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Applying Innovative Technologies and Practices in the Rapid Shift to Remote Learning

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Abstract:

Shifting to remote learning during times of a crisis, such as the COVID-19 pandemic, is very different from well-planned online learning. This paper highlights the experience of shifting to remote learning and outlines lessons learned from the experience. The COVID-19 pandemic brought a wholly new educational context, which uncovered problems such as; course delivery & assessment; communication & misinformation; and technology limitations. This highlights a gap in research on rapid mid-term shift to remote learning in times of a crisis. There are plenty of resources for Information Systems education to draw lessons for effective online learning practices. However, there is limited research on remote learning in response to a crisis, such as COVID-19. This paper presents a case study at Bournemouth University, in which a Business Systems Analysis and Design (BSAD) course was moved to remote learning during COVID-19. The results reflect on the importance of learning focus, students focus, and learning resource focus for remote learning. This includes activities to promote effective communication and information resources, student engagement and support, and remote course delivery and assessment. All these activities are essential elements in a rapid shift from blended learning to remote learning during a crisis, such as COVID-19.

Keywords: Remote Learning, Online Learning, Distance Learning, Learning During COVID-19, Innovative Technologies and Practices, Rapid Shift in Learning Environment, Learning Focus, Student-Centered Communication and Information Focus, Learning Resources Focus.

[Department statements, if appropriate, will be added by the editors. Teaching cases and panel reports will have a statement, which is also added by the editors.]

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1 Introduction

COVID-19 has changed the world abruptly and possibly irreversibly. In the United Kingdom, the "stay-at-home" policy began on 23 March 2020 and was in place beyond the end of the academic year. This was an enforced preventative health measure to control the COVID-19 pandemic. At Bournemouth University (BU), this resulted in the immediate implementation of remote learning. Remote learning is an interactive teaching model conducted entirely online between teachers and students, synchronously or asynchronously (Fu and Zhou, 2019). BU mandated that all university activities be moved online in April 2020. We share the experience of this adaptation to remote learning from blended learning in Information Systems education and, more specifically, the Business Systems Analysis and Design (BSAD) course. We do this by highlighting the technologies and practices deemed effective by students, educators and educational management.

Deliberate and well-planned online learning experiences (Gomez et al., 2009; Zhao et al., 2020) are profoundly different from courses offered online in response to a crisis (Hodges et al., 2020). There is broad and in-depth research covering online learning also referred to as virtual learning (Kerimbayev, 2015; Chou and Liu, 2005; Ferratt and Hall, 2009), e-learning (El Mhouti et al., 2016), and subcategories of online learning such as, massive open online courses (MOOCs) (Kim, 2016; Leon Urrutia, et al., 2016). Therefore, plenty of resources exist for Information Systems education to draw lessons, for informing effective online learning practices (Freeman and Urbaczewski, 2019). However, there is limited research on remote learning in response to a crisis, such as COVID-19. The COVID-19 pandemic brought a wholly new educational context, which uncovered new problems discussed below. This highlights a gap in research on rapid mid-term shift to remote learning in times of a crisis. Thus, while focusing on the problems brought by COVID-19 pandemic in higher education, and specially at campus and classroom level (Holsapple, 2009), this research addresses different aspects of online learning, such as, context and user needs (Mavengere and Ruohonen, 2018), challenges (Gillett-Swan, 2017), best practices (Dixson, 2010), instructor presence (Mandernach et al., 2006), and motivation (Lin et al., 2017). The problems experienced in the BSAD course at BU during and after the rapid shift to remote learning include:

- Communication – rapid shift from face-to-face rich medium of communication.
- Information overload and misinformation – students complained of information overload when remote learning started. Laato et al. (2020) highlighted high volumes of misinformation in times of crisis (e.g. COVID-19).
- Course delivery – overcoming the difference in blended and remote learning delivery techniques.
- Course assessment – overcoming the difference in face-to-face and remote learning assessment techniques.
- Students engagement – social and behavioural problems including motivation.
- Technology limitations – despite the numerous benefits that the chosen learning and collaboration platforms provided, there were limitations that needed to be overcome. These included:
    - Labour-intensive remote course delivery (e.g. group setup).
    - Limited participant capacity in existing communication systems (e.g. Zoom).
    - Tracking attendance at virtual meetings.
    - Students accessing learning resources – connectivity from students' homes and access to appropriate technology. This had a profound effect on engagement and their access to learning and collaborative tools.

In this paper, we articulate the significance of the transition, contributions and lessons learned from addressing these problems. The research question we seek to address is:

How can we apply innovative technologies and practices in the rapid shift from blended learning to remote learning during times of crisis, such as a pandemic?

This paper defines the transition process to highlight adaptable approaches that facilitates rapid mid-term transition to remote learning. The level of analysis of this paper is at campus and classroom level. The efforts from which the lessons were drawn were intended to create and maintain an engaging community

of educators and learners during and following, a transition from blended learning environment to remote learning (Garrison and Cleveland-Innes, 2005; Garrison and Arbaugh, 2007).

2 Business Systems Analysis and Design (BSAD) course before remote learning

The BSAD course provides the basis for elaborating this COVID-19 enforced transition to remote learning. BSAD is a first-year undergraduate course of approximately 300 students in the Department of Computing at BU. The course explores the concepts, methods and practices required for system design and development. Content covered in the course includes topics such as the Human Computer Interaction, Usability and User eXperience. BSAD provides opportunities to design, construct and evaluate interactive systems that meet an organisation's need to provide secure and trusted products and services to stakeholders.

Before remote learning, BSAD was delivered using blended learning through a combination of one two-hour lecture and two one-hour practical seminars per week. Blended learning is the combination of online learning and face-to-face classroom learning (Al-Busaidi, 2012). Seminars were laboratory sessions that featured problem-based learning and student-centred activities, with supporting materials available through the Virtual Learning Environment (VLE). Tasks set in seminars provided a mechanism for both student self-assessment and for formative assessment, helping students identify their strengths and weaknesses. BSAD assignment was a week-long group task called Computing in Business Week (CiB). CiB celebrates student work with an exhibition attended by invited guests from industry who also help assess students' work. Each group goes through the life cycle from analysis through to software implementation to solve a set organisational problem.

3 Mid-term Transition from Blended Learning to Remote Learning - Transformation Process and Adaptable Approaches

The move from blended learning to remote learning was an immediate response to a global crisis, and therefore, no pre-planning or preparation had been done prior to the move. This meant that the steps taken were reactive, and largely relied on trial and error to establish what worked and what did not. The solutions that were implemented to overcome the limitations of remote learning are summed up in three categories namely:

- Learning focus - course delivery, course assessment, student engagement, and attendance tracking.
- Students centred communication and information focus - communication, staff-student communication, student-student communication, and information overload.
- Learning resources focus – technology limitations, access to learning resources, limited participant capacity, and labor intensity.

3.1. Learning focus

In Table we illustrate a systematic connection between the learning focus problems identified in the shift to remote learning, related solutions and justification. The solutions that were implemented to overcome learning focus problems includes:

- Bitesize lectures
- Virtual seminars with weekly seminar "check-ins", project update meetings, interactive FAQs
- Three (3) week virtual case study
- Revised virtual assessment with interim deliverables and live assessment "kick-off" events via YouTube
- Virtual support room (vP201)

Table 1. Remote Learning Transformation Process and Approaches Adopted to Limit Learning Problems

Problems identified	Learning activity / transformation process	Justification / adaptable approaches
1. Course delivery	1. Bitesize lectures (BLs) 2. Virtual seminar "check ins"	Revise delivery and adapt digital pedagogy techniques in line with context such as BLs. Focus on meeting intended learning outcomes and covering material for all assessment tasks.
2. Course assessment	1. Three-week virtual case study 2. Revised assessment	1.Constructive alignment – developing learning activities aligned to assessment and based on intended learning outcomes. 2.Revised assessment, taking into consideration techniques that fit remote learning e.g. interim deliverables and live assessment "kick-off" events via YouTube.
3. Student engagement	Virtual support room (vP201)	Create a platform and practices to support students (e.g. vP201) where students can receive both academic and practical advice.

3.1.1 Bitesize Lectures (BL)

Virtual 'Live' sessions were not possible for a full cohort of students because of limitations with the technology available such as limited participant capacity in existing communication systems such as Zoom. We overcame this by recording the lectures in bitesize chunks (BLs) to make them easier to digest for students. BLs are 10-20 minutes recorded videos on a specific topic or concept. BLs were created, uploaded to the VLE and utilised alongside other synchronous learning activities, such as virtual seminars "check ins".

These allowed students to digest content asynchronously at their own pace, and 95% of students found them at least somewhat helpful as shown in Figure 1. BLs were useful in explaining targeted learning concepts and provide further clarification. In addition, concepts useful for assessments were explained in BLs in line with constructive alignment principles. The application of constructive alignment throughout the transition work ensured intended learning outcomes remained related to learning and teaching activities and assignment tasks (Biggs, 1996).

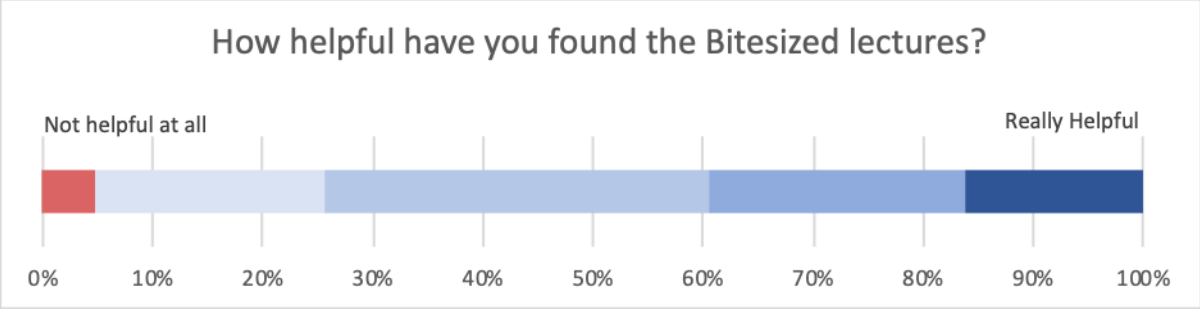

Figure 1. Student ratings of Bitesize Lectures

BLs were used to explain concepts in virtual seminars "check ins". Topics covered by BLs included data flow modelling, reporting and decision tables. In addition, BLs were used to explain to students how the learning technologies would be used for the delivery of BSAD for example Microsoft Teams (MS Teams). Challenges of BLs included their short duration, meaning some students may struggle to gain understanding of the concepts in the short explanations. The solution used to mitigate this concern was to refer, to other learning resources, such as lectures, books and academic articles, in the BLs.

3.1.2 Virtual Seminars "check-ins"

Seminar groups before remote learning had 20 students. These groups were subdivided into smaller subgroups of 8-10 students for remote learning. Seminars ran virtually over three days, allowing time for both independent and group work on a set task over this period:

- Seminar Day 1: Video introduction to the weekly task, delivered via VLE for example on Wednesday.
- Seminar Day 2: Group "check-in" with staff for support and guidance for example on Friday.

The virtual seminars offered virtual flipped classroom learning pedagogy. The students were introduced to the tasks on seminar day one and given two days to work on the tasks. Seminar day two incorporated a group "check-in" where staff met the group on MS Teams to review their work and provide feedback.

The seminars were designed to provide students with an opportunity to apply knowledge gained from lectures to different practical situations. The seminar "check ins" proved very popular with students, as 98% of students valued "check ins", please see Figure 2, and one student commented:

> *"Weekly tasks with a video and 2 days to complete worked really well. The check-in gave a good chance to ask questions and the feedback was always constructive and helpful."*

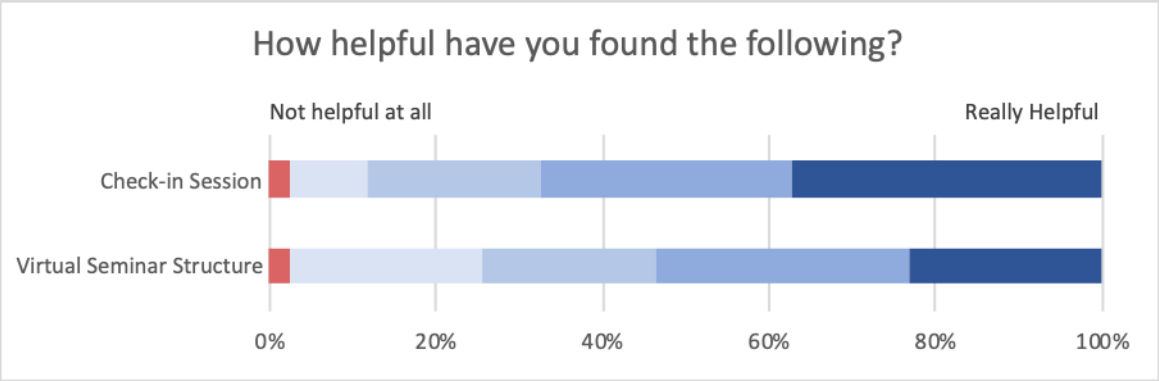

Figure 2. Student ratings of the Check-ins & Virtual Seminar structure

Virtual seminar "check-ins" were also used as a channel for staff and students' interaction which covered both academic and practical information about remote learning. The disadvantage of virtual seminar "check-ins" as a synchronous component of remote learning during a crisis is that frequently student attendance was not 100%. The solution to this problem was the virtual support room (vP201), in which students could request academic assistance.

3.1.3 Three-week Virtual Case Study

A few weeks into remote learning, it became clear that students wanted more focus on the upcoming virtual assignment. To accommodate this, a 3-week virtual case study, akin to the assignment, was devised and introduced.

This formative assessment followed the style of the summative assessment, as advised by constructive alignment principles (Biggs, 1996). This followed the virtual seminar structure elaborated above and was designed to build student confidence when handling the assignment.

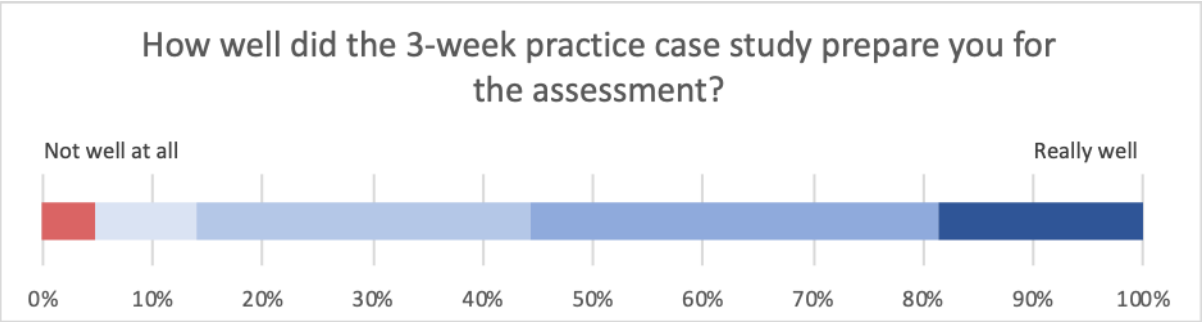

Figure 3. Student ratings of 3-Week Virtual Case Study

95% of students felt the virtual case-study seminar had helped them prepare for the virtual assessment as shown in Figure 3. Most students care about their academic grades and aligning learning activities to assessment tasks helps raise students' motivation, which is essential, particularly in remote learning and in a crisis situation like the COVID-19 pandemic.

3.1.4 Virtual Course Assessment

Remote learning meant that the CiB week-long assessment had to become Virtual CiB, and was run over a three-week period, with weekly group project update meetings between students and staff. The following are components of the virtual unit assessment:

1. Assessment task released via VLE
2. Live "kick off" events, presented via YouTube, launched sections of the assessment
3. Weekly project update meetings
4. First assessment deliverable after one week
5. Final assessment deliverable after three weeks

Adaptable approaches in shifting to remote assessment includes revisions which take into consideration appropriate techniques for this medium. For example, in BSAD, we had interim deliverables and live assessment "kick-off" events via YouTube. Interim deliverables enabled students to aim for milestones towards completing the whole assessment task. Since progress is significantly more visible while they conduct the assessment students' motivation is improved. Live assessment "kick-off" events via YouTube enabled clarification of the assessment task. It also facilitated a platform for students to ask questions about the assessment task, which was released via the VLE the day before first live "kick off" event.

3.1.5 Virtual support room (vP201)

A virtual support room was created in MS Teams and named vP201 to resemble a physical study room on campus called P201 where students can get academic assistance. The idea was to mirror the support system online that students utilised physically before remote learning, thus providing consistency for students, despite being in a different setting and context. To support this, a staff timetable was created for monitoring the virtual support room (vP201), ensuring staff would be available to assist students who needed help. vP201 is a channel for students-staff communication and engagement.

3.2 Students centred communication and information focus

In Table 2 we illustrate a systematic connection between the students centred communication and information focus problems identified in the shift to remote learning, related solutions and justifications.

Table 2. Remote Learning Transformation Process and Approaches Adopted to Limit Learning Problems

Problems identified	Learning activity / transformation process	Justification / adaptable approaches
1. Communication	1. Synchronous communication (e.g. weekly virtual meeting and vP201) 2. Asynchronous communication (e.g. consistent VLE announcements)	Important to relate synchronous communication to asynchronous communication for consistency.
2a. Staff-Student communication	1. Project update meetings during assessment 2. Virtual seminars "check ins" 3. Frequently asked questions (FAQs) platform	Well-planned communication practices and channels to promote interaction (e.g. interactive FAQs).
2b. Student-Student communication	Students collaboration e.g. using MS Teams and Discord	Students' freedom to choose collaboration practices and technologies.
3. Information overload and misinformation	Use of one communication channel (e.g. MS Teams) and weekly updates at a specific day and time.	Consistent communication, as noted above, is essential to limit gaps which fuel social media misinformation.

During a global crisis misinformation is highly prevalent (Laato et al., 2020). Therefore, communication in remote learning is essential to minimise and reduce impact of misinformation. Synchronous communication, for example a virtual meeting, is essential to clarify both practical and academic issues. Asynchronous communication, for example learning management system announcements, are important to ensure awareness of other communications. It is important to consistently use the same communication channels to avoid confusion and/or repetition. Information overload could be reduced by precise information delivered by one member of the teaching team using same communication channel. Effective communication is essential for providing correct and complete information, to mitigate against misinformation, often from social media.

Staff-student contact was maintained throughout the remote learning and assessment period. When initially moving to remote learning, defining platforms and channels used for staff-student communication is critical. Further, defining effective communication protocols, suitable for both staff and students, is also essential. For example, when BSAD remote learning started, we ensured students were informed of communication channels, for instance, virtual seminar "check ins" and vP201, thereby setting communication practices and expectations. Communication is also essential for virtual assessment and should be in line with the revised assessment for remote learning. For example, in BSAD we used SCRUM-style (Schwaber and Beedle, 2002) "project update meetings" for clarification of the assessment and a separate MS Teams channel facilitated FAQs. Utilising interactive FAQs in remote learning during a crisis is useful because of the dynamic nature of the environment.

Student-to-student engagement (Dixon, 2015) is essential in remote learning, as it offers necessary peer support. Garrison and Anderson (2003) argued the need for social presence for successful online learning. To promote student-to-student communication, we placed students in groups to collaborate in conducting BSAD learning tasks and assessment. Student autonomy was encouraged for selecting collaboration methods, with Discord being the most popular outside of the staff communication tool of MS Teams as shown in Figure 4.

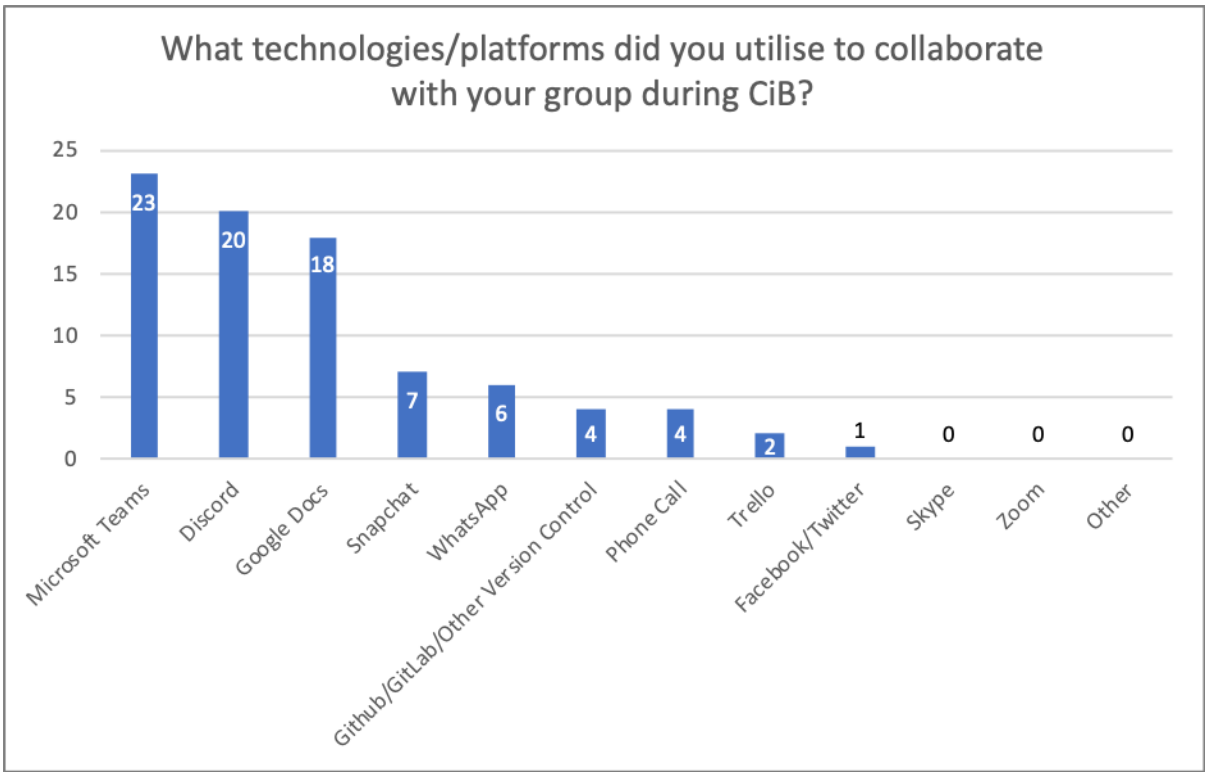

Figure 4. Platforms Selected by Students for Collaborative Work

3.3 Learning Resources Focus

In Table 3 we illustrate a systematic connection between the learning resources-based problems identified in the shift to remote learning, related solutions and adaptable approaches.

Table 3. Remote Learning Transformation Process and Approaches Adopted to Limit Learning Problems

Problems identified	**Learning activity / transformation process**	**Justification / adaptable approaches**
1. Technology limitations	Learning technologies adoption process in times of crisis.	Understand the learning technologies and formulate innovative practices to facilitate continued learning in times of a crisis.

1a. Labour-intensive	Educational leadership support (e.g. extra working hours needed).	Engage educational leadership (e.g. virtual meetings) to seek solutions on remote learning problems (e.g. labour intensity).
1b. Access to learning resources	Customised IT support	IT support which could handle individual problems to enable remote learning.
1c. Limited participant capacity in existing systems	Bitesize lectures	Techniques and practices to foster remote learning, despite technology limitations
1d. Tracking attendance in virtual meetings	Meetings follow-up (e.g. in Virtual seminars or vP201)	Measures to supplement synchronous virtual meetings.

With little time for consideration, technology limitations could be encountered in swift shifting to remote learning in crisis times (e.g. COVID-19). For example, we encountered limited participant capacity in existing systems, lack of a system to track attendance at virtual meetings, and students with connectivity issues when accessing learning resources remotely. In addition, effective remote learning practices required labour-intensive preparation, for example, group setup and management**.** The solutions to such technological limitations included:

- Innovative use of technology with the use of MS Teams automation to setup groups and virtual seminar “check-ins”.
- Recording BLs for improved learning
- YouTube live events to initiate actions.

4 Conclusion

In conclusion, we have highlighted how innovative technologies and practices were applied to enable a rapid shift to remote learning. We highlighted the lessons learned, focusing more on the broadly applicable innovative technologies and practices. In doing so we contribute to the lack of research on remote learning in response to a crisis and provide guidance that can be leveraged to facilitate a successful shift to fully online instruction in the middle of an academic term. The key lessons which would aid and ease the transition to remote learning could be summed up as:

- Learning focus - Course delivery and assessment (e.g. bitesize lectures).
- Students centred communication and information focus - Student engagement and support (e.g. vP201).
- Learning resources focus – Technology and educational resources to foster learning and practicalities of remote learning.

There is a need to adjust courses to remote learning with three focal points; learning focus, students centred communication and information focus and learning resource focus. These focal points relate to community of inquiry, which calls for the inclusion of social presence, teaching presence and cognitive presence in online learning (Garrison and Anderson, 2003). Learning focus includes adjusting course delivery and assessment to suit remote learning context, (e.g. BLs). Students centred communication and information focus includes innovative practices to support, motivate and engage students in times of crisis (such as COVID-19). For instance, using vP201 to provide virtual student support comparable to campus student support systems. Learning resources should be put in place to foster remote learning. There are various technological requirements and skills for remote learning, for instance learning management system support and digital pedagogy. These are essential for successful remote learning. Consideration of the remote learning infrastructure is essential to engage and support students when remote learning is implemented.

In addition, the rapid transition to virtual instruction provided an exceptional opportunity to reinforce the importance of Information Systems topics e.g. the usability and UX topics covered in the BSAD course. It

is an opportunity for students to put into practice learning contents, for example, to challenge students to review the Virtual Support room (vP201) to better reflect best practices in UX and usability. Thus, we recommend giving students an opportunity to apply Information Systems concepts and theories making use of the innovative tools and practices being used in remote learning.

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About the Authors

Nicholas Mavengere is a Lecturer in Business IT at Bournemouth University. He completed his PhD in Information and Systems at Tampere University in 2013. His PhD received best PhD research award at a European conference and a university award. Before joining BU, Nicholas was a Post-doctoral researcher at Tampere University. He has edited conference publications and reviewed in conferences, such as, European Conference of Information Systems and International Conference of Information Systems. He has published papers in fully refereed international conferences, journals and edited two books. Nicholas research interests include digitalization in public sector, technology adoption by SMEs and technology enhanced learning.

Jane Henriksen-Bulmer is a Lecturer in Computing, with several years of experience in industry working as a project manager, business analyst and researcher. She completed her PhD in Privacy in 2019 and since then has been teaching, among other things Business System Analysis and Design, Information Assurance and Business Continuity at BU. Her teaching experience has been predominately working in a face-to-face environment, with the recent move to remote teaching being her first experience of virtual teaching, a very interesting and exciting development opportunity for incorporating the lessons into future teaching. During her time at BU Jane has worked on several outreach projects, collaborating with several external organisations and charities on research projects. This includes 3 commercialisation projects that sought to take university research and turn this into commercially viable products.

David Passmore is a Demonstrator in Computing at Bournemouth University teaching, primarily, units with programming and teamworking disciplines. He has a strong background in both application and software development, working within industry for 8 years as a lead developer and project manager. He has a keen interest in integrating technologies to improve business and functional processes. He has conducted research into the use of technology to aid in both education and clinical settings as well as its use to improve areas such as user's health and their nutritional and mental wellbeing.

Heather Mayes is a Demonstrator in Computing. Her teaching has mainly focused on programming, database design and systems analysis and design. Her research is primarily around teaching computing and the first-year experience, including areas such as peer assisted learning (PAL) and experience-based learning. Heather's primary interests are improving the first-year experience.

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