

## Designing for student wellbeing: challenging assumptions about where our students learn

**David Biggins**

Bournemouth University, UK

**Debbie Holley**

Bournemouth University, UK

### ***Abstract***

Student wellbeing has been foregrounded during the recent Covid-19 pandemic but this is broad brush and contested with different models being followed across the sector. One aspect of concern is the extent to which access to the technology institutions require students to use contributes to additional stress. A student survey (n=30) in one UK HEI revealed the 'hidden spaces' where students learn, and the findings indicate that the formal institutional Virtual Learning Environment (VLE), with its sophisticated learning analytics, did not fully capture the student experience. This work was followed up with a digital wellbeing survey (n=172) and, by drawing together the two datasets, we report on a more nuanced student experience. Initial findings indicate a schism between formal and informal spaces where students learn, especially within our institutional reporting of students working online. Examples include students using their own preferred tools such as WhatsApp, Trello, and Slack to communicate outside the formal channels; these behaviours thereby devalue the validity of the VLE datasets that student-facing staff are encouraged to use for decision-making. This paper offers insights into accessing and interpreting data in ways that are more useful for academics, learning developers, and learning designers, and suggests ways in which we can effectively frame student support by putting the 'real' student experience at the centre of our practice.

**Keywords:** student wellbeing; analytics; hidden learning spaces; technostress.

## ***Introduction***

Hathaway's seminal work suggested that 'the main barrier to effective instructional practice is lack of information' (1985, p.1). The growth in the availability of data, coupled with the evolution of systems to collate and present information means that we can now obtain potentially useful information about the learner and learning process which can inform our education practice. This study focusses on one UK HEI and explores how and where our students access their study information. In addition, it examines where and how students work with each other, and identifies potential areas of stress built into the traditional Virtual Learning Environment (VLE) structure. This comment from a second year, male nursing student is typical of the responses received about students' experiences during the Covid-19 pandemic:

I have found the teaching can be poor and [I am] not able to interact with students and tutors[;] moreover information isn't clear and [isn't] accessible. Moreover key information has been missed by the teaching teams and not much support given.

This study explores students' decisions about how best to support their own learning and examines the implications these choices have on a) students' digital wellbeing and b) the institution's understanding of their decisions. It comprises an initial pilot study (n=30), then the findings were analysed, and the literature was reviewed to develop a conceptual framework which underpinned the main survey (n=172). The subsequent survey thereby builds upon the pilot with the inclusion of additional questions about student wellbeing and digital stress in the light of the Covid-19 pandemic.

## ***The search for hidden learning spaces***

Recent analysis of the VLE at our institution has evaluated the association between the unit outcome in terms of the final mark with usage of the VLE across different units/disciplines. Making use of random forest algorithms, a machine learning technique that uses multiple decision trees to classify and highlight associations within the data (IBM, 2020), the findings have been counterintuitive for they suggest that VLE usage has only a weak correlation with final marks. A key finding was that many units were not designed with learning analytics in mind, understandable given the recent introduction in our

institution, and this no doubt explains some of the variance. However, even those units which did leverage a broader range of VLE functionality failed to display strong predictive ability. Of great surprise was the low correlation between VLE content usage and unit outcomes and this was to such an extent that the random forest algorithm would often omit content completion from its predictive models. That students were passing units despite limited use of the VLE and the tutor supplied content led us to conclude that student learning was taking place but that some/much of this was happening outside the VLE and outside institutional planning, oversight, and control. Shoufan (2019) identified the reasons why students use resources such as YouTube and it became clear that there are a range of non-formal, social learning spaces inhabited by and used only by students. The search for these hidden learning spaces had begun.

## ***Literature review***

Students' experiences of online learning during the pandemic have been subject to much scrutiny. Digital equity has been foregrounded, and the Office for Students (OfS) Digital Poverty Report (2020) challenged assumptions that 'all' students were able to access the technologies and systems required for study. Of the students surveyed, 52% reported their learning was impacted by slow or unreliable internet connections; 71% reported lack of quiet study space, with 22% severely impacted (18% were impacted by lack of access to computer, laptop, or tablet). Of concern was the 4% of students for whom no internet access was possible; this equates to 104,000 students across English HEIs.

Unsurprisingly, the stresses of online expectations brought to the fore narratives of loneliness and isolation, with 52% of students surveyed by the 'Student Minds' mental health charity (2021) reporting this as a key area that impacted their wellbeing. The study further identified key 'fracture points' showing that the burden fell unequally across the student body, with 10% reporting a positive impact on their mental health and wellbeing and 74% reporting concerns about their mental health. It can be seen from this report, and the Citizens Advice 'Life through the Lockdown Report' (2021), that individuals from low-income households, ethnic minorities, and people with disabilities are disproportionately impacted as they cannot afford an internet connection that is fit for purpose.

Two reports from the Office for National Statistics (2021; 2022) on digital inequalities highlight the issues in school attainment across the sector, and specifically highlight the

obstacles faced by young people leaving care settings. The pandemic saw a widening of disadvantage with 20% of students struggling with access to online learning and those particularly impacted were Black, Asian and Minority Ethnic students, those from poorer backgrounds, care leavers, students with caring responsibilities, and students with disabilities (NUS 2020).

In terms of students seeking support, the NUS survey reported that 82% of students seek support from friends and family online, however only 18% are looking for self-help for wellbeing through digital apps; our own analysis also shows that students did not make their way to central resources online, nor access the array of 'digital' wellbeing apps available to them. A McKinsey & Company Report (Heitz et al., 2020) looked at the next stages for the sector and highlighted the imperative for institutions to address students' social, emotional, and human needs as a precursor to offering effective online study. Developing and nurturing students' sense of 'belonging' to their cohort, their disciplines, and to the community at large requires significant adjustment of our previous on-campus practices.

The seminal work by Robinson et al. (2015) clearly identifies the themes highlighted in the charity/policy reports and policy documents that frame this paper. The work emphasises the significance of digital inequalities across a broad range of individual and macro-level domains. Factors determining inequality include life course, gender, race, and class, as well as health care, politics, economic activity, and social capital. In highlighting the concerns of a digitalised society and its impact in leaving people behind, Helsper (2021) points to the relevance of digital gains viewed through the lens of tangible outcomes in everyday lives. Her Corresponding Fields model is a powerful tool that theorises the contextual paths of the individual and calls for a meso-level social exploration of the processes as drivers of digital inequalities. Such tools cannot be seen in isolation but need to be embedded within scholars' ongoing research in digital inequity, or, as Helsper terms it, socio-digital inequalities. These concepts have been amplified in calls for global rights for all to become digitally literate through collaborations linking public and private rebuilding of a connected society (Alvarez, 2021), and reflected through the embodiment of these principles in the recently revised EU digital competence framework (Vuorikari, Kluzer and Punie, 2022).

Post-pandemic, the Student Academic Experience Survey (2022) included an additional question series on undergraduate experiences of online/face-to-face delivery. Kernohan and Dickenson, reflecting upon the survey, point to the continuing mental health issues affecting students and comment that anxiety is

epidemic here where 4 in 10 students are self-reporting high anxiety, with trans, LGBT+, nonbinary, black and international students all significantly above the average, and that [is] showing up as an important factor in non-continuation risk. (2022).

The charity, Student Minds, has a series of publications pertaining to student mental health (co-production, the role of academic tutors, LGBTQ+ intersectionality). Killen and Langer-Crane, in their report for Jisc, identify technologies as key to the government 'levelling up' agenda and as crucial to ensure no one is digitally excluded and excellent online education is framed as powerful, engaging, flexible, and enabling through access to high quality resources (2021).

However, undertaking studies of where and how our students learn are not straightforward. In an age of learner analytics (LA), one of the most significant 'new' topics in higher education (Tsai et al., 2020; Khalil, Prinsloo and Slade, 2022; Mutimukwe et al., 2022), the potential benefits to student outcomes are a key part of many new VLE purchases. The benefits of LA are widely recognised in the literature as improving learning outcomes for students, promoting goal-oriented behaviours, increasing the awareness of strengths and weaknesses, creating actionable insights for learners, assisting with student retention, and improving unit delivery by staff (Ifenthaler and Yau, 2020; Killen and Langer-Crane, 2021; Kleimola and Leppisaari, 2022; Susnjak, Ramaswami and Mathrani, 2022).

While there are identified benefits from LA, improving the learning outcomes of students through the use of information on their engagement/performance during learning module/unit delivery (Pardo, Ellis and Calvo, 2015; Persico and Pozzi, 2015; Ferguson and Clow, 2017) successful implementation can be challenging and, as a result, the literature relating to success is sparse (Macfadyen, 2022). Literature does however contain cautionary notes for those attempting to deploy learning analytics which are categorised in four areas in Table 1.

**Table 1. Limitations of learning analytics.**

Area	Issues	Authors
Institutional strategy and infrastructure	<ul style="list-style-type: none"> <li>▪ Institutions need a clear vision for LA.</li> <li>▪ Senior leadership is required.</li> <li>▪ Many institutions see LA as a tool for institutional management.</li> <li>▪ Institutions need to have the capability to capture students' digital footprints across their systems.</li> <li>▪ Institutions need to make good use of VLE tools to provide a valid basis for data analysis.</li> <li>▪ Institutions need to be able to collate diverse datasets into a connected whole.</li> </ul>	Colvin et al. (2017); Ferguson and Clow (2017); Becker et al. (2018); Tsai et al. (2020); Guzmán-Valenzuela et al. (2021).
Deployment and implementation	<ul style="list-style-type: none"> <li>▪ There are multiple frameworks available to institutions.</li> <li>▪ The accuracy of predictive analysis.</li> <li>▪ If units are changed, comparisons with previous years are invalid.</li> <li>▪ Ethical use of data.</li> <li>▪ An institution's use of LA is linked to their maturity in LA.</li> <li>▪ A student accessing the VLE or engaging with technology enhanced learning (TEL) tools does not mean that learning is taking place.</li> <li>▪ LA ignores learner characteristics, teaching pedagogies, and subject-specific individualities.</li> <li>▪ Personalised learning strategies are ignored in preference to 'one size fits all' LA paradigm.</li> </ul>	Colvin et al. (2017); Ferguson and Clow (2017); Corrin et al. (2019); Hernández-Leo et al. (2019); Foster (2021); Kollom et al. (2021); Lim et al. (2021); Biggins, Holley and Supa (2022); Kaliisa, Kluge and Mørch (2022).

	<ul style="list-style-type: none"> <li>▪ How LA outcomes are perceived, interpreted, and acted upon by stakeholders need to be standardised and personalised.</li> <li>▪ Heterogeneous data is required to provide a more holistic view of student learning of which only a part takes place within the VLE.</li> </ul>	
Engagement by staff and students	<ul style="list-style-type: none"> <li>▪ Student engagement with LA is influenced by their trust in the organisation, concerns about privacy, understanding of LA, what they will gain, and their willingness to share personal information.</li> <li>▪ Staff engagement with LA is influenced by understanding of LA, appreciation of metrics, intervention methods and training.</li> </ul>	Ferguson et al. (2016); Wasson, Hanson and Mor (2016); Kaliisa, Kluge and Mørch (2022).
Impact	<ul style="list-style-type: none"> <li>▪ The benefits of LA have been difficult to demonstrate.</li> </ul>	Viberg et al. (2018); Tsai et al. (2020); Macfadyen (2022).

A limitation of learning analytics that is inherent in Table 1 is that the source learning data must be accessible in order for it to be analysed. Any learning data that is not accessible is ignored. The problem with this approach is that the decisions that are drawn from the visible learning information may be flawed if the data is incomplete.

**Method**

Following Stake (1995), the work is presented as an instrumental case study, where a particular case (students in a single institution) is examined to give insights into an issue (where they go to learn). The surveys capture both quantitative and qualitative data, and the qualitative data is analysed to develop themes. To capture data, we selected a survey

questionnaire. The choice of a questionnaire was further strengthened because it offers the possibility for other institutions to run the same survey and thereby to build a view across the HE sector.

Questionnaire data (both qualitative and quantitative) was collected using the Jisc Online Surveys (JOS) tool and was accessible by a URL link that was given to students via announcements in the VLE. Undergraduate and postgraduate students across all four faculties of the institution were invited to participate. The pilot questionnaire was completed in academic years 2019-2020 and received ethics approval, it was used to test the questionnaire and identify flaws that could be rectified before the main study (Hassan, Schattner and Mazza, 2006). The main, institution-wide questionnaire then took place in academic years 2020-2021 and 2021-2022.

The questionnaire comprised five sections:

1. Profile data: information on the level of study and gender.
2. Participant's confidence in using technology: this was captured using a five-point Likert scale (unaware; aware; practiced; competent; expert).
3. Internet access and engagement with VLE tools: this was sought using a frequency Likert scale (for the internet access) and a difficulty Likert scale (in respect to engagement with VLE tools).
4. Supporting student learning: this section offered a free-text box, and asked for three things that staff could do to better support student learning.
5. Learning in a pandemic: this section used a free text box to capture how students felt about learning in a pandemic.

The open-source analysis and visualisation programming language and environment R is widely used in research (Braun and Murdoch, 2021; Brennan, 2021; Vidoni, 2021; Staples, 2022) and was the basis for all the data analysis for this study. The data was extracted from JOS in CSV file format and imported into a R Markdown report (R Studio, 2022). The benefit of using a R Markdown document is that the source data is not altered and instead, the transformations performed on the data are visible, transparent, and repeatable (Oana, Schneider and Thomann, 2021; Rimal, 2021). Functions in R were used to prepare tabulations and visualisations for the response to each question so that these could be reviewed and discussed by the team. Data cross-tabulations were created in the R



Markdown document and statistical tests were applied (ANOVA and t-tests) which enabled supported conclusions to be generated. The data set for the questionnaire is open access and available from the Bournemouth University data repository, BORDaR.

## ***Results: pilot study***

The pilot study questionnaire was completed by final year undergraduate students in a computing department (n= 30), characterised as being predominantly young, white, and male. Key themes which emerged from the pilot study are listed below:

- **Confidence using technology.** The most frequent response was 'expert' in the areas of computer use (63%), smartphones (67%), social media (43%), and the internet (67%). This contrasted sharply with the use of the VLE where only 13% reported expertise. The most frequent response for VLE use was 'competent' (67%). When it came to using the VLE, respondents reported that component access was either easy or very easy in all areas except accessing the unit schedule.
- **Frequency of access to the VLE.** The most frequent response was 2-3 times per week (53%).
- **Access to materials.** When asked how learning materials were accessed, core materials were either 'frequently' (43%) or 'very frequently' (40%) accessed via the VLE as were assessment materials (very frequently 60%) but these percentages were lower when accessing supplementary materials where the most frequent response was 'sometimes'.
- **Learning materials from peers.** Accessing materials from peers displayed more uniform distribution variation. 25% of students reported accessing core material from peers on a frequent or very frequent basis. 80% of students accessed YouTube for learning materials frequently or very frequently. Figure 1 shows that core materials are shared with peers sometimes or frequently (both 24%) and that men shared proportionately more than women.
- **Improvement suggestions.** In response to the question asking for improvement suggestions, a wide range of responses were received. One student noted the different use of the VLE by staff, saying 'Some parts of the course used [the VLE] effectively, and others really didn't. Some professors barely used it at all, and some

of their content was difficult to follow, while others used huge quantities of content providing many ways to learn'. This variation in how the materials were presented was echoed by another respondent who requested 'a more unified format for learning materials'.

Based upon the literature and the findings, a conceptual map was developed, this is shown in Figure 1 below.

**Figure 1. Conceptual map.**

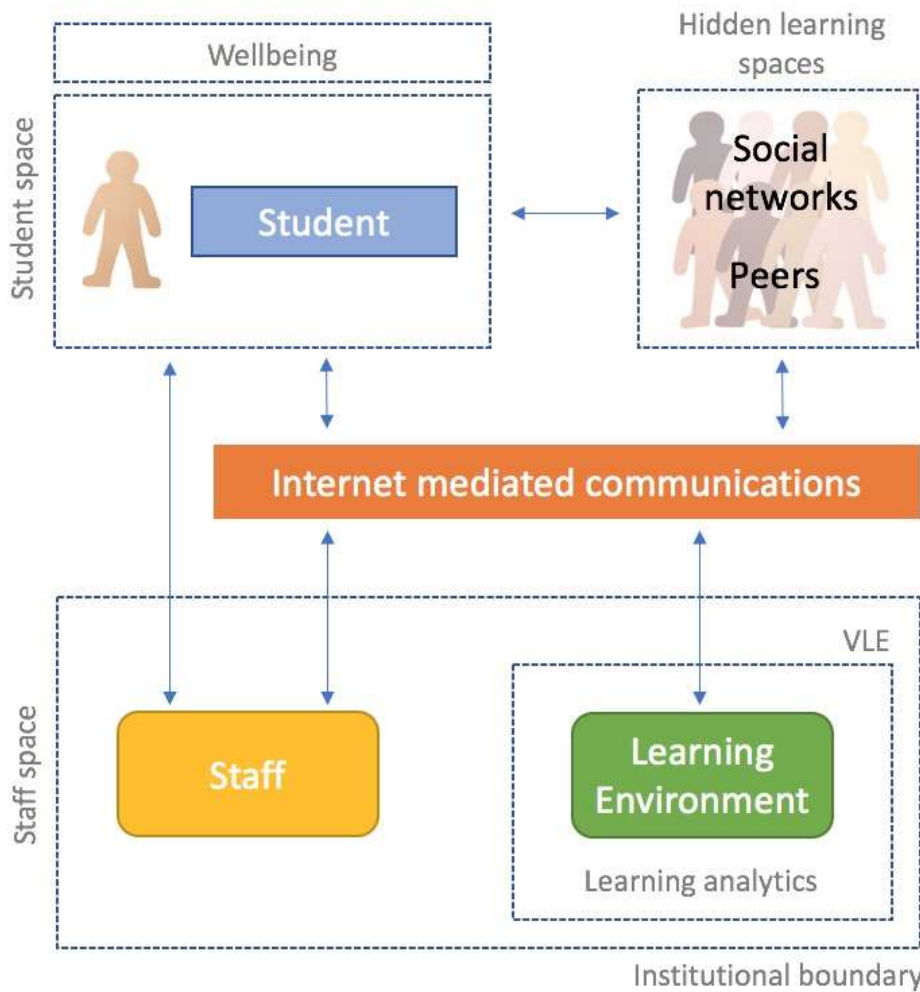


Figure 1 comprises four components. The students and their wellbeing are located in the top left quadrant. To their right are their peers who are connected to them either face-to-face or online. The inter-student learning that takes place here is not visible to institutions and is thus termed the 'hidden learning' spaces. The institutional space, made up of staff and the VLE, is represented at the bottom of the map. Learning analytics are closely connected to the institutional learning environment and draws insights from it. The fourth component, in the middle of the map, is internet-mediated communications. This

demonstrates that many interactions between institutions and students are reliant on this medium of communication, and it therefore becomes a vital element in the system, taken for granted when it operates as expected but a source of frustration and stress when it does not.

Building on the pilot study and the conceptual map, the questionnaire was re-run, with two questions focused on student wellbeing added.

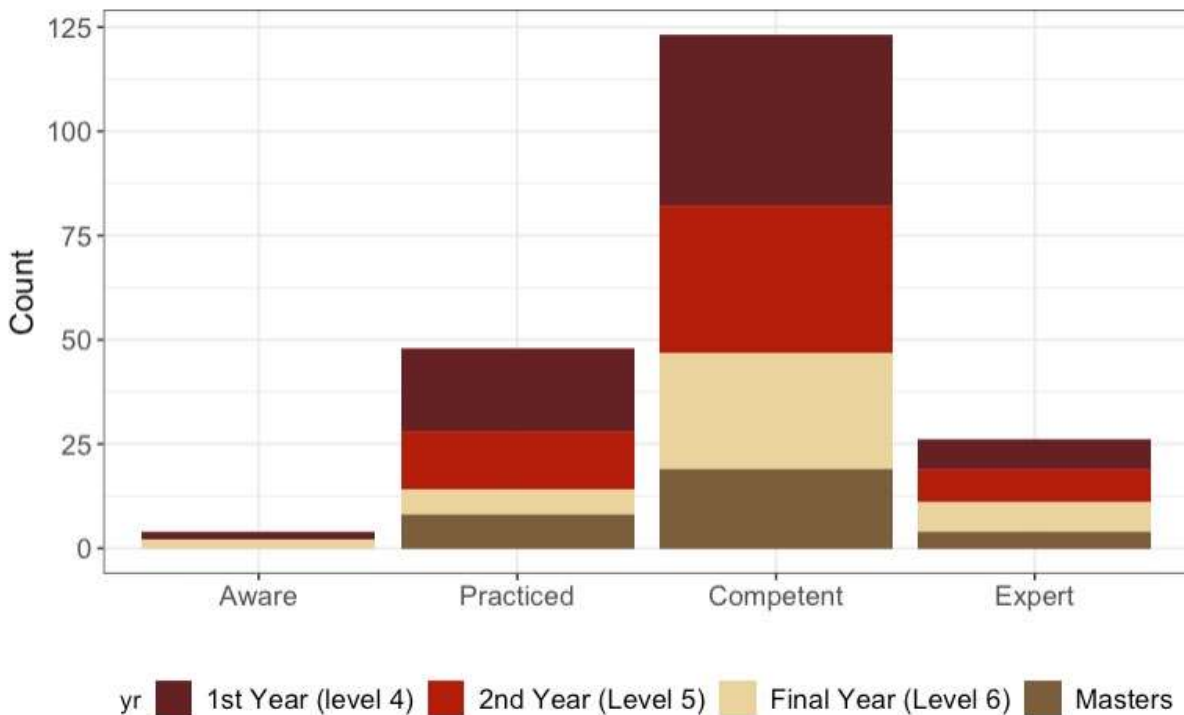
### ***Results: institutional study***

The second questionnaire attracted 172 responses. This institutional survey encompassed all four faculties and students from first year undergraduates to master's level. The responses were combined with the pilot results to give an institutional view (n=202). 59% of respondents were female and 38% male. Most respondents (35%) were first year students, 29% second year, 21% final year, and 15% were master's students.

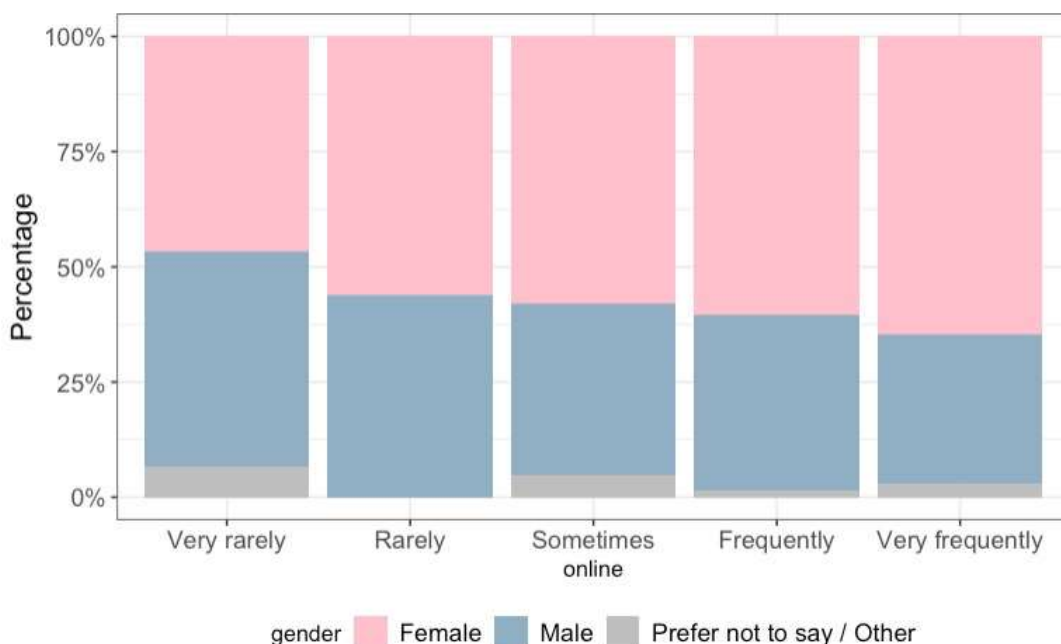
The broader range of students who completed the second questionnaire led to a wider range of responses and subsequent additional themes, addressed below:

- **Confidence using technology.** The most frequent response for computer use, smart phones, social media, and the VLE was 'competent' (range from 43% (social media) to 61% (VLE)). Across all the technology dimensions, master's students who, at our institution are predominantly international students, reported lower levels of confidence compared to undergraduate students who are mostly UK nationals. There were no significant differences across genders. Figure 2 shows confidence levels in the VLE by year of study. An 'awareness' level was reported by one first year and, surprisingly by one final year student but it is possible that this student had only recently transferred to our institution. Figure 2 also shows that the proportions of confidence are unaffected by the year of study. Our expectation was that confidence in the VLE would grow with experience as undergraduates in particular repeatedly use the VLE in their studies, but this was not seen in the data. Our study shows students selecting to use their own technologies and view the VLE as a formal, institutional space and place little value in developing skills in this area.

**Figure 2. Confidence using the VLE by year of study.**



- Access to materials.** Access to the VLE components was reported to be easy or very easy for every component; learning materials, 78%; assessment materials, 75%; recorded material, 65%. The data shows the expected but barely discernible result that VLE components are easier to use as experience grows during undergraduate studies. No gender or faculty differences were noticed in this section of the questionnaire responses. Core materials were accessed frequently (43%) or very frequently (44%) from the VLE, mirroring the pattern in the pilot questionnaire. A similar pattern was noted for access to assignment materials with the mode being very frequently (45%).
- Materials from peers.** The uniform pattern related to accessing core and assessment material from peers was not seen in the second questionnaire. Instead, the most frequent answer was rarely (33%). The second questionnaire also showed a lower reliance of YouTube. The most frequent response was frequently (36%). Women reported a greater frequency of access to YouTube for learning materials than men. Figure 3 shows the frequency of access to YouTube. The percentage increase in the pink bars shows how the proportion of female usage increases in line with the increase in the frequency of access.

**Figure 3. YouTube access by frequency and gender, 100% stacked bar chart.**

- Accessing the internet.** These were new questions prompted by Covid-19. The responses showed that 74% of students owned their own device with ownership not affected by year of study. A good internet connection was frequently reported by 60% of students. Only 18% enjoyed a consistently good connection (that is, a consistent and robust connection, enabling all groupwork and all other required work to be completed without delay or interruption).
- Wellbeing.** Many students commented on the negative effects of online learning on their mental health. One student responded that ‘the lack of personal aspect has been really damaging to my mental health and has been very lonely’. Our themed analysis earlier illustrated the connections between poor mental health and physical health, motivation, relationships, social anxiety, and feelings of isolation. The positive effects of having peer and social networks were highlighted. One student described the need for, but also the difficulty of, forming social networks during lockdowns, saying ‘it did make it more difficult to interact with peers and build a system to help one another’.
- Learning in a pandemic.** This question created 147 responses that could be separated in a minority of positive and majority negative responses. Positive responses included how it was easier to obtain a good grade during the pandemic, fewer distractions, the improved use of technology by the institution, the flexibility to learn from anywhere, growth of the resilience and adaptability of students, more

time to study due to reduced travel time and some appreciation for the extra effort and support from staff. The last positive was unusual because the level of support and understanding from the institution was more frequently seen as a negative. Many commented on the loss of interaction with staff and peers, isolation, distractions, and sometimes poor-quality connections that blighted the learning experiences. One student spoke for many when she said she had 'not enjoyed learning during pandemic, do not feel engaged in the course at all, very detached and do not gain any enjoyment through online learning'. Many commented on the difficulty in keeping up with the communication coming from the institution with some students missing key information.

- **Institutional support.** The final question asked students to rate the institutional support during the pandemic on a scale of 1 (low) to 10 (high). The mean score was 6/10. There were no gender differences. Master's students were the group which rated the institution most highly (6.8) and second year students gave the lowest score of 5.4.

## ***Discussion***

From the survey results and preceding analysis two key themes were identified: students and their wellbeing and students and their preferred study spaces.

### **Our students and their wellbeing**

Central to this study are students and their digital wellbeing. The question asking students to reflect on learning during a pandemic elicited responses from 90% of respondents. Textual analysis of the responses identified frequent use of words including 'hard', 'harder', 'negative', 'difficult', as well as 'family' and 'home', reflecting the NUS report (2020) as well as the work by the Citizens Advice Bureau (CAB, 2021). The difficulty faced by many institutions to quickly convert face-to-face modes of delivery to purely online delivery and the effect this had on students was summarised by one student who said, 'I have been spending too much time online and on my computer and the organisation in some units has been poor'.

Many students perceived a drop in the quality of teaching, especially where courses contained a high level of practical or teamwork. An increase in social anxiety and the difficulty of making friends also appeared frequently in the responses as highlighted by Student Minds' work on student mental health (2021). While most of the comments in this section were negative and many were very negative, a few highlighted the positive aspects of the pandemic in terms of time saved in commuting, being forced to be an independent learner, and technology skills and confidence acquired.

The mixed effects of the pandemic were summarised by one student who wrote 'it has helped me as I have children at home. However, I feel I would be more productive based at uni'. These findings very much reflect the national literature on the intersectionality of BAME, LGBTQ+, disability, and social class. The data suggests these groups are negatively impacted and alongside more robust access to the digital (external driver), more considered and more inclusive and considered learning design is a necessity (internal driver).

Technostress is not a new concept, its origins are in the work of Brod (1984) who wrote about the ways in which computer anxiety could manifest itself in our individual orientation to time, communication models, and interpersonal relationships. His work did nuance technostress into both positive and negative aspects of technology, however, during the pandemic the term was utilised to garner information about the negative aspects of technology usage. This negative use of the term has been picked up and used in official documentation, framing the survey work of the mental health charity, Student Minds (2021), the Office for Students (2020), and the Office for National Statistics' quarterly reports on the student experience (2021; 2022). This question was included in our survey, linked to wellbeing, and provoked a strong response rate of 80%. While some respondents reported not feeling any affects from technostress, most students demonstrated a high awareness of the dangers of technostress. Many responses gave examples of the actions taken to limit technostress (walks, breaks, days away from the computer, and designated time off screen). However, there were many responses chronicling the negative aspects of spending so much time with technology and the difficulty of dealing with technostress. One respondent commented 'I try and go on walks to get outside but it doesn't really help.'

Another generator of technostress was reported to be the reliability of the technology and people's ability to use it. One person notes that 'I try and get help – from the IT dept, my

kids, a local computer guy – I know it saves time and angst to get help sooner rather than later if I can't do something or something isn't working'. The outcomes of technostress were reported to be low motivation, a difficulty focusing, an increased tendency to procrastinate, isolation, anxiety, and a great deal of frustration. Comments that the institution was doing enough to recognise this problem and/or help students to deal with it did not appear frequently in the responses. In the responses to the questions on learning in a pandemic and technostress, students were not confident of the institution's ability to respond effectively to the pandemic. It could be inferred from such comments that this had a detrimental effect on students' wellbeing.

Reflecting on a year of study online and how the 'learning curve was very steep', one respondent concluded that 'my digital well-being was seriously stressed many times!' In common with all institutions, we sought to ramp up the resources available to students and signposted both staff and students to relevant support on many occasions. One of the final questions asked respondents to comment on whether the institution was doing enough to support students, using a scale of 1 (no) to 10 (yes). Answers ranged between 1 and 10. The mean score was 5.8 out of 10; for further nuance the qualitative feedback was revisited, and, when asked about access to any of the available resources, 68% reported not accessing the wellbeing resources. The wellbeing of students needs to be paramount. However, it is clear from the study that well-intentioned institutional responses did not fulfil the needs of students at times of stress.

Technostress is an issue for staff as well as the student body, and there is well documented literature highlighting its impact on university teachers work performance; Li and Wang (2021) point to techno overload as one technostress factor having a significant negative influence on their work performance. Staff and student concerns about technostress need to move from the domain of IT, and institutions need to take a holistic approach in developing strategies to support all stakeholders. A broader perspective for institutions is offered by Biggins, Holley and Supa (2022), with their digital learning maturity model. This model identifies the key drivers and solutions for digital enhancement.

### **Our students and their preferred study spaces**

Reflecting on the conceptual map in Figure 1 which identifies the key components underpinning students' selection of preferred study spaces, the role of social networks and



peers is foregrounded. Our findings clearly demonstrate the reliance of students on their networks and peers for part of their learning; and in doing so they access a wide range of 'Apps'. These are the hidden learning spaces, invisible to academics and to the algorithms of learner analytics. Against a challenging and contested background VLE engagement is seen a proxy for student engagement and/or wellbeing. However, this study shows that a far more nuanced approach is needed to fully understand where the stress points are for students. The VLE is conceptually separated from the student internet mediated learning experiences, and some students are choosing to 'opt out' of VLE communication tools where they can be tracked, measured, and monitored. Further work is therefore required to determine whether it is the usability of alternative 'Apps' which students find attractive, or whether they dislike, for example, the surveillance regime.

Learner analytics packages are sold to institutions with assurances about the validity, reliability, and robustness of the data. This small-scale study challenges these assumptions, and from the analysis, it is now possible pick up the nuances and complexities of interpreting and understanding the data. Our students are far more creative and innovative outside the formal learning spaces offered by VLEs. Our identification of hidden learning spaces raised issues of institutional acceptance of third-party tools and systems, the scope of institutional policy and guidance, data privacy issues, copyright concerns, staff appreciation, student wellbeing, and learning design. Thus, many institutions, when seeking a single point of 'truth' about student learning through analytics packages may, in fact, be making decisions on flawed and inaccurate metrics. In the Jisc Student digital experiences insights survey, the student experiences during the period are labelled as 'pivotal' in an academic year that changes the landscape of HE forever (Killen and Langer-Crane, 2021). However, the societal inequalities remain, and despite a clear evidence base, it is disappointing that some learners remain socio-digittally excluded as defined by Helsper, and along the wider lines identified by Robinson et al. (2015).

## **Conclusion**

Post Covid-19 student research surveys (OfS; ONS; Jisc) are still far from offering us a holistic picture across the sector, and what an institutional case study can offer are insights into a rich and complex set of experiences locally that are mirrored in the contemporary national data sets. Models of, and commitment to, whole institution building, are essential,

as is investing in an equitable digital future powered through staff and student co-creation. Potential solutions are offered in the institutional strategic mapping of student co-creation digital partnerships, such as those advocated by Biggins, Holley and Supa (2022); wider societal solutions are suggested by the reframing of the digital narrative suggested by Helsper (2021) who calls for more nuanced approaches in the addressing of socio-digital inequalities.

Students have excellent suggestions to make about how those who support their learning can offer optimal support. Suggestions for improvement asked staff to be 'more mindful', better 'support students', 'have better communication with students', and 'better contact with the academic advisor', sentiments and language that were completely absent from the 2019 pilot. Some themes were common and included requests to improve the quality of materials, and the timely release and recording of lectures. Many comments focused on the experiences of online learning and the difficulties experienced in interacting and learning in a virtual learning environment, especially where the perceptions were that staff were expecting students to use and access tools that they themselves had not mastered.

The limitations of this work are the small samples and the wide range of respondents within the sample, yet there are useful insights for future learning. It is clear that students value our expertise and guidance yet find it frustrating that we are unable to use some of the digital tools we advocate for them. They are supplementing their learning from a wide range of sources as the content we provide is supplied on a platform that is not intuitive to use. In terms of digital health and wellbeing, students display a mature appreciation of the potential hazards of technostress and the care of their own wellbeing.

What students requested the most from us as supportive members of staff in HE was for us to 'listen better, empathise more, and provide more support'. Good practice in learning development shows that partnership working can overcome some of the technological, cultural, and social barriers experienced by students. This study has identified the different spaces where our students are opting to meet their peers, collaborate, and learn. A challenge for us all, moving forwards, is to develop our own technological skillset so that we can effectively support students wherever they choose to learn.

## References

- Advance HE (2022) *Student academic experience survey*. Available at: <https://www.advance-he.ac.uk/knowledge-hub/student-academic-experience-survey-2022> (Accessed: 18 February 2023).
- Alvarez Jr., A. V. (2021) 'Rethinking the digital divide in the time of crisis', *Globus Journal of Progressive Education*, 11(1), pp.26-28.
- Becker, S. A., Brown, M., Dahlstrom, E., Davis, A., DePaul, K., Diaz, V. and Pomerantz, J. (2018) *NMC horizon report: 2018 higher education edition*. Available at: <https://cit.bnu.edu.cn/docs/2018-09/20180918163624337480.pdf> (Accessed: 18 February 2023).
- Biggins, D., Holley, D. and Supa, M. (2022) 'From tools to wellbeing: a proposed digital learning maturity model (DLMM)', *16th International Technology, Education and Development Conference: INTED2022 Proceedings*. Online 7-8 March. IATED Digital Library, pp.4687-4696. <https://doi.org/10.21125/inted.2022.1235>.
- Braun, W. J. and Murdoch, D. J. (2021) *A first course in statistical programming with R*. Cambridge: Cambridge University Press.
- Brennan, P. (2021) 'Data visualization with the programming language R', *The Biochemist*, 43(5), pp.8-14. [https://doi.org/10.1042/bio\\_2021\\_174](https://doi.org/10.1042/bio_2021_174).
- Brod, C. (1984) *Technostress: the human cost of the computer revolution*. Reading, Mass.: Addison-Wesley.
- Citizens Advice Bureau (2021) *Life through lockdown: what Citizens Advice data tells us about the year everything changed*, March. Available at: [https://www.citizensadvice.org.uk/Global/CitizensAdvice/Covid-19%20Data%20trends/Citizens%20Advice\\_Life%20Through%20Lockdown%20\(1\).pdf](https://www.citizensadvice.org.uk/Global/CitizensAdvice/Covid-19%20Data%20trends/Citizens%20Advice_Life%20Through%20Lockdown%20(1).pdf) (Accessed: 18 February 2023).

- Colvin, C., Dawson, S., Wade, A. and Gasevic, D. (2017) 'Addressing the challenges of institutional adoption', *Handbook of Learning Analytics*, 1, pp.281-289.
- Corrin, L., Kennedy, G., French, S., Buckingham Shum, S., Kitto, K., Pardo, A., West, D., Mirriahi, N. and Colvin, C. (2019) *The ethics of learning analytics in Australian higher education*. Available at: [https://www.researchgate.net/publication/332263485\\_The\\_Ethics\\_of\\_Learning\\_Analytics\\_in\\_Australian\\_Higher\\_Education\\_DISCUSSION\\_PAPER\\_PREPARED\\_BY?enrichId=rgreq-a9442f19d110372a98e526367e519370-XXX&enrichSource=Y292ZXJQYWdIOzMzMjI2MzQ4NTtBUzo3NDUyNDA5MDY0MzI1MTRAMTU1NDY5MDY4NjkzMA%3D%3D&el=1\\_x\\_2&esc=publicationCoverPdf](https://www.researchgate.net/publication/332263485_The_Ethics_of_Learning_Analytics_in_Australian_Higher_Education_DISCUSSION_PAPER_PREPARED_BY?enrichId=rgreq-a9442f19d110372a98e526367e519370-XXX&enrichSource=Y292ZXJQYWdIOzMzMjI2MzQ4NTtBUzo3NDUyNDA5MDY0MzI1MTRAMTU1NDY5MDY4NjkzMA%3D%3D&el=1_x_2&esc=publicationCoverPdf) (Accessed: 18 February 2023).
- Ferguson, R., Brasher, A., Clow, D., Cooper, A., Hillaire, G., Mittelmeier, J. and Vuorikari, R. (2016) *Research evidence on the use of learning analytics: implications for education policy*. Seville: Joint Research Centre. <https://doi.org/10.2791/955210>.
- Ferguson, R. and Clow, D. (2017) 'Learning analytics: avoiding failure', *Educause Review Online*, 31. Available at: <http://oro.open.ac.uk/50385/3/50385.pdf> (Accessed: 18 February 2023).
- Foster, K. (2021) 'Paving the road for the future of data analytics', Jisc, 5 November. Available at <https://www.jisc.ac.uk/blog/paving-the-road-for-the-future-of-data-analytics-05-nov-2021> (Accessed: 21 February 2023).
- Guzmán-Valenzuela C., Gómez-González C., Tagle A. R. and Lorca-Vyhmeister A. (2021) 'Learning analytics in higher education: a preponderance of analytics but very little learning?', *International Journal of Educational Technology in Higher Education*, 18(1), pp.1-9. <https://doi.org/10.1186/s41239-021-00258-x>.
- Hassan, Z. A., Schattner, P. and Mazza, D. (2006) 'Doing a pilot study: why is it essential?' *Malaysian family physician: the official journal of the Academy of Family Physicians of Malaysia*, 1(2-3), p.70. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4453116/> (Accessed: 21 February 2023).

- Hathaway, W. E. (1985) 'Hopes and possibilities for educational information systems', *Information Systems Conference*. Available at: <https://eric.ed.gov/?id=ED253560> (Accessed: 21 February 2023).
- Heitz, C., Laboissiere, M., Sanghvi, S. and Sarakatsannis, J. (2020) 'Getting the next phase of remote learning right in higher education', *McKinsey & Company*. Available at <https://www.mckinsey.com/industries/public-sector/our-insights/getting-the-next-phase-of-remote-learning-right-in-higher-education> (Accessed: 18 February 2023).
- Helsper, E. (2021) *The digital disconnect: the social causes and consequences of digital inequalities*. London: Sage Publications.
- Hernández-Leo, D., Martínez-Maldonado, R., Pardo, A., Muñoz-Cristóbal, J. A. and Rodríguez-Triana, M. J. (2019) 'Analytics for learning design: a layered framework and tools', *British Journal of Educational Technology*, 50(1), pp.139-152. <https://doi.org/10.1111/bjet.12645>.
- IBM (2020) *Random forest*. Available at: <https://www.ibm.com/cloud/learn/random-forest> (Accessed: 18 February 2023).
- Ifenthaler, D. and Yau, J. Y. K. (2020) 'Utilising learning analytics to support study success in higher education: a systematic review', *Educational Technology Research and Development*, 68(4), pp.1961-1990. <https://doi.org/10.1007/s11423-020-09788-z>.
- Kaliisa, R., Kluge, A. and Mørch, A. I. (2022) 'Overcoming challenges to the adoption of learning analytics at the practitioner level: a critical analysis of 18 learning analytics frameworks', *Scandinavian Journal of Educational Research*, 66(3), pp.367-381. <https://doi.org/10.1080/00313831.2020.1869082>.
- Kernohan, D. and Dickenson, J. (2022) 'Anxious students want to us to help them spend time with and learn with each other', *WONKHE*, 9 June. Available at <https://wonkhe.com/blogs/anxious-students-want-to-us-to-help-them-spend-time-with-and-learn-with-eachother/> (Accessed: 18 February 2023).

- Khalil, M., Prinsloo, P. and Slade, S. (2022) 'A comparison of learning analytics frameworks: a systematic review', *LAK22: 12<sup>th</sup> International Learning Analytics and Knowledge Conference*. Online, USA 21-25 March.  
<https://doi.org/10.1145/3506860.3506878>.
- Killen, C. and Langer-Crane, M. (2021) 'Student digital experience insights survey', Jisc. Available at: <https://www.jisc.ac.uk/reports/student-digital-experience-insights-survey-2020-21-uk-higher-education-findings> (Accessed: 18 February 2023).
- Kleimola, R. and Leppisaari, I. (2022) 'Learning analytics to develop future competences in higher education: a case study', *International Journal of Educational Technology in Higher Education*, 19(1), pp.1-25. <https://doi.org/10.1186/s41239-022-00318-w>.
- Kollom, K., Tammets, K., Scheffel, M., Tsai, Y., Jivet, I., Muñoz-Merino, P. J., Moreno-Marcos, P. M., Whitelock-Wainwright, A., Calleja, A. R., Gasevic, D., Kloos, C. D., Drachsler, H. and Ley, T. (2021) 'A four-country cross-case analysis of academic staff expectations about learning analytics in higher education', *The Internet and Higher Education*, 49. <https://doi.org/10.1016/j.iheduc.2020.100788>.
- Li, L. and Wang, X. (2021) 'Technostress inhibitors and creators and their impacts on university teachers' work performance in higher education', *Cognition, Technology & Work*, 23(2), pp.315-330. <https://doi.org/10.1007/s10111-020-00625-0>.
- Lim, L. A., Dawson, S., Gašević, D., Joksimović, S., Pardo, A., Fudge, A. and Gentili, S. (2021) 'Students' perceptions of, and emotional responses to, personalised learning analytics-based feedback: an exploratory study of four courses', *Assessment & Evaluation in Higher Education*, 46(3), pp.339-359.  
<https://doi.org/10.1080/02602938.2020.1782831>.
- Macfadyen, L. P. (2022) 'Institutional implementation of learning analytics: current state, challenges, and guiding frameworks', in Lang, C., Friend Wise, A., Merceron, A., Gašević, D. and Siemens, G. (eds.) *The Handbook of Learning Analytics*. 2<sup>nd</sup> edn. Vancouver: SOLAR.

Mutumukwe, C., Viberg, O., Oberg, L.M. and Cerratto-Pargman, T. (2022) 'Students' privacy concerns in learning analytics: model development', *British Journal of Educational Technology*, 53(4), pp.932-951. <https://doi.org/10.1111/bjet.13234>.

National Union of Students (2020) *Covid-19 and students survey report*. Available at: <https://www.nusconnect.org.uk/resources/covid-19-and-students-survey-report> (Accessed: 18 February 2023).

Oana, I. E., Schneider, C. Q. and Thomann, E. (2021) *Qualitative comparative analysis using R: a beginner's guide*. Cambridge: Cambridge University Press.

Office for National Statistics (2021) 'Consistency needed: care experience students and higher education', *Insight*, 9 April. Available at: <https://www.officeforstudents.org.uk/publications/consistency-needed-care-experienced-students-and-higher-education/> (Accessed: 18 February 2023).

Office for National Statistics (2022) 'Schools, attainment and the role of higher education', *Insight*, 13, April. Available at: <https://www.officeforstudents.org.uk/media/24ac9501-234f-4f34-bf44-edb13e5282c5/insight-brief-13-schools-attainment-and-the-role-of-higher-education.pdf> (Accessed: 18 February 2023).

Office for Students (2020) "'Digital poverty' risks leaving students behind', 3 September. Available at: <https://www.officeforstudents.org.uk/news-blog-and-events/press-and-media/digital-poverty-risks-leaving-students-behind> (Accessed: 18 February 2023).

Pardo, A., Ellis, R. A. and Calvo, R. A. (2015) 'Combining observational and experiential data to inform the redesign of learning activities', *In Proceedings of the Fifth International Conference on Learning Analytics and Knowledge*. New York 16-20 March. New York: Association for Computing Machinery, pp.305-309. <https://doi.org/10.1145/2723576.2723625>.

Persico, D. and Pozzi, F. (2015) 'Informing learning design with learning analytics to improve teacher inquiry', *British Journal of Educational Technology*, 46(2), pp.230-248. <https://doi.org/10.1111/bjet.12207>.

- R Studio (2022) *R Markdown*. Available at: <https://rmarkdown.rstudio.com/> (Accessed: 18 February 2023).
- Rimal, Y. (2021) 'Reproducible academic writing and interactive data visualization using R Markdown (R Programming Flex-Dashboard: Flex\_Dashboard Packages', in Singh Rathore, V., Dey, N., Piuri, V., Babo, R., Polkowski, Z. and Tavares, J. M. (eds.) *Rising threats in expert applications and solutions*. Singapore: Springer, pp.603-615. [https://doi.org/10.1007/978-981-15-6014-9\\_73](https://doi.org/10.1007/978-981-15-6014-9_73).
- Robinson, L., Cotten, S. R., Ono, H., Quan-Haase, A., Mesch, G., Chen, W., Schulz, J., Hale, T. M. and Stern, M. J. (2015) 'Digital inequalities and why they matter', *Information, Communication & Society*, 18(5), pp.569-582. <https://doi.org/10.1080/1369118X.2015.1012532>.
- Shoufan, A. (2019) 'Estimating the cognitive value of YouTube's educational videos: a learning analytics approach', *Computers in Human Behavior*, 92, pp.450-458. <https://doi.org/10.1016/j.chb.2018.03.036>.
- Stake, R. E. (1995) *The art of case study research*. Thousand Oaks, CA: Sage.
- Staples, T. L. (2022) 'Expansion and evolution of the R programming language', *arXiv*, 2208.12382. <https://doi.org/10.48550/arXiv.2208.12382>.
- Student Minds (2021) *University mental health: life in a pandemic*. Available at: <https://www.studentminds.org.uk/lifeinapandemic.html> (Accessed: 18 February 2023).
- Susnjak, T., Ramaswami, G. S. and Mathrani, A. (2022) 'Learning analytics dashboard: a tool for providing actionable insights to learners', *International Journal of Educational Technology in Higher Education*, 19(1), pp.1-23. <https://doi.org/10.1186/s41239-021-00313-7>.
- Tsai, Y. S., Rates, D., Moreno-Marcos, P. M., Muñoz-Merino, P. J., Jivet, I., Scheffel, M., Drachsler, H., Kloos, C. D. and Gašević, D. (2020) 'Learning analytics in European



higher education – trends and barriers’, *Computers & Education*, 155, p.103933.  
<https://doi.org/10.1016/j.compedu.2020.103933>.

Viberg, O., Hatakka, M., Bälter, O. and Mavroudi, A. (2018) ,The current landscape of learning analytics in higher education’, *Computers in human behavior*, 89, pp.98-110. <https://doi.org/10.1016/j.chb.2018.07.027>.

Vidoni, M. C. (2021) ‘Software engineering and R programming: a call for research’, *R J.*, 13(2), p.600. Available at: [https://www.researchgate.net/profile/Melina-Vidoni/publication/358583892\\_Software\\_Engineering\\_and\\_R\\_Programming\\_A\\_Call\\_for\\_Research/links/620d90716c472329dced9b1a/Software-Engineering-and-R-Programming-A-Call-for-Research.pdf](https://www.researchgate.net/profile/Melina-Vidoni/publication/358583892_Software_Engineering_and_R_Programming_A_Call_for_Research/links/620d90716c472329dced9b1a/Software-Engineering-and-R-Programming-A-Call-for-Research.pdf) (Accessed: 21 February 2023).

Vuorikari Rina, R., Kluzer, S. and Punie, Y. (2022) ‘DigComp 2.2: The digital competence framework for citizens with new examples of knowledge, skills and attitudes’, *EconPapers*, JRC128415. Available at: <https://econpapers.repec.org/paper/iptiptwpa/jrc128415.htm> (Accessed: 21 February 2023).

Wasson, B., Hanson, C. and Mor, Y. (2016) ‘Grand challenge problem 11: empowering teachers with student data’, in Eberle, J., Lund, K., Tchounikine, P. and Fischer, F. (eds.) *Grand challenge problems in technology-enhanced learning II: MOOCs and beyond*. Cham: Springer, pp. 55-58. [https://doi.org/10.1007/978-3-319-12562-6\\_12](https://doi.org/10.1007/978-3-319-12562-6_12).

## **Author details**

David Biggins is a Senior Lecturer at Bournemouth University and Senior Fellow of AdvanceHE. David worked as a Technology Enhanced Learning Theme Leader and Academic Learning Designer where he developed a TEL Toolkit, contributed to the design, deployment, and staff training for a new VLE, and led projects in staff skills development, curriculum design, the learning culture, and other institution-wide initiatives. A particular interest for David is the use of data to promote student success, learning analytics, and data visualisation. David’s praxis has developed through his interactions with the LD community and his research is frequently presented at ALDinHE conferences.

Debbie Holley is Professor of Learning Innovation at Bournemouth University. A National Teaching Fellow and a Principal Fellow of AdvanceHE, she is a passionate educator, with expertise in learning design and blending learning to engage a diverse student body. Supporting student writing, drawing on creative practice in her own teaching, and influencing the teaching of others aligns her practice with the LD community, where she regularly presents and supports the annual conference, contributes to the #Take5 blog series, and formerly served on the ALDinHE National Steering Group. Her research in simulation, augmented reality, and immersive worlds reality influence national policy.

### ***Licence***

©2023 The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC-BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. See <http://creativecommons.org/licenses/by/4.0/>. Journal of Learning Development in Higher Education (JLDHE) is a peer-reviewed open access journal published by the Association for Learning Development in Higher Education (ALDinHE).