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Research Article:

Academic Staff's Perspective on Blended Learning Practices in Higher Education Post COVID-19: A Case Study of a Singaporean University

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ABSTRACT

The COVID-19 pandemic of 2020 saw the rapid adoption of fully online higher education (HE) academic programmes across the world. With the likely post-pandemic return to on-campus education, online learning in some form is expected to continue. It is apparent also that globally, students' mindsets about online learning have changed during the pandemic period. It is thus timely to investigate the potential of blended learning (BL), a hybrid form of online and face-to-face education, as a pedagogical approach for HE in the future worldwide. As academic staff are instrumental in implementing effective HE pedagogical approaches, this study explored the academic staff's views and practices with BL. The study implemented the qualitative case study approach, and the in-depth interview method was applied with eight academic staff representing different departments in a Singaporean higher education institution. Thematic analysis on the qualitative data gathered in accordance with the study's foci elicited inputs about the academic staff's BL understandings, usage and impacts, as well as challenges and suggestions for enhancing BL in HE. The findings revealed the academic staff's positive BL perceptions, sound understandings, and strong experience with various digital tools. From this sound foundation, the staff interviewees made suggestions for developing effective BL practices which apply for HE in the future. The study's important implication is that the findings are relevant and valuable in the situation where, post the pandemic, HE adjusts for students return to campuses where BL is likely to replace the face-to-face education. Importantly, these suggestions form the elements of a BL ecosystem that includes policy, infrastructure, training and evaluation and

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demonstrates flexibility for the ecosystem's application to both the Singaporean context and to effective HE BL design globally post the pandemic.

Keywords: blended learning, higher education, post COVID-19, effective practice, BL ecosystem

INTRODUCTION

With higher education (HE) academic programmes offered entirely online as a result of the COVID-19 pandemic of 2020, large-scale change has been required of academic staff who design and present the programmes and of their students who undertake them. On-campus face-to-face teaching will most likely return when the pandemic abates, providing the social-cultural elements of the teacher, the learning environment, technology, learning activities and peers that in undergraduate education support effective student engagement (Crosling et al., 2008; Tay et al., 2021) and students' development of higher-level skills such as problem-solving and technical skills (Saavedra & Opfer, 2012; Dhawan, 2020; Chandra, 2020). It is interesting to note that during the pandemic, students' preferences for online compared with face-to-face shifted worldwide: 78% of tertiary students in Malaysia, 83% in Canada and 78% in China indicated a preference for online learning, if programme fees are reduced accordingly (Karupiah, 2021).

Globally, online learning as the panacea during the pandemic (Dhawan, 2020; Ayebi-Arthur, 2017) was seen in Singapore with the government's requirement of it for the education sector including higher education institutions (HEIs) (Lai, 2021). Post COVID-19 however, it is expected that the new educational model to emerge (Kandri, 2020) is blended learning (BL) which melds face-to-face teaching with online tools (Alammary et al., 2014), bridging between COVID-19 fully-online learning and on-campus face-to-face learning (Kandri, 2020). This case study explores and presents the elements that support effective BL in HEIs and also develop students' skills for the 21st century. Emerging from this in-depth study of the uses and perspectives of academic staff with BL in a Singaporean HEI, the systematic group of elements that constitute a BL ecosystem are identified. This ecosystem that demonstrates flexibility can guide BL development in HEIs in Singapore, and globally.

BL as the likely mode in the transition from the COVID-19 online learning provides the practical benefits of the face-to-face approach with the flexibility of online learning (Glazer, 2012; Continu Inc, 2021). Considered as the new normal for 21st learners in HE, BL promotes students' self, continuous and independent learning (Kandri, 2020), experiential learning opportunities (Nayar & Koul, 2020), improves learning outcomes (Tiwari, 2021), and significantly, enhances students' 21st century skills of problem-solving (Drake & Reid, 2018; Carter et al., 2019; Amin et al., 2021), critical thinking (Hasanah & Malik, 2020), inventive thinking (Turiman et al., 2020), adaptability (Bouilheres et al., 2020; Dhawan, 2020), creativity (Roqobih et al., 2019) and technical skills (Chandra, 2020; Saavedra & Opfer, 2012).

Knowledge of academic staff's BL experiences, challenges, solutions and suggestions for improvement is valuable for enhanced implementation. In Singapore, while education has benefited from Information and Communication Technology (ICT) for more than two decades (Tay et al., 2021), the post-pandemic period of HE BL implementation presents different challenges and opportunities in new pedagogical forms. However, effective BL should be underpinned by an ecosystem (Dhawan, 2020) that reflects the changing relationship between stakeholders (Nikolaidou et al., 2010). Teachers as critical stakeholders in a learning ecosystem (Knovva Academy, 2019) function in HE as programme designers and presenters. Thus, their views and experiences with BL are valuable input into strategies for effective post COVID-19 BL that engages students and develops their higher-level skills and innovative learning with technology (Tay et al., 2021; Dhawan, 2020; Crosling et al., 2021; Elangovan, 2020).

The research questions for this study as follows explore staff views, perceptions and suggestions based on their practice for improved BL design and implementation. These are:

1. To observe the level of knowledge and understanding about BL and 21st century skills among the academic staff at the HEI.
2. To explore the academic staff's BL practices at the HEI.
3. To explore the academic staff's perception about how BL has impacted both teaching and learning at the HEI.
4. To identify emerging issues, and challenges faced by the academic staff in using BL.
5. To explore the future prospects of BL from the academic staff's perspective.
6. To propose an effective BL ecosystem for the HE setting.

BACKGROUND AND LITERATURE REVIEW

BL in General

BL, generally understood as a mix of face-to-face teaching and online learning, presents a balanced strategy combining the best of both approaches (Ng, 2020). Classroom videos, electronic assignment submission and grading, learning management systems with information repositories and connections, polls and quizzes are BL online tools that supplement face-to-face teaching (Alammary et al., 2014; Garrison & Kanuka, 2004; Graham et al., 2013; Holenko & Hoić-Božić, 2008). While BL is not a new concept (Serrano et al., 2019; Atef & Medhat, 2015), it overcomes limitations of stand-alone e-learning and of face-to-face learning (Namyssova et al., 2019; Alammary et al., 2014). Advantages of BL tools have been categorised as improving programme management and pedagogical enhancement for academic learning (Serrano et al., 2019; De George-Walker & Keeffe, 2010), such as moving the emphasis from teaching to learning (Anthony et al., 2021). The latter approach rather than the former impacts

strongly on student learning, providing virtual spaces for deep learning via students' interaction, communicative and collaborative learning (Bouilheres et al., 2020; Chan & Leung, 2016) and engagement in critical thinking and joint problem solving (Hasanah & Malik, 2020; Oakley, 2017)

BL Ecosystems in Higher Education

With learning ecosystems include "people, schools, technology, content, culture" (Knovva Academy, 2019, para. 2), an online learning ecosystem includes: (i) the components of the people (learners, teachers and support staff), (ii) the subject content, (iii) the learning structure, (iv) the learning environment, (v) the technologies used, (vi) the skills required by learners, and (vii) the support for learners (Cowley et al., 2002). The major elements for BL systems as identified in studies reflects common themes across researchers. The key constituent elements as discussed earlier in this article can be categorised under the themes of: policy/procedures/guidelines; infrastructure; training (both students and staff), and evaluation (UNESCO, 2021; Kumar & Pande, 2017). Table 1 presents these themes and the key constituent elements in the literature from which they arise.

Table 1. Summary of literature analysis on BL ecosystem

#	Main aspects of BL	Elements in BL ecosystems	Related studies
1	Policy/procedures/ guidelines	Policy and institutional structure, institutional vision and philosophy	UNESCO (2021)
		Market rules	Limone (2021)
		Stakeholders' and management aspiration and ambition	Ossiannilsson (2018)
2	Infrastructure	Technology and teaching content	Limone (2021); Lim and Lee (2021a; 2021b)
		Infrastructure and support	UNESCO (2021)
		Human-mediated, technology-mediated	Kumar and Pande (2017)
		E-learning infrastructure	Nikolaidou et al. (2010)
		Teacher-student interaction, learning database, optimised learning experience, intensified technology and cultural environment	Li et al. (2021); Lim and Lee (2021a; 2021b)
3	Training (students and staff)	Professional development, learning support	UNESCO (2021)
		Content providers, content consumers, and technology specialist/ consultants	Nikolaidou et al. (2010)
		Students' factual, conceptual, and metacognitive knowledge.	Musyaddad and Suyanto (2019)
		Teacher training, human resources	Limone (2021)
4	Evaluation	Research and evaluation, curriculum	UNESCO (2021)
		Institutional self-assessment tool for BL	UNESCO (2021); Volungevičienė et al. (2021)

21st Century Learning Skills

21st century learning skills constitute "a broad set of knowledge, skills, work habits and character traits" acknowledged as critical for success in today's world" (Rajaratenam, 2019, para. 1). BL online tools can support students' 21st century skills such as critical, creative thinking and problem solving (Rajaratenam, 2019; Saavedra & Opfer, 2012; Hadiyanto et al., 2021; De George-Walker & Keeffe, 2010) for graduates to participate in the knowledge society requiring new solutions for arising issues (Crosling et al., 2015). BL moves students from the teacher-centred education (Crosling et al., 2008) of lectures and information presentation, to student-centred, learning independence (Lim & Wang, 2016) and 21st century skills. Yet, use of BL does not automatically develop students' higher-level skills: studies (Crosling et al., 2021; Hadiyanto et al., 2021) found BL was used mainly for programme management, rather than developing students' higher-level skills. Rather, successful technology-enhanced learning and 21st century competencies are based on increased interaction among university communities, teacher orchestration, technology, and collaborative learning (Hämäläinen et al., 2017).

Academic Staff and BL Implementation

Academic staff as disciplinary rather than educational or technology experts, are instrumental in BL programme design and student uptake (Lim & Wang, 2016). They often have limited expertise in technological learning (Lim & Wang, 2016) as they are focussed on their disciplinary fields, and require technical training (Fisher & Newton, 2014). In Malaysian universities, lack of training in implementing effective BL was a major obstacle (Wong et al., 2019) and successful BL requires staff to have technical and pedagogical development, so that they can not only use the BL technology, but integrate it with quality pedagogical approaches (Minhas & White, 2021; Ma'arop & Embi, 2016). Further, staff's understanding of digital tool usage motivates students to given tasks (Prakash & Samu, 2018) and so engages them in their studies. Staff are key in effective BL as they design and implement academic programmes (Minhas et al., 2021; Tongpoon-Patanasorn & White, 2020; Torrisi-Steele & Drew, 2013; Jeffrey et al., 2014). Thus, as can be seen from the points above identifying staff BL strengths, challenges and suggested improvements is important as it highlights areas of strength to be drawn on and areas of challenge for improvement, for the development of effective BL programmes and students' development of 21st century skills. This is the focus of this study.

BL and 21st Century Learning Skills in Singapore

Like other nations, the pandemic has intensified the Singaporean government's efforts for the new normal of educational delivery. The Ministry of Education aims to embrace BL as the new educational landscape (MOE, 2020; Ng, 2020) to further develop students' 21st century skills, including self-directedness, lifelong learning skills (Ministry of Education Singapore [MOE], 2020) and independent learning (Ng, 2021).

While BL is widely implemented in HE globally, it requires greater preparation and increasing need to monitor students' understanding and encourage class participation (Ho et al., 2021; Lim, 2020; Rose, 2020). Likewise, in Singapore, there are challenges and pedagogical concerns associated with online learning implementation, such as device and infrastructure issues (Lim, 2020), authentic learning assessment (Chandran, 2020), and fostering students' online learning self-efficiency (Lim et al., 2021).

Varying success is evident with BL in Asian countries: Tham and Tham (2011) found that universities had e-learning portals, but BL's potential was limited with the emphasis on porting the classroom online. Hasanah and Malik (2020) found improved communication skills with BL, but others report that BL lacked two-way communication, interaction and discussion, depth in learning content and lack 'fun' in delivery (Tham & Tham, 2011). A 10-year BL Singaporean study at a technological institution found few technological problems (Jones & Sharma, 2019), but teacher and student behavioural change was required for effective BL. Jones and Sharma (2019) found that a university must lead, endorse and support a coherent BL vision, process and resources, and an ecosystem to maximise BL's potential for 21st century education. Lim and Wang's (2016) Singaporean study found that for effective BL, continual change in teachers' roles and systematic transition from instructional teaching is required.

Finally, while there is substantial BL literature including some studies on student and teacher perceptions of it (Tongpoon-Patanasorn & White, 2020), several researchers point out that there is less literature exploring teachers' perception and practices (Jeffrey et al., 2014; Orji et al., 2021; Aji et al., 2020). This study contributes well to this area and as such, the data gathered provides guidance for systematic BL enhancement in HE.

METHODOLOGY

This study explored academic staff's BL views and practices, including their challenges and suggestions for enhancing post COVID-19 BL in HE. The research approach was an exploratory case study deriving qualitative data at a private Singaporean HEI with undergraduate and graduate programmes across five schools in computing, business, social sciences and law.

Case Study

Case study method is a "research approach used to generate an in-depth, multi-faceted understanding of a complex issue in its real-life context" (Crowe et al., 2011, para. 5), and is effective for real-world settings aiming to understand complex issues (Harrison et al., 2017). Thus, it is suitable to study change, problems and their management in organisations. This study involves interviewing academic staff on their BL views, particularly on the level of knowledge and understanding of BL and 21st century

skills, BL practices and impacts on both teaching and learning, emerging issues and challenges, as well as its future prospects. As a challenging, complex and practical real-world situation, case study research is thus suitable.

Interviews

In the case study approach, the interview technique is a commonly used qualitative technique to provide an insight into potentially beneficial aspects (Crowe et al., 2011) as well as to enable exploration of both the factual and meaning levels of issues, that is, deep research to 'get the story behind participants' (Valenzuela & Shrivastava, n.d.). The researcher can ask follow up questions for further understanding. The interview method enables better participant response rate, flexibility for participants and interviewer and allows the interviewer to judge respondents' non-verbal behaviour (Valenzuela & Shrivastava, n.d.).

Based on the analysis of relevant literature as discussed above, the study's research questions gave rise to seven interview questions which are grouped as follows:

1. Understanding: One question (participants' general knowledge and understandings about BL and 21st century skills).
2. Practices: Three questions (participants' personal BL experience, observation about BL practices by others, and the reasons or influencing factors of academic staff's BL practices at the university).
3. Impacts: one questions (participants' perception about how BL brings positive and negative impacts on both teaching and learning aspects).
4. Issues, and challenges: one question (participants' perception about issues and challenges they faced in using BL).
5. Future prospects: one question (respondents' forecast about future BL development and practices and suggestions for an effective BL ecosystem).

Sample

This study's target population of academic staff in Singaporean HEIs was represented in a purposive sample of eight academic staff from one HEI – six female and two male – selected by department heads to represent different organisational levels, work experiences and varying BL classroom involvement. Teaching experience ranges from small to extensive, with subjects seen in Table 2.

Permission was obtained from school department heads for the interviews at the end of 2019. The interview questions were supplied to the heads and arrangements made for the unstructured and semi-structured interviews that lasted 30 minutes. Questions explored respondents' BL uses and views at the case HEI, including 21st century skills. Interviews were tape-recorded and transcribed.

Table 2. Participants' information

#	Participant	Gender	Teaching experience	Teaching areas
1	Dr. M	Male	Less than 5 years	Language/Literature
2	Dr. Y	Female	Less than 5 years	Politics/Economy
3	Dr. R	Female	More than 10 years	Law/Business
4	Mr. N	Male	Less than 5 years	Sports
5	Dr. C	Female	Les than 5 years	Language/Literature
6	Ms. K	Female	More than 10 years	Film
7	Dr. S	Female	More than 10 years	Language/Literature
8	Ms. T	Female	Between 5 to 10 years	Sociology

Data Analysis

Thematic analysis is the method of analysing qualitative data for researchers to identify, analyse, and report patterns or themes associated with a study's central ideas (Braun & Clarke, 2006). Guided by the interview questions, thematic analysis of the interview data was performed via a free version of computer-assisted qualitative data analysis (CAQDAS) software, i.e., the QDA Miner Lite. QDA Miner is a CAQDAS software used for coding textual and photographic data and provides tools for performing content analysis in three basic tasks, i.e., text coding, text retrieval, and file storage in an internal database (LaPan, 2013). The interview transcripts were manually classified based on the questions. Descriptive feedback on the structured interviews derived codes, which were then used to tag the meaning of each data piece. Codes assigned to words and phrases in each transcript aided the interpretation of the meaning. This then led to the development of themes in the data.

RESULTS

This section overviewing the findings on staff BL practices and views including challenges and solutions at the case HEI indicates the sound background in BL of the study participants. This supports the validity of their suggestions for future enhancement in BL practices that in this study, form the elements of an ecosystem for effective BL that can apply to HEIs in Singapore and globally.

Understandings of BL and 21st Century Skills

The participants' sound knowledge of the two study themes – BL and 21st century learning skills – was observed in the interviews. It supports the validity of respondents' BL interview comments, indicating their adequate knowledge of the study's key concepts. This is seen in typical interview comments; 21st century skills were described as:

> the framework that encourages critical thinking alongside experiential learning (Dr. C).
>
> it includes "inter-cultural competence" (Dr. S).
>
> more critical thinking and creative thinking (Mr. N).
>
> its "most fundamental is adaptability' (Ms. T).

Meanwhile, BL was seen by the participants as:

> the use of technology … alongside the setting of the teachers and students (Dr. C).
>
> students' access to online learning materials, additional to the conventional, traditional method (Dr. Y).
>
> about how students and lecturers learn from each other (Dr. R).

Further, staff explained the link between BL and 21st century skills:

> blended learning can make students independent in thinking and allows them to do more research (Dr. R).
>
> both concepts are related … not just adaptability, but also knowing how to find sources to be integrated into classroom, …as instructors and students (Ms. K).
>
> the end objective (of BL and 21st century skills) is still the same. It's … achieving those aims have changed a bit (Dr. Y).

Nevertheless, one participant noted blurry definitions between blended learning and flipped classroom:

> Blended learning, … I am still not very sure. (Dr. S).

BL Practices by the Academic Staff

Extent of BL practices

Staff practice a sizeable amount of BL, supporting the value of their suggestions for effective BL. For the HEI's teaching modes, most are blended mode (50% Face-to-Face (F2F) and 50% online learning), and several other courses are delivered in either fully online or F2F modes. The participants' comments evidence this:

> one course will run over only six weeks, with six face-to-face lessons. But for other BL courses here, the standard is three (weeks) face-to-face, and then three alternate weeks, students will learn online, on the e-resources (Dr. Y).

> It is purely online class.. not blended, lecturers don't see them (students) at all… and do everything through … Zoom (Dr. R).

Pertaining to the extent of BL practices, many of the comments indicate a high level of BL practice among staff, such as according to Dr. M, the academics "are really using it (BL) effectively and we can see that the outcome is created". Similarly, the academics "use and do posts quite a lot" (Ms. T); and they "try to always increasing accessibility, now that everything is online and provided for the students" (Mr. N).

However, one participant shared her experience in moderately practicing BL:

> I cannot call myself as an expert. I have not used Zoom, or collaboration tools as to conduct live lessons online. I also have doubts about how effective it is. Unless it is absolutely necessary, if students cannot be on campus, then we'll use that (Dr. Y).

The use of BL tools/applications

Respondents agreed that staff used various BL tools, indicating broad BL experience. A relevant comment was from Ms. K:

> We use all kinds of stuff here. Different instructors will use different kinds of stuff. There is no structured thing where everybody uses the same thing… everybody … using whatever … they discover or …come to…[*sic*].

Additionally, the university provides technical support and training for staff. According to one participant;

> we are always required to update ourselves. Because otherwise, we wouldn't know how to use this (Dr. Y).

There is also some use of social media at the university, but regulated:

> So, there's social media, like chat groups, we do need permission from the students. We need their personal data, the mobile numbers. So, it's done with some cautions. Because we don't want to intrude the privacy of the students… (Dr. R).

Figure 1 indicates the variety of tools staff use in BL. As observed, the three most-used are online discussion/conference, resources, and marking. The former indicates interactive teaching which underpins students' critical thinking and problem solving. The examples are as follows:

1. Online discussion was used for students to post and interact on problem-based questions. As Mr. N said, it "had got them talking, and getting to know each other".
2. iStudyGuide is the online resources medium. It "is actually a compressed version of course textbooks with a lot of additional information based on the writers' experiences, videos, and links to other resources" (Mr. N).
3. Online marking suggests programme management efficiency, whereby the e-exam application makes it "much easier (for lecturers) to mark when (they) don't have to read all the different handwritings" (Dr. R).

Other tools include quizzes/tests/assignments, learning management system (LMS), class recordings, and other audio-visual tools like presentation and mind mapping. Concurrently, face-to-face method was also used, particularly for discussion.

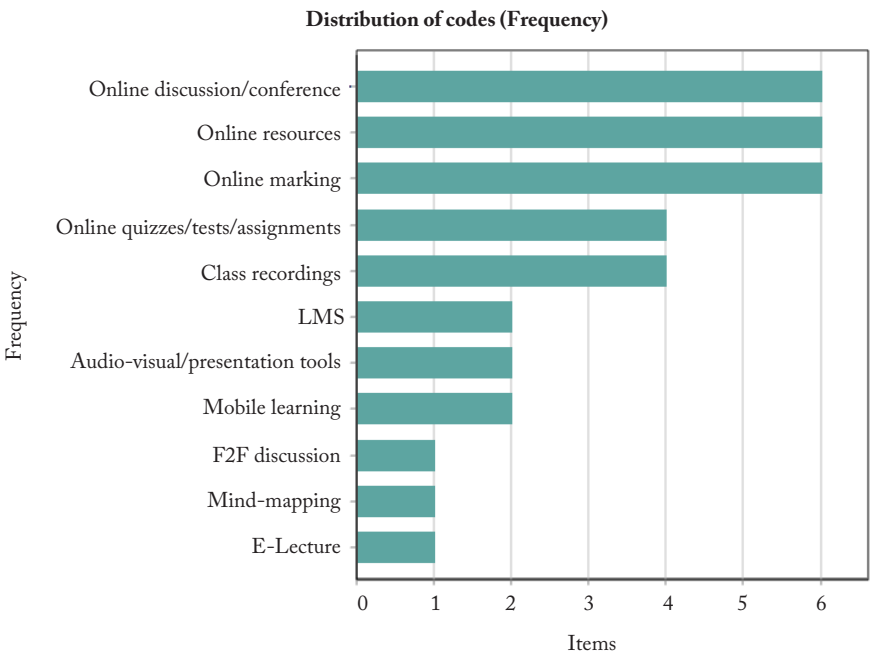

Figure 1. Frequency: Examples of BL tools/applications

Impacts of BL Practices

Impacts on teaching and learning

The thematic analysis revealed that the participants mostly saw that BL has had positive impacts on the HEI's teaching and learning. The identified themes of BL's teaching and learning impacts are:

1. Supports for teaching and learning
2. Increased sustainable development (SD) awareness and practices
3. Improved interaction
4. Enhanced learning skills
5. Enhanced teaching skills
6. Enhanced technological skills
7. Benefits for management

The participants mostly mentioned the beneficial aspects of BL as providing necessary supports for enhancing the HEI's teaching and learning. Importantly for critical, creative thinking and problem solving, they saw BL resources as supporting students' interaction and exploration of their subjects, rather than them merely reproducing disciplinary information. Their comments about the impacts of BL are shown in Table 3.

Table 3. Impacts of BL on teaching and learning

Themes: BL Impact	Relevant Comments
More learning resources	"for us, the instructors, there's variety, there's more resources, it makes you more creative. The students have more 'toys' to play with" (Ms. K).
Medium to disseminate knowledge	"this blended learning has given us the kind of medium for me to try all those kinds of skills to provide this knowledge" (Mr. N).
Experience-based learning	"it's how you try to translate those topics to practical experiences. I was able to use my own experience in my own creativities. So, that's really made the teaching a lot more enjoyable."(Dr. R).
SD awareness and practices	"We also try to use more technologies, like, to do away with hardcopy forms. Everything we can submit online. So, I think that's the way to go. That's the trend. So, everything is moving towards that. We try to be as paperless as possible" (Dr. Y).
Improved levels of student-to-student and student-to-lecturer interactions	"it got them talking, getting to know each other, it got them more involved with each other.. sharing of ideas" (Mr. N); "Because I am able to interact individually, and I can even do breakout groups and all that" (Dr. R).

Impacts of BL on 21st Century Learning Skills

Several participants were positive regarding students' 21st century skills and BL: BL were associated with the following skills:

1. **Independent learning**: "We can say that they have now become more independent, like in reading, thinking, kind of things" (Dr. M).
2. **Critical thinking**: "blended learning provided all the opportunities (for students) to go and think and stuff like that (critical thinking)" (Mr. N).
3. **Creative thinking**: "So, it seems to be effective. There are some creativities in their way of presenting their mind mapping" (Mr. N).
4. **Collaborative learning**: "we can learn together. So, it's a bit more honest and open conversation" (Mr. N).

However, for several participants, face-to-face approach and student motivation also contribute to students' 21st century skills:

> e-learning and blended learning cannot help students, especially in particular skills, like speaking, especially in oral presentation, conference, attending interviews (Dr. M).

> in terms of critical learning, it's still up to how motivated the students are. We teach them, and if they are not willing to learn, and you still see them as not gaining much from the lesson and blended learning (Dr. Y).

Issues and Challenges of BL

The thematic analyses identified several challenges faced by the HEI participants and other staff in implementing BL. The main issue concerns negative attitudes or perceptions among students and staff about BL, particularly on the use of online tools alongside face-to-face to enable students to adopt critical approaches for developing 21st century skills. Examples of the comments are:

1. **Dependency on teachers**: "Students are used to being 'spoon feed', and become dependent on teacher-centred learning approach. "They will not be able to think like that, they were not able to think on their feet.." (Dr. R).
2. **Preferences for face-to-face**: "(language learners) still want the traditional way of learning, and they even prefer to use handwriting for doing assignments" (Dr. M); "(the students) wanted to hear traditional kind of teaching style. They wanted a lecturer, not a facilitator" (Mr. N).
3. **Complacency in online setting**: "And they thought that they could access the recorded lectures. That doesn't always happened. So, it's just that sense of, that complacency that starts to grow from it. And before you know it, it's your exam time. You don't have enough time to have a look at the lectures" (Ms. T).

4. **Fixed mindset and expectation**: "It's become frustrating when students think that just because you cannot use technology, you cannot be a good teacher" (Ms. K); "Current culture for the students has formed their 'non-participatory mindset' in classroom learning: "as much as we want to push for blended learning, it will take some time to change the mindset of the people who are used to such a system" (Mr. N).

Additionally, several issues raised concerned the academic staff's attitude, perception, and skills:

1. **Resistance towards using technology**: "Of course there has been resistance as well, mostly from senior people, and those who have been more on traditional way and they don't like blended way. They may not very used and adaptable to using all the technologies. It's because traditionally, they have been marking hardcopies." (Dr. Y); "good teaching is good teaching, with or without the technology" (Dr. S).
2. **Lack of technological skills/ familiarity**: "And then there are still senior lecturers who may not very comfortable with all these technologies, like using Zoom and all those things, you know. Like even Prezi, and all these new ways of teaching, new software that they are not very comfortable with" (Dr. R);
"I think there's a lot of difficulties for support staff to try to help them to teach them, guide them in, like, how to download the mark scripts. And then, after you mark and then upload them again, some of them really need more help on that" (Dr. Y).

Future Prospects of BL

Future BL Development

The themes in this section align with the participants' previous points on BL. Synthesising these, a BL ecosystem would develop mindsets that value, nurture and support BL for enhanced learning at the HEI. Important in a 'mindset' is staff positive perceptions about the future prospects of BL following the pandemic, as in their comments below:

> .. it's going effectively (Dr. M).
>
> It is going on the positive trend. … there is no other way of moving forward, except for this path… … in terms of co-creation, co-learning (Dr. R).
>
> I think it will be more, not less (Dr. Y).

However, one participant cautioned that necessary planning and efforts are needed due to the emerging issues and challenges which could impact BL's effectiveness:

(BL) going to get worse, hopefully it's going to get worse in a better way (Ms. K).

Future changes in Table 4 indicate the themes identified from the participants about future BL development. Generally, the participants agreed that the area most likely to change following the pandemic is teaching styles. This includes the facilitating role of educators and enhanced pedagogical tools. Otherwise, several participants believed there will be changes in students' learning approaches and BL's HE market segment.

Table 4. Key points on future changes and related comments

Themes	Comments
Role of educators as facilitators	I think the role of educator is changing, it's more facilitation. We need to embrace that lifelong learning thing (Dr. R). So, not so much of telling them what they (students) need to know, trying to help them to think in a way that they can be critical in the information that they see (Mr. N).
Enhanced pedagogical tools	Nowadays the software will be more user-friendly, more interactive, rather than we really have to read and learn on how to use this and that (Dr. Y).
Changes in students' learning approaches	So, now that blended learning provided all the opportunities (for students) to go and think and stuff like that (critical thinking) (Mr. N).
Broadened market segment	To target the larger market, we need to use BL, probably is more and more, like completely online…there are so many classes we learn online now (Dr. R).

Suggestions for effective BL ecosystem

The interviews elicited participants' inputs about the elements in an effective BL ecosystem. The thematic analysis identified four areas for such an ecosystem: policy/procedures/guidelines; infrastructure; training (students and staff); and evaluation. The key points for improvement in BL implementation are seen in Table 5 to 8.

Table 5. Elements for the policy/procedures/guidelines

Key points	Respondent comments
Comprehensive BL system for all education levels	For all these changes to take place, the ecosystem to change, change the whole education system and teaching. So, you have to start from the early child… It's a cultural change (Dr. R).
Proper planning for educational tools	I wish that education institutions will be more prudent when they select all these technologies, rather than adopting each and every new ones that comes. A good teaching is a good teaching, regardless of the tools you adopt. You don't have to adopt every random technology (Ms. T).
Autonomy of academics in teaching	There should be more than one option, one probability, freedom to choose what we are good at, what we want to, rather than having to do it because we have to do it.. so that means there is a certain degree of freedom in thinking, freedom in exploring (Dr. S).

Table 6. Elements needed on the infrastructure aspect

Key points	Respondent comments
Classroom capacity	If it is going to become a thing, then the classes will need to be smaller, equipment will need to be improved, money will be spent (Ms. K).
Software upgrades	Technology and the software have to be improved every now and then (Dr. Y).
More user-friendly tools	Just like recently, when using Zoom, we really have a lot of difficulties. So, it should be more user-friendly (Dr. M).

Table 7. Elements needed on the evaluation aspect

Key points	Respondent comments
Evaluation of BL and impact	The actual impact and effectiveness must be measured accurately. We all need to see how effective it really is (Dr. C).
Evaluation of teaching/ pedagogy	Criteria of which we are judged for our teaching. It's not consistent with all the new kinds of pedagogies of BL which were used for teaching at all the universities.. everyone needs to be in consistent, transparent, and understand each other (Mr. N).

Table 8. Elements needed on the training aspect

Key points	Respondent comments
Technological skills	'Technology and the software have to be improved every now and then. Plus, the students and staff need to go for training to learn to use those tools and technologies' (Dr. Y). We all need some kinds of training (Dr. M).
Technology acceptance	Even though there might be people (who are) not comfortable with BL, we have to get comfortable and learn it. It's because the environment that we are in (Mr. N). Yes (students' attitude). And not just students who say, "So?" (Ms. K).

DISCUSSION AND RECOMMENDATIONS

BL is increasingly viable for future HE following the COVID-19 crisis, but its implementation in HEIs requires a shift in educational practice that impacts on core services. Academic staff are key stakeholders in effective BL, driving learning content, interactions, assessment, credentialing, student support, and technology (Gibson et al., 2017). This study broadens the existing literature by presenting post COVID-19 HE BL practices that derive from academic staff's practical BL experience and form an ecosystem for effective BL.

The study aimed to identify elements for an effective BL ecosystem involving dynamic roles for providers, instructors and learners, content providers and consumers, consultants and e-learning infrastructure (Nikolaidou et al., 2010). Thus, as a key element in the BL ecosystem, academic staff require technological competencies for effective BL.

This aligns with studies of BL frameworks that highlight the importance of instructors' technological competencies which need to be ensured via professional development, training and development (Anthony, 2021; Kumar & Pande, 2017; Evans et al., 2019; Mirriahi et al., 2015), and technical and pedagogical support (Graham et al., 2013). Our study observed that there is adequate knowledge and understanding of BL and 21st century learning skills among the staff and that a sizeably high level of BL with a variety of BL tools is used, indicating broad BL experience at the HEI.

Academic staff's positive perception is significant for ensuring successful BL implementation. In our study, BL was mostly perceived as beneficial for both teaching and learning where the themes identified include the provision of supports for teaching and learning, SD awareness and practices, interaction, enhanced teaching and learning skills, enhanced technological skills, and benefits for management. Anthony et al. (2020) similarly observed that the lecturer's attitude, teaching style, and acceptance toward BL are important factors in motivating students to adopt BL. Despite the positive perception, this study revealed some emerging issues and challenges, the main one being the negative attitudes or perceptions among both students and staff about BL. For students, dependency on teachers was noted by the participants, preferences for the face-to-face approach, complacency in the online setting, and fixed mindsets and expectations. For lecturers, issues reported were resistance towards using technology and lack of technological skills or familiarity. These issues provide useful inputs for designing an effective BL ecosystem. As suggested by Huang (2016), sub-variables which exist in both face-to-face and online learning modes should be investigated since those factors lead to the strengths and weaknesses of BL. Lim and Lee's (2021a; 2021b) framework also shows the importance of technological features and functions and external variables in promoting face-to-face and online learning modes.

Several frameworks advanced for BL implementation include Khan's Octagonal Framework (Khan, 2005) guiding BL planning, development, delivery, management, and programme evaluation: institutional, pedagogical, technological, interface design, evaluation, management, resource support, and ethical. Mirriahi et al.'s (2015) curriculum design and professional development framework are based on Resources, Activities, Support, and Evaluation or Assessment (RASE) criteria and standards for a student-centred and technology-rich environment. Additionally, Halverson and Graham (2019) stressed learner engagement in a BL environment and their conceptual framework includes cognitive and emotional indicators. Graham et al. (2013) developed a Blended Learning Adoption Framework for university administrators in effective BL through a tripartite model of Strategy, Structure, and Support (Adekola et al., 2017).

In line with the existing frameworks, this study provides the elements for an effective BL ecosystem derived from the participants' comments. The main advantage is the ecosystem's validity, having emerged from effective BL practice. Four themes were identified: policy/procedures/guidelines, infrastructure, training (students and staff), and evaluation. The proposed system is feasible as it includes the major elements identified in previous studies,

but are stream-lined in the proposed ecosystem and flexible for adjustment for specific HEI settings. This is evident in that the ecosystem's four readily understood elements may already be in place in HEIs in some forms. These form a coherence that fosters a practical, broad and deep approach to BL implementation.

The proposed ecosystem presented in Figure 2 was developed from the BL challenges identified at the case HEI, linked with the respondents' improvement suggestions. The ecosystem operates like a 'milieu' (Schwab, 1973), developing a BL 'mindset' for effective operation in a HEI. The participants' improvement suggestions included a national BL education policy and plan. As HEI policies and plans are consistent with the nation's policy, in our ecosystem below, policy refers to the HEI's aligned with the national.

In more detail, the ecosystem's four elements that guide stakeholders' design and implementation of effective BL are explained below. The ecosystem is discussed in conjunction with existing frameworks such as Khan's Octagonal Framework, Graham et al.'s BL Adoption Framework, and the BL framework by Mirriahi et al. (2015), highlighting the particular characteristics of this study's ecosystem.

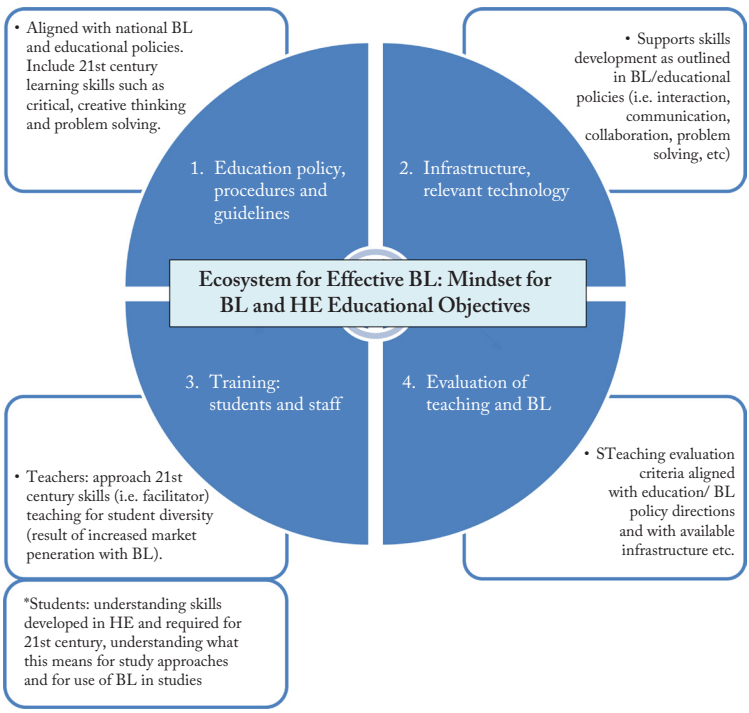

Figure 2. The proposed ecosystem for effective BL

Education Policy, Procedures and Guidelines

One of the main study findings pertains to the vital role of education policy for change underpinning a HEI's effective BL ecosystem. In this study's ecosystem, however, BL policy and implementation at the HEI level should be aligned with the national education policies, including 21st century learning skills. This study has shown that academic staff's positive, less positive, and improvement suggestions derived from their practical BL experience can be thematised into the ecosystem as seen in Figure 2. These are in line with views from the field of the elements required for effective BL and are discussed in more detail in this section.

For instance, Khan's Octagonal Framework which refers to the 'institution' dimension as preparedness to handle administrative and academic affairs, including policies, and organisational change, staff support and student services (Adekola et al., 2017). Lim et al. (2019) similarly proposed that HEIs need to consider strategic planning such as curriculum, vision, and policy alignment in order to drive, sustain, and scale up their BL practices. The urgency for flexible and mobile programmes from COVID-19 has expanded opportunities for countries to adopt policies that support and accelerate BL practices. Thus, education policy, procedures, and guidelines are key drivers for effective BL implementation.

Infrastructure and Relevant Technology

Infrastructure is another vital element in the proposed BL ecosystem. In this study, the participants emphasised the need for appropriate tools and technologies to support skills outlined in educational policies including, for example, for student and staff interaction, problem solving and other activities. In line with the HEI's policy direction, suitable physical and technological infrastructure is required (Garrison & Kanuka, 2004).

Institutional support in designing and providing infrastructure and technology is also recognised as critical for transition to enhanced BL (e.g. Graham et al., 2013; Adekola et al., 2017; Mohd Fadzil, 2020; Osman et al., 2018; Tang & Intai, 2017). Similarly, the 'support' category in Graham et al.'s BL Adoption Framework includes institutional implementation and maintenance of its BL design, technical and pedagogical support staff, and for staff incentives (Graham et al., 2013). In the proposed ecosystem, however, it is aligned with skills development such as for the 21st century.

Training: Students and Staff

The shift to effective BL in HEIs requires re-definition and enhancement of both staff and students' teaching-learning roles and responsibilities. Another key element in the proposed ecosystem is training, where the study findings highlighted two points regarding this aspect. Firstly, for academic staff, training should enhance teaching approaches for 21st century skills. This aligns with greater student diversity resulting from increased

market penetration with BL. Secondly, for students, training supports their knowledge of the capabilities developed through BL for the 21st century. Training for skills and knowledge development is integral in the proposed BL ecosystem, where the participants emphasised the need for student and staff familiarity with BL tools and technology.

The study's findings are consistent with other frameworks. In that proposed by Mirriahi et al. (2015) and Lim and Lee (2021a; 2021b), training and development enhances students' technical capabilities. Graham et al.'s (2013) framework noted the need for incentives for staff training and course development in early BL implementation (Graham et al., 2013). Turiman et al. (2020) similarly noted that students should be exposed to real-life problems in order to develop their cognitive ability. The need for training was also noted by Schutte et al. (2017) whereby the availability of online training facilities was reportedly important to enhance the academic staff's teaching competency.

Evaluation of Teaching and BL

The fourth element in the proposed ecosystem concerns the need for effective teaching evaluation and BL implementation. As emerged from the participants' perspectives, the BL ecosystem needs to provide educational evaluation via clear criteria.

Evaluation in BL implementation is similarly emphasised in other studies. Yuliyana et al. (2021) emphasised that both educators and students require assessment instruments for effectiveness BL approach in teaching and learning. Khan's Octagonal Framework includes the domain of the educational sector which covers pedagogical, ethical and evaluation. Evaluation may include the assessment of learners and of instructions and the learning environment (Elameer & Idrus, 2012). Similarly, in Graham et al.'s (2013) Blended Learning Adoption Framework, the 'structure' strategy includes systematic review of BL learning outcomes in the mature implementation/growth stage (Graham et al., 2013).

CONCLUSION

As HEI campuses open up post COVID-19, BL will feature increasingly in HE studies, bridging the fully-online learning with on-campus face-to-face learning. Experiences and lessons from academics with BL pre-COVID-19 are thus instructional for its effective implementation. The ecosystem for effective HE BL presented in this study is based on the sound BL understandings and practice of the study's academic staff participants. The four key elements forming an effective BL ecosystem derived from this study are education policy/procedures/guidelines; suitable infrastructure; training (students and staff); and evaluation. The ecosystem is aligned with the development of students' 21st century skills, rendering it relevant to HE today and the future.

HEIs may have in place some aspects of the elements of the ecosystem and can readily upscale these for enhanced BL implementation. However, BL as a dynamic process requires multiple perspectives and levels of analysis to fit it for the range of contexts and

practical circumstances, thus HEIs should tailor their BL approaches for their institutional goals and student learning outcomes. The ecosystem presented in this study is a framework with the flexibility for this to occur.

This case study was of one Singaporean HEI. Further work could involve a heterogenous and larger academic staff sample. The two particular contributions that inform and guide future research on BL pedagogical framework are, first, the four key elements of an effective BL ecosystem emerging from this study, and secondly, the elements as exploratory constructs, can be further enhanced by incorporating insights and inputs from other related empirical studies.

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