

Alinhamento de sistemas de robótica educativa com actividades escolares

5.º encontro regional de tecnologias na educação
8 de setembro de 2021



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SUPSI-DFA & EPFL

Uma breve lição de geografia

- **2011-2016:** BSc e MSc em engenharia eléctrica da ETH Zurique
- **2017-2020:** PhD em robótica educativa da SUPSI-DFA e EPFL
- **Desde 2020:** Pesquisador PostDoc na SUPSI-DFA e EPFL



German
French

Italian
Romansh



<https://www.br.de/mediathek/video/professor-roboter-ki-an-der-uni-av:5c36394c9539de0018bd58c6>



<https://bold.expert/what-are-robots-doing-in-schools/>

Robôs como tutor / parceiro:

Robótica social,
Interacção
homem-robô
(HRI), Interacção
criança-robô
(cHRI)



<https://www.mobsya.org/de/produit/wireless-thymio/>



<https://educatec.ch/tts/1270/blue-bot-bluetooth>

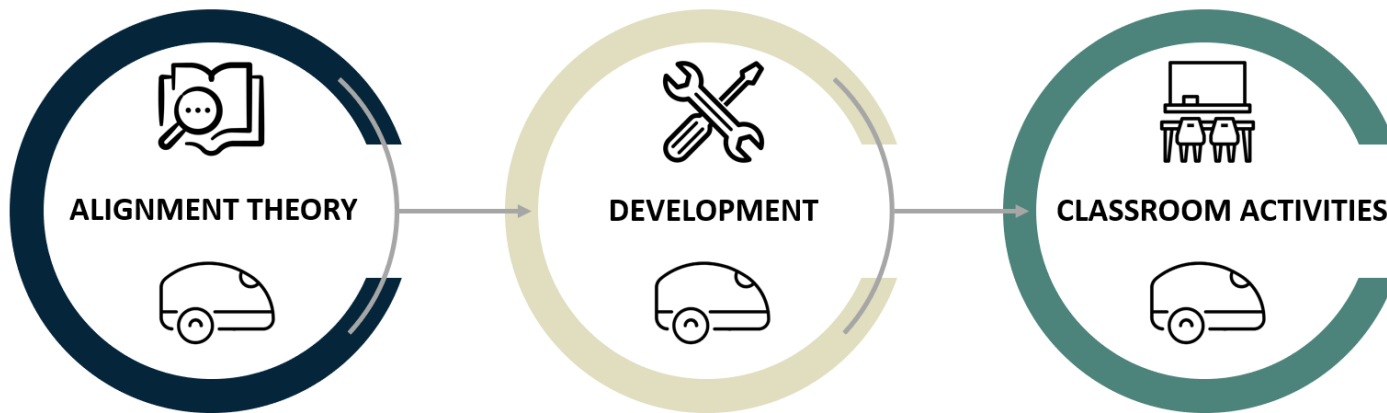


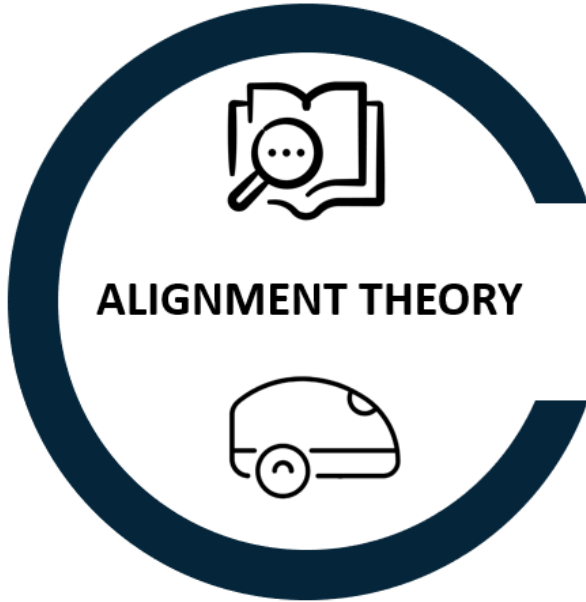
<https://educatec.ch/tectools/mbot/2943/makeblock-mbot-bt>

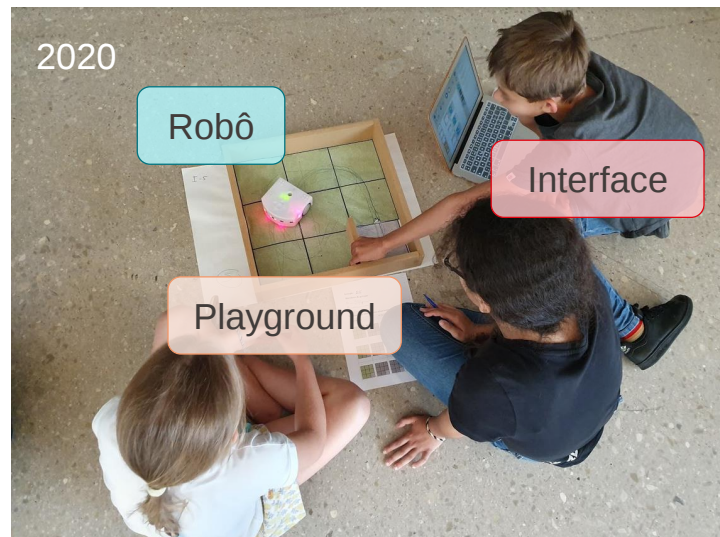
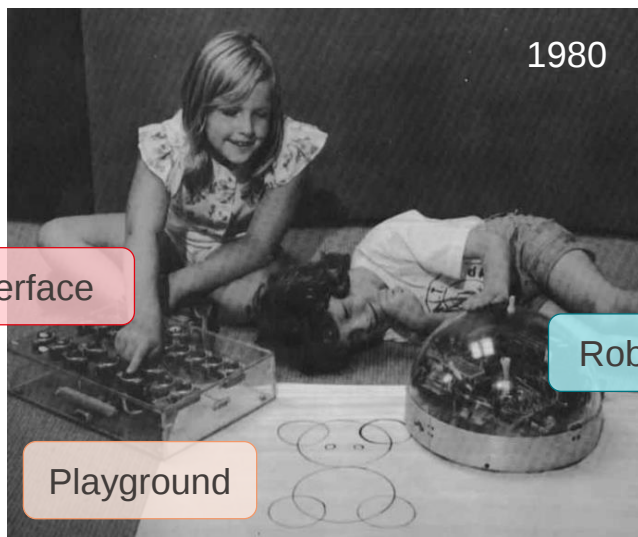
Robôs como instrumento:

Robótica educativa
(ER)

Como alinhar a robótica educativa com as actividades de sala de aula?



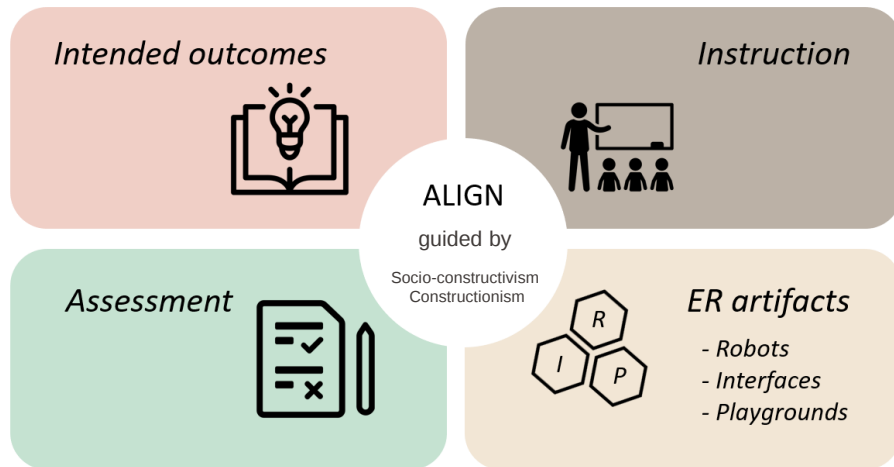




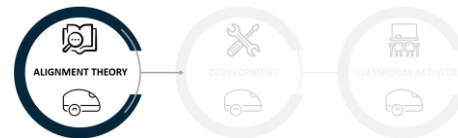
- Sistemas cognitivos situados com três tipos de artefatos cognitivos (Heersmink 2013):
 - Artefato ecológico estrutural (robô)
 - Artefato simbólico de representação (interface)
 - Artefato ecológico espacial (playground)

Heersmink, R. (2013). A taxonomy of cognitive artifacts: Function, information, and categories. *Review of philosophy and psychology*, 4(3), 465-481.

Educational Robotics Learning System (ERLS)



- O sistema inteiro deve ser considerado para:
 - Elaboração de instrumentos ER
 - Elaboração das atividades de ER

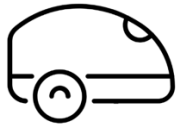


Giang, C., Piatti, A., & Mondada, F. (2019). Heuristics for the development and evaluation of educational robotics systems. *IEEE Transactions on Education*, 62(4), 278-287.

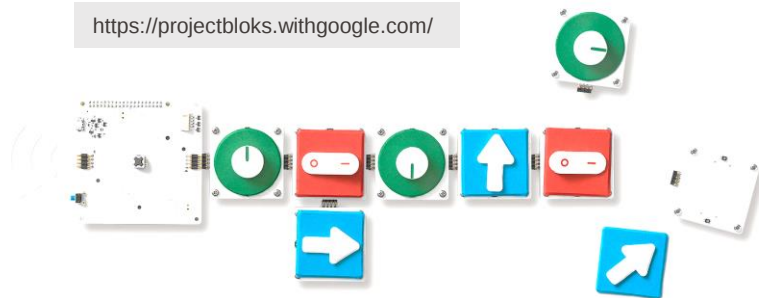
Giang, C., Piatti, A., & Mondada, F. (2020). Towards the alignment of educational robotics learning systems with classroom activities. PhD Thesis, EPFL.



DEVELOPMENT



<https://projectbloks.withgoogle.com/>



<https://www.playosmo.com/en/>

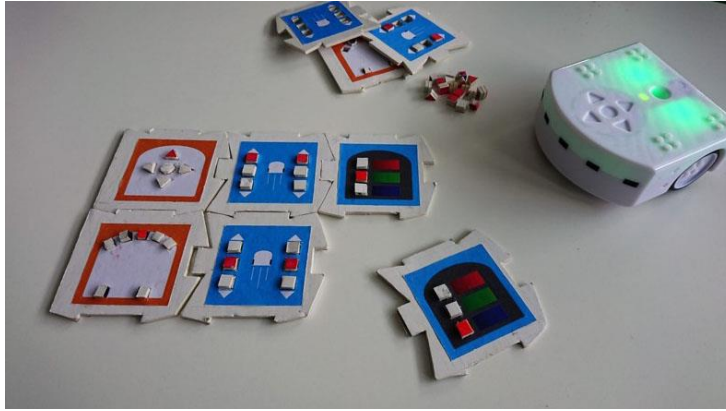


- As linguagens de programação tangível (TPLs) podem:
 - Melhorar a colaboração em grupo (Horn et al. 2008)
 - Aumentar o interesse situacional (Sapounidis et al. 2015)
 - Ter impacto positivo na aprendizagem (Melcer and Ibister 2018)

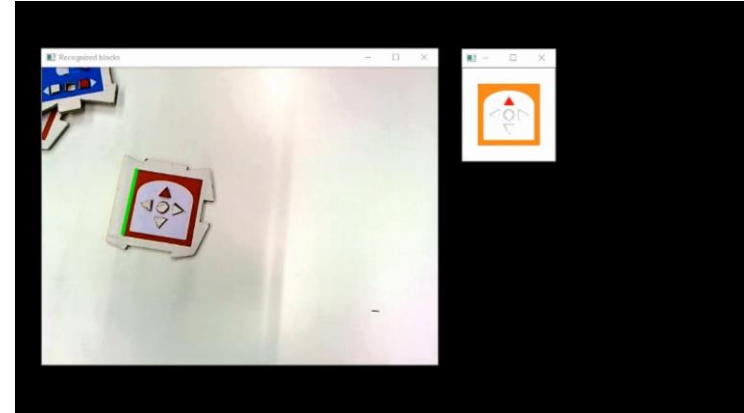
Horn, M. S., Solovey, E. T., & Jacob, R. J. (2008). Tangible programming and informal science learning: making TUIs work for museums. In *Proceedings of the 7th international conference on Interaction design and children* (pp. 194-201).

Sapounidis, T., Demetriadis, S., & Stamelos, I. (2015). Evaluating children performance with graphical and tangible robot programming tools. *Personal and Ubiquitous Computing*, 19(1), 225-237.

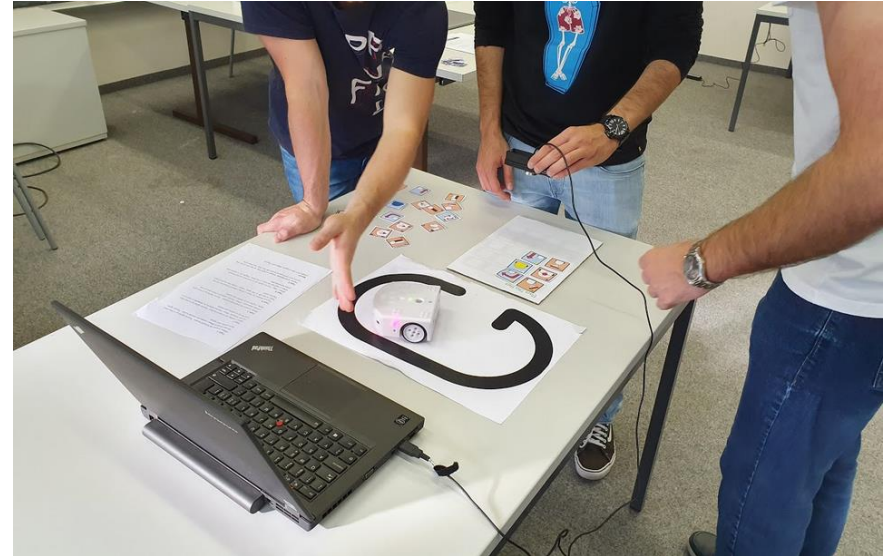
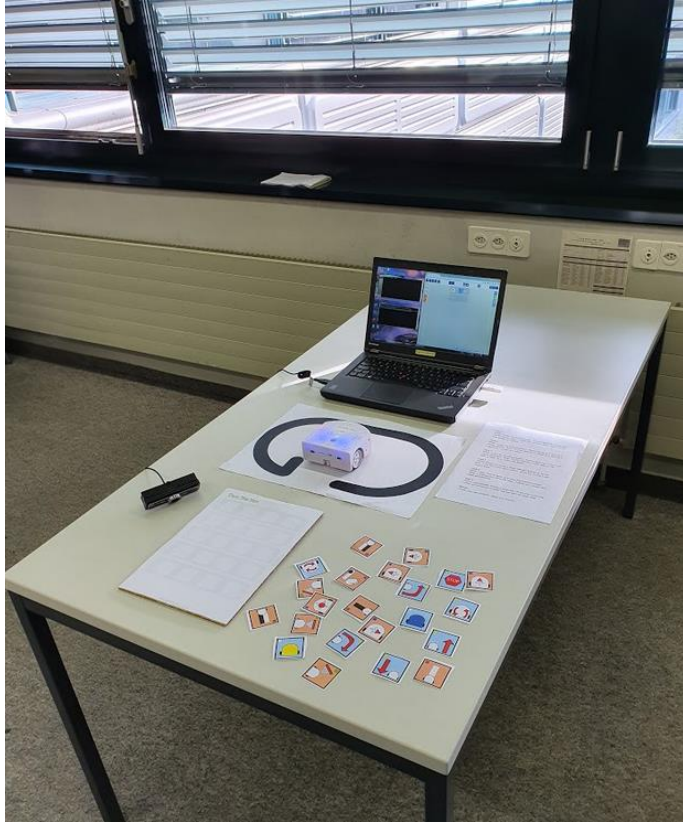
Melcer, E. F., & Ibister, K. (2018). Bots & (Main) frames: exploring the impact of tangible blocks and collaborative play in an educational programming game. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (pp. 1-14).



Mussati, A., Giang, C., Piatti, A., & Mondada, F. (2019). A Tangible Programming Language for the Educational Robot Thymio. In *2019 10th International Conference on Information, Intelligence, Systems and Applications (IISA)* (pp. 1-4). IEEE.



- Desenvolver um TPL para o robô Thymio que:
 - Seja acessível e facilmente reproduzível
 - Explora a infra-estrutura de sala de aula existente



Mehrotra, A.*, Giang, C.*, Duruz, N., Dedelley, J., Mussati, A., Skweres, M., & Mondada, F. (2020). Introducing a Paper-Based Programming Language for Computing Education in Classrooms. In *Proceedings of the 2020 ACM Conference on Innovation and Technology in Computer Science Education* (pp. 180-186). (*) equally contributing authors





Classe A
(n=16)

Introdução a
Thymio (25')

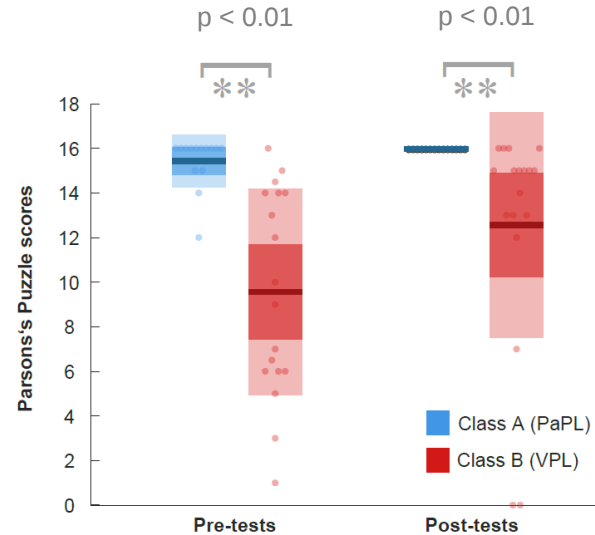
Atividade PaPL (25')

Atividade VPL (25')

Classe B
(n=16)

Atividade VPL (25')

Atividade PaPL (25')





Classe A
(n=16)

Introdução a
Thymio (25')

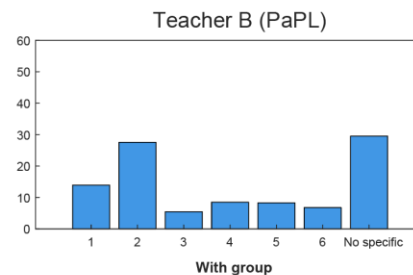
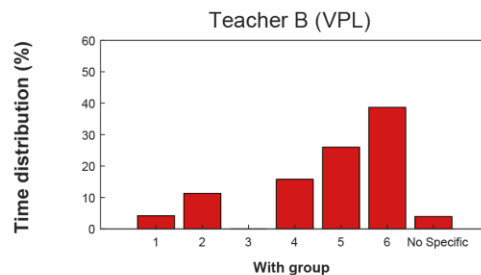
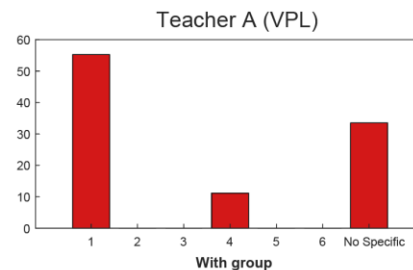
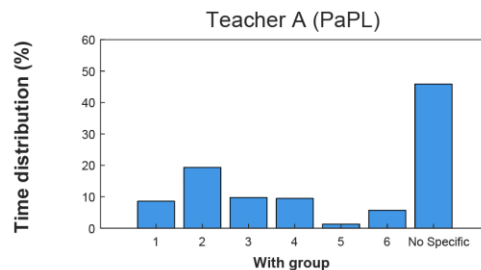
Atividade PaPL (25')

Atividade VPL (25')

Classe B
(n=16)

Atividade VPL (25')

Atividade PaPL (25')



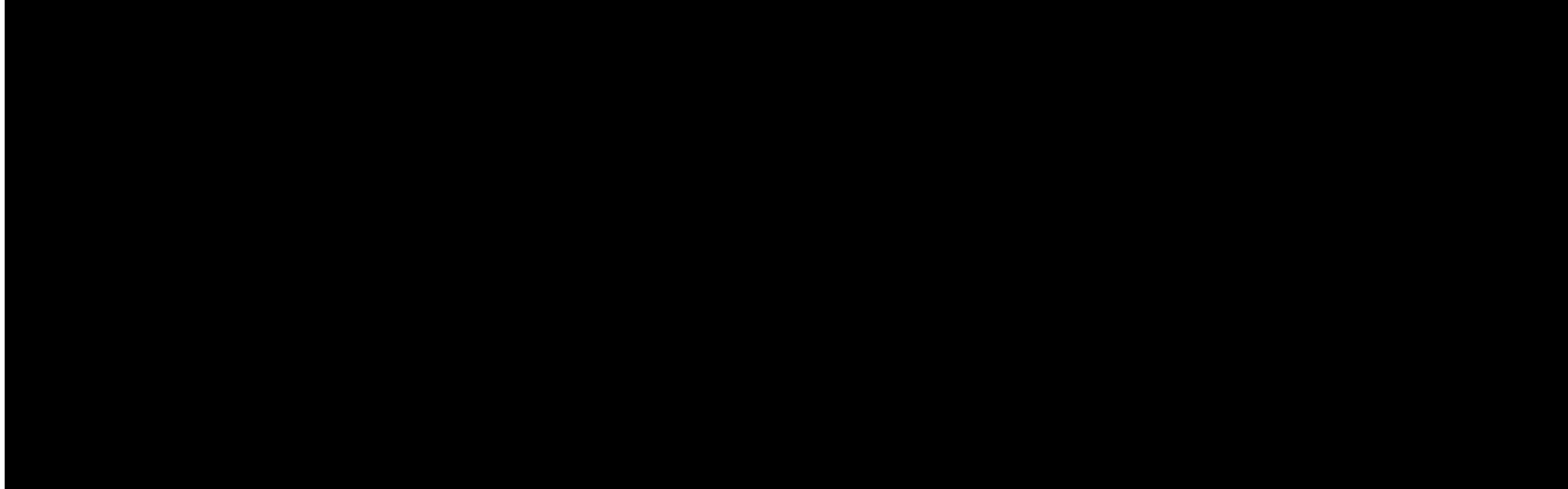
- Linguagem de programação e robô educativo baseados em papelão
- Material e componentes acessíveis
- Introduzir professores e alunos às idéias de *making*
- Proposto no ensino à distância durante o fechamento da Covid-19



Mehrotra, A., Giang, C., El-Hamamsy, L., Guinchard, A., Dame, A., Zahnd, G., & Mondada, F. (2021). Accessible Maker-Based Approaches to Educational Robotics in Online Learning. *IEEE Access*, 9, 96877-96889.

<https://drive.google.com/file/d/1houMbJdTLd4dpVZnD--Zu2XsaO2RYRw-/view?usp=sharing>

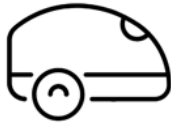
Vídeo de Anthony Guinchard



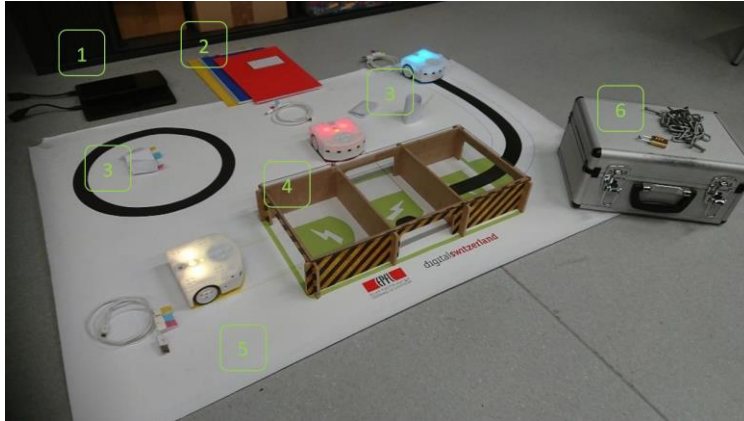
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CLASSROOM ACTIVITIES



Thymio Escape Game



- Os jogos de fuga e as atividades de ER são ambos baseados em uma abordagem sócio-construtivista
- Potencial para alinhar instrução com artefatos de ER

Giang, C., Chevalier, M., Negrini, L., Peleg, R., Bonnet, E., Piatti, A., & Mondada, F. (2018). Exploring escape games as a teaching tool in educational robotics. In *International Conference EduRobotics 2018* (pp. 95-106). Springer, Cham.

Thymio Escape Game

Vídeo de Jerome Guzzi e Alessandro Giusti



https://drive.google.com/file/d/1hso_Rr1BEK0Lw7y4BXLN6LpgYVNLloBF/view?usp=sharing

Thymio Escape Game

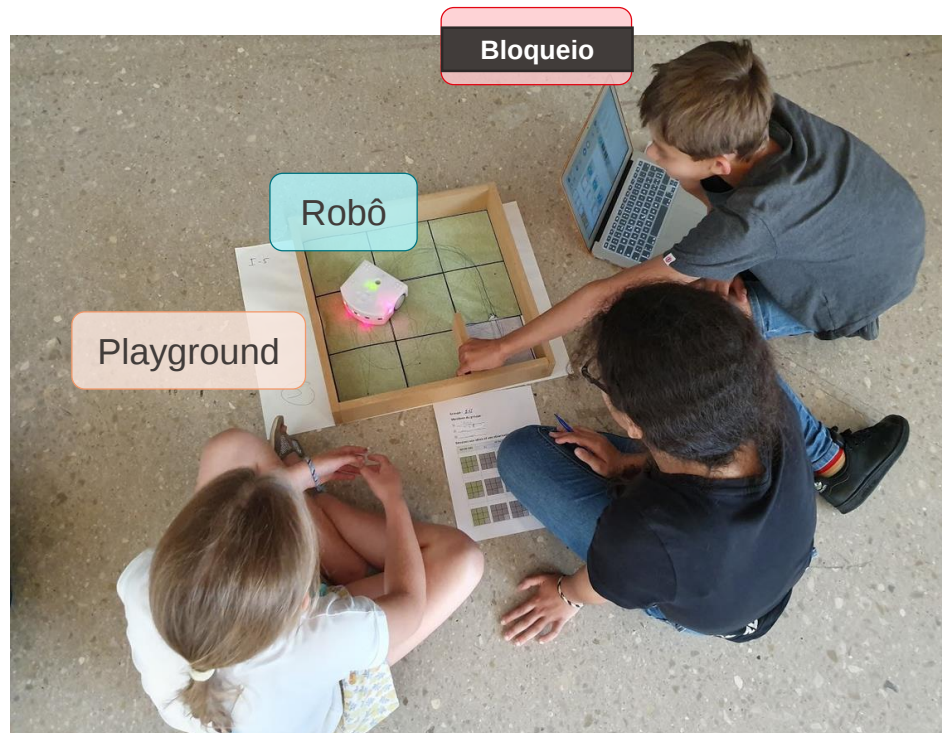
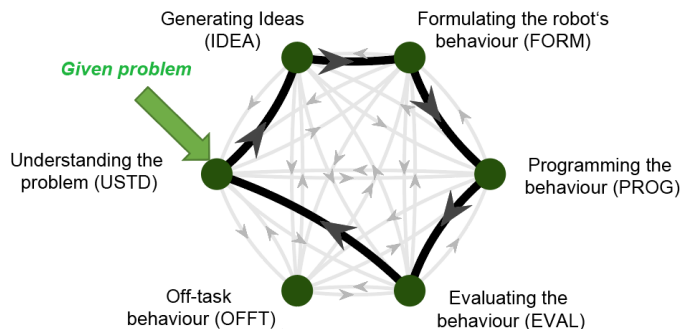
- O material está disponível sob licença CC BY
- Adaptado de forma autônoma por professores em diferentes países
- Jogado por mais de 700 pessoas



Giang, C.. (2019). THYMIO ESCAPE GAME - Documentation (EN).
https://www.researchgate.net/publication/334460027_THYMIO_ESCAPE_GAME_-_Documentation_EN/citation/download

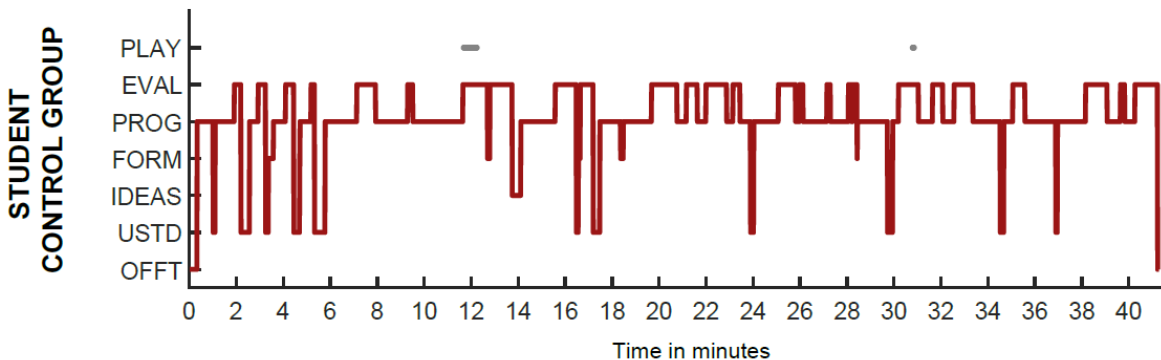
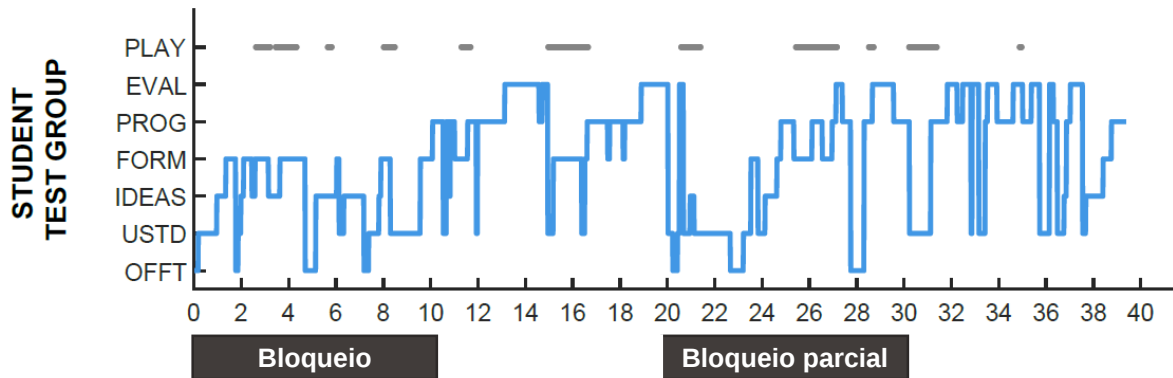
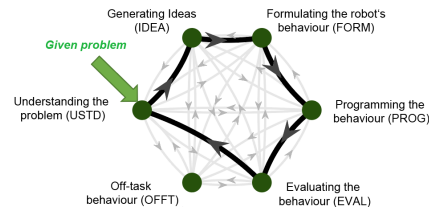
Thymio corta-relva

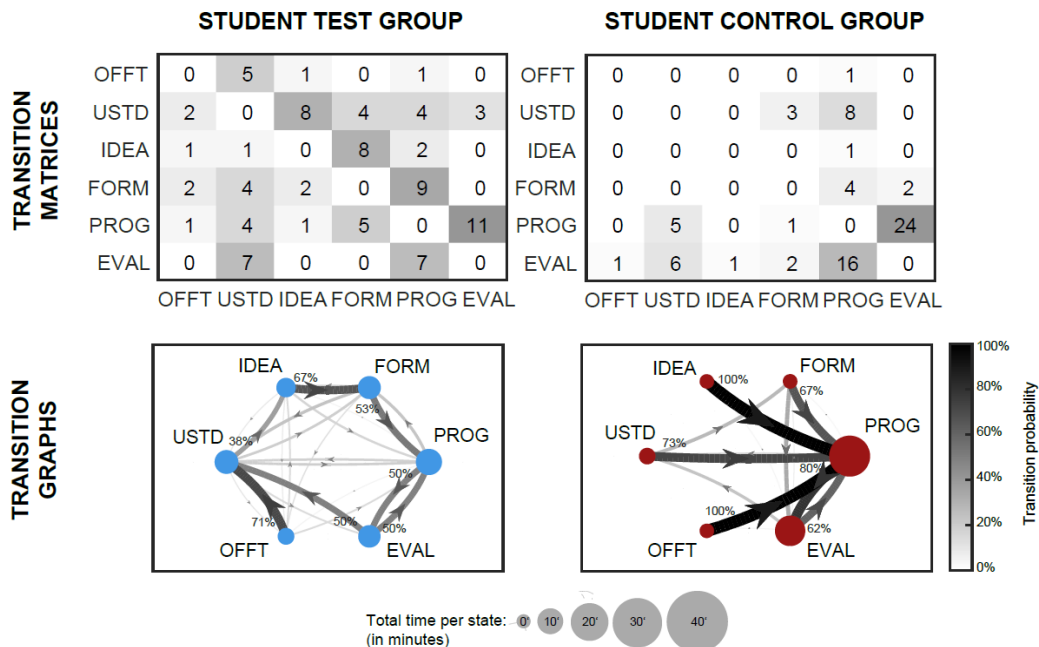
- 40 minutos de atividade em grupos de 2-3 alunos
- Duas condições: Cinco grupos sem restrições, Cinco grupos com restrições de tempo (acesso à interface bloqueado)



Chevalier, M., Giang, C., Piatti, A., & Mondada, F. (2020). Fostering computational thinking through educational robotics: A model for creative computational problem solving. *International Journal of STEM Education*, 7(1), 1-18.

Thymio corta-relva







Obrigado!