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### Implications of learning analytics for serious game design

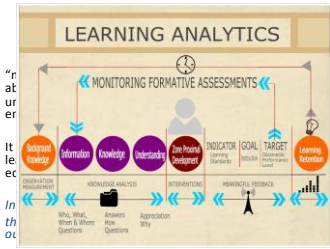
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### Serious Games

Serious Games: Learning through play. The difficulties of learning through games. The outcomes achieved through SGs' use have been a main barrier for successful deployment and adoption of SGs within formal education and corporate training.



### Assessment in SG

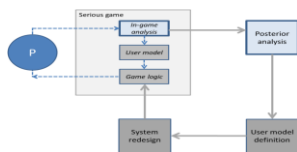
In principle, all SG make use of in-game mechanisms for the assessment of player performance and progress, for an appropriate response to the player's actions. They generate a large set of user data that could be used for monitoring and assessment purposes:

- Monitor the player's progress in the game and assess the level of performance achieved (e.g. performance scores, levels).
- Game challenges or contents are adapted to the players' actions; inappropriate actions may induce guidance like corrective feedback.
- When assessing performance in a game play special attention must be pay since it does not necessarily imply effective learning.

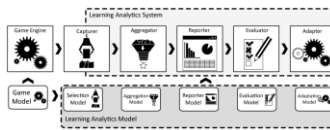
### Assessment in SG

Although some research has been directed to in-game and unobtrusive assessment methodologies that heavily relies on logging data to interrelate observable in-game behaviours to a competency-based score model which quantifies learning outcomes rather than performance. Stealth assessment allows the provisioning of feedback to players during the game play complying with implicit learning. Still the assessment of learning in SGs is far from being straightforward and asks for additional methods and models that produce valid evaluations and evidences of learning in games, which requires additional player data.

### Linking Learning analytics and serious Game Design



### THE GLEANER FRAMEWORK



The idea is to link the educational goals of the game with the in-game observable data and to support their collection.

### Practical Example

- An off-line analysis had been carried out for the VIBO-games used by the Utrecht University.
- These games were developed with the EMERGO SG engine ([www.emergo.eu](http://www.emergo.eu)).
- With respect to the GLEANER's components of data capturing, the EMERGO engine was capable of tracking and tagging every single player action and the involved game objects and attributes.
- Because of the component-based architecture of the EMERGO engine, an aggregator (the next step of GLEANER model) was built to generate a joint status history file: typically a time-ordered relational database of events and associated objects, attributes, parameters and values.
- Considering the nature of the off-line analysis carried out, we did not use a built-in analyser but common software tools (e.g. SPSS) for data processing and reporting (GLEANER step 3).
- The evaluation (GLEANER step 4) comprised a comparison of a set of primary variables (e.g. total time spent, number of trials for tasks completion and task execution time) in order to analyse players' preferences, bottlenecks and variability of behaviours.
- The adaptation (GLEANER step 5) focused on the definition of a set of technical changes at system level for better meeting the actual SG requirements.

## Conclusions

- the SG assessment main issues in relation to learning and performance evaluations and the need of detailed assessment models and user data for producing valid assessments of learning and how to take advantage of the LA tools.
- Research challenges still lie in the *full exploration and validation of gaming analytics methods and tools*, in particular in the development of real time procedures for adaptive gaming and personalised support
- *Full implementations and instrumentation of GLEANER-like approaches*, the development and testing of simple, user-friendly tools for teachers or non-technical persons (e.g. for supporting the steps of reporting and evaluation mentioned in the GLEANER model)
- *The issue of LA interoperability* across different games, genres and platforms engines is also an essential factor for a solid uptake of SGs in authentic educational and training settings

## Acknowledgments



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Thank you for your attention!

Questions?