Developing an Educational Module to Accelerate Competency in Managing Critically Ill Patients on Mechanical Ventilation of Critical Care Providers

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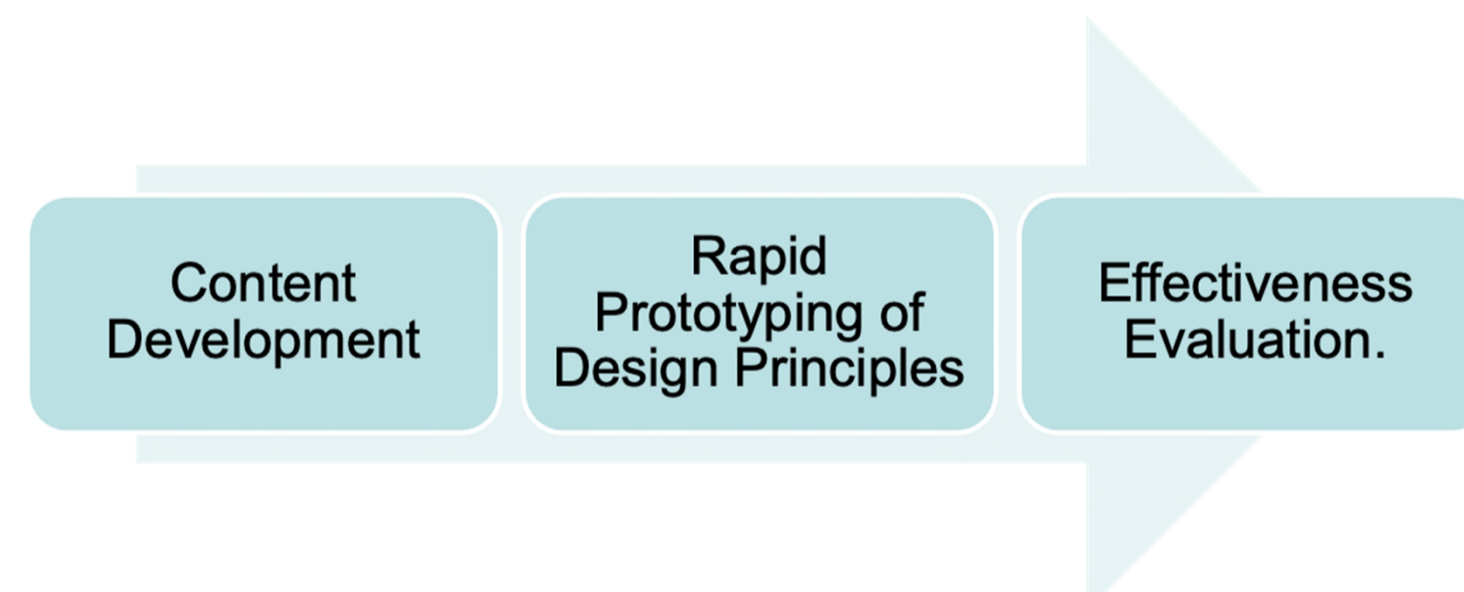
BACKGROUND

Pediatric critical care providers must learn how to manage patients on mechanical ventilation (MV). Teaching about MV often occurs at the bedside, however, there is often insufficient time to teach all necessary concepts. Novel instructional strategies have shown educational benefits, but most require many hours and resources. Serious games are an active learning strategy which have demonstrated effectiveness in augmenting learning medical education, without the significant time burden.
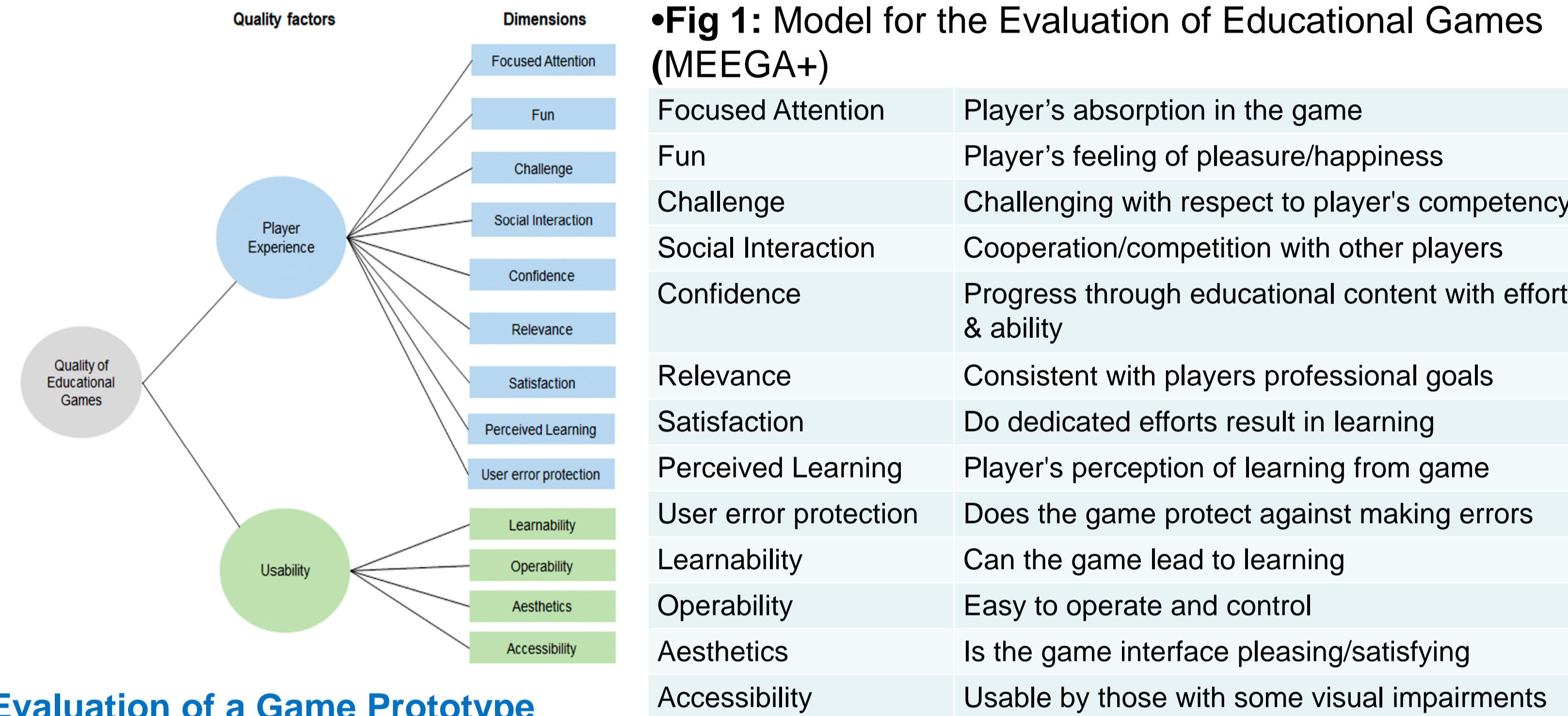
AIMS

- Design an educational module using a serious game approach for teaching critical care trainees about knowledge and strategies in management of mechanical ventilation
- Develop a board game prototype through an iterative process including inputs from learners and stakeholders
- Evaluate the prototype educational effectiveness, usability, fidelity, and acceptability.

METHODS

Content Development → Rapid Prototyping of Design Principles → Effectiveness Evaluation.

- Using iterative cycles of design, evaluation, and redesign, we developed a serious game to expedite the competency in management of critically ill patients on MV
- Surveyed attendings, fellows, and respiratory therapists
- Identified and prioritized knowledge content
- Developed cases to highlight the high yield content
- After evaluating multiple different types of serious games, developed a prototype game
- Prototype underwent multiple rounds of trials, testing, feedback, and refining of game and gameplay

- **Fig 1:** Model for the Evaluation of Educational Games (MEEGA+)

Focused Attention	Player's absorption in the game
Fun	Player's feeling of pleasure/happiness
Challenge	Challenging with respect to player's competency
Social Interaction	Cooperation/competition with other players
Confidence	Progress through educational content with effort & ability
Relevance	Consistent with players professional goals
Satisfaction	Do dedicated efforts result in learning
Perceived Learning	Player's perception of learning from game
User error protection	Does the game protect against making errors
Learnability	Can the game lead to learning
Operability	Easy to operate and control
Aesthetics	Is the game interface pleasing/satisfying
Accessibility	Usable by those with some visual impairments

Evaluation of a Game Prototype

We have modified the MEEGA+ Tool to the health professions education context and incorporated additional dimensions (i.e. Autonomy and Feedback) based on other exemplary models. The final tool is a 36-item, 5-point Likert scale survey. We will also collect validity evidence of this evaluation according Messick's unified validity framework.

Educational Effectiveness

Post-gameplay modified essay questions will assess learner's factual recall and cognitive skills. This will evaluate the educational content of the game based on Kirkpatrick's evaluation model.

RESULTS

Design Principles for a Game Prototype

- "Choose your own adventure" style game in which players will have to make a decision at specific points in time of the story "or a decision tree."
- Different case for each player. Goal is to progress through your own case as efficiently as possible.
- Page cards will provide an element of "realism" - they will be a disruption to the primary case. Players will have to answer their page card correctly before they can go back to their primary case. If they answer a page card incorrectly, they will have to draw another page card, and keep doing this until they get a page card correct (or time runs out).
- The player with the least number of total cards (case and page cards) will be the winner. Requires the players to move through the case as efficiently as possible and answering page card questions correctly.

RESULTS (Cont)

We used a theory-informed conceptual model, the MEEGA+ (Fig 1) to guide the development and evaluation of a prototype.

We derived initial design principles for rapid prototyping–cycles of trial, testing, and refining the game and gameplay by involving pilot users to gain insights from all groups.

Initial feedback regarding protype gameplay has indicated: the game is fun to play, has challenges for novice and advance players, can easily be expanded for other clinical scenarios, had elements of realism that made the game more exciting, players felt that they learned something, and that they would play it again/recommend others play the game.

We have finalized the design principles, a module prototype, and incorporated all content areas for formative evaluation and implementation.

CONCLUSION

We developed a prototype for serious game to emphasize specific knowledge and skills with regards to mechanical ventilation in critical care providers. Next steps include:

- Finalize the design and professional design of formal game beyond prototype
- Implement the game into the existing educational activities for new first year fellows
- Evaluate the game for usability and educational effectiveness
- Collect validity evidence for the modified MEEGA+ Tool