Sources of Evidence for Embedded Assessment in Immersive Games

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Abstract: In this poster, we offer a designer's look at how the activities and data of learning and assessment can be structured in immersive virtual game environments called Massively Multi-Player Online Games (MMOG). In doing so, we examine the sources of evidence from which learning and assessment activities are derived in MMOGs, offering examples of how multiple evidence channels in operation through game-based activities can be utilized to construct rich data trails for assessment.

Sources of evidence in MMOGs

A growing body of literature points to the value of a sub-type of virtual worlds-based game called the Massively Multi-Player Online Game (MMOG) for engagement and learning. Researchers investigating educational MMOGs have explored the design, functionality, and learning impact of such environments, focusing primarily on analysis and evaluation of the curricula embedded in them (e.g. Nelson & Ketelhut, 2007; Nelson, 2007). In this poster, we approach the issue from a different analytical framework, examining the kinds of activities supported by virtual worlds, with a particular focus on how such activities may provide meaningful data for assessment.

In spite of the sensory and situational complexity of MMOGs, there are relatively small numbers of possible recordable interactions supported by the environments from which researchers can gather data relevant to assessment. These interactions provide data via what we define as Global Evidence Channels. These evidence channels track learner activities in three main categories: Location/Movement, Object Interaction, and Communication Activities (Table 1).

Table 1: Global Evidence Channels

Location/Movement	Object Interaction	Communication Activities
Location tracking • X location visited • Time spent at X • Coordinates Movement tracking • Direction • Speed • Acceleration/deceleration • Teleporting Movement patterns • Order of movement • Movement as response • Movement strings over time	Objects: • View • Select • Click • Manipulate • Pickup • Release Object Types: • Artifacts and inventory • Tools • NPCs • Humans • "intangibles"	• Type • Speak (VoIP) • Response selection • Emote • In and out of character • Human and NPC • Goal-oriented vs. social

Location/Movement

The exploration of virtual worlds by learners offers a rich source of direct and indirect evidentiary data that can be mined by researchers, educators, and evaluators. By tracking locations visited and the patterns of movements of learners through a virtual world over time, researchers can assemble a historical trail which provides information about the moment to moment learning of those students.

In creating MMOG-based assessments, designers can plot out assessment hotspot locations in the virtual worlds. Each hotspot can contain opportunities for interactions that help indicate the learning state of a player at that point in space and time. The sequence of location visits within a carefully designed world can also provide evidence about the state of knowledge construction in a given domain among groups of learners. Related to the location evidence collection supported by MMOGs is movement-based evidence. Examining the direction, speed, and duration of travel within a virtual world designed to elicit evidentiary activity can provide data on student learning over time.

Object Interaction

A second channel of evidence supported by MMOGs is Object Interaction. Object interaction occurs in two main ways in MMOGs: simple viewing of objects in 3-D space and direct interaction with objects, i.e. selecting, clicking on, rotating, picking up, moving, or dropping objects in the MMOG world. Within these two categories, players' actions can be divided into two types: "browsing" and "purposeful". In MMOGs, players often interact with objects without clear purpose. In this mode, they click on all visible objects simply to see what happens (e.g. signs, buildings, landscape, and NPCs). In contrast, *purposeful* object interaction is when players seek out, view, select, and interact with objects in a clear and strategic manner to accomplish some goal. They click on specific objects in a virtual world that need to be collected to advance the game or that are awarded as reinforcement for a successful quest completion.

In addition to examining the kinds of interactions a player has with given, data for assessment can be gleaned by examining the types of objects with which the player interacts in completing an assessment quest. There are several object types, each of which provides a different type of data to be analyzed: realistic, enhanced, and media objects. In addition to the different object types, there are a number of in-world object classes with which players can interact, and through which assessment data of varying kinds can be gathered. In examining player use of these different object classes, researchers can investigate the manner in which players interact with the objects, the choice of objects used for specific tasks, the selection and assembly of objects into a limited inventory of useable tools, and the de-selection or discarding choices of objects.

Communication Activity

A third evidence channel supported by MMOGs is Communication Activity. MMOGs generally support three classes of communication: text-based instant messaging, voice-based communication, and non-verbal signaling (also called "emoting"). Across all classes of communication, players can interact with other players (and with NPCs) for social and/or quest-related purposes. Quest-related communication consists primarily of pre-quest planning strategies for upcoming quests, mid-quest communication used to share information about the quest and conduct ongoing evaluation of the current status/effectiveness of team members---a kind of formative peer-based evaluation system---, and post-quest summative peer evaluations. In post-quest communication, players review successful or failed quest strategies and plan changes for future quests to increase the odds of group success.

Dyadic and Triadic Channel Combinations

When players explore MMOGs, their activities and interactions are virtually never completed in the neatly delineated fashion we outline above. Rather, players perform actions that produce evidence in dyadic and triadic combinations from which useful assessment data can be derived.

Conclusion

With careful design, MMOGs can support activities that provide data useful for real-time and post-hoc assessment of individual and group learning over time. These data have no inherent value for assessment by themselves. It is only through careful design of the virtual worlds, in-world objects, tasks, and quests that the data take on meaning for assessment. As we progress in our own research, we are working to refine the initial ideas presented here, and seek to answer the many questions raised by this discussion.

References

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Acknowledgments

The development of this poster and its ideas were supported by a grant from the MacArthur Foundation: James Paul Gee, Principal Investigator.

An extended version of the information in this poster was published in the British Journal of Educational Technology in 2010.