Collaborative game-based learning with iPads and external keyboards in a web development class

Aekaterini Mavri, Fernando Loizides, Nicos Souleles

Department of Multimedia and Graphic Arts, Cyprus University of Technology, Cyprus
Emerging Interactive Technologies Lab, University of Wolverhampton, UK
motivation

programming | web development

➔ surface learning
➔ memorizing
➔ deep learning
➔ comprehension
➔ multimedia design course
➔ resistance mentality
motivation

active collaborative learning

➔ assistive learning method
  ➔ motivation
  ➔ positive social interdependence
  ➔ interest + participation
  ➔ practice time investment
  ➔ enhanced learning outcomes
motivation

iPads

➔ lightweight / portability
➔ excitement
motivation

previous study

➔ single input projected exercises
  ⇒ volunteer
  ⇒ whiteboard real-time projection
  ⇒ assistance from group
  ⇒ device passed-on

➔ groups-of-two exercises
  ⇒ time-constraint
  ⇒ solution on whiteboard
motivation

previous study: results

- learning-by-doing
- absence of point-to-click
  - locate, select, copy, paste
- problematic text-entry
  - size, screen space, feedback
motivation

external keyboards

➔ typists first, programmers second!
➔ from consumption to production
➔ industry keyboard options:
➔ our choice:
➔ the Genius LuxePad i9010 bluetooth keyboard
new study

aims

➔ help with issues related to direct manipulation?

➔ help with issues related to direct manipulation text entry?

➔ pair-collaboration in competitive setting?
experiment design

setting

→ web design + development II
  → 3-hours x 13-weeks
  → 4 thematic units
  → Unit 1
  → client + server side technologies: html, css, javascript, xml, php, mysql

→ 20 3rd + 4th year students

→ 2 x previous study's size
technical

- iPad 3 model
- external keyboard
  - bluetooth Genius LuxePad i9010
  - mechanical QWERTY type
- exercises posted via Facebook
- JS Bin
  - HTML, JS, CSS coding
  - split editor/output view
methods

➔ teams A + B
➔ 5 pairs: 1 iPad each
➔ short lecture units + exercises
➔ time constraint
➔ 10 points per exercise (Team A-B)
➔ 4% ➔ Highest score team
➔ 1% ➔ Winning pair

➔ minor prize
➔ layered competition
why not single-projected exercises?

➔ bigger group
➔ larger room
➔ compromised visibility
  ➔ back seats
➔ lack of social interdependence
  ➔ back seat 'hiding' spot
data collection + analysis

- 2 surveys
  - week 1 + 4

- 1 focus group session
  - week 4

- observation

quantitative | qualitative

qualitative
outcomes

Thematic units

➔ External keyboards
➔ iPad – the device
➔ Collaboration
➔ Game-based learning
External keyboards

➔ positive feedback
➔ easier & faster
  ➔ comparison
➔ arrow keys
  ➔ precision
➔ larger available screen area
  ➔ larger code + preview

➔ External keyboards
➔ iPad – the device
➔ Collaboration
➔ Game-based learning

outcomes
outcomes

➔ External keyboards
➔ iPad – the device
➔ Collaboration
➔ Game-based learning

External keyboards

➔ negative feedback

➔ small keyboard and key size
  ➔ slow
  ➔ incorrect key substitutions

➔ Keyboard layout and key combs
  ➔ \{ \} [] " " ‘ ‘ JS/HTML symbols
  ➔ access through Fn button
External keyboards

- negative feedback
- Absence of keyboard shortcuts
  - cmd + C / V
  - incorrect key combinations
- negative bias
- “difficult” + “complicated”
outcomes

- External keyboards
- iPad – the device
- Collaboration
- Game-based learning

iPad: the device

- absence of direct manipulation aids
  - select, copy, paste
  - text targets require fine navigation

- logic repetition
  - unsatisfactory pace
iPad: the device

- lack of multi-tasking
  - editor/output preview
  - online resources
- lack of split-screen viewing
- serial access of windows
  - time-consuming
  - working memory load

outcomes

- External keyboards
- iPad – the device
- Collaboration
- Game-based learning
iPad: the device

comparison

intuitive use of laptops
light-weight + mobility trade-offs
new generation 12 and 10-inch laptops
ethernet-less connection

positive:
lack of cables + battery life
Outcomes

- External keyboards
- iPad – the device
- Collaboration
- Game-based learning

Collaboration

- **positive interdependence**
  
  (David W Johnson & Johnson, 2009)

- **substitutability**
  
  ⇒ "fill in for each other’s gaps"

- **promotive interaction**
  
  ⇒ good interpersonal communication
  ⇒ encouragement + mental support
  ⇒ enhanced understanding
collaboration

➔ time management
➔ no procrastination
  ⇒ task averseness
  ⇒ delays, poor work, bad learning outcomes
  ⇒ being obliged to practice
  ⇒ collective straightforward resolution

➔ External keyboards
➔ iPad – the device
➔ Collaboration
➔ Game-based learning
outcomes

➔ External keyboards
➔ iPad – the device
➔ Collaboration
➔ Game-based learning

game-based learning

➔ time management

➔ improved completion times
  ➔ slack avoidance
  ➔ better student engagement
  ➔ increased levels of satisfaction
outcomes

➔ External keyboards
➔ iPad – the device
➔ Collaboration
➔ Game-based learning

game-based learning

➔ the no ‘punishment’ approach
  ➔ a small prize for winners
  ➔ no impact on losers
  ➔ "will not affect our grades"

➔ the shielded approach
  ➔ no negative face-to-face tension
outcomes

experiment limitations/
future expectations

➔ lack of expertise accountable
➔ equipment suitability

➔ newer OS ➔ multi-tasking
thank you.