university of groningen

Learning design frameworks and guidelines of MARG

Presenter: Azadeh Rahimichatri

UMARG project
Reference number: 2019-1-RO01-KA201-063778

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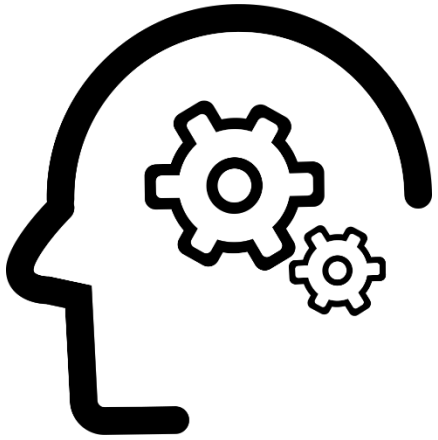
Theories of learning



- Game based learning theory
- Situated learning
- Computer supported collaborative learning

oNline Web Fonts

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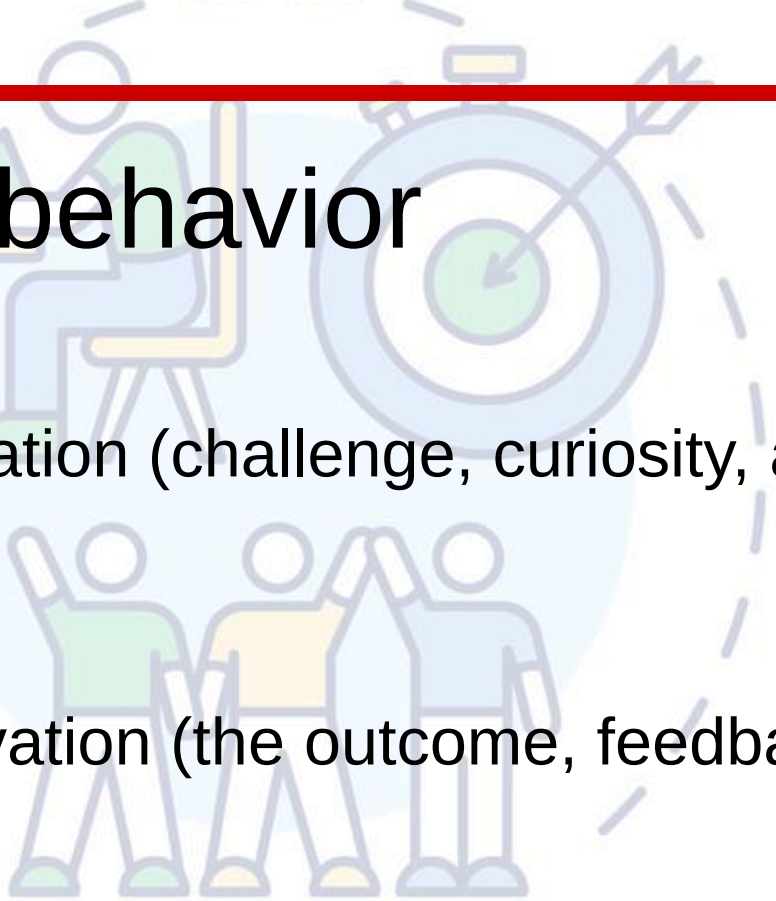
Learning behavior

- Intrinsic motivation (challenge, curiosity, and fantasy)
- Extrinsic motivation (the outcome, feedback)



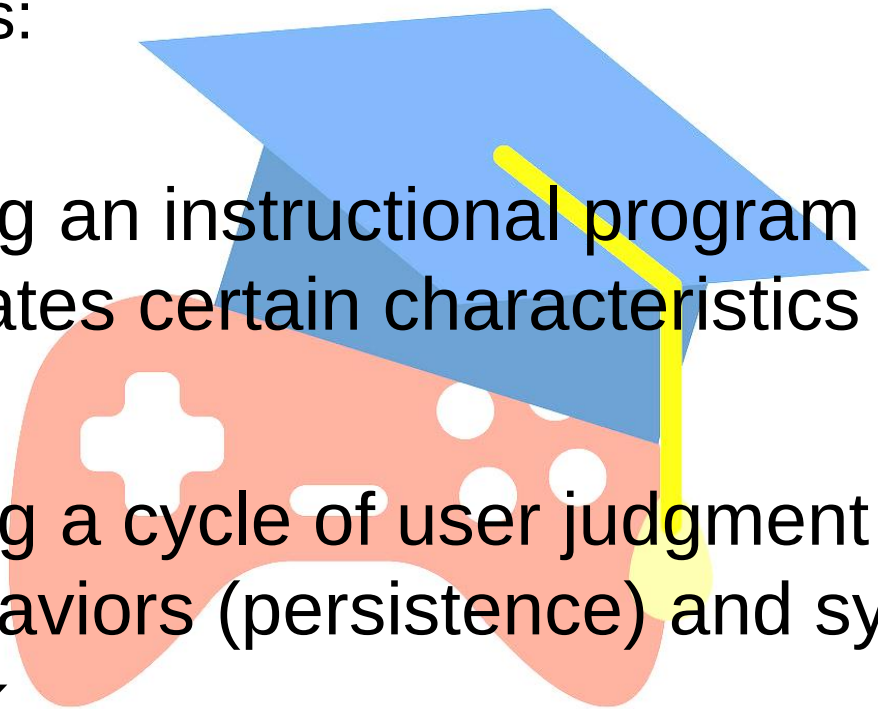
Motivated Students

Garris, Rosemary, Robert Ahlers, and James E. Driskell. "Games, motivation, and learning: A research and practice model." *Simulation & gaming* 33.4 (2002): 441-467.

Malone, 1981; Malone & Lepper, 1987.

Game based learning model

› Objectives:



- Designing an instructional program that incorporates certain characteristics of games

- Triggering a cycle of user judgment (interest) , user behaviors (persistence) and system feedback

Garris, Rosemary, Robert Ahlers, and James E. Driskell. "Games, motivation, and learning: A research and practice model." *Simulation & gaming* 33.4 (2002): 441-467.

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Framework for the development of the games

1. Game-based learning model
2. Dimensions of game design
3. Framework for the development of the games
4. Specific game components

Garris, Rosemary, Robert Ahlers, and James E. Driskell. "Games, motivation, and learning: A research and practice model." *Simulation & gaming* 33.4 (2002): 441-467.

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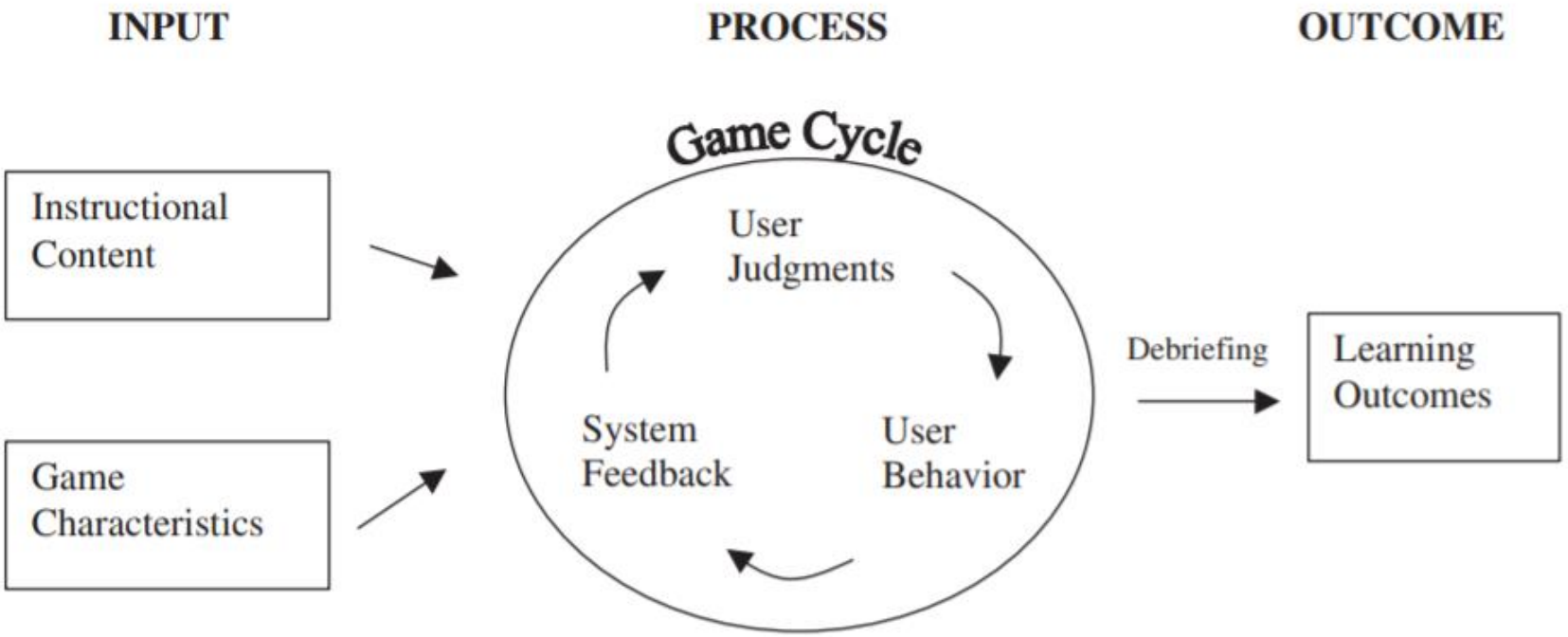
1- Game based learning model



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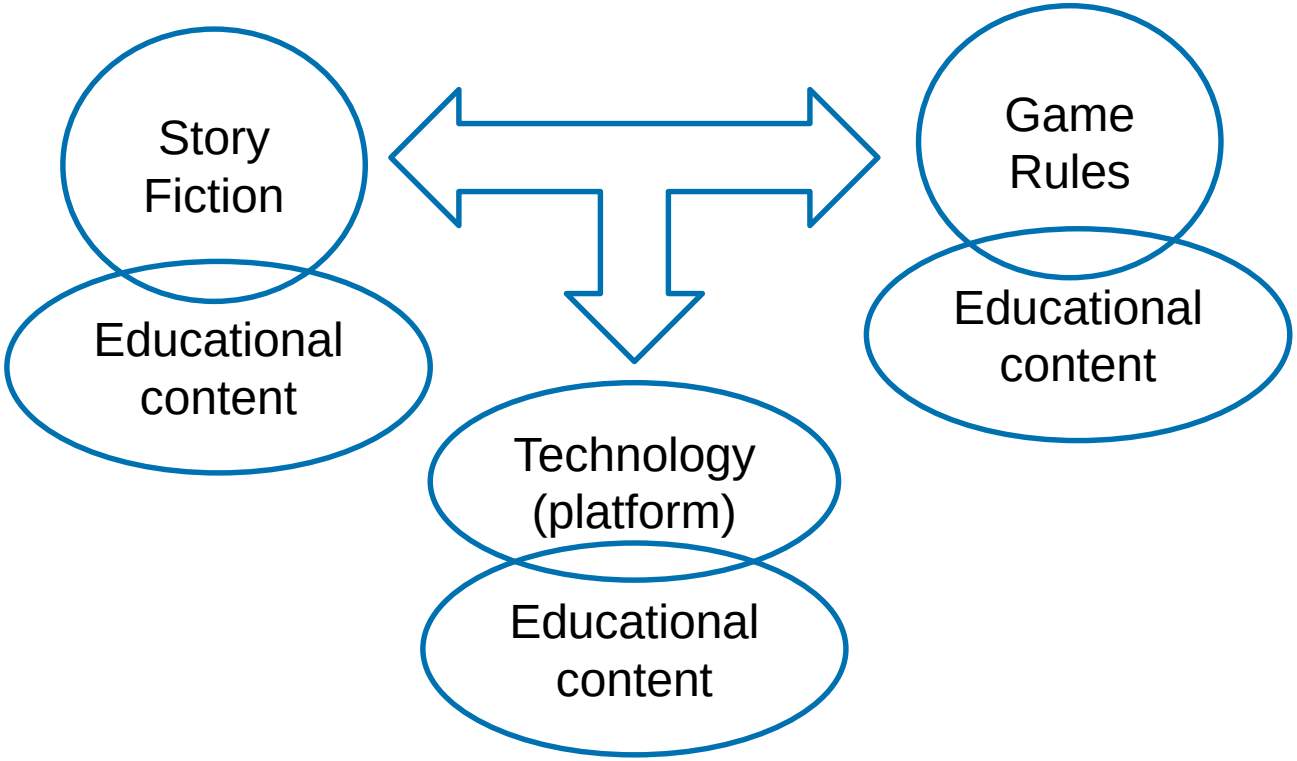
2- Dimensions of game design



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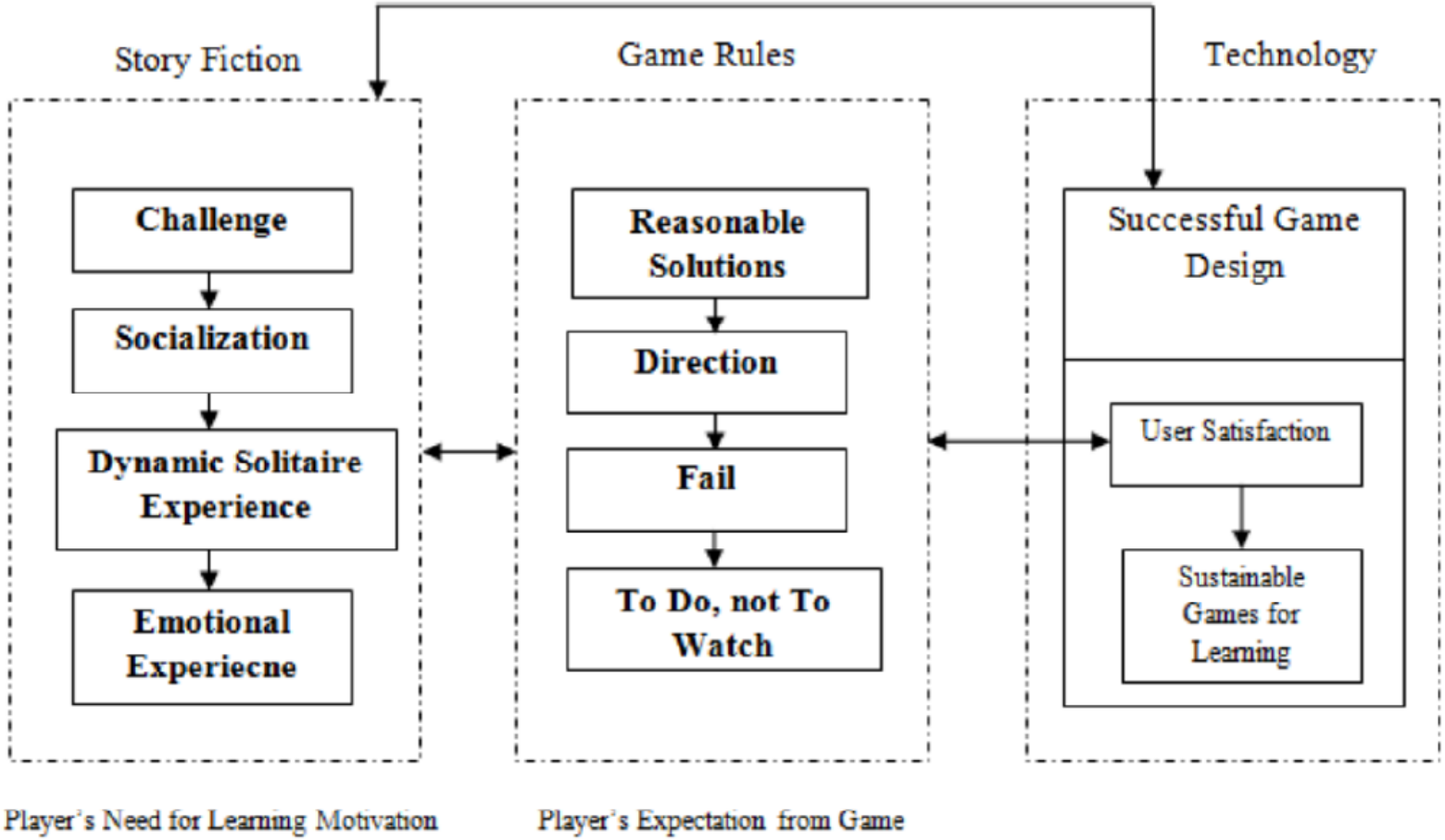
3- Framework for the design of the games



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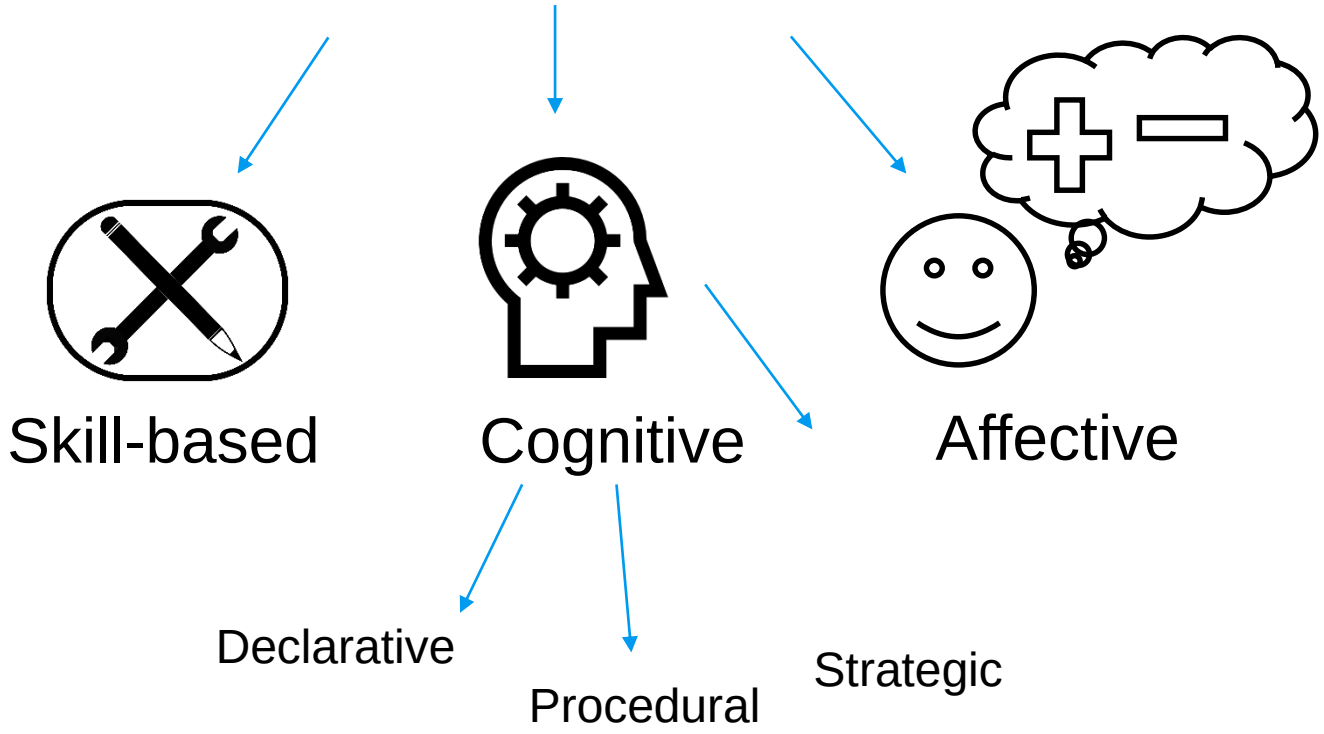
4- Game components

Game component
Game character(s)
Clear story/series of events/beginning-middle-end
Opportunities to learn about diversity
Opportunities for Collaboration
Opportunities to develop problem-solving skills
Opportunities to develop leadership skills
Opportunities to develop active citizenship skills
Opportunities to develop data-literacy skills
Opportunities to develop critical thinking skills
Opportunities to develop information literacy skills
Applications to everyday life
Sound
Feedback/rating system
Visuals

Learning opportunities provided by game design

- Collaboration
- Problem solving
- Leadership
- Social interaction
- Active citizenship
- Data and information literacy
- Critical thinking
- Applying scientific knowledge to everyday life

Types of learning objectives



Icons made by Freepik from www.flaticon.com

Garris, Rosemary, Robert Ahlers, and James E. Driskell. "Games, motivation, and learning: A research and practice model." *Simulation & gaming* 33.4 (2002): 441-467.

Game scenario in terms of its objectives

	Learning outcomes of the scenario (Sustainable waste)	
Declarative	**In terms of knowledge**	The learner **knows and understands**: ✓ Lansink's Ladder; the different ways to process waste; from dumping to re-using ✓ Ecological footprint in relation to using natural resources ✓ Circular Economy
Procedural	**In terms of skills**	The learner is able to: ✓ **Make decisions** about the best ways to deal with various forms of waste. ✓ Balance economical and ecological factors
Strategic	**In terms of competences**	The learner: ✓ **Proposes** solutions for improving waste management and lessening the use of natural resources. ✓ **Makes calculated decisions** about waste management from an economic and ecological standpoint

Types of game scenarios

- **Framing an assignment** (Markouzis & Fessakis, 2016, and Squire & Jan, 2007)

- **Describing the environment and asking for exploration** (Pombo, Marques,
- Afonso, Dias, & Madeira, 2019)

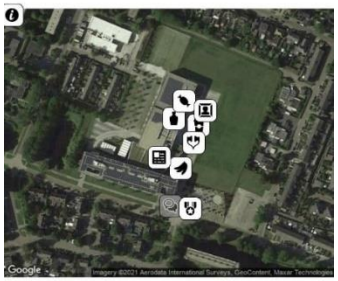
Game scenarios supporting learning objectives

- **Directly** (Furió, GonzáLez-Gancedo, Juan, Seguí, and Rando (2013))
- **Indirectly** (Pombo, Marques, Afonso, Dias, & Madeira, 2019)

Game scenario example

Title of the scenario:	Sustainable waste

The learner starts with a selection of waste that can be found around the house, like kitchenscraps, packaging materials, clothes and e-waste. Located around the play area are different options to dispose of this waste, based on Lansink's ladder. Each wasteproduct has an optimal location to dispose of it, earning (or costing) the learner points and coins, depending on the locations they choose to drop of their waste. Each location also gives information about how that location deals with different kinds of waste, allowing the learner to make a calculated decision on what type of waste to drop of there.



Level of the games

Each game level is customized to a specific target group

Title of the scenario:	**Sustainable waste**
Age range of learners:	**9-12 years old**
Learners' special characteristics: (i.e. immigrants, special needs)	None

Game characters

- Player
- Virtual guide for information
- Virtual character for interaction

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Example of game scenario character

Title of the scenario:	Sustainable waste

- Each location is represented by **a virtual employee or manager** that provides information on how the location processes certain types of waste.

- Optionally **a main character** archetype can be added to represent the player and **a narrator-type character** to inform the player of the consequences of their choices.

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Developing understanding and respecting diversity

- Everybody willing to express his/her opinion and need to understand and respect various points of views.
- Students starting to be more aware and tolerant of others' opinions
- Offering the freedom to devise their own purposes based on their previous experience and knowledge

Collaboration skills

› Playing the game in groups:

- To select a correct answer
- To make a decision
- To select a virtual character to talk with
- To engage students in interpretive and problem-solving activities

Schrier, Karen. "Reliving the Revolution: Designing Augmented Reality Games to Teach Critical Thinking." *Games and Simulations in Online Learning: Research and Development Frameworks,* edited by David Gibson, et al., IGI Global, 2007, pp. 250-270. http://doi:10.4018/978-1-59904-304-3.ch013

Example of game scenario collaborative work:

Title of the scenario:	Sustainable waste

- **Small groups** start the game at school by checking out the items they have to drop off and **make a plan** about what items to drop off where.
- **The players decide** what locations to visit and in what order they do so.

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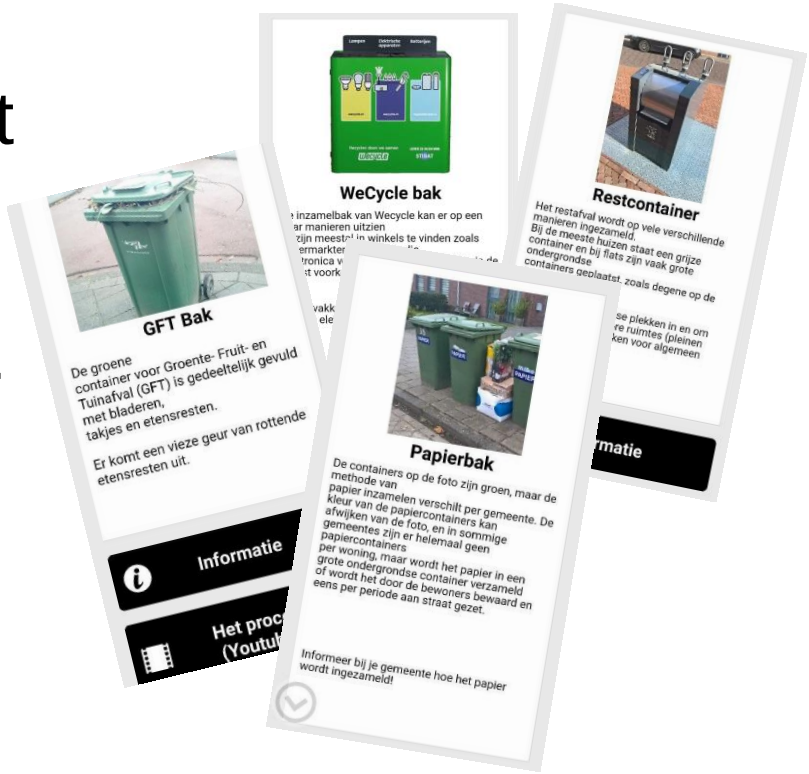
Problem solving skills

Title of the scenario:	Sustainable waste

Players are informed about how each location deals with different kinds of waste, allowing the learner to **make a calculated decision on what type of waste to drop of there**.



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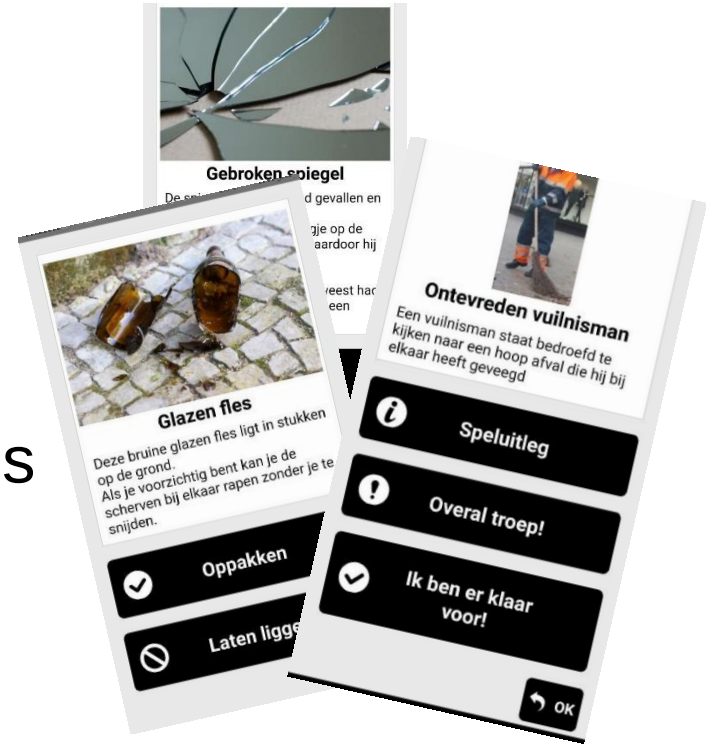
Leadership skills

- Some AR games let users be the leader, making them in charge of the pairs that are playing the game. Participants take turns as the leader.

Active citizenship skills

Title of the scenario:	Sustainable waste

- Awareness of an ecological problem
- Improving waste management and the use of natural resources



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Information and data literacy skills

Title of the scenario:	Sustainable waste

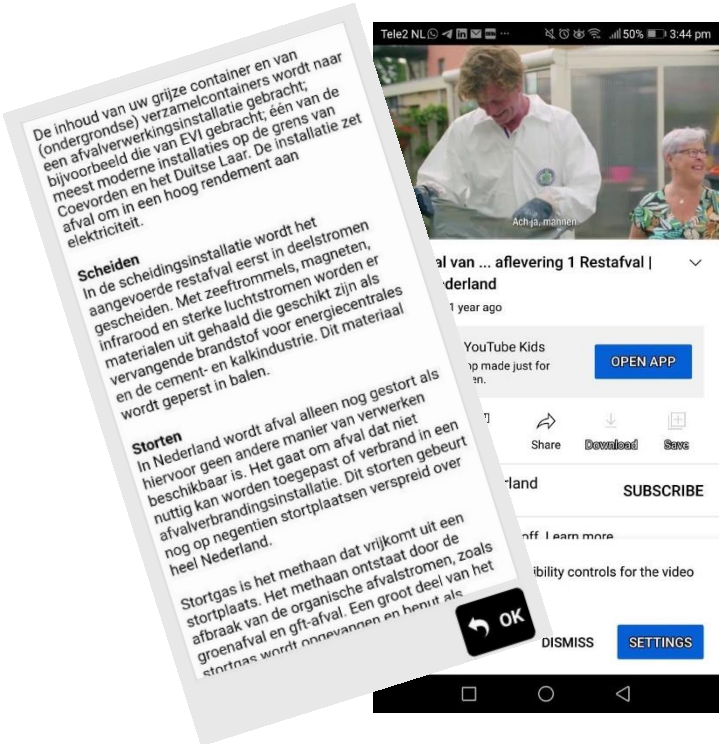
- The students have **to receive the background information** that the guide character in each location gives them, in order to make their decision.

- Players are encouraged **to use information** provided in each of the locations on how that location deals with waste, in order to make a choice.

Example (receiving information)

Title of the scenario:	Sustainable waste

1. Sympany – textile re-use and recycling (**warehouse and office**):
   In this area **players are introduced to** a warehouse employee. They learn about textile recycling through the discussion with the virtual character or through a video.
2. Alting Metal recycling (**metal trader**)
   In this area, through interaction with a metal trader, **players learn about** metal recycling.
3. 'Het Goed' **thrift store**
   The employee of **a thrift store gives information** on how they process old products.
4. 'Milieupark het Kanaal' (**municipal recycling center**)
   Player gains information about how municipality recycles products.
5. 'Tiny Cruiming Meubelstoffering' (**upholstery and furniture restauration**)
6. 'Marktplaats' – **online secondhand trading**



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Information and data literacy skills

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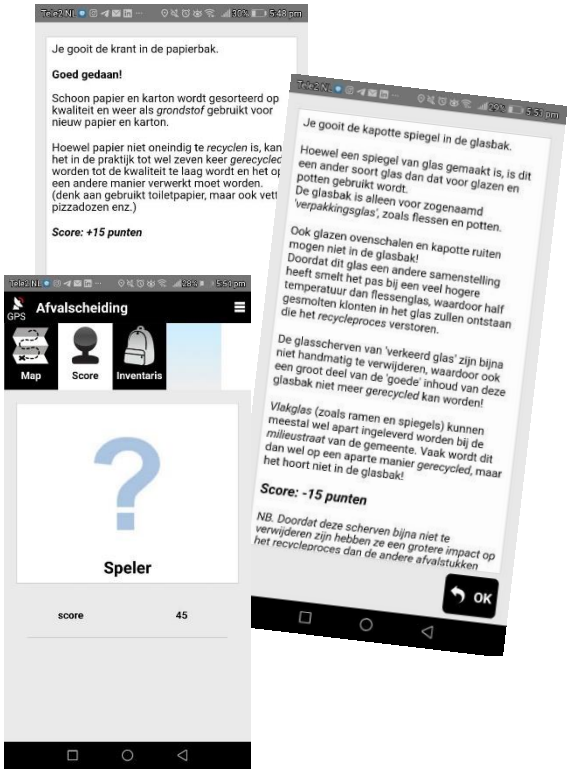
- Players are encouraged **to use information** provided in each of the locations on how that location deals with waste, in order to make a choice.

Example (using information)

Title of the scenario:	Sustainable waste

At each location, players can drop off one or more waste items, scoring points depending on the locations they choose to drop of their waste.



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Applications of scientific knowledge to everyday life

- Decision making in real life situations
- Short and long term consequences of decisions
- Digital tools allow players to process the information in a new way (eg. Calculator in “sustainable waste”)

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Critical thinking skills

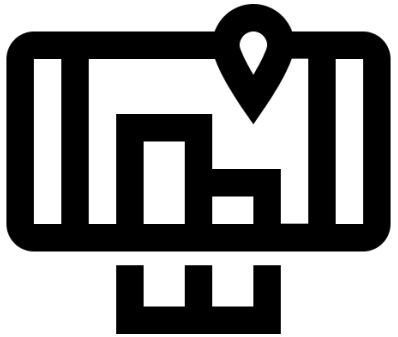
‘The process of analyzing information in order to make a logical decision about the extent to which you believe something to be true or false’.

- Thinking
- Selecting appropriate objects
- Making decisions
- Evaluate information and forming hypotheses

Technical affordances

The technical affordances are the technologies that are used in the game design and are available to the players while playing the game.

- Camera
- Map
- GPS technology
- Touch screen interaction
- Interaction with virtual character
- Sounds, visuals,..



Augmented Reality games

(guidelines for MARG design)

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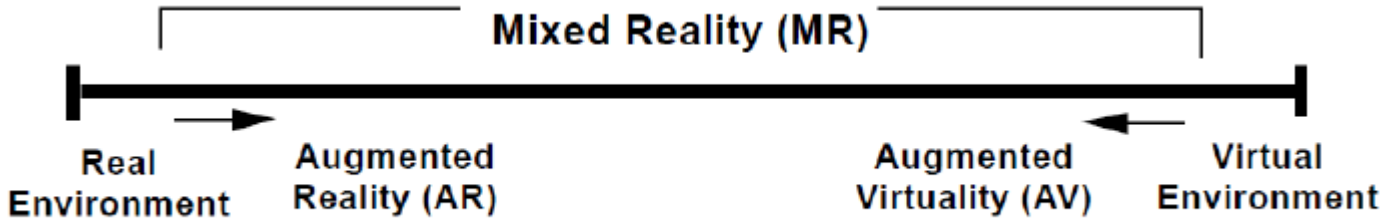
What is Augmented Reality (AR)?



"augmented reality
games are games played in the real world with the support of digital devices (PDAs, cellphones) that create a fictional layer on top of the real world context"

Milgram, Takemura, Utsumi and Kishino, (1994)

Squire and Jan (2007)

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Features of Augmented Reality

- Combined real and virtual objects
- Opportunities for real time interaction
- Accurate registration of three-dimensional virtual and real objects

People vector created by macrovector - www.freepik.com

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Types of Augmented Reality

- Image based

  "the image-based augmented reality is focused on image recognition techniques used to determine the position of physical objects in the real environment for appropriate location of the virtual contents related to these objects"

- Location based

Cheng & Tsai, (2013)

Wojciechowski and Cellary (2013)

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Guidelines for MARG design

- Pedagogy
- Gameplay
- Game scenario
- Social interacting
- Technology

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Pedagogy

‘The theory or principles of education or a method of teaching based on such a theory’

Guidelines regarding pedagogy

- Clear educational objectives
- Creating challenging exercises, and reflection
- Make use of the context and environment
- Explicit role for the teacher

Dunleavy & Dede (2014)
Fotouhi-Ghazvini, Earnshaw, Robison & Excell (2009)
Li, Spek, Feijs, Wang & Hu (2017)

Gameplay

‘The features of a game, such as its story or the way it is played, rather than the images or sounds it uses’.

Guidelines regarding gameplay

- Mixed reality
- Both a virtual and a real environment
- Integrate several levels
- Scaffolding hints
- Clear set of rules

Guidelines regarding game scenario

- The narrative preferably has a definitive ending
- Showing reality
- Scoring systems and rewards

Dunleavy and Dede (2014)

Social interaction

‘Any process that involves reciprocal stimulation or response between two or more individuals’.

Guidelines regarding social interaction

- Team work, role play, and communication channels
- Integration of necessity of teamwork

Dunleavy & Dede, 2014

Li, Spek, Feijs, Wang & Hu, 2017

Technology

› ‘Scientific knowledge used in practical ways in industry, for example in designing new machines’.

Guidelines regarding technology

- Experience of the game
- AR must not become a barrier to the environment
- Multimedia-based content and storylines
- Practice environment
- Working in different settings

Thank you for your attention