# Sign Language by combining video, interactivity and play

Daphne Economou, Markos Mantzelopoulos, Stephen Selwood, Said Abduvaliev, Shirin Primkulova, Timur Martinez-Mukimov


Serious Games at Westminster

Dr Daphne Economou -
D.Economou@westminster.ac.uk

# Outline of the presentation

- Introduction to the research group
- Research context
- Theoretical framework
- Current results
- Future updates and study

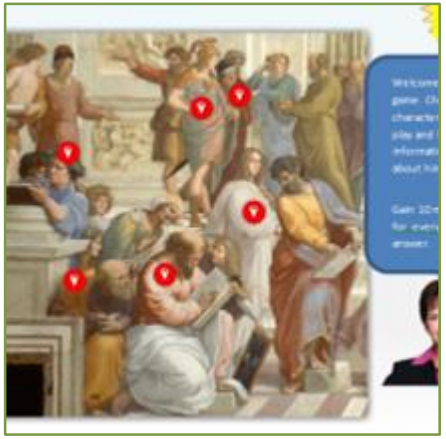
The aim of the Serious Games at Westminster Research Group (SG@W) is to conduct strategic research and developmental activities that focuses on understanding the factors and approaches that contribute to effective serious games design and lead in changes in various domains including:

education

healthcare

culture

publishing



Dr Daphne Economou -
D.Economou@westminster.ac.uk
iLRN2019, London 23-27 June

6/26/2019

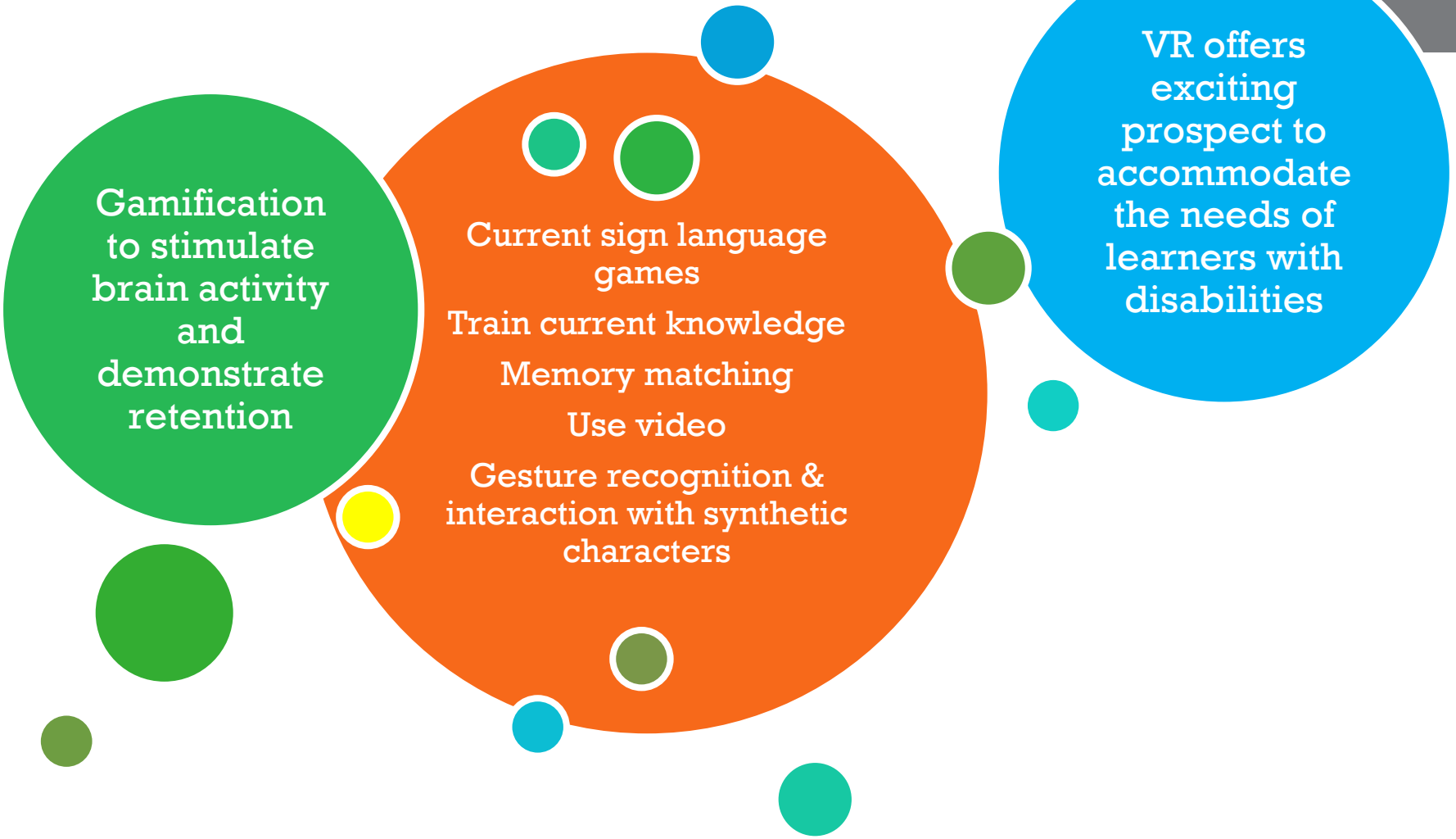
# Serious Games at Westminster

- Members: 7 academics, 6 PhD students since 2015
  - **Mamfe-ter Jacklyn Gemade** – started January 2017 - ***Study the effect of the combination of multimedia theory and gamification in adult education***
  - **Jamil Khan** - started September 2020 - ***Gamification for improving life style*** [working with the Cancer Research Group at the UoW and aiming to develop results that will benefit breast cancer patients]
  - **Md Tusher Sarker** - started September 2020 - ***Serious Games to enhance the visiting experience in Cultural Context*** [forming collaboration with Sutton Hoo and Barbican]
  - **Maritina Keleri** - starting September 2021 – ***The translation of Art into a VR procedure*** [working with the XR lab and using a new facility for VR eye tracking and analysis. Combining VR and Arts]
  - **Argyriou, Lemonia** – *Successfully completed March 2020* - ***Gamification approaches and interaction design in 360° immersive video*** [produced publications that have been **cited by 87**]
  - **Marda, Maria** – *Successfully completed March 2020* - ***Studied the effectiveness of gamification and creativity on digital educational contexts to achieve Deep Learning*** (in pedagogy). Case study on raising awareness for Domestic Violence and Abuse
- Collaboration with Westminster International University in Tashkent (WIUT) in a project for **learning sign language (BSL and Uzbeck) using a VR gamified environment**
- Dissemination of knowledge:
  - approximately 30 publications since 2015
  - Broad members of the Immersive Learning Research Network (iLRN) and organisers of the iLRN conferences
  - Funding members of the IEEE ILE-TC (Technical Committee on Immersive Learning Environments) part of IEEE Education Society
  - Work with Virbela and offering a Virtual campus to be used for student engagement and immersive learning research [**invitation to PhD students and researchers to use the iLRN VR campus creatively**]
- Impact on UoW student experience by designing and developing applications:
  - To engage students with the University life [http://vbouki.com/naviwestminster/story.html]
  - For Information provision & connecting with students [http://vbouki.com/Xmaspsychometrictest/]

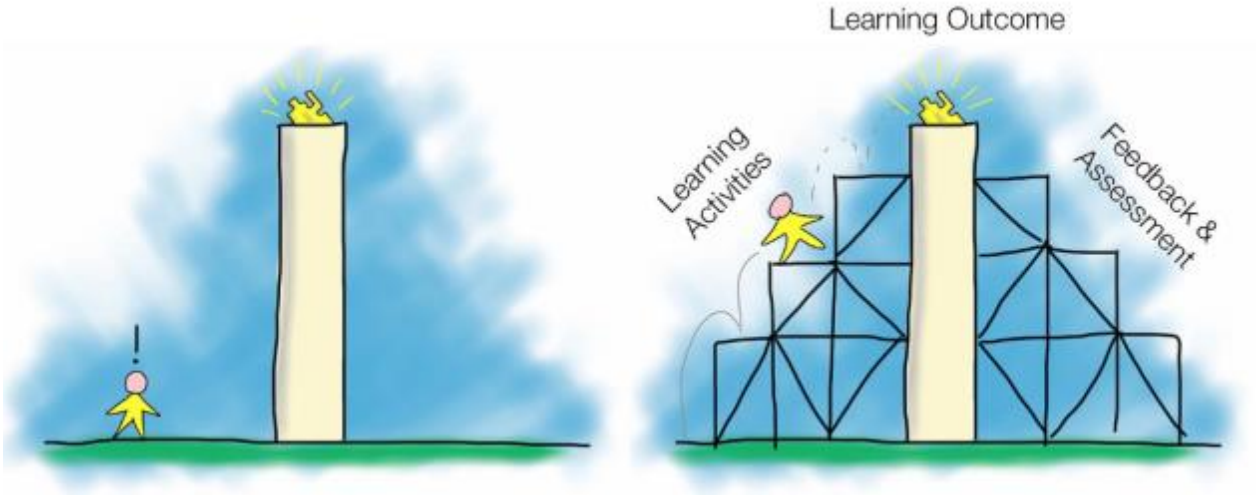

# Context of research

- Based on official statistics:
  - 900,000 people in the UK are severely or profoundly deaf and based on a study by Action On Hearing Loss UK in 2013 only 24,000 of this population, 17 percent, can use the British Sign Language (BSL);
  - A massive proportion of people with a hearing impediment people struggle in social interaction and an even larger proportion of able hearing people who cannot communicate with those of the deaf community;
  - Sign language is the preferred the medium of communication used by a large population experiencing hearing loss, or hearing impediment.
  - 51,000 of the UK population can use the British Sign Language (BSL), 87,000.
- Trying to learn a new language at later stage in life, especially studying at home using educational software or apps is hard.


# Related work



# The theoretical framework




- The educational resource uses an **instructional scaffolding** approach in learning.

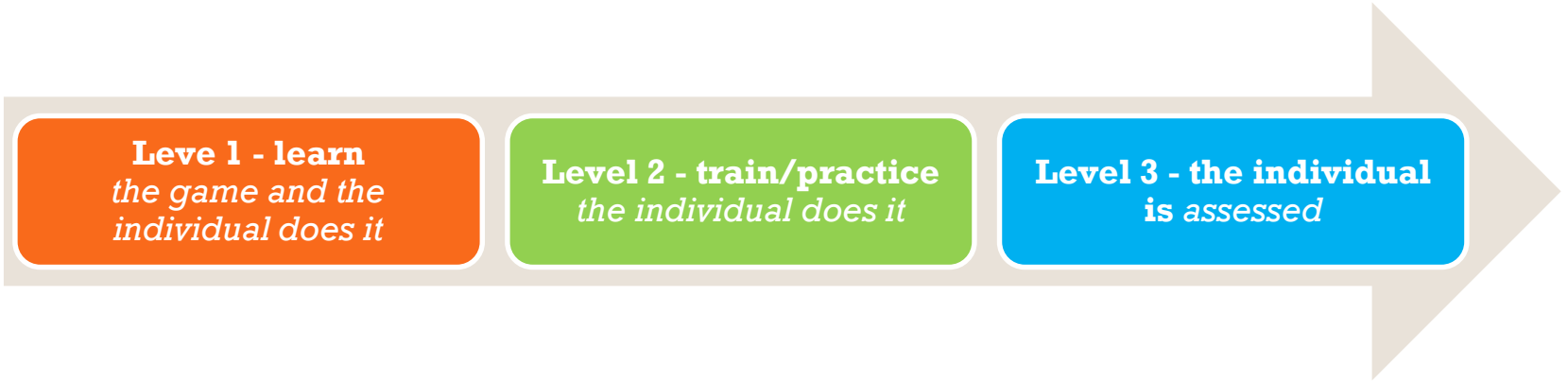
  D. J. Wood, J. S. Bruner & G. Ross, *"The role of tutoring in problem-solving"* 1979

- A systematic sequencing of prompted content, materials, tasks, and teacher and peer support to optimize learning.

  S. V. Dickson, D. J. Chard and D. C. Simmons, *"An integrated reading/writing curriculum: A focus on scaffolding," 12-16,* vol. 18, no. 4, pp. 12-16, 1993

# The theoretical framework

- Similar to scaffolding used in construction, the 3D interactive game platform puts in place temporary support structures to assist students in the process of learning the BSL alphabet. It tailors the learning process to the needs of individual learners by enabling a self-paced exploration of the immersive environment.



# Game


- The lore provides a mission
- The game mechanics to motivate and engage learners

# Signum Battle – The lore

***Mermaids** have used their enchanting **song to lure humans into the sea**, the survivors left in this fantasy world have survived because their **lack of hearing has empowered** them to be immune to the mermaid's chant. The mermaids have become aware of their limitation and have summoned walking sea creatures to come into land to protect the mermaid territory and the humans they have trapped. **A young character** has stumbled into this world and decides to go on a mission to help them. The mermaids and their minions are debilitated by the magical powers of the sign language used by the people of this land, and so the heroine needs to pick up the skills and magical powers of this language to attack the minions, reach the mermaids lair and rescue the humans. The language to be learned is the BSL."*


- The **backstory** is used to provide a framework for a **mission** based game structure;
- This power used to defeat sea creatures is unrealistic, but the players submerse themselves in a game they experience "**suspension of disbelief**" (the cognitive estrangement in fiction) – some people call it immersion
- The **disability becomes a special/magical** power, the subject of deafness is approached in an inclusive and non-patronising way, deafness is presented as positive and empowering element in the story of the game.

# Genre

- **Genre -** third person hybrid action
- Adventure – educational game, aiming to teach sign language in a fantasy mythological world
- The player/learner takes on the role of a hero/explorer who needs to complete several quests to advance through the game.
- The quests are learning based.

# Game demographic

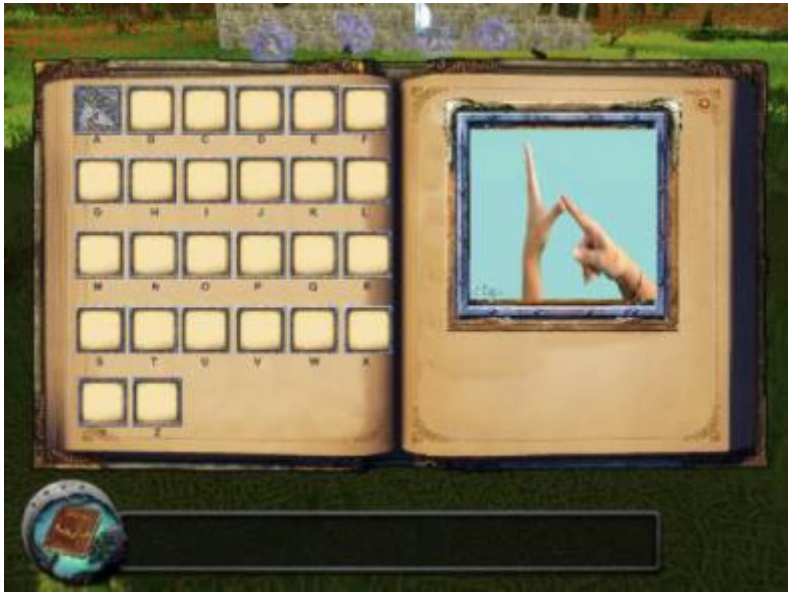
People that learn sign language later in their life. Taking into consideration that after Level 2 of the game there is suggestion to mild violence per the Entertainment Software Rating Board the band in which the game fitted best I s E10+ (Everyone ten and over)

# Current version Game controls

- The game is controlled by mouse clicks to move around and interact with objects in the environment.
- Gestures, using a leap motion controller, are used to practice the signs that have been learned or make selections.
- The keyboard is used to recognise signs.

# Game Levels & Mechanics

Leve 1 - learn → Level 2 - train/ practice → Level 3 - assessment



# Game Levels & Mechanics

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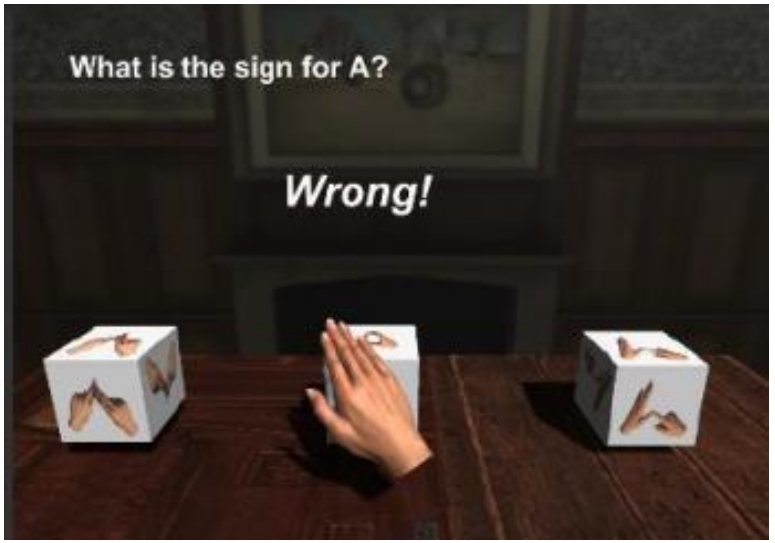

# Game Levels & Mechanics

Leve 1 - learn → Level 2 - train/ practice → **Level 3 - assessment**


# Initial Evaluation

- Heuristic evaluation of the game

  *Economou, D., Gonzalez Russi, M., Doumanis, I., Bouki, V., Mentzelopoulos, M. and Ferguson, J. (2019) Adult Learning Sign Language by combining video, interactivity and play in a 3D game platform, Proceedings of the 5th International Conference of Immersive Learning Research Network iLRN2019, London UK, pp. 99-106*

- Not great difference between learning via videos and the game
- Preference to the game

  *Economou, D., Doumanis, I., Bouki, V. and Mentzelopoulos, M. 2020. Using serious games for learning sign language combining video, enhanced interactivity and VR technology. Special Issue of Journal of Universal Computer Science (J.UCS) on Exploring Immersive Technologies in Learning. 26 (8), pp. 996-1016*

# Game update - Future studied

- Implement all 26 letters
  more realistic e
  memory



- Experiment with 3 designs in the learning level:
  - busy - 8 letters
  - not busy - 8 letters
  - not busy with mnemonics - 10 letters


- Replace leap motion with hand recognition
- Integrate speech for recognising the letters in the assess level
- VR game

# Study

- Comparative study 1
  - video vs updated game
- Comparative study 2
  - desktop vs VR

# Data

- Learning - Performance
  - Time to complete a path
  - Errors - letters they missed to form correctly
  - Errors and if they visited the inventory to watch the video again
  - Path they completed and performance in the assessment (the last level)
- User engagement using biometric data
  - Heat Maps of the desktop game using imotion
  - Heat Maps of the VR game using imotion

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https://www.westminster.ac.uk/serious-games-at-westminster-research-group