

"I READ AND READ, AND GLOWERED; THEN READ AND READ AGAIN" (Thomas Telford): READING FOR A DEGREE IN CIVIL ENGINEERING 2009-2022

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Abstract:

Strategic cramming of 'exam' text from module reading lists is an impoverished approach to reading in higher education. It is understandable that engineering undergraduates will be prone to read less than that of humanities students. Nonetheless, through wider reading, engineering students can begin to conceptualise their professional discipline as more than the sum of mathematical and scientific prowess. In this paper I provide a synopsis of several curricular reading interventions. In 2009, a book reading coursework was introduced into a first-year civil engineering module and supported through the establishment of a department book club. Over the piece other interventions have required students to read magazines such as *New Civil Engineer* and *National Geographic*, Broadsheet & Tabloid Newspapers, and to consult the inaugural addresses of the Presidents of Institution of Civil Engineers (ICE). Of late, the author has employed a Book Reading Jigsaw 'flipped classroom' exercise across all of his modules.

Keywords: Reading; Book Club; Jigsaw; Civil Engineering

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1. INTRODUCTION

The 'reading for a degree' interventions detailed in this paper were motivated by anecdotal evidence indicating a narrowness of the book, journal, and magazine reading habits, of undergraduate civil engineering students, at the University of Strathclyde (UoS). In the proceeding section I make a sojourn into theoretical and practice evidence of undergraduate reading in higher education. In section three I consider if engineers are 'booky people' and whether independent reading is prevalent in the engineering curriculum. Section four provides a synopsis of the seven reading interventions undertaken since 2009, including references where readers can more fully explore each intervention. The paper is concluded with short discussion section and I make several recommendations for improving reading practice within the undergraduate engineering curriculum.

2. UNDERGRADUATE READING IN HIGHER EDUCATION

There is a healthy body of empirical evidence on supporting the reading habits of undergraduate students across the disciplines (i.e. Campbell et al., 2010-Chemical Engineering; St Clair-Thompson, Graham & Marsham, 2017- Psychology, Biology, and Marine Science; Kimberley & Thursby, 2020-Arts; Deale & Lee, 2022-Hospitality Management. Nonetheless, whilst reading is considered to be ubiquitous with learning in higher education (MacLellan, 1997; Fairbairn, & Fairbairn, 2001; Garfield, 2008) there have been fundamental concerns about the role of reading in undergraduate higher education for some time. Marchant (2002) cited (Carkenord, 1994: 164) who contests that 'students do not read textbooks or journal articles as a result of their intrinsic

interest and desire to learn'. Marchant's survey of psychology undergraduates revealed that students tend only to be motivated to read when there is a direct link to assessment, and grades. Godfrey (2013) provides guidance for students in- *How to Use Your Reading in Your Essays* and recommends that they make time for reading and to 'try to engage with the material rather than just reading the words on the page' (p.7). Indeed, Weinstein, et al. (2019) point to the ubiquitous but ineffective practice employed by students who read and reread course notes and books.

On the case for independent learning through reading at university, David Hume, the Scottish enlightenment philosopher (1711-1776) provides a provocative view- 'as you know there is nothing to be learnt from a Professor, which is not to be met with in books, and there is nothing to be required in order to reap all possible advantages from them, but an order and choice in reading them....I see no reason why we should either go to an university, more than to any other place, or even trouble ourselves about the learning or capacity of the professor (Hume, quoted in Graham, 2004, p.58). This view is reiterated in a 1960's report on *University Teaching Methods*- 'If one of the main purposes of a university education is to teach students to work on their own, reading by students must be preferable to attendance at a lecture unless the lecture is superior in presentation or content to the available literature (Hale et al., 1964 p.96).

3. ENGINEERS: NOT BOOKY PEOPLE?

The title of this paper- '*I read and read, and glowered, then read and read again*' (Thomas Telford quoted in Rolt, 2007 p.7) is attributed the first President (1820) of the Institution of Civil Engineers (ICE). Rolt further attests that 'no matter how busy he [Telford] might be he never afterwards denied himself the solace of books' (p.7). Telford's desire to 'become learned' through reading reflects the onset of the Victorian era interest in self-improvement, espoused by Smiles (1862) in *Lives of Engineers*. Unlike many of his predecessors Telford did not have the support of a university education. For one eminent engineer who did, there was a clear preference for the independent learning espoused by Hume: 'I must confess- and it is shocking admission to make in front of an audience like this- that I only attended a few lectures during my time at college because I found it so much easier to read the excellent text books provided.....And a good text book is, I submit, better than a bad teacher' (Ove Arup, 1958, quoted in Tonks, 2012 p.56).

Whilst Telford and Ove Arup may have been avid readers, Burnstall (1953, p.252) cited a historical periodical- *The Engineer (1941)* whose editorial claimed that 'engineers, taken in the lump are not booky people and don't hold with reading, if it can be helped'. Burnstall argued that the engineering profession has suffered due an aversion to serious reading and he criticised the graduate engineer who had not availed themselves to reading during their studies. Over half a century later, a respected engineering academic and book author (Petroski, 2013, p.1) reiterated this concern - 'I think we are seeing more and more students coming through our programs that are not all that well read'. Petroski lamented the lack of both engineering and general reading. Nonetheless, there is no shortage of evidence providing encouragement to prospective engineering students through pre university reading lists (i.e. University of Cambridge 2022; Institution of Civil Engineers; 2022). Perhaps their impact are ineffective, not policed or evaluated?

4. RESEARCH & ETHICS

The interventions were undertaken in a piecemeal fashion, and were not part of a formal approach (i.e. Action Research, Norton, 2009) to evaluate and improve teaching and learning practice. Nonetheless, they do represent an incremental participation in the Scholarship of Teaching & Learning (SoTL), and provide tentative evidence of ‘how learning and teaching can be enhanced through a research-informed approach’ (Evans et al., 2021, p.526). However, an important ethical misdemeanour concerns that of the coursework submissions, free-text feedback, and the unsolicited email text, presented in this paper, and three associated peer reviewed articles emanating from the interventions (Murray & Tennant, 2014; Murray & Ross, 2014; Murray & Tennant, 2016). It is perhaps an indictment of the peer review process that articles were published without the requirement to confirm and state that ethical approval to use student data. Two wrongs don’t make a right, nonetheless judicious use is made of student feedback in this paper to add voice. It is envisaged that the views espoused by Mackay (2022) will provide an interest to delegates attending the conference: ‘There are many assumptions waiting to trick the unwary researchers, e.g. assuming that non-invasive research needs no consent, assuming that participation is research consent, or that once consent is given there is free rein with the data’(p.196).

5. READING INTERVENTIONS

5.1 First-Year Compulsory Book Reading 2009-2016

Each cohort of first-year students were required to select one book from a list of four titles provided by the author, to read and to write a critique (15% weighted assessment, 10 Credit Module) on what they considered salient issues. The books were chosen on the basis that they provide knowledge about the history and heritage of civil engineering, including biographical text and / or contemporary accounts of inspirational civil engineering projects. The aim was to pique the students’ curiosity about civil engineering, and to act as a catalyst to encourage further recreational reading during their studies (UoS, 2016a). Unsolicited email feedback suggested some positive legacy gains: *I read the St Pancras book. I was pleasantly surprised that I actually really enjoyed the book. I was down in London and close to St Pancras station and took the opportunity to visit it. Reading the book and visiting the station has altered my opinion on civil engineering’* (Unsolicited email from MEng Student, 2017). Unintended impact, but confirms the potential for acknowledging how effective higher education teaching & learning can include ‘learning with friends, families, peer groups and professionals [and] should be recognised as significant, and be valued and used in formal processes in higher education’ (Ashwin et al., 2015 p.346): *I feel as if I have known you for the past 5-years due to the feedback from my son who graduated yesterday. As a non-engineer I have been greatly enthused by your coursework at Strathclyde and would like to thank you for stirring my interest in civil engineering. So much so that I was given a Christmas present 'How to Read Bridges-A Crash course spanning the centuries'. I now consider myself an enthusiastic amateur’!* (Unsolicited email from a father of a MEng graduate, 2015).

5.2 Co-Curricular Book Club 2009-2022

A department book club was established to run in parallel with the curricular reading. To encourage students to discuss their book reading with peers, and to afford opportunities to enhance their public speaking skills (Joint Board of Moderators 2021, p.29). Book authors were invited to Strathclyde including David Harvie (2004) reading from *Eiffel, the Genius Who Reinvented Himself*. Excursions were undertaken to meet authors at civil engineering landmarks.

Notable events included a reading in the Hawes Inn with Ann Glen (2012) reading from *Forth Bridge: Restoring an Icon*, accompanied by engineers from Network Rail and Balfour Beatty. Of late, “Trojan Horse” reading events have been hosted by consultant engineers in Glasgow, affording some students an opportunity to practice their public speaking skills and to be mentored by graduate engineers during a post-reading tour of the respective offices. In 2018, AECOM hosted and sponsored a visit from Hugh Ferguson, co-author of *The Civil Engineers: The story of the Institution of Civil Engineers and the People Who Made It* (Ferguson & Chrimes, 2011). Arup hosted David Watt (2018) reading from *-Queensferry Crossing-Vision to Reality: Hearing two of my peers from the course present a short talk has boosted my confidence to speak publicly, I feel more able to volunteer for roles which will push me out my comfort zone as I can now see how beneficial it can be to my overall learning* (2nd year student feedback, 2018). Student participation in the book club is voluntary, attendance at each event has been circa 15-20 students. Due to the Covid Pandemic no meetings were arranged during the 2020-2022 academic session.

5.3 New Civil Engineer 2014

This first-year coursework required students to consult any issue of New Civil Engineer (NCE) a monthly (weekly 1972-2014) industry magazine free to student members (webpage and /or tablet) of the ICE. Hard copies were available in the university library reading room. The task required students to select six technological themes from any section (news, projects, adverts, etc.). To produce six drawings/sketches on either A3 or A4 paper and annotate each sketch and provide further notes indicating evidence of associated research to demonstrate curiosity and information mining skills. The submissions demonstrated that fresher students had some difficulties in defining technological aspects of civil engineering practice (Murray & Tennant, 2014). Nonetheless, introducing students to NCE did have a positive impact on many students who proclaimed that they would read the magazine regularly- *reading the magazine made me inspired and interested [in my studies]; I am more interested in reading them in my spare time as I have realised how helpful they can be for my general knowledge of civil engineering industry.*

5.4 National Geographic Magazine 2014

The idea to promote the *National Geographic* (NG) to students was driven by the author’s subscription to the magazine. To demonstrate a need for engineering students and graduates to appreciate and understand the interplay between technology, nature, society and culture (Bell et al., 2011). To awaken students to the concept of ‘systems thinking’ as an aid to address complex global issues (Godfrey et al., 2010). A pilot study (Murray & Ross, 2014) involved distributing selected editions of NG (including articles on flooding, population growth, infrastructure, energy supply and urban development) to students, during tutorial sessions. The students were tasked with determining the value of reading NG as a supplement to their disciplinary learning. Of note, one student bemoaned that his edition was mainly about elephants and he could not see the relevance to his studies. Directing the student to a BBC News (2014) story- ‘Worries over new roads in Tanzania’s Serengeti’, squared the circle and facilitated a class discussion on the Environmental Impact Assessment (EIA) of civil engineering projects. This issue was also evident in other responses such as-*Recalling from a recent issue on the Three-Gorges Dam, the journalist wrote a very decent article on how the dam has shaped the way of life of the locals forever* (3rd year student).

5.5 ICE President Addresses 2010-2022

This initiative required first-year students to imagine themselves as the President of the Institution of Civil Engineers, delivering their inaugural speech. Drawing on the inaugural addresses of the presidents (1820–2014) as a source of inspiration and motivation, students were required to select and read six inaugural addresses (two each from 19th, 20th & 21st centuries) of former ICE presidents, and use these as a catalyst for writing their own ICE presidential address, while keeping an eye forwards to the year 2050. The addresses were downloaded from the ICE Virtual Library by the author, using the university library licence, and permission was sought from the ICE to store the addresses on a university drive accessible by the students. The coursework required the students to use a minimum of six quotes, one from each former president, to thread together their own address. The results reveal that the ICE presidential addresses help introduce undergraduates to the real and ‘human’ world of civil engineering. Exploring and exploiting the substantial depository of knowledge, values, wisdom and social context of ICE presidential addresses are both innovative and novel and worthy of adoption and adaptation by other academies seeking to prepare civil engineering undergraduates as global citizens. (Murray and Tennant, 2016).

5.6 Newspaper Coursework 2016

This initiative required first-year students to consult UK newspapers and to find six articles that they believed were relevant to their studies. To familiarise themselves with the scope of civil engineering in society and to reflect on how the image of this important industry sector is portrayed in the news media (UoS, 2016b). In small groups the students were tasked to produce a collage from their newspaper cuttings, and a fictitious front page newspaper poster featuring news about civil engineering practice. The students were encouraged to be adventurous and to be creative and playful in story composition, headline and illustration. Whilst a newspaper reading survey revealed that the students did predominantly consult broadsheets, some did have a penchant for creating tabloid! - ‘Construction Work Badgered’ and ‘Thousands Killed as Shard Crumbles’. Other students were less impressed by the task- *I feel the task was a bit too childish for an engineering course*. Nonetheless, the majority of the class appreciated the opportunity to engage in playful learning and to build relationships with peers- *Along the way, we (the group) definitely got to relate, and have a few laughs, with each other. It was really fun, and has got me excited for the rest of the year.*

5.7 Book Chapter Jigsaw 2016-2022

The book chapter jigsaw coursework (UoS, 2018) and classroom reading activity includes a flipped learning (HEA 2015). Students (1st, 3rd, 4th and 5th year) are assembled into ‘home’ groups (4 students per group) and introduced to the class book, tasked with assigning each other one chapter to read from the prescribed list determined by the tutor. Each student forms one part of the home group jigsaw. Students are given two weeks to read their chapter and to take notes about salient issues that they consider worthy of sharing with their peers in the home group. At the next meeting the groups are broken up so that each student meets with peers who have read the same chapter (subgroups) so to gain different perspectives on the same text (i.e. students with industrial placement experience may offer anecdotes about issues). Then the students return to their home group to teach each other about their chapter’s content. To accommodate restrictions imposed by the Covid pandemic, during the 2020-22 academic sessions a modified approach was adopted using ZOOM meetings. Jigsaw learning is intended to foster non-competitive cooperate collaboration (Voyles, et al., 2015) amongst peers. Feedback revealed that whilst the majority of students agreed that the book jigsaw promoted learning- *I felt this was a valuable way of using*

reading as a main learning resource as I understand its importance throughout university, there were the ubiquitous complaints about a lack of trust and collaboration in group working- *was not effective at all as nobody was really prepared to talk about their chapter and some of the people were just chatting*. During the 2021-22 session the assessment criteria was amended to include self and peer evaluation of professional skills communication, utilizing a reflective ZOOM Vlog.

6. DISCUSSION

The seven interventions are intended to nurture, encourage and enable deep reading (Garfield, 2008) by students during their studies. Some of interventions have a specific dual purpose: learning about construction technology (*New Civil Engineer*); history of the civil engineering profession (*ICE President Addresses*); global issues (*National Geographic*) and the co-curricular book club and book jigsaw exercise assist students to develop self-confidence in public speaking, team working and leadership skills. Student feedback, and coursework submissions, speak of a general positive outcome (albeit these are self-reporting an open to optimism bias- i.e. Dunning–Kruger effect-Dunning, 2011) in inculcating curiosity through reading. However, the interventions were not established to test a cause and effect relationship (positivist) between reading and academic performance (i.e. time spent reading and grade point average). Moreover, no post intervention legacy impact data has been collected to evaluate longer term outcomes (i.e. improved epistemic curiosity; employability skills etc.). Nonetheless, the current intervention (book jigsaw) offers an opportunity for a more detailed evaluation should time permit.

7. CONCLUSION

Applegate and Applegate (2004) have argued that teachers to motivate their students to read by sharing their own enthusiasm for reading. Indeed, in *The Slow Professor*, Berg & Seeber (2016) offer a counterbalance to academic labour characterised by performativity. They argue that academics need to ‘just read it’ and not too consider reading as exclusively linked to producing publications. This begs the question ‘what of module reading lists’? Are we encouraging similar instrumental reading behaviour in our students when reading is exclusive to production? The task at hand is surely to motivate our students to engage in wider reading. Practice that will ensure they communicate using disciplinary language, and to help them understand civil engineering from a systems perspective. What then of reading for pleasure? Jacobs (2011) offers some advice to students in- *The Pleasure of Reading in the Age of Distraction*: ‘When we say that education is a leisure activity, we simply mean that you can only pursue education if you are temporarily free from the responsibility of providing yourself with food and shelter. Maybe this freedom comes from your parents; maybe it comes from loans that you’re going to devote a good many years to repaying. But somebody is buying your time to read, think, and study. This is not just a legitimate but a vital point, one that every student really should remember’ (p.114).

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