



Construction students' experiences and engagement with digital technologies

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Aim of the research

1. To evaluate construction students' experiences and engagement with specialist computer based technologies
2. To determine the perceived value that students see in using construction specific technologies to support their tertiary studies



The digital natives' narrative in tertiary education

"They have spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the other toys and tools of the digital age" (Prensky, 2001, p. 1).

The majority of tertiary students nowadays are:

- Millennials/Net generation/Generation Y/Digital natives, born between 1980 and 2000 (Carlson, 2005; Farrow, Liu, & Tatum, 2011; Yan, 2006; Zhao, McCoy, Bulbul, Fiori, & Nikkhoo, 2015)
- Generation Z, born between 1995–2005 (Azhar, Kim, & Salman, 2018)



The digital natives' narrative in tertiary education

Collective characteristics of the new generation of students:

- Ability to multitask
- Access information in a random fashion
- Strong preference for visual and graphics rather than text
- Games to “serious” work
- Staying permanently connected, even over-connected
- Low tolerance for traditional lecturing, step-by-step guides and detailed instructions
- Strong preference for experiential and hands-on learning
- Socialising through student interaction and group work

(Brown, 2000; Farrow et al., 2011; Howe & Strauss, 2005; Oblinger & Oblinger, 2005; Prensky, 2001; UNESCO, 2011)



Digital technology integration in construction education

- **SketchUp** & SketchUp plug-in, **4D Virtual Builder** - for 3D modelling
- **Augmented Reality (AR)** - viewing the real world with the addition of external computer-generated perceptual information
- **Virtual Reality (VR)** – simulated environments to understand construction process sequence
- **Mixed Reality (MR)** - merger of real and virtual worlds to produce new environments and visualizations
- **Rapid Prototyping (RP)** – fabricating scale models using 3D printing
- **Building Information Modelling (BIM)** - generation and management of digital models of buildings



Research context

Degree: Bachelor of Construction

- Three majors: Construction Economics, Construction Management and Property Development

Level 5 elective course: Construction Communication and Documentation

- Designed by the research authors
- First launched in 2018
- Learning outcomes:
 - a) communicate technical concepts and findings in written and graphical formats
 - b) understand the basic concepts of design processes, documentation and management
 - c) use a range of construction drawings as a communication technique to present ideas and data



Research context

Level 5 elective course: Construction Communication and Documentation

- Self-directed learning – 102h
- Directed learning – 48h
- Use of construction specific freeware
 - a) Solibri Model Viewer
 - b) Tekla BIMsight/BIM Vision
 - c) Tekla Field 3D
 - d) Padlet (for the structure of the NZ construction industry)



Research approach

Data collection methods

- Start of the course diagnostics (questionnaire)
- End of the course diagnostics (questionnaire)
- Lecturer diary
- Assessments
- Formal course evaluations

Research sample

24 students, or 100% of the class

Data collected in the first and last week of Semester 1, 2019



Research findings

Demographic data

- 23 students were born between 1980 and 2001 (“digital natives”)
- 1 student was born in 1971
- 62.5% were male and 37.5% were female students
- 70.83% were from NESB and 29.16% were from ESB
- 13 domestic and 11 international students
- 9/24 students already had some construction industry experience
- 17/24 students had non-construction related work experience in various industry sectors (retail, retail shops, cafes, bars, supermarkets, real estate, phone sales)



Research findings

Access to hardware and the Internet

- Unlimited access to mobile phones and laptop computers
- Tablets and desktop computers are not popular

Use of general computer based technologies

- All students started their degree course knowing how to use Word and Power Point

Use of specialist construction based technologies

- 45.8% had used SketchUp over monthly
- 16.6% had used CostX over monthly
- None had used any of the course construction freeware

Use of social media applications

- Most frequently used: YouTube (66.6%), WeChat (58.4%)
Facebook and Messenger (41.6%)



Research findings

Course content

- The majority of students found the course “useful”, “informative”, “interesting” and “fun”
- And particularly valued the use of specialist construction software to aid their learning

Course delivery

- Over 90% of the students thought that the purpose of each lesson and the explanations provided were clear
- They had a clear understanding of the course expectations
- And felt comfortable asking questions



Research findings

Acquiring new skills

- None of the students rated any of the course freeware as being “very difficult” to learn
- Learning happened mostly by intuition
- Students used mainly their own laptops
- They expressed a strong preference for individual work
- And used a variety of social media apps to collaborate with each other on group assessments



Research findings

General student comments and feedback

- In terms of an overall course rating on a scale of 1 “very poor” to 5 “excellent”, 23/24 students, or 95.83%, rated the course as “excellent” (13 students) and “good” (10 students); one student rated it as “fair”
- While a third of the class did not want anything changed, some students were willing to do even more work as they felt engaged in an “interesting” and “useful” course



Conclusions and future directions

- Students **use own mobile devices** and their learning happens through **intuition and experiment** rather than via lectures in a lecture theatre or a classroom, or via step-by-step guidance in a computer lab.
- The **future of traditional computer labs and lecture theatres** needs to be **re-evaluated** as they are not necessarily the most suitable to support students learning.
- The natural inclination for **connectivity using social media** applications needs to be taken into consideration when designing course delivery and assessment.
- The aspiration in the AEC industry towards **more and more collaboration** needs to be matched by the AEC education.



Conclusions and future directions

- **Discipline specific digital technology** can be introduced **successfully** even to first year students:
 - a) It built on **students' general digital literacy skills** to learn new discipline specific software
 - b) It helped the students **to understand basic construction concepts**
- The **generational differences between Faculty** (generation X) **and students** (generation Y and Z) pose a challenge
- The only way to provide effective learning is through **staff's continuous upskilling**
- Course delivery and assessment methods need to be **constantly adjusted**

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