Activity Theory-based Model of Serious Games (ATMSG) in a nutshell

What is the ATMSG?

- A conceptual model to represent, in a systematic way, how gaming, learning and teaching elements are connected to each other throughout an educational Serious Game (SG).

The theory behind the ATMSG

- Activity Theory is the underlying theoretical framework. All human endeavor is called **activity**, defined as the interaction between **subject** and **object**, mediated by **tools**, resulting in an **outcome** (Fig 1).

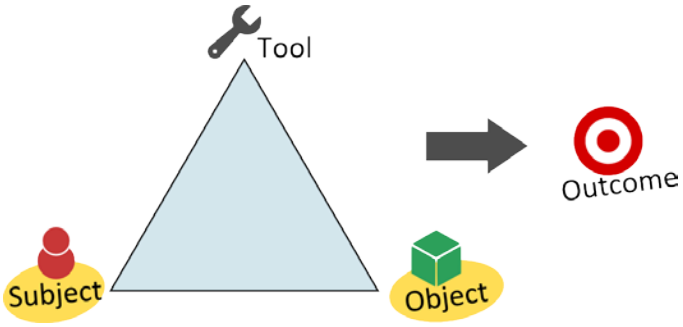

Fig 1. The triangle of activity.

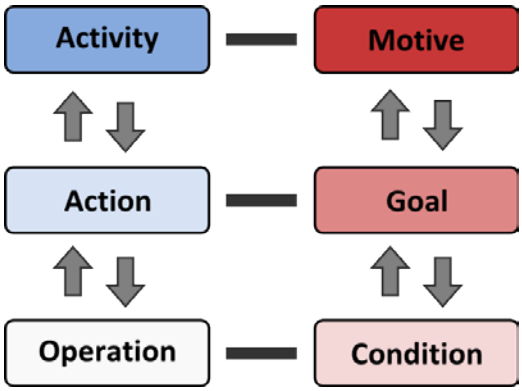

Fig 2. Hierarchical structure of the activity.

- Activities are hierarchical structures with three levels: activities are realized by actions, which in turn are composed by operations. Activities are driven by motives; actions are driven by goals; operations happen according to the conditions. (Fig 2)
- In the ATMSG model, we look at educational SGs as a network of (at least) three activities: **gaming**, **learning** and **instructional** (Fig 3).
- The instructional activity can be subdivided in two activities:intrinsic instructional activity (performed inside the game) and the extrinsic instructional activity (performed by the instructor outside of the game).

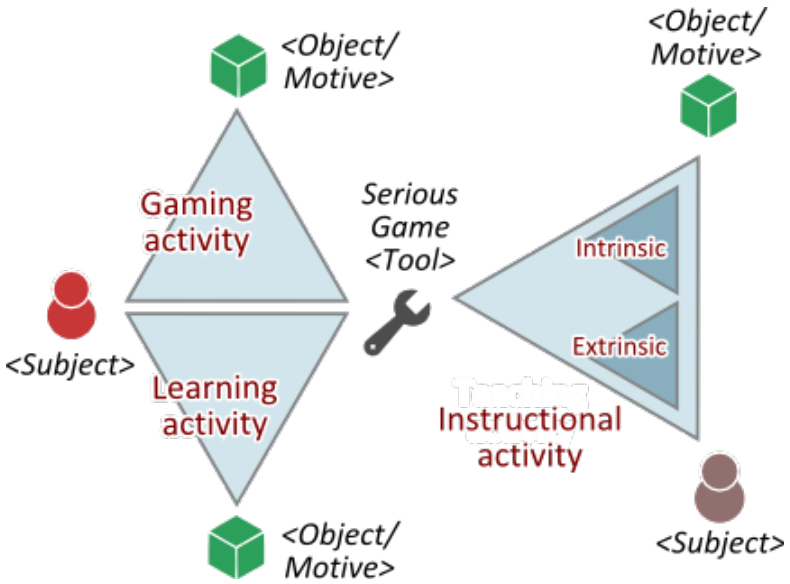

Fig 3. Network of activities in the use of an educational SG.

How to apply the ATMSG model for game analysis

- **Step 1:** Describe the activities involved in the activity system and identiy their subjects and corresponding motives (see Table 1). Each description shifts the understanding of the game and highlights the main aspects of each activity, guiding the user in observing the game from different but complementary aspects.
  - *It is hard to know for sure the player/learner's motivations, but we try to uncover the strategies that the SG designer tried to use to engage players/learners in the SG.*
  - *When analyzing the game from a general point of view (and not in a specific context of use), the fields on the external teaching activity should not be filled in.*
- **Step 2:** Draw a diagram that represents the game sequence in a rough time-line. The purpose of this diagram is to establish a reference point to uncover how the elements of the activity system, which will be identified in Step 3, are connected throughout the game.
  - *Represent the game sequence using shapes connected by arrows (like in an UML activity diagram).*
- **Step 3:** Fill in the actions/tools/goals table (see Table 2 for guiding questions), describing the actions, the objectives and the elements that mediate that action. Match vertically the descriptions with the corresponding step of the game sequence.
  - *Choose the relevant element directly from the taxonomy of serious game elements.*
- **Step 4:** Group each set of actions, tools and goals that are from the same type of activity and that are related to the same node of the game sequence. For each of those blocks, provide a more complete description of their implementation, explaining what is being done at that point in the game, using which tools, with which purpose.

	Subject	**Description**
Gaming activity	Who is the player?	Why is the subject playing? What are the general objectives of the game?
Learning activity	Who is the learner?	Why is the subject engaging with the game? What are the learning objectives of the game?
Intrinsic instructional activity	Why is the subject engaging with the game?	Why was the game produced? How is the game trying to convey its learning contents?
Extrinsic instructional activity	Who is using the game to teach something?	Why is the subject using the game? How is the game used to teach something? Are there any other tools used in conjunction with the game to achieve the learning objectives?

Table 1. Guiding questions to describe activities

	Gaming activity	**Learning activity**	**Internal teaching activity**	**External teaching activity**
Actions	How does the game unfold? Which actions does the subject perform in the game?	What tasks does the subject do in the game that are directed towards the learning goal?	What happens in the game that supports the learner to achieve the learning goals (assessment, feedback)?	What happens, during the game but outside of it, that supports the learner to achieve the learning goals?
Tools	Which elements are involved/used in the gaming actions?	Which elements are involved/used in the learning actions?	Which elements are involved/used in the game to support the instructional actions?	Which elements are involved/used, outside the game, to support the instructional actions?
Goals	What does the subject have to achieve in the game at this point?	Which knowledge or skills the learner is expected to acquire with the learning actions?	What are the instructional goals of the game at this point?	What are the instructional goals driving the actions described above?

Table 2. Questions to guide the identification of the actions, tools and goals