Formative Research on an Instructional Design Theory of Virtual Patients

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Background & Problem

Clinicians become experts in their fields commensurate to the experiences they have across many and varied patient cases (Norman, 2005). However, changes in clinical education, notably the 80-hour resident duty week, have narrowed trainees' opportunities for case exposure (Graber, 2007). Online interactive patient cases that simulate clinical scenarios, virtual patients (VPs), may help fill this gap (Cook & Triola, 2009). However, no VP instructional design (ID) theory exists to guide their development and use.

Research Objective

To develop an instructional design theory of VPs to foster diagnostic (clinical reasoning) skills in medical trainees.

Goal-based Scenarios (GBS)

Two defining characteristics of VPs are that they are problem-oriented (patient condition) and goal-based (diagnosis or treatment). GBS theory (Schank, Berman, & Macpherson, 1999) therefore, provides a logical point of departure for initiating research to develop a VP ID theory. GBS is grounded in the descriptive theories of case-based reasoning (Schank et al., 1999) and experiential learning (Kolb & Fry, 1975) and prescribes methods as shown in Figure 1. Published VP development heuristics (Fleiszer & Shore, 2009) correspond closely to GBS methods.

GBS Methods
Learning Goals
Mission
Role
Scenario Operations
Resources
Feedback

Figure 1. The six methods of the theory of Goal-based Scenarios

Instructional Instance

Since diagnostic skills are largely domain-specific (Norman, 2008), the field of obstetrics, and the skillset, electronic fetal monitor (EFM) data interpretation, will provide the VP content.

The EFM Game is a game technology-based VP recently developed by the MedStar Health Simulation and Training Environment Laboratory (SiTEL) in conjunction with the Department of Obstetrics and Gynecology at MedStar Washington Hospital Center in Washington, DC. Four scenarios taken from this VP instance will serve as the point of departure for theory development.

Research Questions

1. To what extent is GBS theory used in the EFM VP and what elements in the EFM VP are not accounted for by GBS theory?
2. In the instantiation of GBS theory that the EFM VP provides, what did not work in testing with learners and what could be improved?
3. What are the affordances of game-based technology versus hypertext branching logic in the EFM VP in terms of effectiveness, efficiency, and appeal?
4. What recommendations can be made to tailor GBS theory to guide the effective instructional design of VPs?

VP Platforms: Game Technology or Hypertext?

Both game technology and hypertext platforms (Figure 2) are currently used for creating VPs and there are tradeoffs in terms of effectiveness, efficiency, and appeal associated with each approach. This study will examine the affordances of the most recent hypertext-based design, "branching logic," along with game technology in developing an ID theory of VPs. All four EFM Game scenarios will be reproduced as a branching logic, hypertext VP. Learners will interact with scenarios in both platforms during the study.

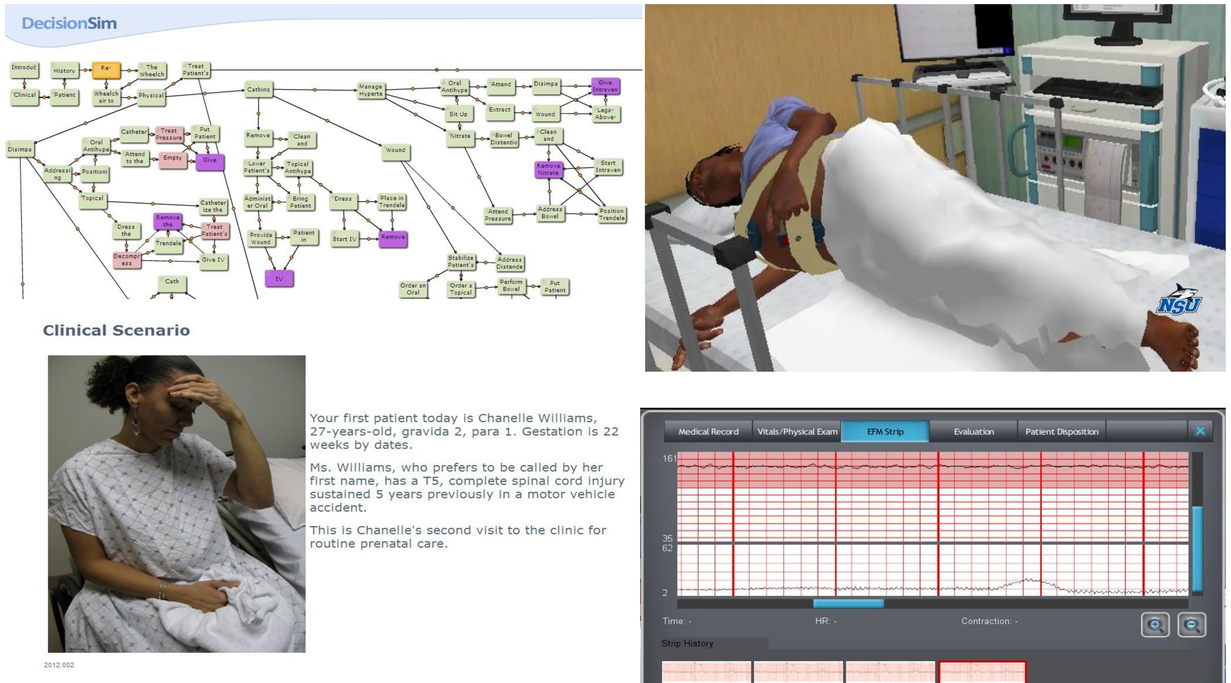

Figure 2. Screenshots from a branching logic VP (above) and the EFM Game created using the Unity game development platform (right and above right).

Methodology: Formative Research

Formative research is a case-based, design research method that works to create knowledge in three areas: how to improve a given instance of instruction, e.g. an instructional product; how to improve the ID theory that underlies the product, and how to refine the descriptive theories of learning that, in turn, inform that theory of instructional design (Reigeluth & An, 2009). A formative research process will be used to develop theory based on the EFM VP as described below.

- **EXAMINE** the extent to which elements of GBS are present in the EFM VP, in scenarios created using both game and branching logic technologies, and what features of the EFM VP are not accounted for in GBS;
- **ANALYZE** what aspects of the EFM VP worked and didn't work with learners;
- **PROPOSE** refinements to GBS to extend its usefulness for design of instruction in intrapartum EFM data interpretation.

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