Reaction to responsive virtual human (RVH) technology for pediatric training

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Poster form

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Abstract:

Reaction to responsive virtual human (RVH) technology for pediatric training

- **Objective:** Our goal is to develop interactive training sessions using virtual pediatric characters and to explore educational issues related to using RVH training.
- **Methods**: RTI International has been working with content experts in pediatrics, linguistics, and cognitive science to develop responsive pediatric characters. RVHs react to a learner's verbal strategies with defined cognitive, psychomotor, and verbal responses. Prototypes of interactive pediatric scenarios were created and pediatric educators (PE; N=14) and third year medical students (N=15) were asked to pilot them. A survey captured demographic data and users opinion about validity, performance characteristics, and current beliefs about the utility of RVHT technology for training.

Ø**Results**: PE felt scenarios (obtaining an ear exam in a 4 year old; examining the lungs of a 10 year old; and obtaining a high-risk behavior history from a teenager) were very to extremely important pediatric competencies and that on average only half of their students were competent in these areas at graduation. Participants rated response time and overall conversation of characters as only somewhat realistic. Participants also reported scenarios were only somewhat comparable or adaptable to real world situations. However, on average, participants felt that if limited clinical experiences were available RVHT would be moderately helpful and would allow for more experiential learning. Finally, participants moderately enjoyed using the RVHT and with improved technology felt they were moderately to very likely to learn with virtual reality during their career.

Ø**Conclusion**: Participant responses to RVHT prototypes were encouraging. Ongoing improvements are occurring. We want your input!

Introduction and Background

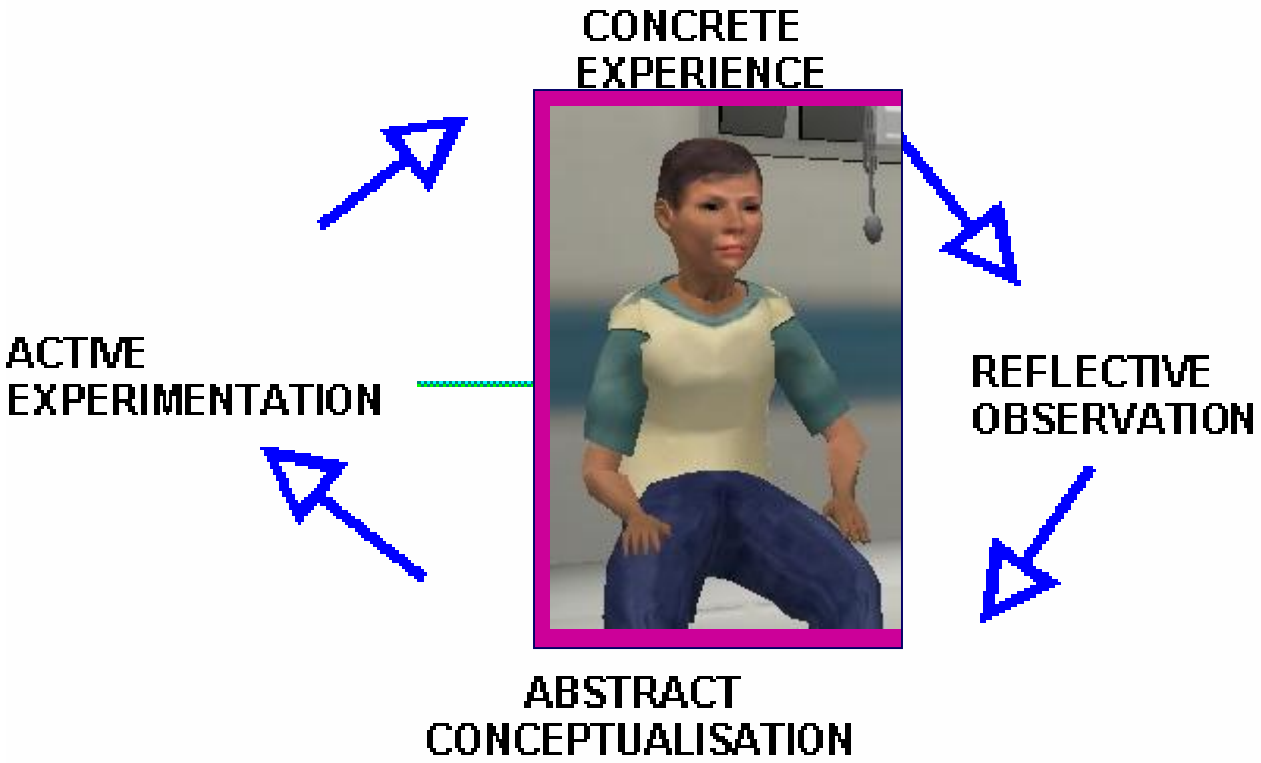
Educational Issues and Needs in Pediatric Medicine

- Instruction:
  - Limited exposure to children
  - Limited one-on-one faculty observation time
  - Limited curricular material: mostly passive learning
  - Limited practice opportunities
  - Variable experiences with behaviors or problems
  - Dispersed learners

- Assessment: No reliable / valid authentic assessment in young children (Standardized Patient).
  - Pediatrics may not be included in assessment
  - Assessment is less authentic: text based or multimedia videos
  - Interaction skills with children may not be valued by the learner

Introduction and Background

- Learning Theory

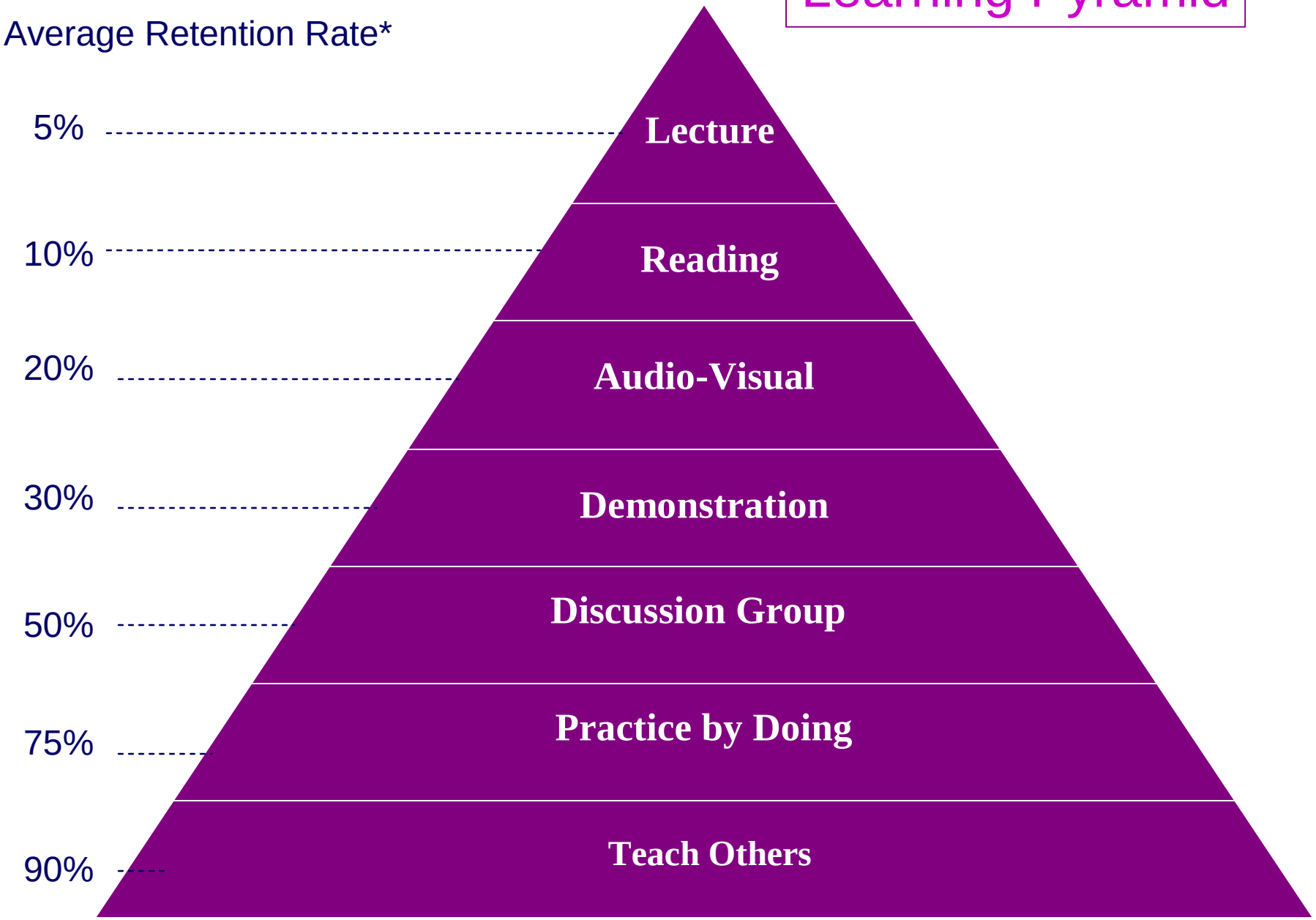


Kolb's model of experiential learning

What is a Responsive Virtual Human?

- Intelligent agent that "behaves" naturally in a given situation
- Responds to natural dialog, not pre-selected
- Body movement, facial expression, gesture is appropriate to mental, emotional, physical state
- Choice of verbal response is contextually appropriate

Learning Pyramid



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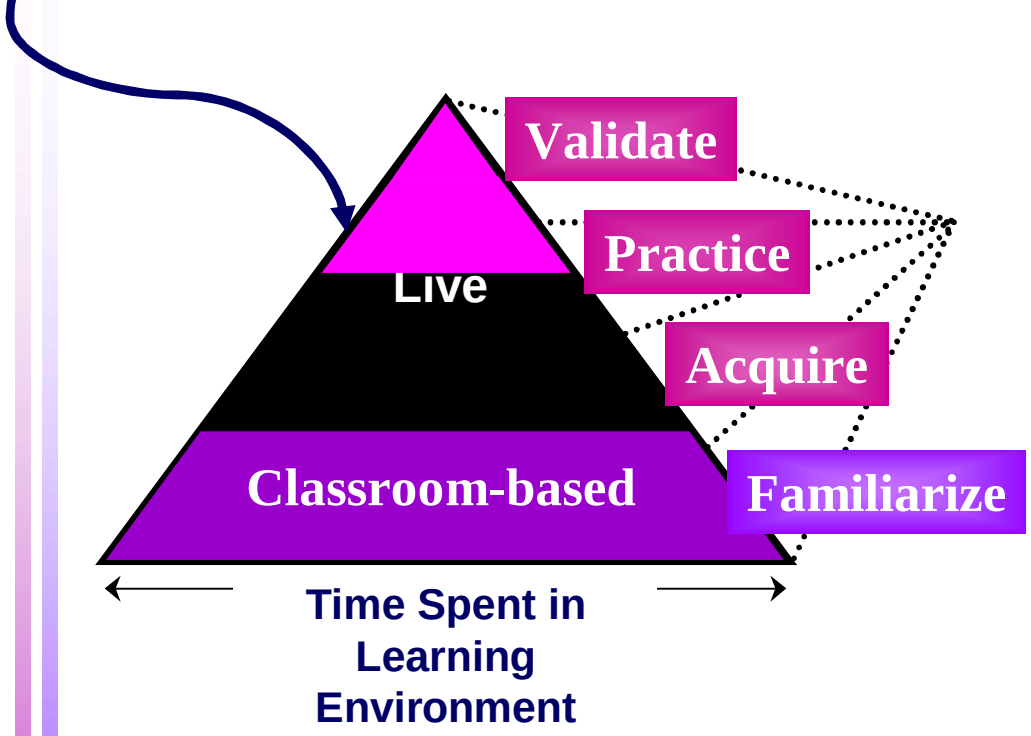
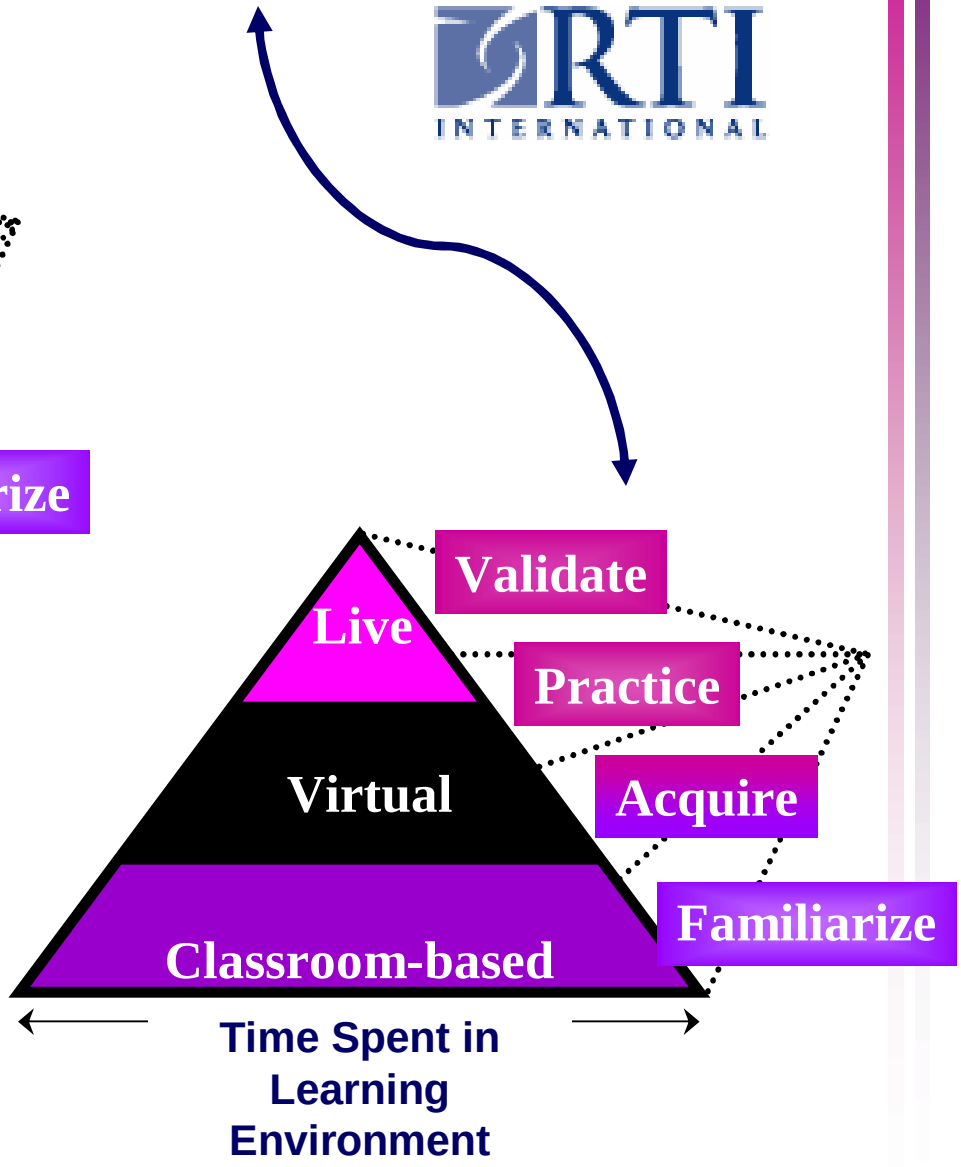
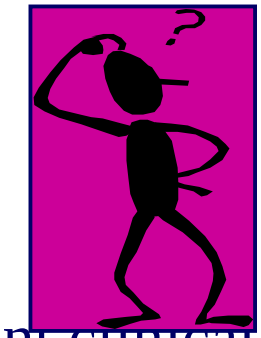
Traditional Training vs Technology Assisted Learning





Overall project goal is to provide:

- information for gold standard setting in scenario development,
- language acquisition to improve robust nature of interaction,
- address face, content, and construct validity.



Questions:

- Are the RVHT prototypes addressing important clinical competencies?
- What technical fidelity is required for authenticity?
- Can RVHT provide a learning experience?
- Do users view the RVHT simulation as a future learning tool?
- Will novice and expert users provide valuable development information about language and strategies in these scenarios?

Methods

- Development team: content experts in pediatrics, cognitive and computer scientists, software engineers, and graphic modelers.
- Development of Responsive Virtual Human, virtual environment, and prototype scenarios
- Pre and Post test survey of expert pediatric educators and third year medical students related to their attitudes and experience using the RVHT alpha prototypes

University of Colorado IRB approved

Results : prototypes

- Specific Task - complete an examine of the ears

Results : prototypes

- Specific Task - complete an examine of the lungs

Results : prototypes

- Specific Task - complete an adolescent social history

Results

Question: Are the RVHT prototypes addressing important clinical competencies? (N=14 Ped Educators)

A. Pre-test likert scale: 0=Not at all; 1 = Barely; 2 = Not very; 3 = somewhat; 4 = moderately; 5 = very; 6 = extremely

Survey Question	N	Mean	Std. Dev
Important for learner to interact with young children and their different emotional states to complete ear exam?	14	5.43	0.5
Important for learner to interact with school-aged children and their different emotional states to complete a lung exam?	14	5.29	0.7
Important for learner to interact with an adolescents and their different emotional states to complete a proper adolescent social history?	14	5.71	0.5

B. Pre-test likert scale: 0=0; 1 = < 40% ; 2 = ≥ 40 - ≤ 60%; 3 = ≥ 60 - ≤ 80%; 4 = > 80%

Survey Question	N	Mean	Std. Dev
Acquired the skill of appropriately interacting with young children to complete an ear exam by medical school graduation?	14	1.50	0.65
Acquired the skill of appropriately interacting with school-aged children to correctly complete a lung exam by medical school graduation?	14	2.43	1.0
Acquired the skill of appropriately interacting with an adolescent to obtain a proper adolescent social history by medical school graduation?	14	1.57	0.85

C. Pre-test likert scale: 0=Not at all; 1 = Barely; 2 = Not very; 3 = somewhat; 4 = moderately; 5 = very; 6 = extremely

Survey Question	N	Mean	Std. Dev
Do you believe there are “best practices” for interaction skills with pediatric patients	14	4.50	1.2
Do you believe there are “best practices” for physical exam skills with pediatric patients	14	4.71	0.7

Results

Question: What technical fidelity is required for authenticity? (N= 14 Pediatric Educators and 15 MSIII students)

Post-test likert scale: 0=Not at all realistic; 1 = Barely; 2 = Not very; 3 = somewhat; 4 = moderately; 5 = very; 6 = extremely realistic

Survey Question	N	Mean	Std. Dev
Realistic rating of response time?	29	3.34	1.1
Realistic rating of conversation?	29	2.62	1.0
Comparison of simulation to real world experience?	29	2.72	1.3

Answer: Improved technical fidelity is required and being addressed!

Results

Question: Can RVHT provide a learning experience? (N= 14 Pediatric Educators and 15 MSIII students)

Post-test likert scale: 0=Not at all; 1 = Barely; 2 = Not very; 3 = somewhat; 4 = moderately; 5 = very; 6 = extremely

Survey Question	N	Mean	Std. Dev
RVHT experience adaptable to clinical interactions?	29	3.31	1.3
RVHT added value to learning if limited clinical experiences available?	29	4.0	1.1
RVHT allows opportunity to experiment with different interaction approaches when compared to actual encounters with children?	29	4.0	1.0

Answer: Users believe even the first alpha version of RVHT can provide a learning experience.

Results

Question: Do users view the RVHT simulation as a future learning tool?

Post-test likert scale: 0=Not at all; 1 = Barely; 2 = Not very; 3 = somewhat; 4 = moderately; 5 = very; 6 = extremely

Survey Question	N	Mean	Std. Dev
Did you enjoy working with the application?	28	3.82	1.3
Assuming technology continues to improve, how likely are you to use virtual applications such as this to enhance your learning during your career?	29	4.7	1.0

Answer: Users enjoyed RVHT and believe applications such as this will be used to enhance their learning in the future.

Conclusions

- RVHT prototypes are addressing important clinical skill competencies that are currently not being fully addressed.
- The first alpha RVHT prototypes need improved fidelity (language and graphics) to improve authenticity.
- Users believe even the first alpha RVHT prototypes can provide a learning experience.

Conclusions

- Users enjoyed RVHT and believe applications such as this will be used to enhance their learning in the future.
- Responsive Virtual Human Technology (RVHT) is in its infancy but may offer new and promising opportunities for learning and assessment in pediatric medicine.
- There is much to be learned by educators and developers.

Credits:

- Application Development: Curry Guinn and Rob Hubal
- Digital Content Creation: Henry F. Schwetzke
- 3D software engineer: Jimmy Zimmer
- Sound and voice recordings: Jerry Heneghan
- QA testing: James Cowgill
- Subject matter expertise: Robin Deterding

- Funding: RTI International and National Science Foundation