Harnessing the Power of Data: Driving Game-Based Personalized Instruction Through Learning Telemetry

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ABSTRACT

A DATA-DRIVEN SYSTEM: FOUNDATIONS OF LEARNING AND TELEMETRY DESIGN

A. Evidence-Centered Design
- Embedded assessment through ECD principles (Groff et al., 2015) built into design from inception
- Enables formative assessment, just-in-time scaffolding, and formative feedback as students play
- Comprehensive, design-aligned, event-stream data structure → assessment milestones

B. Telemetry Design for Learning Analytics
- Resulting event-stream data (telemetry) captures all player action and system feedback, labeled within the context of learning mechanics and game progress (e.g., corresponding to each assessment milestone in play).
- This framework enables learning analytics of all kinds.

DATA-DRIVEN DESIGN: ITERATIVE SYSTEM IMPROVEMENT WITH LEARNING ANALYTICS

A. Iterative design cycle
- Insights empowered through the embedded data culture and data integrity.
- Formative assessment informed through evidence-based design and personalization.

B. Descriptive visualizations for designers
- Descriptive analysis and visualizations are powerful to inform core learning mechanics aligned with evidence.
- These analyses fuel iterative design for improved learning experiences personalized to each student.

WHAT IS MASTERING MATH?

A system of adaptive learning games designed to help preschool to kindergarten children build a strong understanding of fundamental number sense concepts.

Personalized Mastery Learning System uses interaction data to recommend learning games and adapt both the sequence of activities and within each activity to optimize each child’s learning experience.

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C. Educational Data Mining (EDM) for intelligent system overlays
- Rich, structured data stream allows exploration of emergent player patterns through methods like EDM

D. Descriptive visualizations for designers
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REFERENCES

[Provide a list of references related to the document content]