Introduction
Over the past two decades, universities have increasingly added online options to their core face to face offering. However, an unprecedented surge in online teaching occurred during 2020, as HEIs (Higher Educational Institutions) responded to the Covid-19 pandemic. Two types of delivery are possible in the online environment, asynchronous and synchronous. Asynchronous delivery relies upon students accessing pre-existing learning materials in their own time (Singh and Thurman, 2019) while synchronous teaching is defined as interactions between students and teachers that overlap (such as chat) or that take place at the same time (live tutorials). Synchronous delivery offers social contact in an online reconstituted form. This may be important because social interaction can be disrupted by the move away from face-to-face learning events, with levels of student interaction being reported as being low online (Politis and Politis, 2016). This is significant because social interaction is recognised as an important aspect of learning (Brown, 2001); learners need to share knowledge, values and beliefs in order to construct new knowledge for themselves (Lu and Chen, 2011).

Synchronous and asynchronous methods vary slightly, both in terms of their pedagogical purpose and the skills required for effective delivery. For online learning to be effective, it has been suggested that instructors must have a comprehensive understanding of the benefits and limitations of both methods (Hrastinski, 2008), see also Martin et al (2017) for a systematic review of research on synchronous online learning. Over time, delivery platforms have evolved to enable synchronous learning, this includes different forms of technology using audio, interactive teaching tools, document sharing and increasingly, the facility for video conferencing and chat. By undertaking a review of the literature, this paper focuses on best practice in terms of synchronous delivery of online teaching. Some reference will be made to asynchronous online teaching as they are often used in tandem. Although the focus of the review is the established body of knowledge in this area, we supplement this with studies undertaken during the Covid-19 pandemic. These are kept separate
in order to reflect the distinct nature of teaching during this time. To reflect the approach taken in the literature the review is not discipline specific.

Purpose of review
This review investigates these questions:

- What are student and teacher experiences of synchronous online learning?
- What strategies enable successful learning in synchronous online learning?
- What did we learn about synchronous teaching during the Covid-19 pandemic?

Methods
To answer these research questions, a set of selection criteria were established:

*Selection criteria*

1. Research should focus on addressing the experience of students and teachers of synchronous online learning in a higher education setting with students over the age of 18 years.

2. Research must consist of empirical studies reporting data derived from actual observations or experimentations. Literature reviews, unpublished works, and conceptual articles were not included in the analysis.

3. Research must have been published in peer-reviewed, English-language, academic journals within the selected 21 year time frame (2000–2021). Papers published in non-peer-reviewed, non-English-language or outside this time frame were excluded. (Note: Papers after March 2020 are discussed separately.)

*Identification of eligible studies*
• **Searching phase**
Databases searched were: Academic Search Complete, British Education Index, CINHAL, Education Research Complete, ERIC, Medline, APA Psyc Articles, Scopus and World of Science.

The search strategy was based around the following terms “synchronous NEAR/1 online NEAR/1 learning” AND (student OR learner OR pupil OR adult) AND (experience OR expectation OR behaviour OR attitude OR perception OR satisfaction OR view OR feeling). An alternative search was also carried out using ‘synchronous communication’ as it appeared frequently in key words of identified articles.

**Screening phase**

The resulting 212 articles were screened by two members of the research team reading abstracts and measuring the content against selection criteria, leaving 92 articles.

**Analysis phase**

The remaining 92 articles were divided among the three researchers who analysed the studies using the set of criteria outlined in Table 1

[Insert Table 1 here]

A further group of papers were removed (n=33) as they did not meet criteria in terms of research methods or setting, leaving a total of 59 articles.

[Insert Figure 1 here]

**Results**
**Overview of evidence**

A fuller summary of the characteristics of the 59 papers can be found in Table 2.

{Insert Table 2 here}

In this section we provide brief details of the papers reviewed. They were drawn from a variety of countries across the world (North America, 20; UK, 7; Asia, 12; Europe/Middle East, 9; Australasia, 7; International, 4). Commonalities could be identified in the theoretical perspectives presented in the papers; these were largely concerned with the role of social interaction in distance learning. Space limits the detail we can provide on these theories. One of the most commonly included was Moore’s, (1989) ‘Transactional Distance Theory’, which identifies a ‘sense of distance’ felt by the student in the learning environment. Another commonly used theory was the ‘Community of Inquiry Framework’ (CoI), developed by Garrison et al, (1999). This assumes that learning occurs within a community through the interaction of three core elements, cognitive presence, social presence, and teaching presence. As indicated above, no specific discipline was focused on in this review, but the most popular subject areas were education, science, maths, and technology, and in some studies, tutors’ reflections were also included (See Table 2).

In the next step of the review, we used content analysis to discover the common themes across all the collected papers. All authors thematically coded the findings of an initial five papers together. The scope of each code was then discussed and refined by authors. Additional codes generated during subsequent reading of papers, or the merging of codes, was discussed during regular follow up meetings. In the remainder of this section, we detail the themes identified. In the main body of literature these were: Use of technology, Planned pedagogy, Comparison of synchronous and asynchronous learning, Online Interaction between Tutor and Student. In response to the emergence of research undertaken during the pandemic, we also include thematic findings from papers undertaken during Covid-19. The themes from this section included; Impact of sudden change, Social interaction, Adaptation as key to motivation and success. These are reported on
separately from the main body of literature because their findings may be affected by the circumstances under which teaching was moved online during this period and a comparison of the two sets of literature provides additional context.

- **Use of technology**
  The papers coded under this theme include those concerned with the use of technology to promote delivery and communication in the online classroom. This was frequently commented on in papers, with some reporting that technology was key to establishing social norms in online classroom settings (Jung and Brady, 2020). However, the time span of this review, limits some of the usefulness of these findings as newer technological advances such as Whatsapp were not featured.

Falloon, (2012) suggests the quality of computer hardware and network connectivity was important to enable students to interact in online classes, with others identifying how technology used inappropriately or with poor planning, hampers learning (McBrien *et al.*, 2009; Middleton and Smith, 2013; Donelan and Kear, 2017; Erikson *et al.*, 2020). Some studies found students were reluctant to engage with the use of webcams and audio, but reported they were happier to use other tools such as the chat facility, whiteboard, and emoticons (Kuo *et al.*, 2014; Parenti, 2013; Swaggerty and Broemmel, 2017; Middleton and Smith, 2013). The extent of web cam and audio usage was difficult to assess, however it appeared to work best within small group work settings (de Jong *et al.*, 2018; Hopkins, 2010). A consistent finding was the importance of webcam use by teachers during sessions (McDaniels *et al.*, 2016; Clark, 2015), with Cakigolu’s (2019) study specifically linking them to cognitive presence.

Across the papers, the competence of the tutor, and the tools used to connect, were key to a good experience for students. The primary purpose of the tool should be that it matches the pedagogical aim of the teaching session and the tutors’ skills and knowledge (Eady *et al.*, 2017). Wang and Reeves’s (2007) early study asserted that the pedagogy of online teaching and teacher experience is
more important than the technology used to deliver the session. Pedagogy is the theme we turn to in the next section.

- **Planned pedagogy**
The papers in this theme stressed the importance of infrastructure, clear instructional design and organisation on the part of the teacher. The importance of clear objectives and organisation on the part of the teacher was stressed (Lu and Chen, 2011). Smith (2014a) suggest that structure may help to focus work, including use of turn taking, articulation and divergent thinking. Trespalacios and Uribe-Florez (2020) go further to suggest that students felt instructional activities foster a sense of community, and that while online collaboration can be difficult, it is desired by students. However, Robinson et al (2017) suggest that some students find group work stressful, and that it needs clear guidance and instructor facilitation.

While classroom approaches may be directly transferred to the online setting (Eady et al, 2017; Francescucci and Shamir-Inbal, 2018) some techniques work better than others. Problem-based learning in small groups appears to lend itself well to this setting (de Jong et al, 2018), however it should reflect specific ‘real world experiences’ (Donelan and Kear, 2017; Robinson et al, 2017). The value of problem-based approaches for post-graduate research planning has also been demonstrated (Swaggerty and Broemmel, 2017).

However, it was reported that larger groups take on a didactic style perhaps because students make more use of text rather than audio facilities (Kuo et al, 2014). This means that student-student interaction will be limited (Ng, 2007) reinforcing the need to adjust teaching roles to the group size. Lowe et al, (2016) in a rare longitudinal study, found groups established in the virtual environment worked well to supplement to face to face tutorials. We turn specifically to this blended approach in the next section.
Comparison of synchronous and asynchronous learning

Those articles included in this section reflect that students’ preferences in relation to delivery modes showed no clear pattern. Although our focus was on synchronous delivery, they are included here to allow for the patterns that emerged in the review to be used in decision making, as they show some of the benefits of each mode. For example, Falloon, (2012) suggests students preferred asynchronous, over synchronous learning for in depth work, but McDaniels et al (2016) suggest the contrary was true. One of the clear learning points was that synchronous teaching could not stand alone and was best used for particular teaching tasks (de Jong et al, 2018; Falloon, 2012; Jiang et al, 2019). The value of recordings of synchronous sessions was stressed (Lowe et al, 2016; Ng, 2007). However, live discussion was seen to have a valuable role in contributing to idea formation (McDaniels et al, 2016; Blau and Shamir-Inbal, 2018). In order to make this as effective as possible, learning material should be provided in advance, with the online class then being used for an in-depth discussion of this material (Benschoff and Gibbons, 2011; Marshall and Kostka, 2020). This is further reinforced by Falloon (2012) who suggests that maximising the benefits that are possible in synchronous environments requires considerable student and tutor preparation.

A common theme was that courses with synchronous approaches, that were complemented by asynchronous learning, could be particularly effective. For example, Yamagata-Lynch (2014) suggests that blended online synchronous and asynchronous courses can strengthen social presence, with the synchronous delivery providing students with a stronger sense of connection.

Online Interaction between Tutor and Student

Another important theme was the online interactions between teacher/instructor and student. The common elements identified across the papers, including student and tutor attitudes to these interactions, are discussed here. This aspect was particularly highlighted in surveys looking at the Community of Inquiry Framework which focuses on the influence of different aspects of ‘presence’ (see Cakiroglu, 2019 for a more detailed discussion). However, there was little evidence in relation to what this connection should look like.
Campbell et al., (2019) suggest teachers see their role as facilitators but student expectations are for a didactic approach. Those examining social presence in online learning, identified the importance of teacher presence, in relation to learning and building a sense of community (Cakiroglu and Kilic, 2018; Cakiroglu, 2019). Such was its value that learner-instructor interaction was the strongest predictor of variance in student satisfaction (Kuo et al, 2014).

Aspects of online learning that students particularly enjoyed in synchronous interactions included opportunities to connect in small groups, Cornell et al (2019) report that it increased their sense of community. Webcams seem crucial here, as students were negative about the lack of non-verbal cues in online discussions, with Erickson et al, (2020) reporting this meant discussion did not flow as well as in classroom setting.

Yuzer et al, (2009) reported that shy students felt more comfortable expressing their opinions in the online environment. However, some students felt disconnected and overwhelmed by multitasking. The subject being studied may be important here, as students desire for synchronous opportunities may vary. For example, students undertaking language studies particularly enjoyed the social aspect of coming together with other students (Hopkins, 2010).

Overall, it appeared that tutors were less enthusiastic about online interactions than students, and often lacked confidence (Middleton and Smith, 2013). The extra workload encountered in making ‘classroom’ resources work online was problematic (Giesbers et al, 2009; Erickson et al, 2020).

Studies reported that additional interpersonal skills are required to manage online student interactions (de Jong et al, 2018), with teachers reporting they needed extended time for technical and logistical preparations (Falloon, 2012), and support, training and practice in the use of the online setting (Kear et al, 2012). The next section will include a discussion of themes from studies that were undertaken since the Covid-19 pandemic began to impact on teaching.
**Covid-19 Reflections**

We now turn to our analysis of papers undertaken during the pandemic. We have kept these articles separate from the main findings to reflect the unique nature of teaching that was transferred to the online environment at short notice.

- **Impact of sudden change**
  As might be expected, the lack of time for teachers to receive training and/or prepare students were core challenges (Khan *et al.*, 2021; Al-Balas *et al.*, 2021). However, as with earlier studies, access to appropriate technology continues to be an issue to some, with one Bangladeshi study finding that while most students had access to smartphones, fewer had access to laptops or PCs (Khan *et al.*, 2021). Additional challenges included technical glitches, slow internet connections and malfunctioning video cameras or headphones (Esharmi *et al.*, 2021; Sugino, 2021; Al-Balas *et al.*, 2021; Warr and Sampson, 2020; Nam-Nguyen *et al.*, 2021). However, there are global differences in this access, as studies from Europe (Polokava and Klimova 2021; Camilleri and Camilleri, 2021) suggested students had the necessary technology, good conditions to work in and the appropriate technology to achieve their learning outcomes online. Thus, indicating how online classes may lead to a ‘digital divide’ between students who have the appropriate resources and those who do not (Khan *et al.*, 2021).

- **Social interaction**
  Many of the papers published post pandemic reflected earlier studies in reporting the importance of social interaction, between student and teacher and between student and student. For example, Nam-Hyun and Ahnlee (2021) suggest there is a positive relationship between student satisfaction with online learning, teacher presence and social interactions. A number of studies re-emphasised that online interactions with learning content, instructors and other students were significant predictors of student satisfaction (Chaaban *et al.*, 2021; Buckley *et al.*, 2020; Nam-Hyun *et al.*, 2021; Sugino, 2021; Thatch *et al.*, 2021). Overall students appeared to be positive about the move online,
and liked the interactivity of synchronous sessions, especially the ability to use ‘chat’ (Sugino 2020; Buckley, 2021).

Evidence found that while students perceived benefits in flexibility and convenience there was also a sense that it felt different, Erickson et al’s (2020) study showed students reporting that ‘ideas did not flow so easily’, it was ‘hard to establish a rapport’ and students were ‘scratching the surface of the topic’. Blackley et al, (2021) suggest that students felt they lost the sense of community, connection, and agency in their move online. This study also showed there was a lack of non-verbal cues, a fear of being judged and of the permanency of their input if recordings were taken. This was echoed by Warr and Sampson, (2020) who suggest a feeling from some students that they needed to ‘filter’ their answers due to the visibility of the medium.

- Adaptation as key to motivation and success

One new theme to emerge from pandemic studies looked at how student’s traits and characteristics were linked to their ability to adapt to the new situation. Purajomandangrud et al (2020) emphasise the importance of a ‘sense of identity’, ‘sense of purpose’ and a ‘sense of presence’ in producing a positive impact on student engagement and online interaction. Nam-Hyun et al, (2021) found that student satisfaction with online learning was positively related to self-management of learning and academic self-efficacy, while Besser et al, (2020) considered the impact of traits such as mood and adaptability to online learning. Unsurprisingly, these suggested that students with higher levels of adaptability reported more favourable responses to synchronous online learning.

Factors explored in more depth than in earlier studies were the impact of online education on the mood of students and the strategies that needed to be employed to help decrease the sense of isolation experienced by most students. Sim et al (2020) described low motivation and concentration as being linked to the suggestion that online learning lacked fun. Loneliness, isolation and boredom were described in a number of studies (Sugino, 2021; Blackley et al, 2021; Buckley et al, 2021).

Students were having to deal with distractions from their immediate environment, or temptation to
undertake other activities as they cannot be seen in the online class (Sugino, 2021; Nam-Nguyen et al, 2021).

Some articles suggested strategies to improve student experience and learning. Barber (2020) talks about a fully online learning community where students are allowed to take ownership of their learning. Burke et al (2021) similarly suggests a need to overcome the loss of connection and disempowerment felt by students by reimagining the teaching space. They describe a pedagogy of care for online learning consisting of; modelling an environment in which every student feels respected and valued; dialogue consisting of synchronous interactive activities, providing safety and support; engaging in practical experiences and confirmation. This is supported by Zajac and Lane (2021) who found it was possible for an instructor to convey a sense of caring online and this was an important element of a successful online course.

Discussion
Central to teaching is the interaction between student and teacher. However, there has been a general shift in the role of the instructor towards one which provides not only support on techniques and subject content, but one which fosters and promotes student autonomy in relation to developing their knowledge. There is also growing awareness of the importance of the emotional wellbeing of the student. Among this, technology is changing how we teach and learn. Synchronous online delivery can support new ways of teaching by providing accessible and flexible spaces for peer evaluation, discussion groups and online study groups. It is important to consider both the positive and negative aspects of synchronous delivery from the perspective of both students and tutors, to ensure we make online learning effective and productive. The original and explicit focus of our review was to explore student and teacher experiences of the synchronous aspect of online learning. We begin this discussion by acknowledging some of the limitations of this review.
Limitations
Firstly, there was a limited evidence base from which to draw firm conclusions about the student and teacher experience of this aspect of online learning. Instead, the literature was focused broadly on blended learning, or sometimes comparing functionality and effectiveness of online teaching with traditional approaches. Secondly, a drawback was that we did not use a quality assessment tool in our review. However, we did note that educators were frequently involved in studies which investigated the experiences of their own students. This may compromise the reliability of the findings. Thirdly, there was a surprising lack of papers on newer technology. This may be due to the emerging nature of this work, and we would expect increased attention on these elements in future studies. Finally, there was also a dearth of papers highlighting how online teaching should be adapted to different disciplines. Instead, generalisations were made across the studies which were dominated by education and technology. We thus wish to acknowledge at the outset of our discussion that while these studies provide a useful starting point, in the absence of a systematic review of this area, they can offer only limited insights into the experiences of both students and teachers specifically in the online synchronous teaching environment.

Core Findings
As universities move quickly towards a more blended model of teaching, it is vitally important that we reflect in detail upon the evidence we already have about what works in synchronous modes of learning. Despite the limitations, our review shows there are a number of consistent findings across the studies. For example, the findings from the Covid-19 studies reinforce the need for preparation time and training, the importance of social interactions and the demotivational impact of social isolation. Collectively, our findings provide some direction for the development of strategies for those keen to develop their understanding of this area of teaching.

Our core finding is that neither asynchronous nor synchronous stand alone in delivering online teaching. Instead, they must be planned carefully so the benefits of each are understood and exploited. A number of ideas stood out from the papers reviewed; the importance of considering the
proportion of synchronous to asynchronous sessions and where possible, the use of offline interaction with students by way of preparation for more in-depth synchronous sessions.

However, we think there is considerable scope for further research development specifically looking a synchronous delivery, in the remainder of this discussion we identify five specific strategies that the literature suggests can be used in practice to improve online synchronous learning.

1. **Technology training is vital**
Consistent findings across the studies relate to the continuing debates about the usefulness of technology in supporting student engagement (Smith, 2014b). Across the papers they also show the practical challenges technology creates and increasing teacher and student confidence through training is vital. Existing staff should receive expert training on the technology they are expected to use, with particular attention being paid to training that provides opportunities for supported practice of skills, or demonstration of the best practice use in teaching of any technology that is provided. There is also a need to acknowledge the additional workload and role for tutors in simultaneously ‘managing’ technical issues and queries from students (de Jong et al, 2018).

2. **Support in developing online identities**
Although students are often described as ‘digital natives’. It should also be remembered that students often are creating a new ‘learning identity’ online, many young people prefer chat facilities and they may not be used to verbal interaction online. Clearly, we need new studies that explore the intricacies of how this translates to the student experience of online teaching. However, given the multiple online identities that we know are possible, as a first step it is essential to assist students in the ‘creation of new identity as online learner’ (Yamagata-Lynch, 2014), one in which they feel safe to share. Similarly, teachers need to create a new online ‘teacher presence’. Universities should thus invest time in new student and staff induction programmes to discuss and prepare individuals for engagement online.
3. **Creating clear, tailored community expectations**

Another finding to emerge from our review was the importance of the relationship between the teacher and student. Studies point to a lack of clarity, consistency and a mismatch in student-teacher expectations. Technology, particularly webcams, was an important factor in breaking this barrier and establishing ‘teacher presence’. Routine use of cameras by teachers should be encouraged. Clear guidance for student use of cameras should be developed at the outset of each module, with tutors giving careful consideration to its value in their particular setting (for example class size may prohibit its usefulness). Expectations in relation to student use of cameras should however be consistently reinforced at each session to ensure students are clear on how they are being used in each setting to create and develop community engagement.

4. **Limiting online synchronous class size**

Group size was repeatedly raised as a determining factor in the experience of synchronous learning. To what extent online synchronous learning can be a positive experience for students at a larger scale remains unclear. Typically, class sizes at university level will vary but they are often larger than the evidence would suggest online synchronous learning seems to support. This is likely to cause tension to those institutions who require large numbers of students to make their business model work, and to those who see online provision as providing an opportunity to upscale the student to teacher ratio. It is thus suggested that the pedagogy underpinning the selection of synchronous sessions are carefully thought through so that their maximum benefit can be achieved. For example, planning some highly focused synchronous sessions with a smaller group, supported by more recorded asynchronous sessions is likely to be more beneficial to students.

5. **Preparation and confidence in creating a community of learning**

Regardless of group size, building a community of learning which relates and responds to the interaction between all parties is central to the success to online synchronous teaching. It was apparent that students responded well to a consistent structure to lessons and clear communication about expectations. Students will also pick up on reluctance or lack of enthusiasm on the part of the
tutor. Tutors need time to plan the sessions carefully as clear guidance and facilitation are key to the success of synchronous sessions. Providing material in advance also allows students to be confident about the structure and expectations for their involvement. Additionally, training to support tutors in the interpersonal skills required to manage groups online would be helpful in shaping these encounters. Students may find online work more stressful, and tutors need the confidence to be able to support and manage these encounters so that students grow and develop.

**Conclusion**
The already increasing impetus to respond to students’ needs by creating distance education courses, was accelerated by the unprecedented demands of Covid-19 to teach online. This review demonstrates there are some concerns about the evidence base that underpins this specific aspect of teaching. The current climate is perfect for exploring exactly how we can make the best use of innovations in synchronous delivery. Achieving confidence in this new environment has significant benefits but it will require students and lecturers to adapt, and each will need to be provided with training and ongoing technical support to gain the confidence and skills needed to thrive online. Institutional level administrators involved in the delivery and planning of education should ensure this is supported in future planning.

**References**


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