

Serious Games : Rationale for Use in Medical Education

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Segamed
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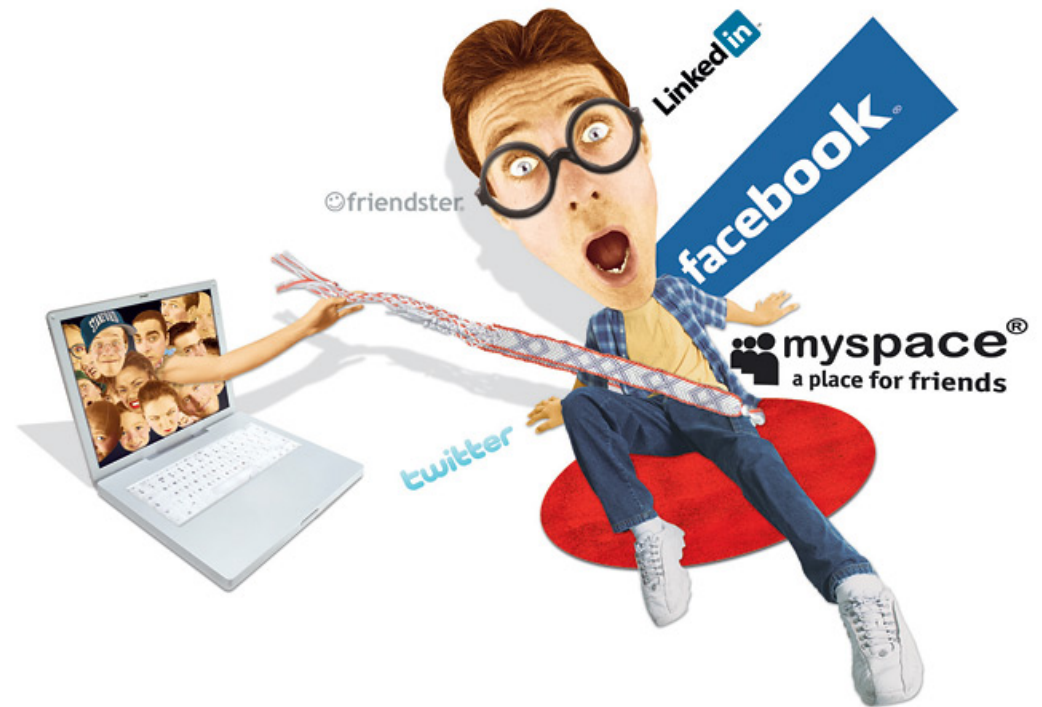
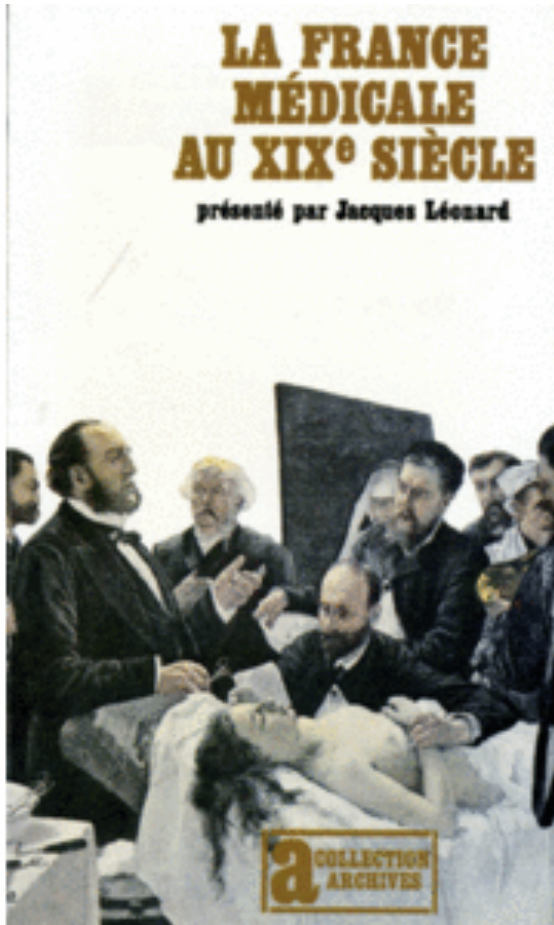


« It's misleading to suppose there's any basic difference between education and entertainment. This distinction merely relieves people of the responsibility of looking into the matter. It's like setting-up a distinction between didactic and lyric poetry, on the grounds that one teaches, the other pleases. However, it's always been true that whatever pleases teaches more effectively »

McLauhan M. Classrooms without walls, in Explorations in Communication, Beacon Press, Boston MA, 1960



Students have changed...



Students have changed...

The Millennial student :

- ✓ The most important generation ever seen in the US ;
- ✓ They were born with a PC mouse (and never quit it) ;
- ✓ They value collaboration and interactivity ;
- ✓ They multitask ;
- ✓ They expect available information 24 hours a day ;
- ✓ They have high visual attention and perception ;
- ✓ They enjoy new media technologies ;
- ✓ They favor image-rich environment ;
- ✓ They forego passive activity ;
- ✓ They dislike reading ;
- ✓ They hate passive learning ;

- ✓ But inductive problem solving is hampered ;
- ✓ But critical thinking is hampered hampered ;
- ✓ But imagination is hampered...



But have we changed ?



Is that efficient ?



What are we speaking of ?

❖ Educational game :

- ✓ Instructional method requiring the learner to participate in a competitive activity with preset rules ;
- ✓ Experiential learning where the learner engages in some activity, looks back at the activity, critically abstracts some useful insights from the analysis and puts the result to work ;
- ✓ 3 different aspects :
 - virtual environments ;
 - social and cooperative play ;
 - alternative reality ;

❖ Virtual world :

Electronic environment that visually mimics complex physical spaces, where people can interact with each other and with virtual objects, and where people are represented by animated characters (avatars) ;

❖ Serious game :

Interactive computer application, with or without significant hardware component, that has a challenging goal, is fun to play and engaging, incorporates some scoring mechanism, and supplies the user with skills, knowledge or attitudes useful in reality



What are we speaking of ?

- ❖ Serious games :
 - ✓ Commercially available games repurposed for health care ;
 - ✓ Specifically designed games for health care ;
 - ✓ Specifically designed games for health care workers.



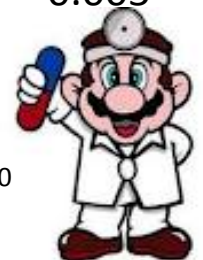
Do medical students play video games ?

	Males (%)	Females (%)	p
Play games	73 (63)	43 (37)	< 0.001
Puzzle games	28 (38)	31 (72)	< 0.001
Strategy games	46 (63)	7 (16)	< 0.001
Role-playing games	33 (45)	8 (19)	< 0.001
First person shooter games	41 (56)	2 (5)	< 0.001
Sports games	32 (44)	8 (19)	0.005



Wat do medical students find in serious games ?

	Males (%)	Females (%)	p
❖ It was fun	90 (97)	103 (96)	NS
❖ It helped me to develop skill and comfort In patients interaction	79 (85)	101 (94)	NS
❖ It modeled economic of different healthcare systems	79 (85)	87 (81)	NS
❖ It let me experience firsthand the authentic experience that shaped the values of professors I admire	79 (85)	87 (81)	NS
❖ As a course, it included in-person mentoring sessions with professors	79 (85)	86 (80)	0.04
❖ It was virtually crafted and strategically designed to equal the best of entertainment properties	77 (83)	81 (76)	NS
❖ It modelled politics in a realistic way	75 (81)	74 (69)	0.045
❖ It allowed me to meet interesting people in other health-related fields	72 (77)	76 (71)	0.05
❖ It was part of for-credit course	72 (77)	70 (65)	0.05
❖ It let me overcome challenges in a group with friends	68 (73)	66 (62)	0.005



Playing extensively video games could be risky...

- ❖ Ecological risk due to flat panel displays ;

- ❖ Personal somatic risk :
 - ✓ Obesity ;
 - ✓ Stress injuries :
 - Computer Visual Syndrom ;
 - « Mouse elbow » ;
 - Increased scrotal temperature with laptops.



Why do they work ?

Gaming is a major component of the effectiveness :

- ✓ Its usually voluntary ;
- ✓ It is intrinsically motivating ;
- ✓ It involves some level of active and even physical engagement ;
- ✓ It has a make-believe quality ;
- ✓ Plays as stress management ;
- ✓ Role-playing favours empathy.



Why do they work ?

- ❖ Familiarity to new learners ;
- ❖ High acceptance ;
- ❖ Convenient use ;
- ❖ Motivating (competition) ;
- ❖ Promotion of learning in cognitive, affective, and psychomotor domain
- ❖ Repetition ;
- ❖ Informations tracking ;
- ❖ Augment reality ;
- ❖ Anonymity ;
- ❖ Cost ;
- ❖ Collaboration, team-working ;
- ❖ Assessment after standardization.

Meet 4 major concepts of simulation :

- ✓ Kolb model ;
- ✓ Deliberate practice ;
- ✓ Adult learning ;
- ✓ Debriefing.

From : Taekman JM. *Int Anesthesiol Clin* 2010
Akl AE. *The Cochrane Collaboration* 2009
Kolb DA. *Experiential Learning*, 1984
McCaghie WC. *Med Educ* 2006
Knowles MS. *The Modern Practice of Adult Education*, 1970



Nobody is perfect...

- ❖ Cultural aspect ;
- ❖ Lack of technical standards ;
- ❖ Virtual environment familiarity ;
- ❖ Lack of non verbal communication ;
- ❖ Level of fidelity ;
- ❖ Cost.



Is there evidence of efficiency ?

Educational games (excluding serious games) for medical students and health care workers :

- ❖ 2 recent reviews (2009, 2010) ;
- ❖ 6 eligible papers :
 - ✓ Improvement of scores (2 reached statistical significance) ;
- ❖ Low to moderate methodological aspects :
 - ✓ Randomized controlled trials ;
 - ✓ Unconstant active control group ;
 - ✓ Unconstant pre and post intervention assessment ;
 - ✓ Uncommon use of structured outcome measurements ;
 - ✓ No protection against contamination ;
 - ✓ Unconstant concealing allocation.



Is there evidence of efficiency ?

Commercial Games :

- ❖ Nausea/vomiting in pediatric oncology :
 - ✓ Video games vs books, TV, games or relaxation ;
 - ✓ Improvement of nausea/vomiting in the intervention group ;

- ❖ Pre anesthesia anxiety in pediatrics :
 - ✓ Video games vs midazolam vs no intervention (except parents) ;
 - ✓ No difference with the midazolam group ;

- ❖ Physical therapy in spinal chord injury or spina bifida :
 - ✓ Improvement of VO_2 ;
 - ✓ Particularly in the most demanding patients.



Is there evidence of efficiency ?

Commercial dedicated games :



❖ Burn pain :

- ✓ SnowWorld® ;
- ✓ Reduction of pain and motion during debridement ;
- ✓ No difference with analgesics ;



❖ Diabetes :

- ✓ Packy and Marlon®, Escape from Diab®, Nanoswarm : Invasion from Inner Space® ;
- ✓ Diet improvement ;
- ✓ Parents communication improvement ;
- ✓ Self-management improvement (glucose monitoring, insulin, diet) ;
- ✓ Diminution of diabetes emergencies and unscheduled consultations.



Is there evidence of efficiency ?

Commercial dedicated games :

❖ Asthma and mucoviscidosis :

- ✓ Bronkie the Bronchiasaurus® ;
- ✓ Improved of knowledge, self-care behaviors, self-efficacy ;



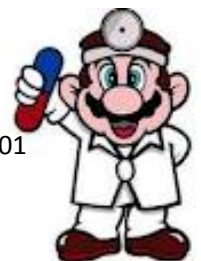
❖ Bladder dysfunction and Irritable Bowel Syndrom :

- ✓ Biofeedback ;
- ✓ Efficient, even in young children ;
- ✓ Biofeedback maintained ;



❖ Pediatric and young adults cancers :

- ✓ Re-Mission® ;
- ✓ Improved levels of chemotherapy, compliance with antibiorophylaxis, cancer knowledge, self-efficacy.



Is there evidence of efficiency ?

Specifically-designed serious games for health care workers :

Reference	Effectif	Comparison	Method	Results
Youngblood (2008)	30	Serious game vs hifi simulation	Pré / post test	No statistical difference
Andreatta (2010)	15	Serious game vs SP	Pré / post test	No statistical difference
Heinrichs (2010)	10 MD + 12 RN	Serious game	Exit questionnaire	86% : confident or very confident
Knight (2010)	91	Serious game vs card game	Triage accuracy	Serious game statistically superior



Is there evidence of efficiency ?

Serious game and surgery : a link ?

❖ Video games enhance surgery performance :

- ✓ Improved speed ;
- ✓ Fewer errors ;
- ✓ On laparoscopic or gastroscopy simulators ;

- ✓ improved visual attention ;
- ✓ Improved visual memory ;
- ✓ Faster response time to visual attention tasks

❖ ...But unconstantly :

- ✓ No difference for sinus surgery, robotic surgery, and colonoscopy.

From Kato PM. *Rev Gen Psychol* 2010
Rosser J. *Arch Surg* 2007
Grantcharov T. *Surg Endosc* 2003
Shane M. *Surg Endosc* 2008
Enochsson L. *J Gastrointest Surg* 2004
Glaser AY. *Head Neck Surg* 2005
Hagen M. *Int J Med Robot* 2009
Harper J. *J Endourol* 2007
Westman B. *J Gastrointest Surg* 2006

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Is there evidence of efficiency ?

❖ Serious game and surgery : link or causality ?

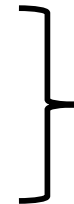
Kolga Schlickum (2009) :

✓ 30 surgical novices ;

G1 : 5-week training with Half Life®

G2 : 5-week training with ChessMaster®

G3 : no training



Pré and Post test with
laparoscopic and endoscopy
simulator

✓ Results :

Significant improvement for G1 and G2 for the laparoscopic simulator

Significant improvement for G2 for the endoscopy simulator ;

Half Life® : high visual-spatial demand and visual similarities to endoscopy ;

✓ Conclusion :

Possible causality



Why so few convincing results ?

- ❖ Poor-quality papers ;
- ❖ Medical educators are not found of RCT or meta analyses, despite well-established evidence ;
- ❖ « File drawer problem ».



What future for serious games in medical education ?

- ❖ Well-designed serious games with clearly-identified relevant educational goals ;
- ❖ Lowering costs and alternatives (Second Life® ...) ;
- ❖ Technical standardization ;
- ❖ Caution on particular public : women, people with disabilities ;
- ❖ Better research ;
- ❖ New domains : assessment, CME, team training, medical education,...

