Versione PROVVISORIA del contributo presentato al Convegno Annuale

MUTANT: MUltimodAl, TrAcked aNd parTecipated e-learning

Valentina Cesari[1], Angelo Gemignani[2], Danilo Menicucci [3]

[1,2,3] Department of Surgical, Medical and Molecular Pathology and Critical Care Medicine, University of Pisa, Italy

[1]valentina.cesari(«»)phd.unipi.it

[2]angelo.gemignani(«»)unipi.it

[3] danilo.menicucci(«»)unipi.it

ABSTRACT

MUltimodAl, TrAcked aNd parTecipated e-learning (MUTANT) is a concept prototype for optimize skills acquisition *via* e-learning platforms taking advance from three essential psychological assumptions: multimodal learning to enhance sense of presence; eye-tracking to detect fatigue/cognitive load; interactive learning to encourage participated decision making.

KEYWORDS

E-learning, eye-tracking, multimodal integration, participated learning

1. INTRODUCTION

E-learning the unique alternative to guarantee the continuation of educational services due to COVID-19 pandemic restrictions. However, it has some limitations: it requires motivation and time management abilities to face absence of personal relations and remoteness; it is not effective when hands-on practical exercises are required (Arkorful and Abaidoo, 2015); it leads to excessive fatigue during demanding and complex teaching (Pimenta et al., 2020).
The implementation of MUTANT could overcome these limitations, since it is anchored to strong assumptions.

2. BEHIND MUTANT

1. Multimodal. The enhancement of external perception *via* multimodal integration is important for cognition and thinking (Anastopoulou et al., 2011). Skills acquisition could be optimized adopting embodiment-based learning (e.g by integrating haptic feedbacks), since individuals experience a higher control of supplementary sensory information as their own, thus increasing the sense of agency (Caspar et al., 2015).
2. Tracked. Accumulating evidences indicate that eye tracking is a reliable method to detect signs of cognitive load and fatigue, that often prevent skills acquisition (El Haddioui, 2019). Parallelly, it provides a real-time feedback to the user. Individuals could be trained to detected signs of "nonoptimal state" by receiving, initially, feedbacks signaling a state of fatigue/overload. For enhancing self-control and state awareness, individuals will recognize nonoptimal state without being informed by feedbacks.
3. Participated. A virtual environment in which individuals could manipulate the same object by receiving tactile feedback could augment the sense of group presence. Individuals will be also stimulated with group decision-making learning tasks, in which superordinate goals will be reached after a process of exchange and integrate information.

MUTANT will take advantage from internet-based learning to allow small groups to interact real-time via haptic interface in conjunction with visual/auditory one, while subjects wear non-intrusive glasses for eye-tracker. Educator (i.e., teacher) will supervise the entire sessions promoting activities which stimulates group decision-making.

MUTANT will optimize intellectual and perceptual-motor skills during e-learning sessions, offering the opportunity to minimize side effects related to the absence of physical environment, thus guarantying an optimal learning process.

ACKNOWLEDGEMENTS

Progetti di Ricerca di Ateneo 2020-2021 - Servizi pubblici e piattaforme digitali. Categorie giuridiche, processi, garanzie (PRA_2020_73)

REFERENCES

[1] Anastopoulou, Stamatina, Mike Sharples, and Chris Baber. 2011. "An Evaluation of Multimodal Interactions with Technology While Learning Science Concepts." British Journal of Educational Technology 42 (2): 266–90.
[2] Arkorful, Valentina, Nelly Abaidou 2014. "The Role of E-Learning, the Advantages and Disadvantages of Its Adoption in Higher Education." *International Journal of Education and Research* 2 (12).
[3] Caspar, Emilie A., Axel Cleeremans, and Patrick Haggard. 2015. "The Relationship between Human Agency and Embodiment." Consciousness and Cognition 33 (May): 226–36.
[4] El Haddioui, Ismail. 2019. "Eye Tracking Applications for E-Learning Purposes." Cognitive Computing in Technology- Enhanced Learning, 151–74.
[5] Pimenta, André, Sergio Gonçalves, Davide Carneiro, Florentino Fde-Riverola, José Neves, and Paulo Novais. 2015. "Mental Workload Management as a Tool in E-Learning Scenarios." In *IEEE*, 25–32.