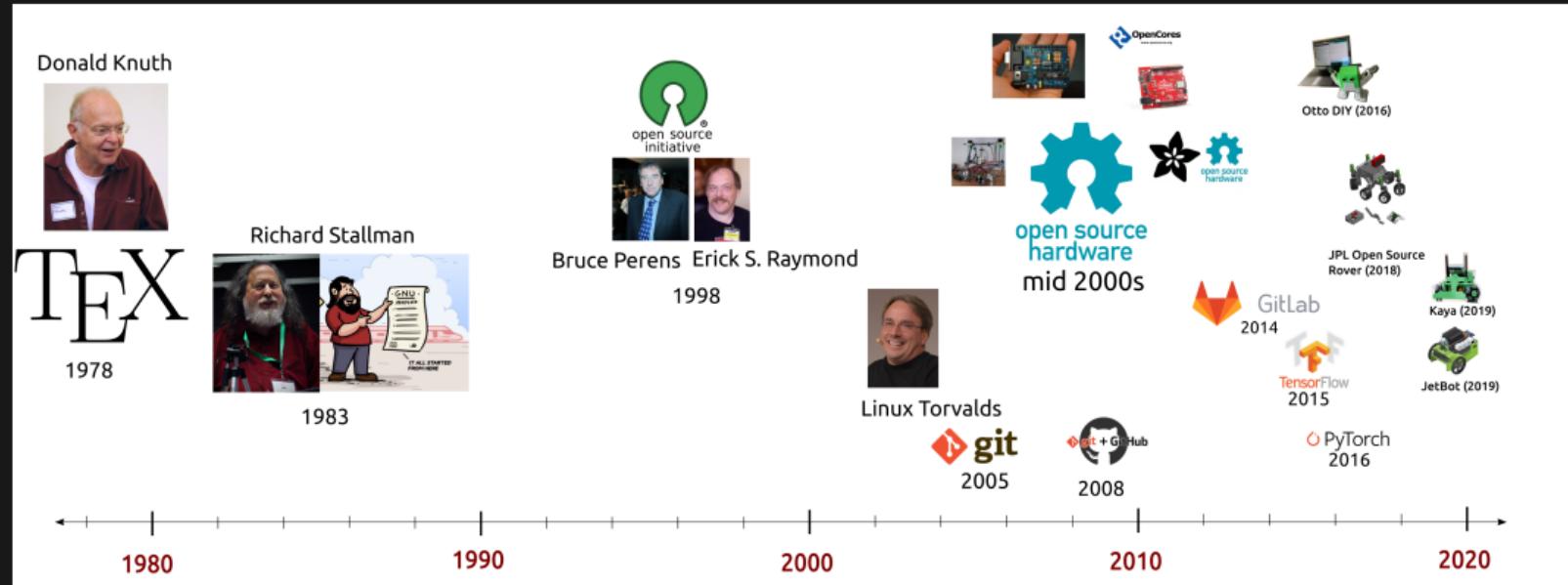
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Open source software and hardware in AI and Robotics



What is air4children?

air4children, Artificial Intelligence and Robotics for Children, aiming

- ▶ to create a more inclusive, affordable and fair participation of children in AI and Robotics,
- ▶ to create child-centred AI and Robotics curriculums based on Montessori Education, and
- ▶ to build Open source robots to be affordable and fun.



Prototyping Open Source Robots (2013 – 2017)

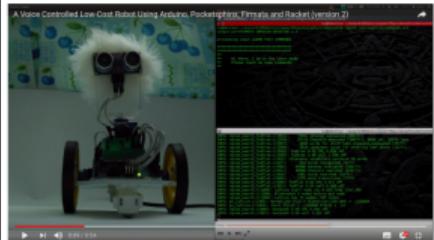
V00-MAY2014



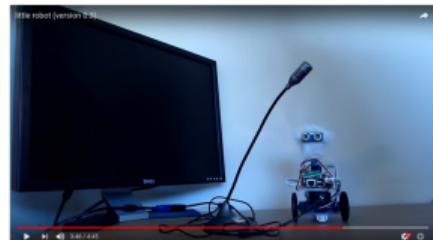
V01-JUNE2014



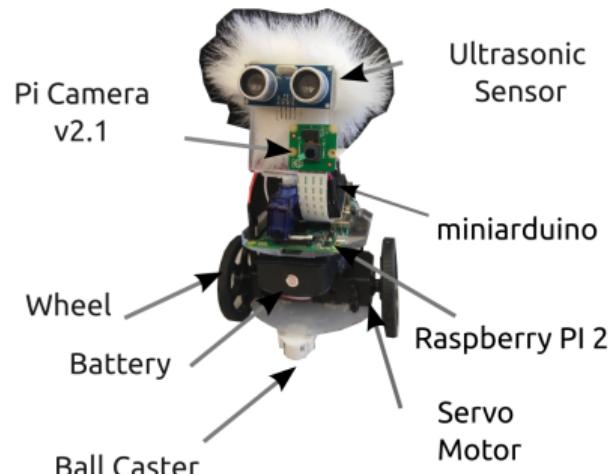
V02-JULY2014



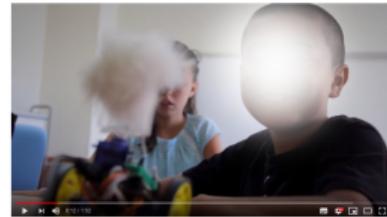
V03-APRIL2016



V04-DEC2017



Piloting robot prototypes (2015 – 2019)



June 2015



October to December 2020

Montessori Education

”The hand is the instrument of the mind.” Dr. Maria Montessori (1970-1952).



Building
Trinomial cube



Using
4 cylinder blocks

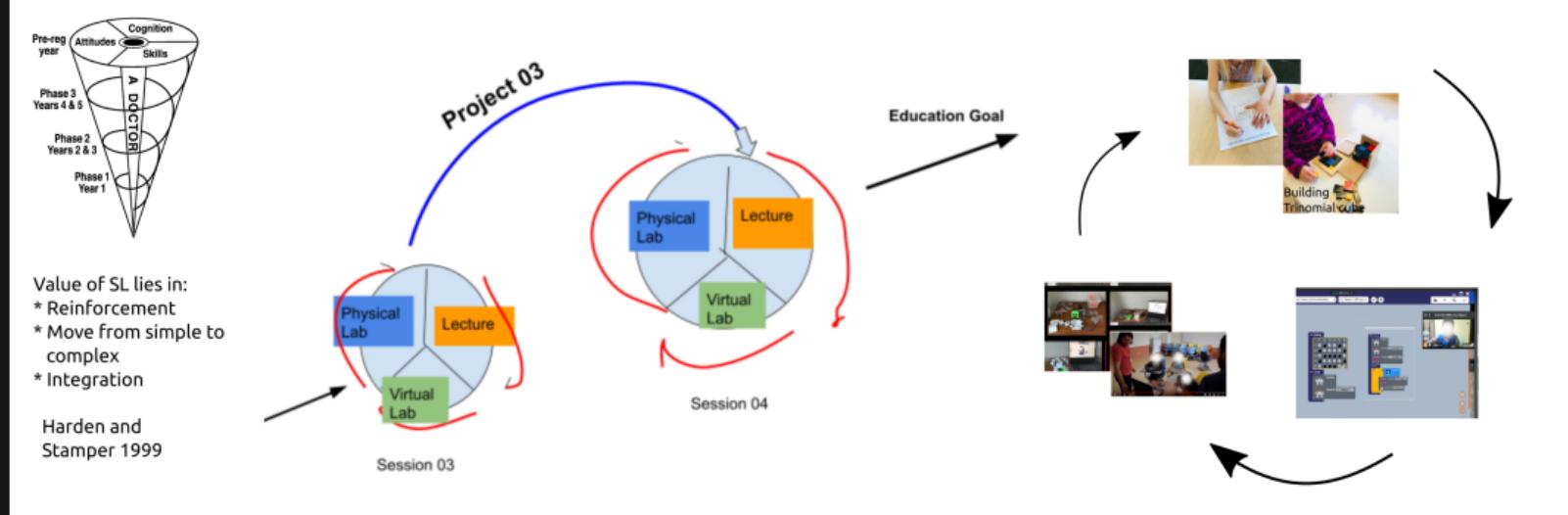


Relating human anatomy with AI/Robot anatomy



Children are participating in creative explorations to develop fine motor skills and to engage in collaborative and teamwork activities.

Spiral Learning Method



Value of SL lies in:
* Reinforcement
* Move from simple to complex
* Integration

Harden and
Stamper 1999

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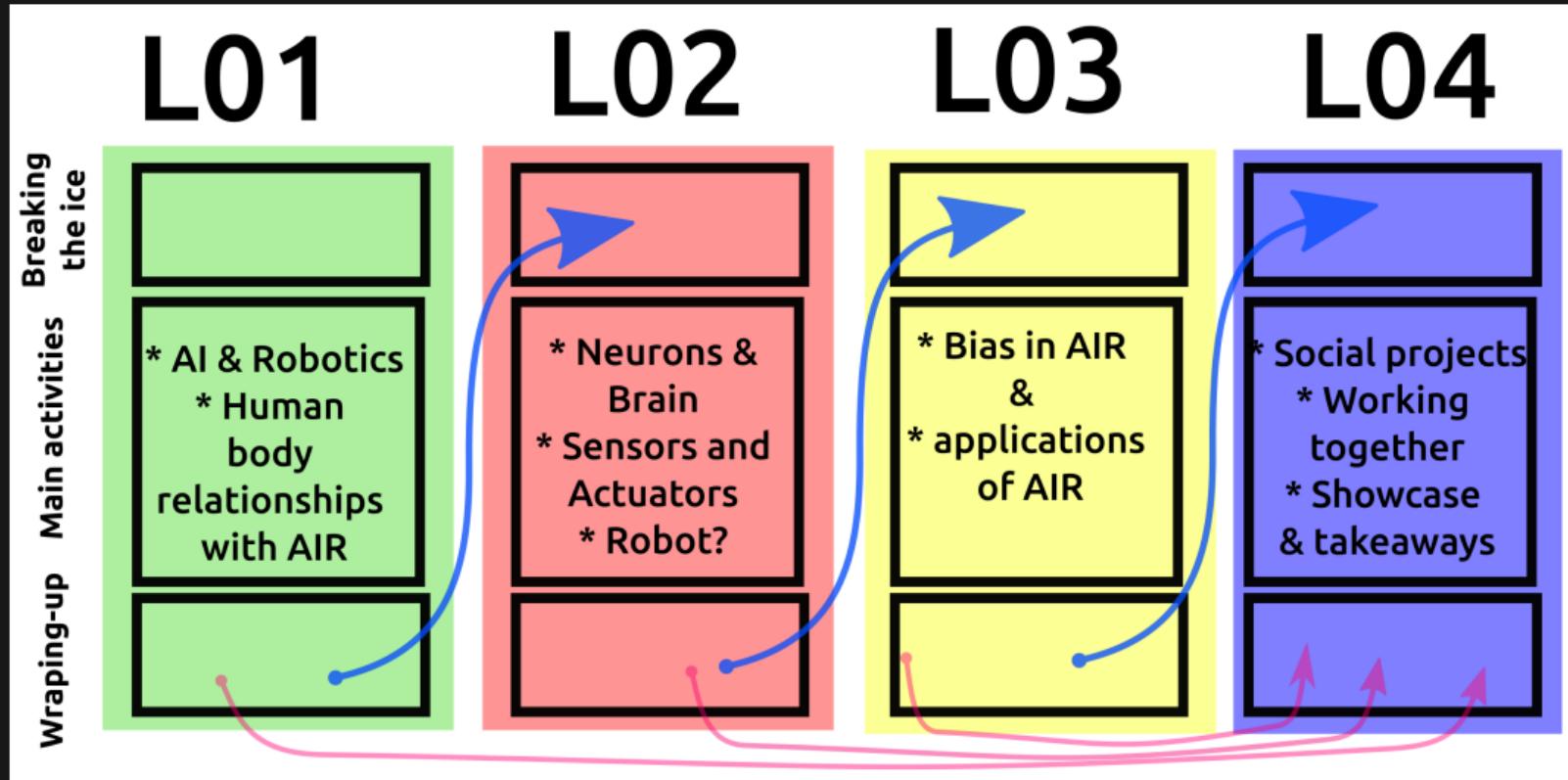
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Curriculum



Piloting workshop: Coding and bingo activities



Piloting workshop: Teaching activities



Piloting workshop: Group activities



Survey results

Evaluación de actitudes de ingeniería y ciencia. air4children 2022

Nombre (solo nombre) _____ Edad: _____ Fecha: _____

Instrucciones

Por favor responde cada pregunta honestamente. Marca con una X tanto estás de acuerdo o desacuerdo en cada una de las preguntas. Muchas gracias.



Totalmente
en desacuerdo



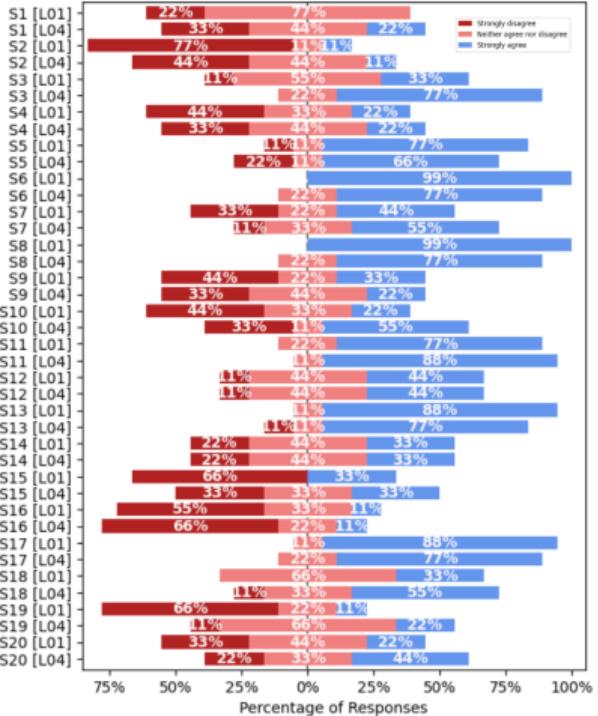
No estoy
seguro



Totalmente
de acuerdo

| | |
|---|--|
| 1. Me gustaría ser un científico cuando crezca. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 2. Me gustaría ser un ingeniero cuando crezca | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 3. Me gustaría un trabajo donde pudiera inventar cosas. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 4. Me gustaría ayudar a construir puentes, edificios y túneles. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 5. Me gustaría un trabajo que me permita crear coches, robots o naves espaciales. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 6. Me gustaría construir máquinas que ayuden a la gente a caminar. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 7. Disfrutaría un trabajo donde se hagan nuevas medicinas. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 8. Disfrutaría un trabajo ayudando a proteger el medioambiente. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |

| | |
|--|--|
| 9. Yo pienso que: la ciencia no tiene nada que ver con la vida real. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 10. Yo pienso que: las matemáticas no se usan en la vida cotidiana. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 11. Me gustaría: un trabajo que me permita entender cómo funcionan los robots. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 12. Me gusta pensar en crear nuevas y mejores cosas que faciliten mi trabajo. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 13. Me gusta saber cómo funcionan las cosas. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 14. Soy bueno para construir cosas. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 15. Yo pienso que: Los científicos defienden el mundo (guerras). | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 16. Yo creo que: Los ingenieros causan problemas en el mundo. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 17. Yo creo que: los científicos ayudan a hacer una mejor vida a las personas. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 18. Yo creo que: Los ingenieros ayudan a hacer una mejor vida a las personas. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 19. Conozco lo qué hacen los científicos en sus trabajos. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |
| 20. Sé lo qué hacen los ingenieros en sus trabajos. | <input type="checkbox"/> Totalmente en desacuerdo <input type="checkbox"/> No estoy seguro <input checked="" type="checkbox"/> Totalmente de acuerdo |



Conclusions and future work

Challenges

- ▶ inclusive, affordable and fair participation of children in AI and Robotics,
- ▶ child-centred curriculums in AI and Robotics
- ▶ creation of Open source robots to be affordable and fun

Open questions

- ▶ how to increasing research funding?
- ▶ how to establishing networks, communities and facilities?
- ▶ how to foster international collaborations and creating training programs?

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