

Supporting Higher Education Adult-learners in Blended Learning Courses

Nanda van der Stap



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Colofon

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PhD thesis, Open University of the Netherlands, Heerlen

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ISBN: 978-94-6510-468-3

Cover: Theo van den Bogaart & Nanda van der Stap

Layout: Nanda van der Stap

Printed by: Proefschriftmaken.nl

Dit proefschrift werd mede mogelijk gemaakt met financiële steun van de HU University of Applied Sciences

Supporting Higher Education Adult-learners in Blended Learning Courses

PROEFSCHRIFT

ter verkrijging van de graad van doctor
aan de Open Universiteit
op gezag van de rector magnificus
prof. dr. Th.J. Bastiaens
ten overstaan van een door het
College voor promoties ingestelde commissie
in het openbaar te verdedigen

op donderdag 3 april 2025 te Heerlen
om 16.00 uur precies

door
Maria Susanna Theodora van der Stap
geboren op 12 juni 1965 te Heelsum, Gem. Renkum

Promotor:

Prof. dr. ir. J.M. Versendaal Open Universiteit

Copromotor:

Dr. T. van den Bogaart Hogeschool Utrecht

Dr. E. Rahimi Open Universiteit

Leden beoordelingscommissie:

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Prof. dr. R. Klenke Open Universiteit

Dr. O. Noroozi Wageningen University and Research

*Do not go where the path may lead,
go instead to where there is no path and leave a trail*

Ralph Waldo Emerson

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1

GENERAL INTRODUCTION

RATIONALE

In a changing society where the implementation of ICT developments is commonplace and where it is deemed essential that learners adopt 21st century skills, education has seen an opportunity to change the pedagogical approach from teacher-centred education to learner-centred education. Consequently, the focus of the activity shifts from the teacher to the learner through problem-solving activities, discussions, and debates, among others. The use of ICT is particularly advantageous to such an approach in the case of blended learning, where part of the learning occurs online as it is technology-mediated (Garrison & Kanuka, 2004; Graham, 2006; Hrastinski, 2019), and part occurs face-to-face (f2f), hereinafter called the online 'mode' and the f2f 'mode'. The combination of these two modes can facilitate a learner-centred approach as basic aspects of learning can take place online, freeing up time during f2f moments to delve deeper into the learning content through, *inter alia*, discussions and group activities. As such, blended learning offers new opportunities for evoking higher-order thinking and deep learning through individual, cooperative and collaborative activities shared across the two modes of learning (e.g. McKenna et al. 2020; Richardson et al. 2017; Serrano et al. 2019). Whilst there are various definitions of blended learning (Osguthorpe & Graham, 2003), in this dissertation the somewhat broad definition is maintained, which explains that the online mode of blended learning is supplemental to the f2f mode where further instruction and elaboration take place through thoughtful integration. As Garrison & Kanuka (2004) explain: this [blended learning] requires a "thoughtful integration of classroom face-to-face learning experiences with online learning experiences" (p. 96). In blended learning then, online learning is the pillar as it facilitates students to familiarise themselves with basic concepts through individual and collaborative activities prior to attending the f2f sessions.

Blended learning, in its affordances of a learner-centred approach, is particularly interesting for adult-learners in higher education whose salient educational needs include deep learning, self-directed learning, autonomy, problem-solving opportunities, and building onto existing knowledge (e.g. Chametzky, 2014; Konstantinidou & Nisiforou, 2022; Pappas & Jerman, 2015). Indeed, studies have shown that their distinct learning characteristics and educational needs, more prominent than other learners, (e.g. those having just left secondary education), influence the way adult-learners in higher education approach learning (e.g. Konstantinidou & Nisiforou, 2022; Pappas & Jerman, 2015; Youde, 2018). Additionally, higher education adult-learners, who are presumed working professionals, having to juggle time with work, family, and education, welcome such an approach as it affords them flexibility in terms of time and place (e.g. Choi & Kim, 2018; Milheim, 2011; Youde, 2018). In this dissertation, adult-learners are distinct from younger learners just entering tertiary education for the first time, or indeed from adult-learners in vocational education. Moreover, higher education adult-learners cannot be defined simply by biological age, but are rather framed within adult-learning theories that set out their learning characteristics and educational needs (Merriam et al. 2007), including transformational adult-learning theory and self-directed adult-learning theory, as elaborated below.

In meeting the developments of a changing world and in helping students develop 21st century skills, the researchers' institute, a higher education teacher-trainer college, decided to revise the curriculum by adopting a blended learning approach to her 23 teacher-training programmes, both undergraduate and graduate. Whilst blended learning is specifically interesting for adult-learners in higher education as it affords, *inter alia*, deep learning opportunities, an empirical study (van der Stap, 2017) conducted prior to the research in this dissertation held among the institutes' teachers revealed that according to 82% of the teachers interviewed ($n=48$) adult-learners hardly interact with the online mode. Interaction with the online mode is interpreted here as student engagement with course content and activities in the online mode (Murray et al. 2013).

The teachers at the above-mentioned teacher-trainer college are highly skilled in didactics as it applies to the pre-blended learning phase, but the above-mentioned empirical study (van der Stap, 2017), shows that 76% of those interviewed ($n=48$) felt that employing blended learning requires an expansion of their didactical repertoire. A further 88% reported that to remedy non-interaction, they would need

more knowledge about online interaction in combination with f2f meetings, preferably in the form of an instructional model or framework on blended learning. These results are consistent with views held by teachers at other higher education institutes in the Netherlands, based on interviews with stakeholders held by the researcher at these institutes ($n=27$). It would appear that an instructional model, specifically fostering higher education adult-learners into online interaction in blended learning courses, may expand teachers' didactical skills in line with the specific needs of adult-learners in blended learning courses.

The importance of an instructional model on blended learning is emphasised by Siragusa et al. (2007) who explain that an instructional model is needed to effectively implement blended learning. As King & Arnold (2012) assert, "effective blended courses require effective instructional designs" (p. 47). Serdyukov (2017) further explains that without evidence-based blended learning instructional models, teachers may fall back into traditional teaching methods. Arriving at such a model requires three challenges to be met, namely 1) a comprehensive understanding of higher education adult-learners' learning characteristics and educational needs in higher education, 2) factors influencing interaction with the online mode, 3) a comprehensive understanding of designing a blended learning environment, i.e. where adult-learners' educational needs are constructively aligned with the design of both modes of the learning environment in order to effect learning processes that meet the targeted learning outcomes (Biggs, 2003). These are further elaborated when the research challenges are articulated into distinct objectives, but shall briefly be addressed below.

Higher education adult-learners have educational needs that are not necessarily tantamount to non-adult-learners, or indeed to adult-learners in vocational education (Boelens et al. 2018). Higher education adult-learners' needs include a high level of autonomy, needing to add to their existing knowledge and experience, and needing more opportunities for reflection and deep learning (Chametzky, 2014; Konstantinidou & Nisiforou, 2022; Vanslambrouck et al. 2019; Youde, 2018). Meeting any student's educational needs is essential when designing education (Biggs, 2003), therefore a comprehensive understanding of specifically higher education adult-learners' educational needs is essential, especially considering that adult-learners' lack of interaction with the online mode is a known concern. Several studies echo the findings of the empirical study (Van der Stap, 2017) conducted prior to the research in this dissertation, as they reveal that adult-learners in higher education hardly interact with the online resources of the learning environment, bringing with it a downward spiral where said adult-learners have poorly perceived learning experiences (e.g. Armellini & De Stefani, 2015; Kim et al. 2016; Morueta et al. 2016), attain lower learning outcomes (e.g. Cuesta Medina, 2018; McKenna et al. 2020; Serrano et al. 2019), or even leave the programme prematurely (Choi & Kim, 2018; Kuo & Belland, 2016). Teachers, in compensating for the lack of interaction with the online mode, tend to repeat the online content during f2f sessions in a blind continuation of traditional teaching and learning activities (Kjærgaard, 2017; Serdyukov, 2017), resulting in a dilution of both modes (McKenna et al. 2020), and adult-learners in particular ignoring the 'added' online mode as they fail to see its relevance (Östland, 2008; van der Stap et al. 2019).

Studies addressing a lack of interaction with the online mode have been examined in literature reviews, prior to the research in this dissertation, revealing two salient factors, namely 1) social presence, where individuals are aware of the existence of others and the ability of presenting themselves to the other participants as 'real people' in the online environment (e.g. Andel et al. 2020; Hodges et al. 2020; Ke, 2010), and 2) convergence, where the f2f learning mode and the online learning mode are structured according to their content and activities without overlap from either mode (e.g. Cuesta Medina, 2018; King & Arnold, 2012; Kjærgaard, 2017; Murray et al. 2016; Owston & York, 2018).

With regard to the first factor (social presence), when students feel isolated and do not experience the presence of others, they will refrain from online interaction (Martin & Bolliger, 2018; Oyarzun et al. 2018). Likewise, with regard to the second factor (convergence), when students do not see the relevance of the content and activities in the online mode, or when they fail to see the relation of both

modes, they tend to ignore the online environment and resort to attending f2f only as this is the medium of education with which they are most familiar (Östland, 2008; van der Stap et al. 2023). Whilst there is an abundance of literature on social presence, this relates to online learning only, and neglects the dynamics of blended learning. Likewise, literature on convergence or sequencing of both modes, does not address the issue of social presence, presumably because students meet f2f on a regular basis. Consequently, literature on convergence alone does not do justice to students' educational needs in the complexity of engaging with online content, engagement being a result of interaction (Martin & Bolliger, 2018). As such, there is gap in the literature concerning blended learning, and therefore no guide that addresses *both* factors to leverage interaction with the online mode. Such challenges ask for a well-designed blended learning environment that incorporates not only the educational needs of students, but also the content and activities that make up both learning environments (e.g. Hodges et al. 2020; Pan, 2022; Yin & Yuan, 2021). This dissertation addresses the gap in the current literature as it meets said factors, and is hence of importance to the teaching community as it expands their didactic repertoire. Besides addressing this gap, new insights also emerge from this dissertation that inform an instructional model in blended learning courses catering for higher education adult-learners.

Designing a blended learning environment entails for the course designer to make several considerations, namely 1) the design of the learning environment across both modes (online and f2f), and 2) the characteristics and learning needs of the learner (here: adult-learners). Biggs (2003) refers to these two aspects as 'presage', perhaps better understood as preconditions (Noroozi et al. 2012), for these conditions need to be met before any learning processes may be expected. Meeting the preconditions then is the first step in designing any learning environment in order to effect desired learning processes through which the targeted learning outcomes may be expected (Biggs, 2003). Indeed, when a learning environment is not effectively designed in line with said preconditions, learning processes are impaired (Hodges et al. 2020; Kuo & Belland, 2016).

In sum, in catering for adult-learners in blended learning courses, an effective design of the learning environment entails understanding what leverages higher education adult-learners into interaction, how adult-learners should interact with the content and activities (both f2f and online), with whom, and according to which mode (e.g. Hodges et al. 2020; Kjærgaard, 2017; Murray et al. 2013; Park & Bang, 2021). It furthermore entails an understanding of the dichotomy of a blended learning environment, i.e. how can learners experience the presence of other beings online (social presence), and how can learners see the relevance and meaning of both modes (convergence). These considerations may be met through an instructional model catering specifically for higher education adult-learners in blended learning courses. Therefore, to arrive at a well-designed blended learning environment, an instructional model is needed to guide the design of blended programmes and to prevent teachers from falling back into traditional in-class teaching methods (Serdyukov, 2017).

Instructional models incorporating online learning requires a re-consideration of pedagogy (Allen et al. 2013; Kinney et al. 2012), one that Serdyukov (2017) refers to as 'e-pedagogy'. Accordingly, studies on instructional models incorporating new considerations of e-pedagogy emerged (Dick et al. 2004; Dixon, 2010; Gradel & Edson, 2011). However, present studies generally focus on approaches that are aimed at traditional students, i.e. non-adult-learners. Adult-learners in higher education may not be served by such an approach, since they have different learning characteristics and educational needs that play a critical role in the way they will approach learning in the online mode (Pappas & Jerman, 2015). A well-designed blended learning instructional model, particularly aimed at the educational needs of higher education adult-learners, is therefore essential (e.g. Chametzky, 2014; Hodges et al. 2020; Konstantinidou & Nisiforou, 2022; Vanslambrouck et al. 2019; Youde, 2018). Furthermore, such an instructional model should be aimed at higher education adult-learners in such a way that effective interaction with both modes of the learning environment is leveraged (Milheim, 2011; van der Stap et al. 2024b). An instructional model fostering adult-learners into interaction with the online mode in blended learning courses not only fills the gap in educational design, instructional design, and blended learning design, but also strengthens teachers with an expanded didactical repertoire that may enhance

their educational practice. Considering the fact that adult-learners in higher education are a rapidly growing group, one that has consistently tripled since 2014 (BICC, 2022), the quality of teaching may be at risk if there is no design that meaningfully addresses blended learning scenarios for adult-learners in higher education.

Against this background, I will explore **three objectives** as they stem from three research challenges through an initial literature exploration. The three objectives will lead to five research questions with five related studies of this dissertation as outlined below. The overall approach of this dissertation fits the educational design research (EDR) paradigm through various exploration, creation, validation and iteration rounds as described below. See also Figure 1 at the end of this chapter for a quick overview.

INITIAL LITERATURE EXPLORATION

The literature exploration consists of three main themes, namely 1) adult-learners in higher education, 2) factors influencing interaction with the online mode, 3) constructively aligned blended learning designs. The first theme situates the research within the context of adult-learners in higher education, the second theme provides an overview of the challenges affecting online interaction, and the third theme provides the intricacies of designing blended learning environments tailored to adult-learners as informed through theory and validated empirically. To synthesise the aforementioned challenges in a blended learning instructional model, this dissertation will articulate the challenges into three objectives, tackled in three parts. The first part starts by shortly describing the status quo of higher education adult-learners in blended learning courses, followed by an illustration of the most typical learning characteristics and educational needs of higher education adult-learners. The second part deals with the objective of online interaction brought forward through blended learning and the solutions that aim to deal with both. The third part deals with the essences of a blended learning environment, and how the same can be constructively aligned (Biggs, 2003) with adult-learners' needs and their subsequent learning processes through an instructional model. Whilst it is argued that blended learning can be understood as an approach to learning that maps onto adult-learning theories (Youde, 2018), the reality has shown that teachers have often been holding onto traditional teaching methods in the absence of knowledge on sequencing online and f2f learning (McKenna et al. 2020; Phelps & Moro, 2022), as well as leveraging online interaction through social presence (Pan, 2022; Richardson et al. 2017; Serrano et al. 2019). A model that aids the appropriate design of both modes of the blended learning environment would not only avoid students feeling isolated in the online mode, a phenomenon that stems from a lack of social presence, but would also enable deep learning whilst mapping onto adult-learners' educational needs. Throughout the literature review, the three objectives are put forward, which will lead to fulfilling the main objective of this dissertation, namely to identify the specific requirements needed to design an instructional model facilitating higher education adult-learners into online interaction in blended learning courses.

Part I: Adult-learners in higher education

Higher education adult-learners' learning characteristics and educational needs

The term adult-learner, as well as the idea of adult-learning theories framing the learning characteristics and educational needs of (higher education) adult-learners, is generally assumed to be applicable to working professionals with substantial life-experience and knowledge, and little time due to family obligations, among others (Chametzky, 2014). This raises questions concerning the scope of what is considered to be an 'adult' and the basis of these assumptions, however, such a debate is beyond the scope of this research. In this research, the concept of adult-learners follows the assumption given above, inferring that adult-learners are better served with an educational approach that meets specified educational learning needs as defined in adult-learning theories. As Biggs (2003) explains, considering students' needs is imperative when designing educational programmes.

The field exploring higher education adult-learners' needs is vast and varied, an all-encompassing approach of which would do an injustice to the specific needs of adult-learners in higher education, for there is no one size fits all. One way of narrowing an understanding of adult-learners is by viewing adult-learners in vocational studies on the one hand, referred to as 'hands-on-learners' (Boelens et al. 2018), and those in higher education on the other. Adult-learners in higher education, as said, have been shown to have unsatisfying learning experiences (Armellini & De Stefani, 2015; Kim et al. 2016; Morueta et al. 2016), resulting from a lack of interaction with the online mode (Hodges et al. 2020; Konstantinidou & Nisiforou, 2022). Therefore, adult-learners, despite being self-motivated, need to have their educational needs met in order stay motivated to interact online (Hagen, 2016; Konstantinidou & Nisiforou, 2022; Pappas & Jerman, 2015).

It has been suggested that the needs of adult-learners in higher education are, *inter alia*, higher-order thinking, deep learning, collaboration and conversation with peers, and reflecting upon feedback (Biggs & Tang, 2007). Other approaches to adult-learning emphasise adult-learners' need for autonomy and self-directed learning (Chametzky, 2014; Hoey, 2017; Konstantinidou & Nisiforou, 2022; Youde, 2018), including the need for the learning environment to be meaningful (e.g. Bolton, 2006; Cercone, 2008; Chametzky, 2014; Chan, 2010). As said, rather than a traditional pedagogical approach, adult-learners are better served with an andragogical approach that meets these needs (Hagen, 2016; Vanslambrouck et al. 2019; Youde 2018).

An andragogical approach results from the first known adult-learning theory, andragogy, and which was first coined by Alexander Knapp (1833, as cited in Taylor & Kroth, 2009). When the number of adults entering higher education was on the increase, the term was revisited and fully explored by Knowles (1984). Adult-learners' educational needs are, as said, framed in various adult-learning theories that approach the guidance of adult-learners in education through a specific lens. Since the revisiting of andragogy by Knowles (1984), its intricacies have further been defined by Merriam et al. (2007) who frame andragogy in six assumptions as follows: 1. Self-Concept: Adult learners are self-directed, autonomous, and independent. 2. Role of Experience: Repository of an adult's experience is a rich resource for learning. Adults tend to learn by drawing from their previous experiences. 3. Readiness to Learn: Adults tend to be ready to learn what they believe they need to know. 4. Orientation to Learning: Adults preferably learn for immediate applications rather than for future uses, as their learning orientation is problem-centred, task-oriented, and life-focused. 5. Internal Motivation: Adults are more internally motivated than externally. 6. Need to Know: Adults need to know the value of learning and why they need to learn. Whilst stated separately, some of the identified aspects could be summarised into 'needing to see meaning', for example assumptions 4 and 6 above.

Consequently, higher education adult-learners' needs to have meaningful interaction, a meaningful learning environment, and meaningful activities have been addressed by various adult-learning theories, including the transformational adult-learning theory (Cercone, 2008; Chametzky, 2014; Snyder, 2009) and the experiential adult-learning theory (Henschke, 2010; Milheim, 2011). Whilst incorporated in other adult-learning theories, the concept of self-directedness is specifically illuminated by the self-directed adult-learning theory (Chan, 2010; Merriam et al. 2007; Milheim, 2011; Zhang & Zheng, 2013). Another commonality that can be inferred from the various theories on adult-learning, is that adult-learners in higher education need deep learning and higher-order thinking to be evoked (e.g. Armellini & De Stefani, 2015; Biggs & Tang, 2007; Kjærgaard, 2017; Konstantinidou & Nisiforou, 2022; Vanslambrouck et al. 2019; Youde, 2018). Considering the three salient commonalities then, it could be summarised that higher education adult-learners: 1) need deep learning and higher-order thinking to be evoked, 2) need to see the meaning and relevance of content and activities, and 3) need to have opportunities for self-directed learning and autonomy (e.g. Cercone, 2008; Chametzky, 2014; Milheim, 2011). These salient educational needs can easily be mapped onto the affordances of blended learning (Youde, 2018).

Higher education adult-learners and blended learning

Adult-learning theories, as they relate to higher education adult-learners, centres adult-learners' self-directedness and internal motivation through meaning and deep learning (e.g. Hoey, 2017; McKenna et al. 2020), which may find their fruition in well-designed blended learning courses (Youde, 2018). Additionally, as higher education adult-learners tend to be autonomous, they embrace the flexibility that blended learning can provide (McKenna et al. 2020). It can be anticipated that higher education adult-learners' learning outcomes may be improved through the design of a blended learning environment specifically aimed at their educational needs and learning characteristics (e.g. Hajibayova, 2017; Hoey, 2017; Konstantinidou & Nisiforou, 2022; McKenna et al. 2020). Indeed, once familiar with well-designed blended learning courses, adult-learners would favour blended learning over solely f2f classes or online learning for the flexibility it affords, whilst still facilitating some f2f interactions (e.g. Hodges et al. 2020; McKenna et al. 2020; Vanslambrouck et al. 2019; Youde, 2018).

Designs of the blended learning environment for higher education adult-learners should therefore enable deep learning and higher-order thinking – an aspect that not only flows from well-designed blended learning courses, but also relates to the educational needs of adult-learners (e.g. Vanslambrouck et al. 2019; Youde, 2018). Deep learning could be established, for example, by placing basic concepts online with some collaborative activities to accommodate them, which can then be further explored during the f2f setting (e.g. Cuesta Medina, 2018; Kjærgaard, 2017; Konstantinidou & Nisiforou, 2022; Serrano et al. 2019). Similarly, an effective design should have meaningful interactions and activities, as well as meaningful sequencing of the online and f2f modes (Cuesta Medina, 2018; Kjærgaard, 2017; Owston & York, 2018; Park & Bang, 2021). Lastly, blended learning affords flexibility in time and place. This maps onto higher education adult-learners' needs for autonomy and self-directedness, of which flexibility is a pre-requisite (Amoozegar et al. 2022; Hoey, 2017; Pan, 2022). A well-designed blended learning course would align the benefits of blended learning and the educational needs of adult-learners, in the absence of which adult-learners may well make choices that are more meaningful in relation to their time management rather than their learning processes (Östlund, 2008; van der Stap et al. 2023).

In sum, the **first objective** is two-fold, namely 1) to investigate higher education adult-learners' perceived satisfaction and initial experience in relation to blended learning courses, as well as a first understanding of their learning characteristics and educational needs. This will be investigated in a case study as adult-learners in higher education, being the target group, can provide a first-hand account of their experiences and design requirements as they relate to blended learning. As such they provide a valuable source of experience and knowledge through which more insight can be had, including the ability to explain why some elements are less effective (Könings et al. 2005). 2) Whilst empirical findings are highly valuable, in order to arrive at design principles that meet the educational needs of adult-learners in higher education, further understanding must be sought from theory. This is important because empirical findings from a relatively small sample of the population may provide results that might not be transferable to a broader context (Cohen, 2013). Therefore, to meet this objective, a systematic literature review is carried out. Literature on adult-learning is highly fragmented as it results from various adult-learning theories, hence a clear overview is needed. Moreover, literature on adult-learners generally does not distinguish between vocational adult-learners and higher education adult-learners. Dealing with this first objective may help arrive at an empirically and theoretically informed framework that caters for the needs of higher education adult-learners, hence the following research questions are asked:

Research Question 1: To what extent do social online presence and convergence play a role in adult-learners' online interaction¹?

Research Question 2: What are the specific characteristics and needs of adult-learners in higher academic education as they emerge from the various theories on adult-learning?

¹ This study was conducted at a single, specified Institute

Part II: Salient factors inhibiting online interaction

Social Presence

With part of the learning moved to the online environment, there is a risk of psychological isolation that could demotivate students from interacting with online content and activities (e.g. Halibayova, 2019; Martin & Bolliger, 2018; Wei et al. 2012). Moore (1989) explains that physical distance creates both a communicational and psychological space that could lead to misunderstandings between students and teachers, which he terms 'transactional distance', as described in his transactional distance theory (TST). This distance influences students' decision to interact, and henceforth engagement in learning. Communication, or as framed by Garrison et al. (2000) 'inquiry through academic discourse', plays a critical role in developing a sense of community where knowledge is constructed. This view follows the social constructivist theory as first expressed by Vygotsky (1978), which explains that cognitive processes are constructed and leveraged through social interactions.

The challenge of social interaction in an online environment is to reduce the transactional distance (Moore, 1989), as social interaction is important for the social climate which has a direct effect on the learning processes (Belt & Lowenthal, 2021; Li, 2022; Martin & Bolliger, 2018). Such interactions can be critical for students since they serve as encouragement and acknowledgement, and which are essential aspects for motivation and learning (Amoozegar et al. 2022; Pan, 2022). One way of reducing the transactional distance is by facilitating social presence, for students who perceive social presence are better motivated to interact in the online mode of the learning environment (Oyarzun et al. 2018; Richardson & Lowenthal, 2017). In the online mode, social presence endeavours to replicate the social aspects of 'being there' and 'salience to others' (Dixon, 2011; Garrison et al. 2000). The ability of perceiving others in the online environment then is an experience that affects students' online participation and decision to interact (Amoozegar et al. 2022; Andel et al. 2020; Hodges et al. 2020), as students particularly need to feel the psychological presence of others to prevent feeling disconnected and henceforth demotivated (e.g. Ali & Smith, 2015; Blackmon & Major, 2012; Bouilheres et al. 2020; Croft et al. 2010; Rasheed et al. 2020). In blended learning then, social presence is essential as it relates to students experiencing others as participants with whom a personal and affective relationship can be developed. Indeed, as defined by Garrison and Akyol (2013), social presence is "the ability of participants to identify with the group or course of study, communicate purposefully in a trusting environment, and develop personal and affective relationships progressively by way of projecting their individual personalities" (p.107).

One way in which affective relationships can be evoked is through meaningful collaborative activities (e.g. Lowenthal & Dunlap, 2018; Martin & Bolliger, 2018; Oyarzun et al. 2018; Pan, 2022). The strategy of meaningful collaborative activities is one that is commonly implemented in order to evoke and establish social presence, and which also maps onto deep learning and higher-order thinking as it invites students to critically reflect on different perspectives (Kjærgaard, 2017; Serrano et al. 2019). Mahoney & Harris-Reeves (2019) further explain that through collaboration, students understand new concepts hence achieve deep learning. In short, the evoking of social presence through collaborative activities coincides with higher-order thinking, as collaborative learning centres on the idea that deep learning or higher-order thinking is achieved through the 'pursuit of inquiry' within a social learning community (Garrison et al. 2000; Johnson et al. 2017; Li, 2022; Pan, 2022).

The pursuit of inquiry within a social community plays a central role in the COI (community of inquiry) framework (Garrison et al. 2000), a leading reference in online learning. According to the COI framework, a successful higher educational experience is embedded within a community of inquiry where learning occurs through the interaction of three core elements:

1. Cognitive presence: the extent to which online learners are able to construct meaning and critical thinking through sustained communication.

2. Social presence: the ability of individuals to project their personal characteristics into the learning community, thereby presenting themselves to others as 'real people' whilst building affective relationships.
3. Teaching presence: the design (material, organisational, and instructional) of the course, the facilitation, and the direction of learning processes in order to achieve learning outcomes (Garrison et al. 2000). Designing the course involves planning and preparing for the course, including personality, values, and approach (Anderson et al. 2001).

All three presences within the COI framework overlap to create a meaningful and motivating learning experience (Garrison et al. 2000). To understand the interconnection between the three presences, it is important to comprehend that cognitive presence, one of 'sustained communication', implies social presence as a pre-requisite (Garrison & Kanuka, 2004). As such social presence is a causal factor for cognitive presence (e.g. Li, 2022; Gutiérrez-Santiuste et al. 2015; Kozan & Richardson, 2014; Morueta et al. 2016). As cognitive presence results from social presence, likewise social presence is evoked by teaching presence (e.g. Amoozegar et al. 2022; Hoey, 2017; Lowenthal & Dunlop, 2018; Martin & Bolliger, 2018).

Students' learning processes then are ignited by teaching presence, as said, through the design of the course, facilitation, and further direction throughout the course. It is through careful course design and further facilitation that social presence is evoked and experienced by community members (Zilka et al. 2018). However, as explained, the three presences are intertwined, hence there is an overlap between teaching presence and social presence which cannot be represented by the sole definition of teaching presence. To understand the full impact teachers have on their students, an 'extra' presence becomes apparent, namely the 'teacher's *social* presence' (Oyarzun et al. 2018). The teacher's social presence is where social presence and teaching presence overlap, usually viewed as 'setting the climate' (Amoozegar et al., 2022; Garrison & Akyol, 2013; Oyarzun et al. 2018). The teacher's social presence is established and maintained through self-disclosure, support, humour, and personal contact (Belt & Lowenthal, 2021; Oyarzun et al. 2018). As such, teaching presence and the teacher's social presence evoke students' satisfaction and the decision to interact online (Oyarzun et al. 2018). Whereas social presence is a psychological state in an online learning community, one of which it is hoped that students experience, teaching presence, including the teacher's social presence, is a set of materials, strategies, and behaviours that a teacher may intentionally employ (Lee, 2020).

Convergence

With two modes pertaining to one learning environment (f2f and online), careful considerations need to be made in terms of structuring learning activities and learning content according to the most appropriate learning mode (e.g. Hodges et al. 2020; Yin & Yuan, 2021). Learning content and learning activities in these modes should not overlap but work complementary (e.g. Cuesta Medina, 2018; Phelps & Moro, 2022; Yin & Yuan, 2021). This raises the challenge of deciding which content and activities are best placed along which mode (online or f2f) in order to evoke desired learning processes, without duplicating either mode (McKenna et al. 2020; Yin & Yuan, 2021). Considering the learning needs of adult-learners in higher education, such categorisation should be meaningful since particularly higher education adult-learners in blended learning courses are initially wary of embracing the online learning mode (Hodges et al. 2020; Owston & York, 2018). Adult-learners therefore need to see the relevance of the 'added' online mode (Hodges et al. 2020; Konstantinidou & Nisiforou, 2022; Murray et al. 2016), but will fail to see such when the online mode is not effectively implemented (Richardson et al. 2017; Yin & Yuan, 2021).

In sum, the **second objective** is to identify the design principles needed to meet both challenges of online interaction to construct theory-based design principles. This is important because literature on the first challenge, social presence, is highly fragmented due to varying interpretations of social presence, whereas literature on the second challenge, convergence, is scarce. Moreover, up until now,

both factors have not been synergised into an existing framework or guide that will facilitate the design of blended learning courses. Consequently, teachers facing a thoughtful design of blended learning courses are still faced with implementing the same (Jonker et al. 2018). Henceforth, resolving this challenge through two systematic literature reviews, followed by synergising the results of both, may serve to identify design principles that leverage online interaction, and which could be helpful for both researchers and practitioners in terms of designing new blended learning courses, or evaluating existing ones. The second objective shall be met through answering the following research question:

Research Question 3: How can online interaction in blended learning courses in higher education be leveraged through social presence and convergence?

Part III: Blended learning designs

A blended learning environment

A learning environment could be considered as the allocated place where learning activities are carried out in order to construct knowledge that directly influences learning processes (Biggs, 2003; Gómez & Duarte, 2011). Without interaction with either mode of the (blended) learning environment, students will not become involved with learning content because interaction precedes such involvement (Martin & Bolliger, 2018), as a result of which learning processes will be impaired (Kuo & Belland, 2016). This resonates with the intersection of social presence and cognitive presence in the COI framework (Garrison & Akyol, 2013), as social presence evokes cognitive presence.

It is the teacher (presumed course designer) who decides what content and activities should be in which mode, how the facilitation process should be planned in order to evoke social presence and kindle cognitive presence, and how and when direction may be needed to sustain both (Amoozegar et al. 2022; Li, 2022; Pan, 2022). In the model that results from this research the term 'teacher context', as coined by Biggs (2003), has been replaced by 'teaching presence' as it allows for an elaborate understanding of the design, facilitation and direction of learning processes in line with the COI framework. In Biggs' (2003) 3P model, the first 'P' aligns with presage (here: 'preconditions', following Noroozi et al. (2012)) as a causal factor for learning processes (the second 'P'), which, in turn, effect learning outcomes (the third 'P'). Tynjälä (2013) slightly adapted Biggs' 3P model as she explains that learners interpret what they need to learn in relation to their own needs and the learning context before any desired learning processes may result. Tynjälä's aspect of 'interpretation in relation to context' aligns with the needs adult-learners have in relation to the context of the blended learning environment. These preconditions then effect learning processes, and since learning processes are a pre-requisite for learning outcomes, it follows that impairment of the former will adversely affect the latter. To carefully guide the constructive alignment (Biggs, 2003) in a way that may foster adult-learners' online interaction in blended learning courses, design principles, integral to an instructional model, are needed (Hodges et al. 2020; Milheim, 2011).

Towards designing and validating an instructional model

In meeting the challenges, incorporating all the requirements, and enabling the possibilities that the two modes of the blended learning environment afford, an instructional blended learning model could assist teachers as this will guide them in considering the design, planned facilitation, and monitoring (e.g. Amoozegar et al. 2022; Chametzky, 2014; Hodges et al. 2020; Li, 2022; Vanslambrouck et al. 2019; Youde, 2018). Such a design should follow along the lines of Biggs' (2003) 3P model, as adjusted by Tynjälä (2013). The model should pay particular attention to higher education adult-learners' needs in the context of blended learning, hence should allow for the concentric learning process that blended learning affords, for example, where basic concepts build upon higher-order learning as one learning mode scaffolds upon the other (Cuesta Medina, 2018; Kjaergaard, 2017; McKenna et al. 2020; Park & Bang, 2021; Serrano et al. 2019). An instructional model then should incorporate a concentric approach as this is a strategy for sequencing f2f/online modes, but at the same time allows for social presence and deep learning through e.g. collaborative activities, in line with adult-learners' educational needs.

These factors, as explained, affect adult-learners' decision to interact online (e.g. Konstantinidou & Nisiforou, 2022; Park & Bang, 2021; Vanslambrouck et al. 2019; Youde, 2018). In short, an instructional model can guide the creation of a blended learning course, the flow of learning content and activities between modes, and the dynamics of both learning environments. As said, the design of such a model should be guided by design principles as these articulate the integral interventions (Van den Akker, 1999).

Van den Akker (1999) explains that design principles are formulated in order to evoke a design intervention. The design intervention should be related to achieving a specific goal or purpose, and hence follow specific procedures through which it is characterised or identified. For such specific procedures the reasons or function of a given procedure should be clearly stipulated. A design principle should be formulated thus: characteristic of intervention, procedure to follow, for reasons such as goal or purpose given. Previous studies in the domain of higher education have successfully used said formulation of design principles (e.g. Noroozi et al. 2012; Spelt et al. 2009; van Ginkel et al. 2015).

Furthermore, an instructional model should not only be grounded in theoretical and empirical studies, but should include validation through a panel of experts in the field, as they can rely on both their experience and expertise, and hence provide valuable insights, together with arguments for why some of the suggested features in the instructional model may or may not be feasible in practice (Könings et al. 2005).

In sum, **the third objective** is to explore the specifics of an instructional model for the design of a blended learning environment for adult-learners in higher education both theoretically and empirically, and how said principles can be actualised in a validated model. This is important because previous studies on blended learning design frequently omit to combine social presence and convergence in blended learning courses, as well as ensuring alignment with adult-learners in higher education. Moreover, in these designs higher education adult-learners' needs are often not clearly articulated thereby missing opportunities to foster them into online interaction and to facilitate them into engaging with learning processes. In the case of this dissertation the research context is focussed on adult-learners in higher education, for there is a lack of research that examines how blended learning designs, addressing *both* factors of social presence and convergence, can support higher education adult-learners. Meeting this objective therefore through a multiple case study that examines adult-learners' salient educational needs and preferences in line with online interaction in blended learning, together with teachers' design choices, may serve to identify design principles of blended learning. These findings that further build upon the research as encompassed by objectives 1 and 2, inform an instructional model that is particularly supportive for adult-learners in higher education as further examined and validated through a Delphi study. The third objective shall be met through answering the research questions in chapters five and six:

Research Question 4: How can online interaction be leveraged amongst higher education adult-learners in blended learning courses?

Research Question 5: How do experts perceive the usability of the developed instructional model for fostering higher education adult-learners into online interaction in blended learning environments?

AIMS, DESIGN, AND STRUCTURE

Main Objective

The main objective of this dissertation is to identify the specific requirements needed to design an instructional model facilitating higher education adult-learners into online interaction in blended learning courses. As outlined above, the following three articulated objectives have been examined in this dissertation.

Objective 1: to investigate adult-learners' perceived satisfaction in relation to blended learning and the factors that foster their interaction with the 'added' online mode; and a thorough understanding of adult-learners' educational needs and learning characteristics derived from theory.

Objective 2: to understand the factors of social presence and convergence, and how these can be ingrained into design principles that foster online interaction.

Objective 3: to explore the specifics of an instructional model for the design of a blended learning environment for adult-learners in higher education, both theoretically and empirically, and how said principles can be actualised in a validated model.

Research Context

The research conducted in this dissertation was initiated at the HU University of Applied Sciences in the Netherlands as it followed a pilot programme on blended learning. The potential of this programme was high, however, the results were less promising than hoped for mainly as a result of a lack of adult-learners' online interaction (van der Stap, 2017). Due to the unsatisfying experiences, from both students and teachers alike, blended learning, as it was once implemented, ceased to be facilitated. Following preliminary literature studies on the phenomenon of online interaction, two factors in online interaction were brought forward, namely social presence and convergence. The first study in this dissertation (van der Stap et al. 2019) therefore explores the experience of adult-learners in relation to the said factors at the author's own institute in a case study. Following this initial study more theory was needed as it relates to adult-learners' educational needs on the one hand, and the intricacies of the aforementioned factors of online interaction on the other.

Following two systematic literature reviews on social presence and convergence (van der Stap et al. 2024), it was important to validate claims made in literature in a different context than the author's own institute. It was decided that a multiple case-study would be carried out as multiple case-studies not only broaden the context, but also increase external validity. The research context therefore includes five universities, of which three are in the Netherlands, and two in Belgium. All the institutes used the same LMS (Learner Management System), namely Canvas. This enabled a clear focus on the implementation of blended learning and the extent to which social presence and convergence are facilitated, without preferences that may be related to the affordances of a given LMS. Additionally, different experts across different universities were asked to give their expert opinion on the instructional model for the design of a blended learning course, which was the outcome of this research.

Research Design

Overall Research Design

The **main objective** of this dissertation is to identify the specific requirements needed to design an instructional model facilitating higher education adult-learners into online interaction in blended learning courses.

The following research questions provided an approach for addressing the main objective:

RQ1: To what extent do social online presence and convergence play a role in adult-learners' online interaction?

RQ2: What are the specific characteristics and needs of adult-learners in higher academic education as they emerge from the various theories on adult-learning?

RQ3: How can online interaction in blended learning courses in higher education be leveraged through social presence and convergence?

RQ4: How can online interaction be leveraged amongst higher education adult-learners in blended learning courses?

RQ5: How do experts perceive the usability of the developed instructional model for fostering adult-learners’ online interaction in blended learning courses?

The five studies (related to the listed five research questions) in this dissertation that together seek to address the main objective are based on an educational design research method. Educational design research (McKenney & Reeves, 2012; Ormel et al. 2012) has an iterative character whereby validated theory and practice serve as input for further exploration and refinement, upon which further validation is sought, and so on. This requires for a researcher to be closely involved with the content and practice. This method in particular helps the fruition of a validated model firmly grounded in theory and practice. Since a validated blended learning model for higher education adult-learners is sought after, educational design research is considered to be a suitable research approach that helps bring forth new knowledge aimed at improving blended learning environments through iterative rounds of design, validation, and refinement of said model. In this light, educational design research is defined as “a series of approaches, with the intent of producing new theories, artifacts, and practices that account for and potentially impact learning and teaching in naturalistic settings” (Barab & Squire, 2004, p.2). As such, educational design research has two aims: 1) to bring forth new knowledge, and 2) enhance educational practice (McKenney & Reeves, 2012; Ormel et al. 2012). Due to the complexity of context-based research in a real-world setting, such as generating evidence about the intricacies of a particular design in a given context, whilst at the same time advancing theoretical knowledge of the field, this type of research needs a body of evidence for a particular design (Barab & Squire, 2004; Whetten, 1989).

In guiding structured educational design research (EDR), McKenney and Reeves (2012) explain that such research has three progressive phases that have an iterative structure, namely analysis and exploration, design and construction, and evaluation and reflection. McKenney and Reeves (2012) further explain “that educational design research progresses through three main phases, each of which involves interaction with practice and contributes, directly or indirectly, to the production of theoretical understanding and the development of an intervention, which matures over time” (p. 77). To visualise the three phases of educational design research McKenney and Reeves (2012) have developed a generic model showing a clear overview of each phase, together with aim, practical outcomes, and theoretical outcomes (McKenney, 2016).

Table 1
Three phases of EDR (based on McKenney & Reeves 2012; McKenney, 2015)

	Objective	Practical contribution	Theoretical contribution
Analysis and exploration	Obtaining an initial insight on the problem, the context of the problem, needs of practitioners and stakeholders	Further exploration of the problem, setting immediate and future goals, determining initial design principles	Providing a description and analysis of the problem in context
Design and construction	Generating an initial solution, and/or further defining a series of potential solutions	Using initial solutions as a first educational intervention	Justifying intervention choices within a theoretical framework

Evaluation and reflection	Test or validate the design or educational intervention empirically as guided through a theoretical framework	Further redesign or finetuning educational interventions, generating ideas in relation to theory	Furthering understanding of the design or educational intervention within a theoretical framework
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In line with educational design research, the studies in this dissertation follow the three suggested phases through which the implementation and understanding of practical and theoretical outcomes are planned and executed (McKenney & Reeves, 2012). Representing one chapter per study, Table 2 shows how the five studies (corresponding with the five research questions) have been framed within the overall educational design research approach.

Table 2

Overview of how each chapter is related to the three phases of EDR

	Analysis and exploration	Design and Construction	Evaluation and reflection
Chapter 2	x		
Chapter 3	x	x	
Chapter 4	x	x	
Chapter 5	x	x	x
Chapter 6	x	x	x

In relation to data collection, Runeson and Höst (2009) add that as data should ideally be gathered from a variety of sources, the collection of such data can be explored using first-degree, second-degree, or third-degree collection techniques, corresponding with the various data sources. A first-degree (FD) collection technique rests on a direct relation between the researcher and the object or subject of study. In second-degree (SD) techniques there is an indirect analysis of the object or subject of study, whereas in the third-degree (TD) technique, the researcher examines data that has already been collected, hence no contact, direct or indirect, is needed.

All three degrees of data collection have been exploited in this research in an effort to comprehend and capture phenomena in a natural real-world context. In relation to FD data collection, interviews, focus groups, and a Delphi study have been applied. With regard to SD data collection, surveys have been utilised, and with regard to TD data collection, secondary data has been explored. In order to arrive at meaningful interpretations from the volume of data, the principles of grounded theory have been applied through thematic coding in order to arrive at themes which serve to inform theory.

In the following sections a brief description is provided of how each study in this dissertation has been particularly framed within the educational design research approach, as well as the research design that was chosen to conduct each separate study.

The first objective: Research design Chapter 2, study 1, RQ1

Prior to the research in this dissertation, an explorative study conducted among 50 students, together with preliminary literature reviews on the topic (Van der Stap, 2017), were the first input to arrive at the first case study (study 1) of this research. This first empirical study departs from the exploration and analysis phase. A study in its natural setting creates the opportunity for the researcher to delve into

the problem being explored within its natural context (McKenney & Reeves, 2012). This helps to get a deeper understanding of the context and the subjects within that context, and to develop initial ideas of potential successes and failures within the given situation (McKenney & Reeves, 2012). Following Biggs (2003), where it is explained that before any design of a learning environment, student factors must be considered, study 1 reports on higher education adult-learners' experiences of how existing blended learning courses meet their needs. In particular, surveys were held with 33 students, followed by semi-structured interviews with ten students who responded to an invitation call to further elaborate on what works or does not work for them, and why. All data was analysed using open coding with Atlas.ti. Despite the fact that preliminary literature provided a conceptual framework, using open coding allowed for unknown themes to emerge (Cohen, 2013). In this study then, principles of grounded theory were applied (see also table 3).

The first objective: Research design Chapter 3, study 2, RQ2

The second study is initially situated in the first phase of education design research, namely exploration and analysis. With an initial context-based understanding of higher education adult-learners' experiences of blended learning courses, more insight into their needs and characteristics was needed in order to meet these in design principles (Vanslambrouck et al. 2019; Youde, 2018). This study commences therefore with a systematic literature review since qualitative research should have its roots in a theoretical basis (Maxwell, 2005). Elaborating further with a first tentative framework with needs and characteristics of adult-learners, this study then shifts to the design and construction phase as the main outcome of this phase is grounded in both practical and theoretical insights through which possible solutions to the problem can be arrived at as a first step towards a thoughtful intervention (McKenney & Reeves, 2012). In conducting the systematic literature review, fourteen distinct studies on adult-learners in higher education were selected for analysis. As in the first study, all data were analysed using open coding (Cohen, 2013) with Atlas.ti, hence in this study principles of grounded theory were also applied.

Following the systematic literature review, a first identification of potential implications for teachers, relating solely to the educational needs of adult-learners, was drafted into a framework. The drafting of the framework was discussed in three focus groups who were all experienced teachers. The given framework would serve as the first point of departure when designing learning environments (Biggs, 2003). This second step in the design and construction phase, whereby an educational intervention is crafted, is an iterative process (McKenney & Reeves, 2012). This iterative process is first shaped by the findings during the analysis and exploration phase (Chapter 2 and 3). Next, the solutions arrived at during the design and construction phase (Chapter 3) were followed up and refined with data gathered in consecutive exploration and design phases. As a last step, further refinement followed during data gathered in the formative evaluation of designs or initial interventions (McKenney & Reeves, 2012).

The second objective: Research design Chapter 4, study 3, RQ3

Biggs (2003) explains that in addition to student factors, the requirements of the learning environment must be clear. In this study this step relates to blended learning environments in which two factors have been identified, namely social presence and convergence. In order to meet said factors, further understanding is needed. As such, study 3 is also situated in the first phase of educational design research, namely analysis and exploration. Hence, two systematic literature reviews were carried out to discern two factors as they relate to the blended learning environment. To this extent, like study 2, this study also has its roots in a theoretical basis in line with the standard of qualitative research (Maxwell, 2005). After carrying out two separate systematic literature reviews, both studies warranted further synthesis since they relate to one phenomenon, namely a blended learning environment. Twenty studies on social presence were selected for analysis, as well as eight studies on convergence. As in the first study, this study departs from the principles of grounded theory, hence all data were analysed using open coding, followed by axial and selective coding (Cohen, 2013) with Atlas.ti.

In line with the approach to study 3 (Chapter 2), a set of design principles, relating solely to the two factors of online interaction in blended learning environments, was created by a design team. To this extent a co-design approach was implemented, comprising of one teacher, the researcher, and a stakeholder working thoughtfully together in order to design, realise, and evaluate the educational intervention (Roschelle & Penuel, 2006). Könings et al. (2005, 2007) explain that such a collaborative approach is not only effective, but can pay a positive contribution to the result. It is through co-design that various perspectives, skills and knowledge can be combined (Könings et al. 2005; Könings et al. 2014; Könings & McKenney, 2017). Accordingly, a shared solution to a problem can be found, increasing transferability and practice-based implementation. The design principles were formulated following Van den Akker's (1999) guidelines which state that designed interventions for a specific purpose or goal should be characterised or identified through specific procedures for reasons given. The drafting of this set of design principles was also discussed in a focus group consisting of four teachers having experience in blended learning, placing this study also in the design and construction phase. The set of principles then serve as the second point of departure when designing learning environments (Biggs, 2003), and further follows the iterative process as outlined above.

The third objective: Research design Chapter 5, study 4, RQ4

Study 4 validates the claims made in literature (Cohen, 2013), aims to further explore causes not yet revealed relating to a lack of online interaction, and re-examines and refines the design principles as informed through study 3 (Chapter 4) in alignment with higher education adult-learners. This exploration was carried out through a multiple-case study as case studies allow for examining a phenomenon in detail and in a natural and real-world context (Yin, 2014). Such an approach can therefore expose real causes which can contribute to actual solutions. This study departs from the analysis and exploration phase, using the framework from study 2 and the design principles from study 3, and mapping these onto the findings of this study through a participatory design as explained above. Additionally, the final set of design principles were discussed in a focus group of four teachers. This study then shifts to the construction phase with an aim to construct an intervention that fits in a real-world setting (McKenney & Reeves, 2012). McKenney & Reeves (2012) explain that through an iterative process the intervention will be fine-tuned, elaborating on theories, and articulating design principles, whereupon a solution can be arrived at and "do real work" in practice (Cobb et al. 2003, p.10).

Surveys, semi-structured interviews with students, and deep interviews with teachers were held for the multiple-case study. Despite known themes, the results were coded using open coding (through Atlas.ti), allowing for new themes to emerge (Cohen, 2013). Henceforth, like the studies above, this study also has principles of grounded theory applied. Departing from a multiple-case study that critically reflects upon the results of the previous studies and combines them with the present study in order to arrive at a co-designed educational intervention, places study 4 in the analysis and exploration phase, the design and construction phase, and the evaluation and reflection phase. The co-designed, collaborative intervention follows two iteration rounds in study 5.

The third objective: Research design Chapter 6, study 5, RQ5

Study 5 is the last empirical study and discusses the co-design and the validation process of the model (IMABLE). The co-designed model was first presented to four teachers experienced in blended learning, after which it was distributed to a panel of experts for further validation through a Delphi study. This panel of eight experts in the field, with notable expertise and research on blended learning, were asked to study, answer questions, and provide feedback on the educational intervention. Such exchanges can reveal and overcome inconsistencies in following iteration rounds, leading to more powerful educational interventions, henceforth a more powerful learning environment (Könings et al. 2005). Based on this formative evaluation, improvements and refinements were made and formed part of a second iteration round. To this extent, this study was still part of the construction phase, however, as this study also examines why certain design principles relate to certain converging procedures, and hence bring forth learning processes, this study also relates to the evaluation and reflection phase. To conduct the Delphi study, an anonymised survey was used, together with feedback boxes per question inviting the experts

to explain their answers and make suggestions for alterations, additions, or omissions. During this process full anonymity was maintained. The total study took two iteration rounds after which full alignment of the experts' opinions (100%) was reached.

In conclusion, the various studies conducted in this dissertation meet the five main features of the educational design research process as formulated by McKenney & Reeves (2012):

1. theoretically oriented: preliminary theory and systematic literature reviews were used to frame the inquiry.
2. interventionist: interventions to actual problems were designed.
3. collaborative: the researcher, a teacher, and a stakeholder (adult-learner) collaborated in order to co-design, realise, and evaluate the instructional model aimed at guiding the design of blended learning environments. Additionally, focus groups were employed.
4. responsively grounded: the blended learning instructional model was informed through scientific literature and empirical evidence, co-designed and discussed in focus groups, and validated by experts' expertise and research in the field.
5. iterative: the overall process as described in this dissertation underwent four iterative steps before arriving at the blended learning instructional model. The model itself was shaped and re-shaped through two in-depth iterations rounds of development and refinement.

In the following section the various approaches of different research methods will be detailed.

Application of the salient research methods

As various research methods have been applied in this dissertation, this sub-section will further elaborate on these methods. A quick overview is given in Table 3, followed by a detailing of the different methods.

Table 3

Overview of used research methods per chapter.

Chapter	Preliminary Literature Review	Systematic Literature Review	Focus Groups	Delphi Study	(Multiple)-case Study	Principles of grounded Theory
2	X		X		X	X
3	X	X	X			X
4	X	X	X			X
5	X		X		X	X
6	X		X	X	X	
7	X					

Note: The details on exactly how these research components have been utilised is presented in the chapters that follow the present chapter.

Preliminary Literature Review

A preliminary literature review ensures that studies that follow will have their roots firmly grounded in theory (Maxwell, 2005). Literature reviews help establish a conceptual framework, in the context of which research questions can be arrived at (Okoli & Schabram, 2010). As such, the research questions positioned in theory follow from an initial search and data extraction process (Cohen, 2013). In this research, such data extraction is always considered in a focus group discussion of at least three people and the researcher (Cohen, 2013). In this research, all the studies were preceded with a preliminary

literature review, and all data was considered with a co-researcher and focus groups. The literature reviewed in the seventh chapter adds onto this overall dissertation.

Systematic Literature Review

In order to identify requirements needed to specify existing concepts, systematic literature reviews were conducted in this research to identify, select and examine further data from multiple publications yet related to the research questions in order to review relevant literature using a thorough and systematic process. As such systematic literature reviews help to arrive at a clear set of answers to a research question in a body of fragmented knowledge, or even in the scarcity of such existing literature. As three salient phenomena needed to be explored, three systematic literature reviews were conducted in two studies of this research.

Focus groups

Focus groups are particularly efficient as a method of data collection because they allow for real-time interactions. To this extent focus groups are within the paradigm of qualitative research, allowing for multiple interactions on a given topic (Morgan, 1998). Focus groups differ from interviews which are one on one, and whilst interviews afford more privacy, the risk of desirability bias is higher (Cohen, 2013). Carefully selected focus groups can inform the researcher about greater detail on a given topic, allowing for cross-participant discussions and shared decision making, including validating surveys (Cohen, 2013). In all the studies of this research, focus groups were utilised.

Delphi study

The Delphi study is a method of data collection in a setting in which full anonymity is guaranteed. The Delphi method is an in-depth iterative process in which controlled feedback is obtained (Mulder, 2017). This allows for consensus to be generated on a given construct. The iterative process and controlled feedback is through a series of surveys, interspersed with feedback (Mulder, 2017), which allows a group of individuals to deal with a complex issue (Okoli & Pawlowski, 2003). In contrast to focus groups where participants are face-to-face and may experience a certain form of bias, participants in a Delphi study are completely anonymous. The Delphi study is a technique by and large used to validate artifacts, such as an educational intervention. As such, a panel of experts in the field, highly versed in the topic, is the standard. In this study, the Delphi method was applied in study 5 (Chapter 6).

(Multiple) case study

A case study is a method that allows the exploration of complex issues in real-world contexts (Yin, 2014). A case study can be used to either build theory, or validate existing theory (Yin, 2014). Using different levels of data collection, such as First Degree, Second Degree, and Third Degree, a case study allows for a broad collection of multiple angles of a phenomenon (Runeson & Höst, 2009). A multiple-case study is preferable over a single-case study since it can rule out rivalry explanations and enables cross-case comparisons which can lead to internal validity (Yin, 2014). Multiple case-studies broaden the context and as such also increase external validity (Yin, 2014), hence a multiple-case study is chosen over a single-case one. In the first case study (Chapter 2), a single-case study was used as this was a first explorative case study to ascertain initial experiences. In study 4 (Chapter 5), multiple case studies were used to uncover student preferences, validate claims made in literature, and to expand knowledge from evidence-based practices.

Principles of Grounded Theory

Principles of grounded theory are specified by searching patterns in existing data during data collection and analysis. In grounded theory, no hypotheses need to be used as theory is formulated through multiple cycles of coding (Strauss & Corbin, 1994). The first four studies have open coding applied through which categories, themes, and theory were formulated. Said approach is an inductive one which studies the specifics before building towards the general. All the first four studies in this research were approached with the principles of grounded theory using three cycles of coding, namely open, axial, and selective coding (Babchuk, 2011).

Dissertation Outline

This dissertation consists of seven chapters. The first chapter (this one), is the general introduction, Chapters 2-6 describe the five studies that have been carried out: Chapter 2 presents the results of an empirical, explorative study. Chapter 3 presents a systematic literature review. Chapter 4 presents two systematic literature reviews. Chapter 5 presents the results of a multiple-case study, and Chapter 6 presents the results of a Delphi study. Chapter 7 provides a general discussion and conclusion of the dissertation. Figure 1 presents an overview of the structure of this dissertation, and the relations between the five studies as presented in Chapters 2-6, followed by a short overview of each chapter.

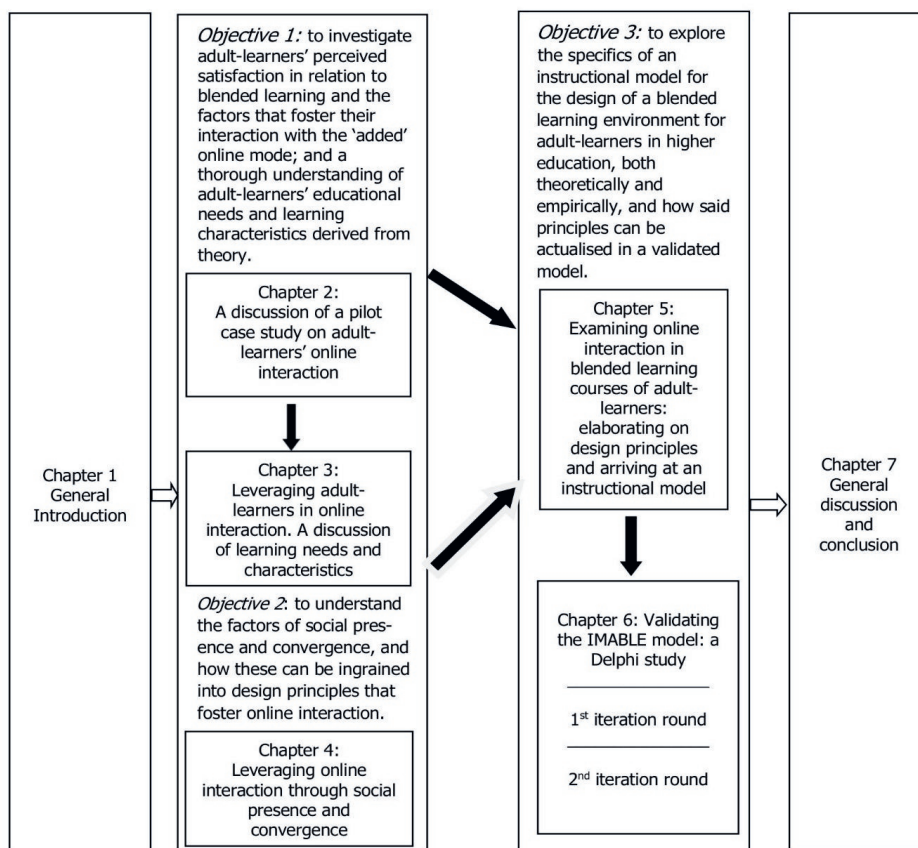


Figure 1: Overview of the dissertation structure.

The current chapter presents a general introduction to this dissertation. It provides a literature review on adult-learners in higher education, the factors that leverage online interaction, and the design of blended learning environments. Additionally, three objectives are formulated that frame the context of the research conducted. Following this, an overview of the objectives and research questions, the research design, and the methodology is presented.

In Chapter 2 (addressing RQ1), a survey was conducted among 33 higher education adult-learners, together with semi-structured interviews with ten students to provide a detailed insight of said students' initial experiences with blended learning. The questions of the survey in the pilot case study were informed through preliminary literature studies on blended learning and through interviews in the pre-

explorative phase (prior to the research in this dissertation) from which variables became evident. The questions were created with a co-researcher in alignment with the variables, upon which they were discussed in focus groups. The results validated two salient factors that affect online interaction, provided an initial idea of design requirements based on students' experiences, and which form the input for further investigation in Chapter 3. The results of the study in Chapter 2 were analysed using open, axial, and selective coding, upon which themes could be identified. The research described in this chapter has been published in *British Journal of Education*.

Chapter 3 (addressing RQ2) is a systematic literature review of the research on the learning characteristics and educational needs of adult-learners. To this extent fourteen distinct publications were selected and systematically analysed based on open, axial, and selective coding. A comparison of adult-learning theories, as outlined by influential studies on adult-learners, revealed an overlap of three salient educational needs that affect adult-learners' motivation. Whilst not negating other educational learning needs, the commonality of the learning needs in the studies under review were used as a lens to partly inform the instructional model. The research described in this chapter has been published in *LearnTech*, the proceedings of the SITE conference on teaching and education.

Chapter 4 (addressing RQ3) is a combination of two systematic literature reviews on the factors of social presence and convergence. To this extent, 20 distinct publications were selected and systematically analysed based on open, axial, and selective coding through Atlas.ti for the first factor (social presence). Next, eight distinct publications were selected and systematically analysed, also using open, axial, and selective coding through Atlas.ti for the second factor (convergence). Both systematic literature reviews were synthesised by first summarising the findings, next, using an inclusion threshold, extracting design propositions, followed by articulating the design principles as per van den Akker's (1999) guidelines. The entire co-design process occurred in a team consisting of the researcher, a teacher experienced in the field of blended learning, and a stakeholder, upon which further input was obtained from four teachers. The research described in this chapter has been published in *Journal of Computer Assisted Learning*.

Chapter 5 (addressing RQ4) reports on a multiple-case study on adult-learners experienced in participating in blended learning courses. In particular, this study provides insight in higher education adult-learners' preferences of the facilitation of online interaction as it relates to their need for deep learning, need to see meaning, and self-directedness (as informed through study 2, Chapter 3), as well as yielding additional insights from expert course designers. To this extent a survey was held among 84 students, whereupon sixteen students were interviewed through semi-structured questions. Additionally, eight teachers were invited for deep interviews to gain more insight in design choices. Data were analysed using open, axial, and selective coding through Atlas.ti. In co-design with a team of an experienced teacher, the researcher, and a stakeholder, design principles were extracted using an inclusion threshold. Mapping onto the design principles extracted in study 3 (Chapter 4), the design principles were refined and reformulated into a comprehensive framework of design principles following van den Akker's (1999) guidelines. The framework of design principles was discussed in a team of four teachers for further insights. The research described in this chapter has been published in *Journal of Computers and Education*.

Chapter 6 (addressing RQ5) presents the co-design and the validation of the instructional model. To arrive at said model, the design team (as above) constructed the design principles obtained from study 4 into a concentric model. Following this process, validation of the model occurred through a Delphi method, using two iteration rounds, until full alignment was reached (100%). Eight panel experts in the field participated through questions, suggestions, and directions. The model was finetuned twice to reflect and incorporate feedback, alterations, additions, and deletions. The research described in this chapter has been published in *Journal of Computers in Human Behavior Reports*.

Finally, Chapter 7 presents the implications of the research undertaken in this dissertation for theory, educational practice, and policy. Additionally, limitations are discussed and suggestions for further research are considered. The chapter closes with a final conclusion.

Chapters 2, 3, 4, 5, and 6 were written as stand-alone articles for publication in academic journals that can be read independently, hence there may be some overlap in this dissertation. Furthermore, whilst this overall dissertation was a singular undertaking, the said stand-alone articles for publication were a collaborative effort, therefore these were written in first person plural.

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A PILOT CASE STUDY ON ADULT- LEARNERS' ONLINE INTERACTION

This chapter is based on:

Van der Stap, N., van den Bogaart, T. & Versendaal, J. (2019). Discussion of a Pilot Case Study on Adult-Learners' online interaction. *British Journal of Education*, 7(4), 21-38.
<https://doi.org/10.37745/bje.2013/vol7n42138>.

ABSTRACT: This study investigates a lack of online interaction among higher education adult-learners in blended learning courses, where learning occurs partly online, the online mode, and partly face-to-face (f2f), the f2f mode. Following a preliminary study that showed a lack of online interaction among adult-learners in higher education, the present pilot case study was carried out to investigate claims made in literature that explain the salient causes for such lack of online interaction as being related to 'convergence' and 'social presence'. A mixed-method approach was used in this pilot case study through a questionnaire and interviews. Results in this pilot case study reveal that students do not engage with the online mode when the same content is repeated during f2f meetings, or when online assignments receive no further attention online or during f2f meetings. Social presence was particularly important in the form of teacher feedback.

INTRODUCTION

A Learning Management System (LMS) can be used in several ways, usually related to either 'distance learning', where learning is solely acquired in a formal context through multi-media technologies (Garrison & Cleveland-Innes, 2003), or 'blended learning' where there is a convergence between online learning (technology-mediated learning) and traditional face-to-face (f2f) learning (Graham, 2006). It are the interactive possibilities, enabled through technology, that have popularised blended learning (Garrison & Cleveland-Innes, 2003; Swan, 2001). In fact, through its utilisation of technology, blended learning has been a major factor of digitalisation in education (Drysdale et al. 2013).

In staying on par with Dutch government requirements (OCW, 2015), developments of a changing world, and meeting the need for helping students develop 21st century skills, the researcher's institute, a teacher-trainer college, decided to revise the curriculum by adopting a blended learning approach. The Institute currently has 23 teacher-training programmes, both graduate and undergraduate, that are offered full time and part time, with an average of 2500 students. Nearly a third of these students are adult-learners, both graduate and undergraduate, who participate in the teacher-training programme on a part-time basis.

The Institute defines her interpretation of blended learning along the combination of learning theories, learning objectives and outcomes, and didactic strategies delivered through both the digital environment as well as face-to-face interactions. The first group of students that were introduced to the Institute's blended learning course were the Institutes' part-time students that fall within the definition of adult-learners (Chametzky, 2014).

Two years into the re-designed curriculum, an explorative study (van der Stap, 2017) held among the Institute's teachers showed that 82% of the teachers ($n=48$) report that adult-learning students hardly interact with online content. Interaction with online content is interpreted here as student engagement with course resources in the online mode (Murray et al. 2013). To ensure that said adult-learners do not miss out on learning content as a result of a lack of online interaction, teachers repeat the learning content that was available to the students in the online mode during f2f meetings. The teachers acknowledged that repeating online content during f2f meetings was not a desirable approach to blended learning, however, they felt they had little choice since said students hardly, if at all, interacted with the online mode. The teachers at the teacher-trainer college are highly skilled in didactics as it applies to the pre-blended learning phase, but indicated that employing blended learning in their education requires an expansion of their didactical repertoire. Many teachers (88% of those interviewed) reported that to remedy non-interaction, they would need more knowledge about online interaction in combination with f2f meetings, preferably in the form of an instructional model on blended learning. These results are consistent with views held by teachers at other higher education institutes, based on interviews ($n=27$) with stakeholders conducted by the researcher at these institutes.

The importance of an instructional model on blended methodology that guides teachers, *inter alia*, on the structure of the online environment, the type of information made available to the student in the online environment, the convergence of online learning and f2f learning, the role played by peers online, and the role played by the teacher is not a new realisation. The importance of an instructional model on blended learning is emphasised by Siragusa et al. (2007) who explain that an instructional model is needed to effectively implement blended learning. As King & Arnold (2012) assert, "effective blended courses require effective instructional designs" (p. 47). Serdyukov (2017) further explains that without evidence-based blended learning instructional models, teachers may fall back into traditional teaching methods. However, before embarking on an instruction model, a full understanding of factors leveraging adult-learners with online content in a blended learning course needs to be obtained.

Whilst studies on blended learning are not a new phenomenon, there is hardly any literature on leveraging online interaction in a blended learning course that focusses specifically on higher education adult-learners, and which is transferable to other educational institutes. An explorative literature search shows that existing studies are frequently based on single case studies, mostly at educational institutes in the U.S., which lack transferability and may not be useable for other educational institutes. As Picciano & Dziuban (2007) explain, “blended solutions are often specific to a particular institute and may not be transposable to other institutes” (p.11). Accordingly, this present explorative study will generate extended research, offering academic relevance as it adds descriptive knowledge to the current knowledge gap on encouraging higher education adult-learners with online content that is transferable to other institutes.

This present pilot case study is an explorative one, and part of a larger study aimed at leveraging adult-learners with online content. Therefore, a first understanding of factors engaging adult-learners with online interaction is needed.

PRELIMINARY LITERATURE REVIEW

In this preliminary literature review, two dominant factors uncovered in a prior literature review as causes for impairing student interaction with online content, are investigated, namely under-representation of supportive modes (social presence), and lack of convergence. Additionally, these two common causes need to be considered in relation to adult-learners since this present pilot case study serves as a first orientation into the lack of online interaction among adult learners specifically. Henceforth, a basic understanding also needs to be had on the concept of ‘adult-learners’.

Social Presence: Supportive Modes

Moore (1989) explains that when students learn, three modes of interaction are relevant: student-student interaction, student-teacher interaction and student-content interaction, the salient mode being student-content interaction, for without it there is no education. The key element in the methodology of blended learning then appears to be interaction with online content (Abrami et al. 2011), the other two modes, student-teacher interaction (Kehrwald, 2008; Persico et al. 2010; Dixson, 2010), and student-student interaction (Abrami et al. 2011), being the supportive modes. Both supportive modes are also referred to as ‘social presence’ (Kehrwald, 2008): student-student interaction (social presence-peer) and student-teacher interaction (social presence-teacher). Student-student interaction, frequently referred to as online collaboration, is largely dependent on the role the teacher plays (van Leeuwen, 2014). Additionally, Kaendler et al. (2014) explain that teacher competences are necessary for the successful implementation of collaborative learning, one that can be acquired through training. It seems, therefore, that the teacher’s presence cannot be removed from the social presence of peers, or indeed, from successful online collaboration (Onrubia & Engel, 2012). A lack of fully exploiting the supportive modes can result in students failing to spend time interacting online (King & Arnold, 2012).

Convergence

Lack of convergence occurs when the overall activities and content are not thoughtfully categorised across the f2f and online learning modes (Bergstrom, 2011; Murray et al. 2016). Murray et al. (2016) add that f2f interactions should work complementary with the online activities since that is when online and f2f learning truly converge. King & Arnold (2012) further explain that for convergence to be meaningful, higher-order and lower-order activities must be organised into the most appropriate learning mode (f2f or online). When online content and activities are not in synergy with f2f content and activities, students will fail to see the relevance of spending time online, and accordingly refrain from online interaction (Murray et al. 2016).

Adult-Learners

Snyder (2009) explains that "most literature on blended learning has been written with respect to traditional students but assumed to apply equally to adult-learners" (p.48). In the case of adult-learners, it would seem more appropriate to think in terms of andragogy or other adult-learning theories, an approach directed at learners who, inter alia, have the life experience needed to self-direct and self-manage (Chametzky, 2014). Whilst the term 'andragogy' is not a new one, it was revived through Knowles' (1984) definition, one that Merriam et al. (2007) explain as being based on a set of assumptions that include 1) self-directedness, autonomous, and independent; 2) the role of experience in learning; 3) readiness to learn what they need to know; 4) learning for application of learning content rather than for future use, being problem-centred and life-focussed; 5) internally motivated; 6) a need to know the value of what it is they are learning. Other adult-learning theories that appear to surface most often are the theory of self-directness (e.g. Zhang & Zheng, 2013), experiential learning, and transformational learning (e.g. Cercone, 2008). Zhang & Zheng (2013) particularly emphasise that adult-learners are independent and internally motivated, and need an instructor to act as facilitator. Whilst there are many theories on adult-learning, a discussion that is still current, all theories seem to highlight, inter alia, self-direction, flexibility, and the process of learning rather than the content. These theories are learner-centred and recognise the importance of a customised approach to learning. Moreover, adult-learners come from traditional education backgrounds and may not have learning experience with blended learning where learning occurs in part online. As such, Pappas & Jerman (2015) add that the major need of adult-learners is one of coaching.

THE PRESENT STUDY

In order to remedy the lack of online interaction among adult-learners, the causes related to such a lack need to be understood and verified first. Hence, the aim of this present study is to seek validation of claims made in literature relating to said causes for lack of online interaction as it relates specifically to adult-learners, and which will forthwith inform the initial design requirements based on students' experiences, and the direction in which subsequent research should go: necessary steps to close the knowledge gap on leveraging adult-learners with online content.

Since online interaction seems dependent on, among others, social online presence and convergence, the research question in this study is:

To what extent do social online presence and convergence play a role in adult-learners' online interaction²?

METHODOLOGY

Research setting

A pre-explorative study conducted among 50 students (van der Stap, 2017) has shown that adult-learners barely interact with online content and activities. Accordingly, in line with this pre-explorative phase, a literature review was carried out in order to ascertain factors that foster online interaction. The salient factors are said to be social presence and convergence. As a result, this pilot case study intends to explore adult-learners' lack of online interaction at the researcher's institute, identify initial design requirements, and to validate claims made in the preliminary literature review. Additionally, this pilot study not only serves as a means of further exploration, but also to assess the proposed data analysis techniques, and to uncover potential problems (Holloway, 1997) before further case studies are

² This study was conducted at a single, specified Institute

embarked upon. For this pilot case study a mixed-method approach was applied, hence a closed-ended questionnaire was developed and semi-structured interviews were held with adult-learners.

In this mixed-method approach a convergent design was carried out which compares both qualitative and quantitative data sources simultaneously (Creswell & Plano Clark, 2011). Data was analysed separately, however, parallel constructs for both types of data were used. The results were compared side-by-side, followed by a discussion with a co-researcher, after which the results were jointly displayed (see Appendix D). The mixed-method approach enabled the collection of qualitative data to evaluate personal experiences (Creswell & Plano Clark, 2011), whilst also gathering data from questionnaires measuring the exploitation of blended didactics. As such, the potential strengths of both qualitative and quantitative methods are drawn upon.

Participants and data collection

Questionnaire

The participants in the questionnaire were a conveniently sampled selection of part-time students of the researcher's institute, totalling 33 students. The part-time students in this study are the adult-learners referred to in the preliminary literature review. The students that were approached claimed to have no personal study experience with blended learning, and their mean age was 39 years (SD=9.3) as taken from the student-registration programme.

A close-ended questionnaire was developed since close-ended questions enable a quick comparison of answers between students (Cohen, 2013). The questionnaire was developed in the research team consisting of three researchers. The questions were based on a set of variables that resulted from the pre-explorative phase, and were further discussed in a focus group of five participants. The questionnaire was based on a four-point Likert-type scale, aimed at obtaining an overview of students' reasons for online interaction. A four-point scale was favoured over the traditional five-point scale because a 'forced option' was sought after since it has been observed that respondents, who are not willing to express an opinion one way or the other, can escape by answering 'neutral' and henceforth divert the results (Chyung et al. 2017). With a large number of participants such 'neutral' choices can easily be eliminated from the data, however, since in this study only 33 students were asked to participate, it seemed logical to avoid having to eliminate results from data. Henceforth, the rating used is not a Likert scale, but a Likert-like scale. In any event, there is much discussion about the rating of Likert scales proper, since the distance between each successive item category is not equivalent, neither in a four-point scale, nor in a five-point scale, albeit that this inference is often made (Wakita et al. 2012). Clearly, a score of 'agree' and 'strongly agree' is not 'agree-and-a-half'. As such, the use of averages cannot account for the importance of capturing and understanding variability. Henceforth, no averages were calculated.

In this questionnaire, questions were phrased using both positively as well as negatively worded items. This approach cancels out 'acquiescence bias' (Robinson et al. 1991), where respondents might prefer to avoid looking at the negative side of any issue. Whilst it is noted that respondents might favour a positive outcome over negative response options, this study is specifically aimed at uncovering why students do *not* interact with the online mode. This aim has been clarified to the respondents both in writing as well as verbally. Restricting the data acquisition to solely positive constructions was determined to be at odds with the goal of unveiling negative factors and therefore both positive and negative constructions were included in the questionnaire. The questionnaire had a total of fourteen questions, investigating seven variables. Each question in the questionnaire was phrased twice, using different words, in order to increase construct validity (Cohen, 2013) as this double-checks the answer

to the earlier question to which it is paired. The questions related to a set of variables (see Appendix C) in line with the two factors discussed in the literature review, namely social presence and convergence.

To further increase construct validity, after the first construct of the questionnaire, the questions were discussed with a focus group and adjustments were made upon which new discussions were held with focus groups followed by further alterations. The questionnaire was given to a pilot group of eight students, after which adjustments were made to the questions. This process was repeated three times, i.e. the questionnaire was piloted three times, until no alterations were deemed necessary. The final version of the questionnaire was followed up with retrospective interviews with six of the participants as outlined below.

Further reliability results from internal consistency, where the various multi-scale items used in this questionnaire are shown to be homogeneous, in that they measure the same target area. This questionnaire has fourteen questions relating to seven variables, and has been answered by 33 participants. Since such a small number of items and scales in relation to students' answers needed to be calculated, these items were tallied manually together with a co-researcher. The double-checking by the co-researcher allowed the researcher to be confident about the internal validity of the questionnaire. Any calculations relating to internal consistency using methods such as Cronbach Alpha would require a much larger sample size for analysis to be meaningful, a sample size being dependent on the number of participants, number of questions, and number of multi-item scales (Yurdugül, 2008). Since in this study a limited number of questions were asked of a relatively small number of respondents using only a four-point Likert-like scale, the resulting data set was deemed too small to provide any meaningful returns using such statistical analysis programmes.

The questionnaire was conducted during lessons in order to increase the number of respondents. Additionally, to further increase validity, six students were retrospectively interviewed after having completed the questionnaire to ensure that the answers given were in fact the answers they had intended to give. Such retrospective interviews ensure comprehensiveness and systematicity (Gass & Mackey, 2000). Before distributing the final questionnaire, an explanation of the questionnaire and the study at hand was given, anonymity was fully guaranteed, upon which written informed consent was given by all the students ($n=33$). The students took an average of ten minutes to complete the questionnaire. Since the questionnaire was conducted during classes, the return rate was 100%.

A total number of 32 students were included in the questionnaire, since one student was eliminated (see further below). This in itself is rather a small number of students, however, the current pilot case study seeks only to validate claims from literature and thus the findings are not intended to be transferable to a wider population (Yin, 2014). In this case therefore, convenience sampling was applied to approach the group to which quickest access was had, since the parameters of transferability are negligible here (Cohen, 2014).

Interviews

In addition to the questionnaires, online interaction over several courses was observed so that it became clear which students were active online, and which students were not active online. Henceforth, a stratified sample of ten students (five active, five inactive) were randomly selected from a pool of 600 students. The selected students were unknown to the researcher, and accordingly purposive sampling was undertaken as the students that are inactive online are seen as 'critical cases' (Teddle & Yu, 2007) that can provide insights that might have a broader implementation. No generalising statements are made yet in this context, since the results only serve in achieving an understanding of the phenomenon of 'online interaction or the lack of it' as explicated in the literature review carried out in the pre-

explorative phase. Any selection made therefore, concerns a choice of two groups, both with one and the same characteristic, namely online interaction or the lack of it, hence no bias was involved.

The interviews were semi-structured to increase reliability since the structure and types of questions were the same for all candidates, whilst at the same time leaving scope for further questioning when deemed necessary (Keith, 1988). The interview questions were first discussed in two focus groups to validate the construct, and analysed in relation to the variables to ensure content validity. The interview protocol was designed around a number of predetermined open-ended questions that were inductively acquired. The open-ended questions allowed the interviewer to ask for more in-depth clarification (Cohen, 2013). The protocol focussed on adult-learners' leverage with online interaction, the two main themes, as said, being social presence and convergence. The interview protocol can be found in Appendix A.

Accordingly, ten students were invited for semi-structured interviews: five students that were active online, and five students that were not active online, whereupon the answers of both groups were compared. After the first five students (some active, some inactive) it became clear that saturation had been reached (Straus & Corbin, 1994), i.e. until students' various answers had become repetitive. Whilst it had already become clear that answers repeated themselves, the students had already been invited so the interviews took place nevertheless. In order to achieve familiarity with the content prior to analysis, the researcher transcribed all the interviews.

All participants were interviewed by the first researcher of this study. Each interview lasted between 10 and 30 minutes, with an average of 20 minutes. In order to avoid desirability bias (Cohen, 2013), prior to each interview the interviewer ensured the participant that all names would be anonymised, that there were no right or wrong answers, and that data would be treated and reported confidentially. One interview (pertaining to an active student) could not be transcribed and analysed due to the poor quality of audio recording. Since saturation had been reached after just five interviews, no new interviews were held, hence nine students remained in the study. All students were of the same level, had no personal learning experiences with blended learning, and their mean age was 41 years ($SD=9.4$) as taken from the student-registration programme.

Data analysis

Questionnaires

The first step in analysis was to clean the data (Gillham, 2000). In this instance data cleaning involved correcting contradicting data. From the 33 students, one student was inconsistent with answers, 'agreeing' on one item and 'disagreeing' on the second item to which it was paired. To remedy this, it was decided with a co-researcher to remove the illogical combination this student produced. Hence, to maintain reliability, the student was eliminated from the questionnaire altogether. No other contradictions were found as all the other students were seen to be consistent with their answers, the only variations being between the degree upon which students either agreed or disagreed.

The parallel questions were added to the questions they were paired with upon which the results were totalled, giving an overall score of 64 responses per paired item. Accordingly, the total score was halved to account for the actual number of included participants ($n=32$). Since this can result in a score of 5.5 students for a given item, the scores were reverted to percentages in relation to the variables. No other calculations were made as only the frequency table (see Table 1) was used due to the fact that calculations based on any averages and standard deviations would give unreliable results when using a four-point Likert-like scale. The results were double-checked by a co-researcher.

Interviews

Content analysis was applied to the interviews in order to avoid interference of inter-rater subjectivity (Brown, 2000). To carry out such analysis, the interview transcripts were coded using open coding, axial coding, and selective coding (Cohen, 2013) with Atlas.ti, since an exhaustive theoretical framework was yet to emerge from subsequent systematic literature studies. The first researcher checked the codes twice, relabelled them, and refined the codes by re-reading the transcripts several times (Cohen, 2013). A co-researcher checked the emerged coding scheme and applied them to four randomly chosen scripts, after which codes were added and some removed. Emphasised and repeated quotations were coded accordingly. The researcher and co-researcher held a discussion on the coding strategy, whereupon the second coder independently analysed all nine scripts, after which inter-rater reliability was calculated. Percent agreement for the overall coding was 98%. Miles and Huberman (1994) explain that minor differences in outcome are considered good inter-coder agreement. After coding, the various disparities were discussed by the two independent coders until agreement was reached.

After the coding process, the codes were categorised through deductive reasoning using sensitising concepts to guide the analysis (Straus & Corbin, 1994). Next, broader categories were formed describing the content of responses in order to allow for comparisons with other responses. As only the interviews of nine students were used, the categories were not numerically coded since such an undertaking would unnecessarily consider the data quantitative rather than qualitative. Each category was summarised together with the independent co-researcher. Following this, the summaries were drawn together and emerging patterns were analysed, echoing the two salient themes in relation to the specifics of adult-learners, namely the teacher's online presence (social presence teacher) and convergence. All conclusions were drawn together with the co-researcher. The final version of the coding scheme (see Appendix B) consists of the complete list of codes as they have been placed in the various categories.

RESULTS

Results questionnaire

In the questionnaire the online mode is referred to as "HUBl" (HU blended learning). Students are familiar with this term as this is their LMS, and might be confused if the term 'online mode' were used. The paired questions are placed together. See Table 1.

Table 1

Results questionnaire

V	Question	Strongly agree	Agree	Disagree	Strongly disagree
1	<i>I skip the learning team assignments in HUBl because no-one gives peer-feedback</i>	2	8	15	7
9	<i>I ignore the assignments in HUBl because I get no peer-feedback from my learning team</i>	3	7	16	6
2	<i>I carry out the assignments in HUBl because I need them in preparation for the f2f meetings</i>	2	6	13	11
6	<i>Since I need the assignments in preparation for the f2f meetings, I carry them out</i>	3	5	13	11
3	<i>When I find that most assignments in HUBl lack relation with my professional practice or the tests, I skip them</i>	7	19	3	3
11	<i>I skip the assignments in HUBl when I find that they are</i>				

	<i>unrelated to the exam or my teaching practice</i>	6	20	4	2
4	<i>The reason I would skip assignments in HUBl is because the teacher does not give feedback on them</i>	9	15	4	4
8	<i>When no teacher feedback is given on HUBl assignments, I skip them</i>	10	14	6	2
5	<i>If I ignore the learning content in HUBl, I will have difficulty following what is dealt with in the f2f meetings</i>	5	10	11	6
12	<i>It is difficult to follow what is dealt with in f2f meetings when I have not studied the learning content in HUBl beforehand</i>	6	9	12	5
7	<i>The content in HUBl and the f2f meetings are the same, so I attend either the f2f meetings, or learn the content in HUBl</i>	10	14	6	2
14	<i>I either attend f2f meetings, or I study the learning content in HUBl because they are the same</i>	7	17	6	2
10	<i>I ignore assignments in HUBl when no attention is given to those assignments during f2f</i>	13	17	2	0
13	<i>If the HUBl assignments are not brought up in f2f meetings, I will skip them</i>	11	19	2	0

* V = variable to which the question is matched

Note: See Appendix C for an overview of the variables

The results of the answers have further been calculated in comparison to their variables, where the ratings in which students can agree or disagree have been merged in an overall agree or overall disagree. See Table 2.

Table 2

Results questionnaire to variables

Variable	% agree N=32	% disagree N=32
Assignments in HUBl are not carried out when there is no peer-feedback	31	69
Assignments in HUBl are needed in preparation for the f2f meetings	25	75
Assignments in HUBl are not carried out when there is no relation to professional practice or tests	81	19
Assignments in HUBl are ignored when there is no teacher-feedback	75	25
Studying learning content in HUBl is necessary in preparation for the f2f meetings	47	53
Learning content in HUBl is repeated during f2f meetings, so only one is attended to	72	28
Assignments in HUBl are not carried out when no attention is given to them during f2f meetings	94	6

Note: See Appendix C for an overview of the variables in relation to the salient factors of social presence and convergence (meta themes)

Results interviews

When analysing the nine interviews, some additional themes, other than the ones in line with the preliminary literature review, related to students' preferences. These themes were 'structure of the LMS', and 'preference of online content presentation tools'. In relation to the structure of the LMS, the students felt that the online mode was not always clear in structure and not always up to date, which did not necessarily prevent them from interacting online, but did serve as a discouragement. Additionally, a majority of students preferred the online content to be text-based rather than film clips, web lectures (unless accompanied with a text), or Prezi's.

Nine categories, additional to the ones mentioned above, and arrived at through deductive reasoning using sensitising concepts to guide the process (Straus & Corbin, 1994), can be related to the themes from the preliminary literature review: 1a) relevance of assignments, 1b) lack of relevance of assignments, 2a) convergence of content, 2b) lack of convergence of content, 3a) convergence of assignments, 3b) lack of convergence of assignments, 4a) social presence teacher, 4b) social absence teacher, 5) social presence peer. Accordingly, these nine categories were matched with students' reasons for (not) interacting online and (not) attending f2f meetings. Some overlap between the categories became apparent. These nine categories can be mapped to the themes of convergence and social presence from an adult-learner's perspective. See Appendix D.

In relation to the first and second category 'assignments are (not) relevant', no students would carry out assignments that were irrelevant. They all would, however, carry out assignments if they were related to tests or practice, or would enhance their knowledge or expertise of a given subject. Assignments without such relation were considered to be "lame" and "meaningless". In relation to the third and fourth category (lack of) convergence of content, all the students felt that 'repeating online content during f2f meetings' was a "waste of their time", for which they "did not have to drive all the way to campus", and would rather "self-direct what is needed to learn". Nevertheless, "sheer obedience" or a "keen interest to learn" were reasons for attending for at least two students (the ones that were active online). For two students this was a reason not to study online content altogether. With regard to the fifth and sixth category, (lack of) convergence of assignments, all the students unanimously agreed that "f2f meetings should add to the content of the online mode", preferably in the form of "discussing assignments". This was a reason for them to both study online and to attend f2f meetings.

All the nine students expressed that "assignments that would receive teacher feedback will be carried out", whereas assignments that did not receive teacher feedback were not carried out by at least seven students. The two students that would still carry out assignments despite the absence of teacher feedback were students that were active online. With regard to the seventh and eighth category, social presence or absence of the teacher, all the students reported that "if assignments did not receive online feedback, or if assignments were not addressed during the f2f meetings, they would not be carried out", whereas if they were "discussed during f2f meetings", they all would carry them out. The only difference between the active students and the inactive students was that active students interacted online out of a "sense of obligation" and "compliance". With regard to the ninth category, social presence of peers, none of the students felt that lack of peer-feedback inhibited their online interaction and/or f2f attendance. All students reported, however, that they would prefer not to collaborate online, but "rather prefer to work independently and alone, for the online collaborative assignments were mostly time-consuming and meaningless".

Comparing questionnaires and interview results

The variables of the questionnaire and the categories relating to the interviews, although slightly different in construction due to the differences in question-type and sequence, can both be mapped

onto the themes that were discussed in the preliminary literature review, namely convergence and social presence from an adult-learner's perspective.

In order to logically compare the results of the questionnaire and the interviews, the results of the questionnaire, for the sake of such comparison, have been grouped into 'agree' and 'disagree' in relation to their variables, regardless of the ratings according to which students answered, see Appendix E. This merger is justified based on the fact that the 32 participants that were included in the questionnaire were consistent with their answers throughout as far as agreeing/disagreeing on the multiple-scale items is concerned. It follows logically that a participant who *strongly* agrees to a statement, agrees in any event.

There are some minor differences between the questionnaire and interviews, which by and large are due to the different question strategies which flow naturally from questionnaires using a Likert-type scale and semi-structured interviews. Morgan (1998) explains that in order to consider the meta-themes, it is necessary to move away from reporting the findings of the interviews and questionnaires after analysis of both components has been carried out. Such an undertaking is considered a "third effort" and a necessary one in order to make general conclusions that summarise both.

Accordingly, the results clearly overlap as they relate to the so-called meta-themes, which in this study are identified as 'convergence', and 'social presence', and which provide a first understanding of design requirements. Students meet repetition of the online mode with great chagrin, which results in either not attending the f2f meetings, or not studying the online content. With regard to carrying out online assignments, in this study most students do not carry out online assignments if no attention is given to them either in terms of teacher online feedback, or during f2f meetings. Even the students who are in fact active online explained in interviews that despite their willingness to "do as is expected", time pressure may push them to make choices as to which assignments are carried out, and which assignments are ignored. Choices made are based on whether or not "meaningful attention is given to the online assignments during f2f meetings or online feedback from the teacher". As far as social presence is concerned, the absence of the teacher in the online mode is considered more problematic as compared to the absence of peers in the online mode.

DISCUSSION

Although social presence directly influences students' online interaction, in this study a lack of convergence (Murray, et al, 2016) seems to be the major culprit. Repeating online content and ignoring answers given to online assignments is a reason for not carrying out online assignments. This is obviously a problem because carrying out assignments should help students understand learning content.

Another aspect that became apparent in this study was the aspect of students' presence online. The lack of student-student interaction was less of a problem as compared to the lack of teacher-student interaction. In fact, students explain that they rather work alone in the online mode whilst appreciating collaboration in the form of discussions during f2f meetings. The desire to work alone in the online mode as opposed to working in teams could possibly stem from the type of activities that have been designed. Additionally, it appears that the lack of the teacher's presence in the online mode becomes problematic when assignments receive no form of online feedback, or no further attention is given to them during f2f meetings.

Lastly, in this study it was shown that students, being adult-learners in higher education, felt that assignments should not only have a relation to tests, as might indeed be the case for all students,

including non-adult-learners, it should also strongly relate to their professional practice and leave room for "working independently", "self-management", "self-direction", "autonomy", and "self-regulation".

Limitations

Some limitations pertain to both the size of the respondents to the questionnaire, as well as possible bias. The size of the group of respondents consists of only 32 students, whereas the entire available pool accounts for over 600 students. Nevertheless, the group that have completed the questionnaire do not represent this wider population since no generalisations are made beyond the actual group. The present pilot case study is intended to validate claims made in literature pertaining to the lack of online interaction. With such validation in hand, the results from this pilot case study will then simply serve as a direction that subsequent research should follow in terms of systematic literature reviews and case-studies.

Furthermore, whilst care has been taken to avoid any bias, it cannot be ignored that negatively worded questions can result in biased answers in spite of the above-mentioned justification. Whilst stating the same question twice but worded differently might somehow lift this bias, the results of the interviews would need to be considered in comparison with the results of the questionnaire.

Implications for research and practice

The present study explored claims made in literature pertaining to causes for lack of online interaction, since a preliminary study had revealed that adult-learners hardly interact online. Accordingly, a questionnaire was carried out and interviews were held among adult-learners to ascertain the causes of such a lack of online interaction. The results hold two important implications to both research and educational practice.

The first implication is that students by and large refrain from online interaction when there is no convergence, i.e. when online content is repeated in the f2f mode and when online activities are not synergised with f2f activities. The results from this study could be used as a first point for instructors reflecting on the design requirements in relation to the educational needs of their adult-learning students, and their own approach to following-up on online content and activities. Additionally, with the knowledge that students feel encouraged to interact online when the teacher is present in the online mode, instructors could adjust their approach to their teaching practice.

The second implication relates specifically to instructional models and the role of the institute. Whilst consideration of the intricacies of instructional models is an essential endeavour, it should be noted that research should not only investigate what such an instructional model should precisely entail, but also how this can be adopted at institutional level. In an ideal situation, implementation of blended learning relies upon a thorough knowledge and understanding of students' needs, the institutes' aims and values, and the requirements of the curriculum, since implementing blended learning on a large scale is an aspect that affects the entire curriculum (Anderson, 2004).

CONCLUSION

In this study, the findings from the questionnaire and interviews by and large validate the results from the preliminary literature review whereby the salient factors, or meta themes, exposed as being causes for lack of interaction, correspond. Moore (1989) explains that there are three modes related to student engagement, namely student-student interaction, student-teacher interaction, and student-content interaction, the latter being supported by the two former (Kehrwald, 2008; Persico et al., 2010; Dixon, 2010; Abrami et al., 2011). It seems from this study that the lack of student-student interaction does not play a role in whether or not to interact online. On the contrary, it appears to be an obstacle for

students as they would rather work alone. However, it is too soon to draw such a conclusion since it is possible to assume that students have not yet been exposed to the different, perhaps more suitable types of activities in relation to student-student online interaction. Additionally, the teacher's role in relation to online collaboration has not yet been examined in the questionnaire and interviews, whilst it is said to be imperative for successful student-student interaction (Kaendler et al. 2014). Lastly, it should be noted that adult-learners have been educated in the traditional manner and are not accustomed to online collaboration, therefore adult-learners need coaching (Pappas & Jerman, 2015).

Furthermore, students feel that the teacher's presence in the form of online feedback is missing, the absence of which results in not carrying out online assignments. This may partly be due to students not yet understanding the dynamics of online learning content and activities in relation to f2f learning content and activities, since at this point students are of the impression that f2f meetings are mostly a place and means for receiving teacher feedback when none such is given online. In the absence of convergence between the online delivery mode and the f2f delivery mode, content and activities are not fully synergised (Murray, et al., 2016), resulting in doubling of online content and activities during f2f meetings on the one hand, and a void of meaningful follow-up activities during said f2f meetings on the other.

FUTURE RESEARCH

According to a preliminary review, the main causes for lack of online interaction are lack of convergence of content and activities between online and f2f delivery modes, and lack of social presence of both peers and teacher. In this study these claims were corroborated, except for the claim 'social presence of peers', frequently referred to as 'online collaboration' (van Leeuwen, 2014).

Further research will have to show the manner of said convergence, i.e. the type of activities suitable for the online environment and those suitable for f2f meetings, as each should be delivered in the appropriate delivery mode (King & Arnold, 2012). Additionally, further research is needed to unveil the type of online assignments that are of interest to the adult-learner in terms of collaboration. Moreover, further research will have to show whether the obstacle of 'not giving online assignments attention' overshadows other obstacles that have at this point not yet surfaced. Most of these students come from traditional educational backgrounds (van der Stap, 2017) and have the tendency to consider the LMS as a File Sharing System, treating a dynamic learning environment as a static one whereby online material is printed out and assembled by the students into a self-made reader. Furthermore, further research will have to show to which extent a teacher should be present in the online environment.

This study pertains to adult-learners, therefore further research into adult-learning theories will have to show if the above interpretation of adult-learners can be corroborated and what type of assignments are suitable for the online environment that 'make sense' to the adult-learner specifically. Assignments then should not only relate to the adult-learners' professional environment, but also to the specific characteristics and needs of adult-learners, doing justice to, *inter alia*, adult-learners' experience, self-management, self-direction, and self-regulation.

Results from this pilot case study show a clear direction into which immediate systematic literature reviews should move. However, a further literature review should explore different instructional models in order to arrive at designing a model that leverages adult-learners' interaction with online content.

3

LEVERAGING ADULT-LEARNERS IN EDUCATION: A SYSTEMATIC LITERATURE REVIEW

This chapter is based on:

Van der Stap, N., van den Bogaart, T., Ruiz-Thijssen, D. & Versendaal, J. (2023). Leveraging Adult Learners in Blended learning courses. In Elizabeth Langran (Ed.), *Proceedings of Society for Information Technology & Teacher Education International Conference* (pp. 1094-1103). New Orleans, LA, United States: Association for the Advancement of Computing in Education (AACE). Retrieved March 24, 2023 from <https://www.learntechlib.org/primary/p/222007>.

ABSTRACT: Blended learning courses for adult-learners in higher academic education bring with it the challenge of designing online learning environments that do justice to the needs and characteristics of adult-learners. According to Biggs (2003) student factors need to be clearly defined as these affect learning processes. Current blended learning designs are typically related to the more traditional learners, i.e. learners having just left secondary education and entering tertiary education for the first time, rather than adult-learners. As attempts to define higher education adult-learners' educational needs and learning characteristics are fragmented across adult-learning theories, a systematic literature review was carried out. From an initial 562 studies, 14 distinct studies on adult-learners' educational needs and learning characteristics were selected through the guidelines of the PRISMA statement (2010), using pre-defined criteria. Each study was analysed by two coders. The results show that adult-learners, inter alia, need to see the relevance of content and activities, are self-directed learners, need to add knowledge to existing experience, need real-world problems, are problem-centred learners, are intrinsically motivated, need collaboration, need deep learning, need clarity, are independent, and are task oriented.

INTRODUCTION

Adult-learners in higher academic education embrace the idea of blended learning, where part of the learning occurs in an online environment, and part in a face-to-face (f2f) environment (Garrison & Kanuka, 2004; Graham, 2006; Hrastinski, 2019). Adult-learners appreciate the flexibility in terms of place and time that blended learning affords (Aslanian & Clinefelter, 2012; Decelle, 2017; Jones & Blankenship, 2017; Diep et al. 2019). Having (part of) their learning in an online environment takes away the need to travel to campus (Diaz, 2010; Islam et al. 2014, Mallinson & Krull, 2013).

The COVID-19 pandemic has led to teaching institutes transferring their education programmes to online learning in the absence of f2f possibilities (Schneider & Council, 2021), which has sparked off a new interest and research in online learning (Sun al. 2020; van der Spoel, et al. 2020). Nevertheless, blended learning is a deliberate didactical choice that combines online learning with f2f learning (Garrison & Kanuka, 2004; Graham, 2006) in order to benefit from both learning environments (Decelle, 2017; Diep et al. 2019). Therefore, blended learning is not a reaction to a pandemic, switching to online education for logistical reasons where f2f options are not possible (Hodges et al. 2020). As such, implementing blended learning appears to be an ongoing struggle, specifically where it relates to adult-learners (Hodges et al. 2020), as a detailed instructional model aimed at adult-learners seems to be scarce (Ke, 2010; Graham et al. 2014; Hodges et al. 2020). An instructional model based on an adult-learning theory, rather than a traditional pedagogical one, might encourage adult-learners to engage with online learning content as it caters to their needs (Milheim, 2012; Chametzky, 2014), and may prevent them from dropping out altogether (Choi & Kim, 2018; Johnson et al. 2018). This echoes a previous pilot case study (Van der Stap et al. 2019) that indicates that adult-learners at higher education institutes participating in blended learning courses hardly engage with the online learning environment, opting to only attend f2f meetings, or leave their blended learning education programme prematurely.

Part of this premature departure relates to how a blended learning course meets the needs and characteristics of these learners. An instructional model that caters for adult-learners would need to have a full understanding of their needs and characteristics (Youde, 2018), in order to design a blended learning course that meets such needs (Vanslambrouck et al. 2019). Indeed, as Biggs (2003) explains, for students to fully embrace learning processes, students' needs and characteristics, the so-called 'student factors' need to be clarified and considered.

Whilst there is abundant literature on adult-learners' needs and characteristics, these studies are highly fragmented as they emerge from different adult-learning theories, and not specifically focussed on higher education adult-learners. An adult-learning theory is a set of guiding principles and best practices for teaching adult learners, referred to by Knowles (1984) as 'andragogy'. Due to this fragmentation, there is no coherent overview of the student factors that can be utilised for the creation of design principles for blended learning courses leveraging specifically higher education adult-learners with interaction in the online learning environment.

A blended learning instructional model with andragogical principles at its core, and henceforth incorporating the student factors (Biggs, 2003) as they relate to adult-learners in higher education specifically, would fill the gap in the current literature on instructional models for blended learning courses geared towards higher education adult-learners. Such an instructional model would assist teachers in designing blended learning courses. Henceforth, this study systematically reviews adult-learners' needs and characteristics as approached by the various adult-learning theories, since the departing point of any instructional design is a consideration of the student factors (Biggs, 2003).

In the following sections we will explain adult-learning theories, and why blended learning education design principles should cater specifically for higher education adult-learners, followed by our aim of this study, our research question, and the method and analysis applied. In our results section we will present the most-cited adult-learning theories and the various adult-learners' needs and characteristics that emerge from these theories. Lastly, we will address how the findings in this study add descriptive knowledge in relation to blended learning education design principles, followed by limitations, implications, and recommendations.

THEORETICAL FRAMEWORK

In order to conduct a guided systematic literature review, several search terms will be maintained using the PRISMA method (see below), and which are the result of an earlier pilot case study (Van der Stap et al. 2019).

During the past decade there has been an increase in the adult-learning community at higher academic education (BICC, 2022). However, as learners interact with online content, generally a traditional pedagogical approach aimed at younger learners has been used, in particular since traditional learning communities serve younger learners (Biggs & Tang, 2007). There are many pedagogical approaches based on different pedagogical theories, including behaviourism, constructivism, social constructivism, connectivism, and liberalism. However, in this context a pedagogical approach is considered to be the method and practice of teaching as it traditionally caters for learners in primary and secondary education, as well as younger learners entering tertiary education for the first time (Korr et al. 2012; Chametzky, 2014). With the implementation of blended learning, numerous frameworks have adapted a pedagogical approach to meet the incorporation of technology in blended learning courses, one that Serdyukov (2017) refers to as 'e-pedagogy'. However, these approaches might not be an appropriate way of engaging adult-learners with online content (Korr et al. (2012) as adult-learners have different needs and characteristics, i.e. different student factors (Biggs,2003), that are not met with a pedagogical approach as defined in this study.

A pedagogical approach in this study is one that, as said, traditionally caters for the younger learners where the teacher takes on a central role in the learning process, in contrast to an andragogical approach where the learner is placed in a central role in the learning process, and more is expected in terms of self-direction, autonomy and critical thinking, in particular in higher academic education (Chametzky, 2014). Others elaborate, explaining that adult-learning has a focus on constructing knowledge and reflect upon its practical use (Batson, 2008; Pew, 2007). It has even been argued that adult-learning in higher education is focussed on deep learning, requiring higher-order thinking, collaboration and sharing perspectives, whilst a pedagogical approach is traditionally aligned with surface-learning (Biggs & Tang, 2007). Since higher education adult-learners are, among other characteristics, more autonomous and self-directed than younger learners who have just entered tertiary education, they are better served with an andragogical approach that facilitates deep learning and higher-order thinking instead of a pedagogical one (e.g. Korr et al. 2012).

An andragogical approach stems from the first known adult-learning theory, namely 'andragogy' (the art and science of teaching and coaching adults). The concept of andragogy was fully explored by Malcolm Knowles (1984), and was subsequently met with theoretical debate, which is still subject of continuing research. Like subsequent adult-learning theories, andragogy describes an approach to adult-learning based on the specific characteristics and needs of adult-learners. There is some debate on whether or not adult-learning should indeed be labelled as 'theory', a discussion of which is beyond the scope of this research.

Korr et al. (2012) emphasise that an andragogical approach should be maintained when catering for adult-learners. They have empirically shown that adult-learners need a different approach than younger learners who are served by traditional pedagogical methods. They argue that in particular blended learning lends itself to such an adult-learning approach, an approach that specifically meets the needs of higher education adult-learners.

Meeting students' needs and characteristics, referred to by Biggs (2003) as 'student factors', is essential when designing an educational programme, here: blended learning courses. Blended learning courses tailored to adult-learners would, inter alia, do justice to their ability to self-manage and self-direct (e.g. Chametzky, 2014; Chan, 2010; Millheim, 2012; Snyder, 2009; Zhang & Zheng, 2013; Pappas & Jerman, 2015; Hagen & Park, 2016). An instructional model with andragogical considerations at its core is as of yet absent in blended learning educational designs. To design a blended learning course that employs andragogical considerations, a first understanding of the student factors as they relate to higher education adult-learners is needed. It is therefore necessary to explore the needs and characteristics of adult-learners in a systematic literature review.

AIM AND RESEARCH QUESTION

This study consists of a systematic literature review which focusses on obtaining an understanding of adult-learners' needs and adult-learners' characteristics in higher academic education, as contextualised by the various adult-learning theories.

At this point, seeking an extensive description of adult-learners' characteristics and needs resonates with Biggs' notion of student factors. In order to ascertain an extensive description of adult-learners' needs and characteristics, the following research questions will be answered:

What are the specific characteristics and needs of adult-learners in higher academic education as they emerge from the various theories on adult-learning?

MATERIALS AND METHODS

Literature search strategy

In order to fully understand adult-learners' needs and characteristics, it was deemed imperative to obtain a full description of the concept of adult-learning as it relates to their needs and characteristics, hence the search included the terms 'adult-learning', 'adult-learners', 'adult-learning theories', 'adult-learners' characteristics', and 'adult-learners' needs' through the Web of Science, and from which 562 hits emerged. The Web of Science is a multidisciplinary platform facilitating comprehensive searches since it shares ideas across disciplines from approximately 1.7 billion cited references. These search terms themselves result from a prior pilot case study (Van der Stap et al. 2019) that gave rise to this current literature study.

Exclusion and inclusion criteria

To refine the search into the most relevant studies, this systematic literature review has been conducted using a search protocol. The protocol has been designed along the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines (Moher et al. & PRISMA Group, 2010). The PRISMA flow diagram in particular enables the display of the selection process: filtering out appropriate studies through guided steps such as removing duplicate papers, screening on title, screening on abstracts, screening on introductions and conclusions, and arriving at screening whole texts. The screening process is guided through inclusion and exclusion criteria, henceforth, in order to obtain a

focused review whilst including appropriate studies (Green et al. 2006), inclusion and exclusion criteria were drawn-up. See table 1.

Table 1
Inclusion and exclusion criteria

Criterion	Inclusion	Exclusion
Language Outlet	English Peer-reviewed conference proceeding papers or journal papers	Non-English Master theses, editorial comments
Framework	Studies focused on adult- learning theories in higher academic education Studies focused on adult- learners’ needs in higher academic education. Studies focused on adult- learners’ characteristics in higher academic education	Studies providing only a general discussion on education Studies focused only on pedagogical theories Studies pertaining to vocational or lower level academic education Studies lacking discussion of student factors (adult learners’ needs and characteristics)
Validation	Studies that included a theoretical framework Studies with low external validity, disabling transferability	Studies without literary discussions Studies that are too limited to enable transferability, in particular: Studies focusing on teacher context only Studies relating to unique case studies, or limited subject pools Studies focusing on domain- specific complexities

The inclusion and exclusion criteria are based on a selective approach. Since the research question of this study is pertaining to adult-learners in higher academic education only, studies that fell outside of this scope were excluded. As such, studies not specifically related to higher education, or studies not focused on adult-learners in particular, were excluded since such studies are not in alignment with the research question.

Additionally, studies that were either teacher context specific, case-study specific, or limited complexities pertaining to a narrow domain rendering such studies beyond the scope of transferability, were excluded. Studies that were based on education in general, or embraced a traditional pedagogical approach were

also excluded from this study, since student-related factors as they relate to adult-learners in higher education were sought after. Studies that lacked a theory discussion were excluded from this study since it is descriptive theory that was aimed for. Lastly, it was considered crucial to include studies up to fifteen years old, since this would allow for articles into the study that were published when a renewed interest in adult-learning theories coincided with the rising popularity of blended learning courses. Whilst we appreciate that this is rather dated, it was to allow pioneers on adult-learning theories, who sparked off the discussions on adult-learning, into the selection.

The first researcher performed an initial screening, in order to exclude papers based on said exclusion criteria and to include papers based on the inclusion criteria. Following this, a co-researcher reviewed the papers independent of the first researcher, and then judged their inclusion or exclusion, based on the same inclusion and exclusion criteria. After this process, both authors discussed the eligibility of the various studies until full agreement was had. Accordingly, fourteen distinct studies remained in the study pertaining to adult-learning theories.

Table 2

Number of hits per Exclusion Criterion

Exclusion criterion	Hits excluding duplicates (19)
Studies providing a general discussion on education	5
Studies focussing on teacher context only	53
Studies focussing on technical complexities pertaining to a single type of domain or single course	147
Studies relating to unique, single case studies	123
Studies incorporating pedagogical theories	21
Studies not pertaining to higher academic education	131
Studies not pertaining to adult learners' needs and characteristics	45
Studies not peer reviewed	1
Studies older than 15 yrs	0
Studies lacking theory discussion	3
Total number of papers excluded	529

Additionally, a PRISMA diagram has been drawn up to reflect the selection procedure based on the inclusion and exclusion criteria. See Figure 2 below.

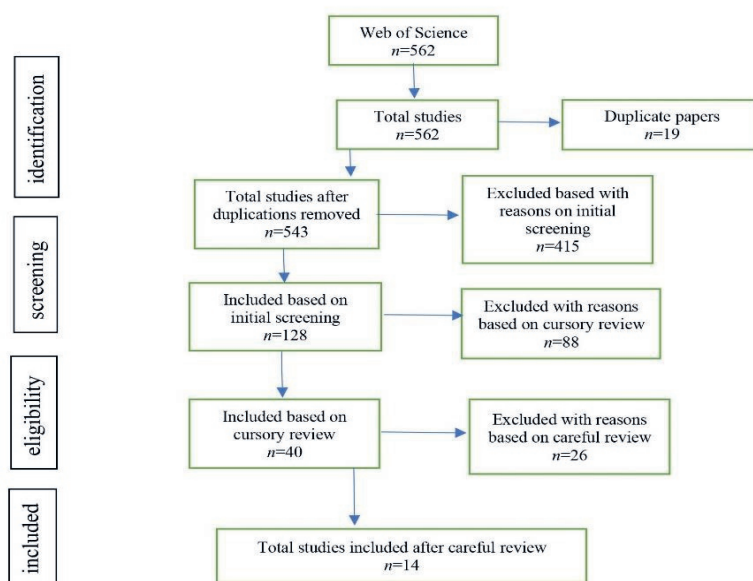


Figure 1: Prisma Diagram

Analysis

After the selected studies were decided upon, the first researcher and a co-researcher read the full text of each paper included in the study. This method helped to ensure consistency of coding. Accordingly, a coding scheme was created in order systematically analyse the retrieved studies in two phases. In the first phase the above-mentioned conceptual framework and research question was used in order to arrive at an initial coding scheme. In the second phase said coding scheme was applied to the articles included in the selection, upon which further fine-tuned codes and sub-codes resulted. Implications for teaching practices and design of the learning environment were inductively derived during this part of the analysis.

To ensure that another coder could identify the content that corresponds with the given definition, each code was defined in an operational way (Miles & Huberman, 1994). Once the coding scheme was completed, the papers included in this study were analysed based on their description of needs and characteristics of higher education adult-learners.

As a first step in the actual coding process, the first researcher coded all papers. Second, an independent coder received a brief training by the first researcher concerning the aims of the study, the selection of the publications, and the method through which the coding scheme was arrived at, namely the conceptual framework and the research question. After this, the first researcher and the coder coded one publication together, followed by a discussion on the coding strategy. Next, the remaining thirteen articles were reviewed independently by both coders. After the operational definitions of both categories (i.e. needs and characteristics) were further clarified, percent agreement for all 32 of the variables pertaining to these categories ranged between 74% and 100%. When completed, both the first researcher and the

independent coder discussed any differences until full agreement was reached on all codes. Any differences that became evident were not due to either coder having different interpretations of the codes, but rather a result of overlooking relevant information.

In a last step the analysed results were summarised and designed into a framework consisting of adult-learners' needs and characteristics, together with potential implications for teachers (Appendix J). The framework was then discussed in a focus group consisting of three teachers.

RESULTS

An overview of the included studies on adult-learning theories as they apply to higher education adult-learners shall be presented (see also Appendix I), following which a closer look shall be given to the needs and characteristics of higher education adult-learners as they emerge from these adult-learning theories. After the various overviews have been presented, a few examples shall be given pertaining to the possible implications teachers should be aware of when designing a blended learning environment for adult-learners (section 5). Future studies should elaborate on these implications and examine them further in relation to the remaining key-factors of online interaction, namely that of social presence and convergence as validated by the pilot case study (Van der Stap et al. 2019).

Most Cited Adult-Learning Theories

Andragogy

The oldest, most widely-known adult-learning theory is andragogy, a term that gained renewed interest after Knowles (1984) addressed this upon observing a trend of adult-learners entering education. Merriam et al. (2007) phrase Knowles' (1984) characteristics of adult-learners as based on six assumptions: 1. Self-Concept: Adult learners are self-directed, autonomous, and independent. 2. Role of Experience: Repository of an adult's experience is a rich resource for learning. Adults tend to learn by drawing from their previous experiences. 3. Readiness to Learn: Adults tend to be ready to learn what they believe they need to know. 4. Orientation to Learning: Adults preferably learn for immediate applications rather than for future uses, as their learning orientation is problem-centred, task-oriented, and life-focused. 5. Internal Motivation: Adults are more internally motivated than externally. 6. Need to Know: Adults need to know the value of learning and why they need to learn.

Following Knowles' (1984) initial exploration, other adult-learning theories emerged, such as 'self-directed learning' (Bedi, 2004; Cercone, 2008; Chan, 2010; de Frey, 2003; Henschke, 2010; Merriam et al. 2007; Milheim 2011; Zhang & Zheng, 2013), 'experiential-learning' (Cercone, 2008; Henschke, 2010;), and 'transformational learning' (Cercone, 2008; Chametzky, 2014; Snyder, 2009).

Self-directed adult-learning theory

Cercone (2008) defines self-directed learning theory as one that is based on the premise that adult-learners are independent, have a stick-to-itiveness in learning, are willing to take initiative and to learn more. Furthermore, they are self-disciplined and self-confident, are able to manage time and tasks, and are goal-oriented. Self-directed learning then grants a large amount of autonomy to higher education adult-learners, one in which they direct and strategise their own learning (Chan, 2010; Milheim, 2011; Merriam et al. 2007; Zhang & Zheng, 2013).

Transformational adult-learning theory

The transformational adult-learning theory relies on a constructivist approach, and is based on the idea that adult-learners have a frame of reference and wealth of experience which requires transformation to help them make meaning of these experiences (Cercone, 2008; Snyder, 2009). According to the

transformational adult-learning theory, adult-learners require an approach to teaching and assignments that help elevate experiences and knowledge they already have. As such, learning content should add to adult-learners' experiences and knowledge (Chametzky, 2014; Snyder, 2009).

Experiential adult-learning theory

Like the transformational adult-learning theory, experiential adult-learning theory stems from the idea that adult-learners have prior knowledge and experience. The experiential adult-learning theory emphasises the desire for personal growth adult-learners have, and as such, adult-teaching should be grounded in adult-learners' experience and prior knowledge (Cercone, 2008; Milheim, 2011). Whilst the transformational adult-learning theory relies on the idea that adult-learners need to make sense of their experience, the experiential adult-learning theory advocates providing opportunities for adult-learners to incorporate prior experience and knowledge specifically to enable personal growth (Henschke, 2010; Milheim, 2011). Providing adult-learners with opportunities for personal growth is therefore a key-factor in the experiential adult-learning theory.

Adult-Learners' Characteristics and Needs as Contextualised by Adult-Learning Theories

Whilst adult-learning theories take adult-learners' needs and characteristics as a focus for construction of the learning theory, in order to fine-tune the answer to the research question, i.e. to the characteristics and needs of adult-learners, a closer look at these has to be taken.

Characteristics

Studies on adult-learning theories emphasise adult-learners as being 'independent' and 'autonomous' (Bedi, 2004; Cercone, 2008; Chan, 2010; Merriam, et al. 2007; Milheim, 2011; Zhang & Zheng, 2013), and having the 'ability to self-manage' and 'self-direct' (Bakar, 2013; Cercone, 2008; Henschke, 2010). Furthermore, adult-learners are 'internally motivated' (Bakar, 2013; Cercone, 2008; Chametzky, 2014; Henschke, 2010; Merriam et al. 2007), and 'problem or goal-oriented' (Bolton, 2006; Cercone, 2008; Merriam et al. 2007).

Needs

Studies on adult-learning theories emphasise various needs adult-learners have, including 'the need for the instructor to act as facilitator' (Cercone, 2008; Zhang & Zheng, 2013); 'the need to be involved in planning learning objectives', 'the need to see meaning and relevance' (Bedi, 2004; Birzer, 2004; Cercone, 2008; Chan, 2010; Zhang & Zheng, 2013), the need for 'active involvement in the learning process' (Hencke, 2010); 'the need to solving real-world problems', 'the need for deep learning' (Bolton, 2006; Cercone, 2008; Chametzky, 2014; Chan, 2010; Milheim, 2011; Snyder, 2009), and 'the need to self-evaluate or self-assess' (Birzer, 2004; Cercone, 2008; Henschke, 2010). Other needs include 'availability of course material and technological tools' (Snyder, 2009), 'tailored coaching' (Cercone, 2008; Pappas & Jerman, 2015), 'a physically and psychologically conducive learning atmosphere' (Birzer, 2004), and 'the freedom to identify resources' (Birzer, 2004).

Additionally, Cercone (2008) adds that adult-learners need 'scaffolding to be provided by the instructor', adult-learners need 'to make use of prior experience', adult-learners need 'a learner-centred environment', and adult-learners need 'a collaborative, mutual and informal working climate'. Based on the idea that adult-learners need a clear focus on the course programme, De Frey (2003) adds that adult-learners need a programme-design approach, the basics of which include: stating clear expectations, incorporating multiple forms of feedback, providing regular communication to individual learners and the group, providing learner flexibility and control, offering a variety of forms of learner support, maintaining the focus of content within units, providing consistency among courses, respecting learner roles and life experiences. Bolton (2006) adds that it is important for adult-learners to understand why something

needs to be learned. Moreover, adult-learners need to know whether the learning content is of value to them. Bolton (2006) furthermore stresses the importance of making rubrics available to adult-learners. See appendix H for an overview of adult-learning theories as they apply to higher education adult-learners.

DISCUSSION

This study set out to provide an extensive overview of higher education adult-learners' needs and characteristics as they emerge from the various theories on adult-learners. With regard to the research question: *what are the specific characteristics and needs of adult-learners in higher academic education as they emerge from the various theories on adult-learning?*, it is shown that, despite the numerous theories on adult-learning, the commonalities between these theories are (1) self-direction and autonomy, (2) meaning and relevance through e.g. immediacy of application, and (3) a learner-centred approach that evokes deep learning, and where collaboration, reflection and higher-order thinking take central focus (Biggs & Tang, 2007).

Immediately then a problem becomes apparent because when adult-learners newly enter into higher education programmes, having presumably been away from the educational system for a considerable amount of time, they may have been exposed and grown accustomed to surface-learning, traditionally aligned with a teacher-centred, pedagogical approach (Biggs & Tang, 2007). The detailed description then of the various needs and characteristics of adult-learners as they emerge from the adult-learning theories, is a direction towards understanding the first steps in designing education, which, as explained above, are referred to by Biggs (2003) as 'student factors'.

Biggs (2003) explains that student factors and teacher contexts (learning environment, Tynjälä, 2013) are directly related. An example of how teacher contexts or learning environment could align with the student-related factors is by, e.g. allowing adult-learners more autonomy in line with their ability to self-manage, providing meaningful task-oriented learning opportunities to meet the adult-learner's need of real world, problem or goal-oriented challenges, or creating collaborative tasks to cater for the adult-learner's need for higher-order thinking and learning in an informal working climate.

Whilst there are more adult-learning theories and adult-learning approaches than discussed above, the salient and most cited studies have been included in this study, since this study is aimed at offering a description of the student factors of learning along the lines of Biggs' 3P model of learning (2003).

Several theories highlight different needs and characteristics of adult-learners, however, they all emphasise self-direction and autonomy, meaning and relevance, and the process of learning through higher-order thinking rather than just the content. This requires a learner-centred method and recognising the importance of a customised approach to learning, which is an interesting starting point for subsequent studies as it aligns with Biggs' (2003) idea of student factors on the one hand, and teacher context or learning environment on the other, both of which together facilitate optimum learning processes.

The findings of this study suggest that when designing blended learning courses aimed at higher education adult-learners, care should be taken to ensure that students have projects that entail meaningful, real-world contexts, an approach that involves learners in planning, identifying resources, higher-order learning processes, and learning evaluations. Course design should include careful planning of feedback, monitoring, collaborative activities, problem-solving activities, and transformational learning. Such a learner-centred environment shifts the role of the teacher to one who should facilitate, provide prompt and frequent feedback, create structured assignments with clear rubrics, and ensure scaffolding is provided.

Limitations

This study has highlighted higher education adult-learners' needs and characteristics as they emerge from a number of well-known adult-learning theories. Whilst care has been taken in carefully selecting distinct studies, a choice has been made to limit the number of studies due to the scope and focus of this research. Hence, it has ignored a number of adult-learning theories which possibly might show interesting aspects not mentioned here, and which could lead to new insights and results.

A second limitation pertains to the type of studies that have been included in this research. The focus of this study was to arrive at a description of student-related factors as applicable to adult-learners in higher education. Studies that fell beyond the scope and focus of this research, due to specifics of a given study that reduce transferability, may offer interesting insights as they might vary in their emphasis on higher education adult-learners' needs and characteristics. Nevertheless, a common ground between the various theories of the selected studies was considered, rather than a closer examination of the differences.

Another limitation pertains to the distinction held between needs and characteristics of adult-learners and the more traditional learners. The distinction suggests that there is a clear dividing line between the two, whereas in all likelihood the distinction is less decisive than has been suggested here. For example, there may be traditional learners that have entered tertiary education for the first time who may be better served by an adult-learning approach rather than a traditional pedagogical one. Likewise, it could be equally likely that some adult-learning students may not fit within the standard definition of adult-learners as defined by the adult-learning theories. For the purpose of this study it should be noted, however, that the focus was on adult-learners who study part-time, and presumably do so due to other obligations, such as career and family, that would justify them being labelled as having 'altering needs' (Hsu et al. 2015).

Implications

An immediate implication of this study is the guidance it provides teachers when designing learning environments for their adult-learning students. Teachers can consider adult-learners' needs when designing learning environments and arrangements for their adult-learners. From these results, the teacher is not only made aware of the needs and characteristics of their adult-learning students, but can adapt their approach to meet these needs.

Additionally, the results of this study, the sum of higher education adult-learners' needs and characteristics as contextualised by the various adult-learning theories, shall be used to further explore the teacher context (Biggs, 2003) or learning environment in subsequent studies, since previous studies have indicated the importance of the learning environment in order to evoke deep learning processes (Biggs, 2003; Biggs & Tang, 2007). As such, the results of this study shall provide a focus for these subsequent studies whereby we will further explore the learning environment as it relates to adult-learners.

4

FOSTERING ONLINE INTERACTION IN BLENDED LEARNING: A SYSTEMATIC LITERATURE REVIEW

This chapter is based on:

Van der Stap, N., van den Bogaart, T., Rahimi, E. & Versendaal, J. (2024a). Fostering Online Interaction through Social Presence and Convergence: A Systematic Literature Review. *Journal of Computer Assisted Learning*. <http://doi.org/10.1111/jcal.12981>

ABSTRACT:

Background

Online interaction in blended learning is leveraged through social presence and convergence. However, little systematic work currently exists on how researchers have explored these challenges in higher education institutions and no studies have synthesised these challenges.

Objectives

The purpose of this study is to give a novel overview of social presence and convergence to improve blended learning in higher education. The findings will be synthesised into blended learning design principles.

Method

Two systematic literature reviews, one on each challenge, were carried out through the Web of Science databases and consulting cited sources in review articles. Accordingly 20 distinct studies were selected through the guidelines of the PRISMA statement, using predefined selection criteria.

Results and Conclusions

The results show that social presence in blended learning is mostly evoked through course design, introductory f2f meetings, collaborative activities, prompt online feedback, the teacher's presence, and planned facilitation. To establish convergence, it is recommended to make basic theory available online through video clips, web-lectures, articles, followed by simple online assignments or self-study to increase understanding, thereby creating opportunities for deep learning during face-to-face through discussions and collaborative activities.

Implications

This paper adds to the theory on blended learning and instructional design in higher education, and further offers an elaborate set of design principles for educational practice. Future research on instructional design may investigate in particular how a target group or student factors, are affected by the blended learning environment in order to tailor designs for a specific target group.

INTRODUCTION

Literature on educational technology generally interprets blended learning as a 'blending' of face-to-face (f2f) and online instructional activities, aiming to stimulate and support learning (Boelens, et al. 2015). More precisely, a blended learning approach mixes different teaching and learning media in order to optimise learning and instruction (Kirschner, 2021). In this line, blended learning is perhaps not a new phenomenon, as such a mix has always played a role in good educational practices (e.g. Garrison & Kanuka, 2004). To this extent, a blended learning approach requires "the thoughtful integration of classroom face-to-face learning experiences with online learning experiences" (Garrison & Kanuka, 2004, p. 96). As Hrastinsky (2019) points out, with the vast definitions of blended learning it is important to define the approach of blended learning in any study. Following Garrison & Kanuka (2004) therefore, the understanding of blended learning in this present study rests on 'thoughtful integration of classroom and online learning'.

According to Kjærgaard, (2017), thoughtful integration involves balancing content and activities according to the most appropriate learning mode: online or f2f. To this extent, online learning and f2f learning are two modes of learning pertaining to one and the same learning environment, which is interpreted here as an allocated place for engaging in learning activities that directly effect and affect the learning processes (Gómez & Duarte, 2012; Tynjälä, 2013). These two modes of the learning environment aim to benefit learning by taking advantage of online learning and f2f learning (Decelle, 2017; Diep et al. 2017; Greef, 2017) as they offer opportunities that may fit a learner-centred approach by addressing the flexibility required in line with learners' needs and preferences. Consequently, with learning moving from an in-class, pedagogical approach to part f2f learning and part online learning, blended learning affords flexibility to learn at a place and time that is convenient for students (e.g. Aslanian & Clinefelter, 2012; Decelle, 2017; Diep et al. 2017; Ilgaz & Gulbahar, 2015; Jones & Blankenship, 2017). Yet, despite the benefits blended learning affords, low achievers in particular may have lower perceived learning experiences and may prefer traditional in-class learning if given the choice (Owston et al, 2013), or they may "disengage with education in the long term" (Lorenza & Carter, 2021, P. 4). Moreover, lack of social online interaction may result in students dropping out (Wei et al. 2019), as does a lack of learner-content interaction in the online learning environment (Choi & Kim, 2018).

Online interaction is understood as engaging with learning content and activities, peers, and the teacher in the online mode to bring about learning processes (Andel et al. 2020; Li, 2022). A lack of online interaction may therefore affect learning processes, which in turn affect learning outcomes (Hodges et al. 2020; Johnson et al. 2018; Kuo & Belland, 2016). Said learning processes are effected through the design of the learning environment (Martin & Bolliger, 2018; Tynjälä, 2013), which should leverage online interaction (Hodges et al. 2020; Johnson et al. 2018). The literature shows that online interaction in blended learning faces two challenges. The first one is how to establish social presence, explained as students experiencing the presence of others, a factor that can positively influence students' decision to interact online (Andel et al. 2020; Hodges et al. 2020). The second challenge is convergence, explained as structuring content and activities along the most appropriate learning mode: online or f2f (Kjærgaard, 2017; McKenna, 2020; Murray et al. 2016). Both challenges, as explained, directly affect students' online interaction. If online interaction therefore is to be leveraged, it seems logical that both challenges need to be explored in order to arrive at design principles that foster online interaction.

Whilst studies relating to social presence are abundant, these are highly fragmented as there are various interpretations of social presence that determine not only the theoretical understanding of social presence, but also its operationalisation. Furthermore, studies on convergence are scarce. Additionally, there are no studies that bring both challenges together as these phenomena are commonly examined in isolated studies. As a result, there is no coherent overview of blended learning educational design

principles needed to leverage online interaction as it pertains to blended learning (Allen et al. 2013; Hodges et al. 2020; Serdyukov, 2017). To arrive at design principles therefore, the challenges not only need to be understood, the knowledge that is offered through the various studies also needs to be synthesised. Accordingly, the challenges of social presence and convergence are further explored in systematic literature reviews as we seek to understand how online interaction in blended learning courses in higher education can be leveraged through a synergy of said challenges. The main research question addressed is:

How can online interaction in blended learning courses in higher education be leveraged through social presence and convergence?

The results not only yield a thorough understanding of how social presence can be afforded and how convergence can be implemented, which will help fill the gap in literature on the uses of digital technology in education and instructional designs, the findings are also synergised into blended learning design principles that can foster online interaction which practitioners can use when designing blended learning courses.

In the following chapters we explain social presence and convergence, followed by research sub-questions, and method and analysis. Lastly, we discuss how the findings in this study add prescriptive knowledge as they relate to blended learning and instructional design, together with design principles for course designers.

THEORETICAL FRAMEWORK

In the literature, social presence is by and large a topic that is discussed in relation to solely online or distant learning, that is, where there are no f2f interactions. In the absence of f2f interactions, establishing social presence may become challenging. A lack of social interaction could potentially lead to a feeling of isolation as will be discussed below. Convergence, on the other hand, is more commonly encountered in discussions on blended learning where the question of how to categorise content and activities across both learning modes arises. Although this study is related to blended learning courses, it is considered presumptuous to eliminate aspects relating to social presence when challenges related to online interactions are studied, as it appears that both above-mentioned themes are major causes for the lack of online interaction in blended programmes (Dixson, 2010; Hodges et al. 2020; Murray et al. 2016).

Theme 1: The impact of social presence

Garrison et al. (2000) explain that "social presence is the ability of participants in a community of inquiry to project themselves socially and emotionally as 'real' people (i.e. their full personality), through the medium of communication being used" (p. 94), an experience that affects students' participation and decision to interact (Andel et al. 2020; Hodges et al. 2020) as students particularly need to feel the psychological presence of others in order to prevent feeling disconnected and henceforth demotivated (Ali & Smith, 2015; Blackmon & Major, 2012; Bouilheres et al. 2020; Croft et al. 2010; Rasheed et al. 2020).

Social presence involves three factors, namely 1) co-presence, which is experiencing the salience of others; 2) intimacy, which is the extent to which people trust others, make relationships, express themselves, and physical proximity; and 3) immediacy, which entails more elaborate interpersonal relationships that include a sense of psychological involvement (Dixson et al. 2017; Garrison et al. 2000).

A core element of social presence stems from the theory of social constructivism, an educational theory related to cognitive constructivism, and which explains that knowledge is constructed through interaction

with others in a learning community. As Vygotsky (1978) explains: cognitive processes are constructed and stimulated by social interactions. In online environments social learning becomes a challenge as it endeavours to replicate the social elements that create the sense of 'being there' and 'salience to others' (Dixon et al. 2017; Garrison et al. 2000).

Whilst social presence is illuminated due to the social constructivist theory upon which it rests, social presence cannot, in itself, be seen as a concept separate from cognitive processes and the role of the course designer and teacher (teaching presence), since social processes, cognitive processes and the role of the teacher overlap as illustrated in the framework of Community of Inquiry (Garrison et al. 2000). Within the Community of Inquiry (COI) framework, social presence plays a central role in cognitive presence through, inter alia, discourse within a community of inquiry. As explained by Garrison et al. (2000), "The primary importance of this element is its function as a support for cognitive presence, indirectly facilitating the process of critical thinking carried on by the community of learners" (p.89).

Community of Inquiry

Tantamount to social constructivism is collaborative learning, which explains that learning is based on interaction, collaboration, and group work (Akpan et al. 2020). Through collaboration, students understand new concepts and achieve deep learning or higher-order thinking (Mahoney & Harris-Reeves, 2019), as opposed to simply recalling facts known as surface learning (Biggs & Tang, 2007). Collaborative learning then centres on the idea that through reflection of various perspectives shared in a social learning community, a higher level of knowledge is achieved (Johnson et al. 2017). In collaborative learning situations, learning is learner-centred whereby students play a central role in learning acquisition through participation in learning activities, whilst the teachers act as facilitators (Kirschner, 2001).

As a frequently used theoretical and practical framework for online learning, the Community of Inquiry (COI) framework focuses on learning from a social constructivist theory and a collaborative point of view (Garrison et al. 2000). The framework allows for a dynamic approach as it assumes that learning in online environments occurs through three core elements that overlap, namely 1) social presence, 2) cognitive presence, and 3) teaching presence (Garrison et al. 2000), see Figure 1 which displays the synergy of the three presences. In the COI framework, social presence is essential for collaborative learning: when social presence is established, cognitive presence is evoked and more easily supported (Amoozegar et al. 2022; Gutiérrez-Santiuste et al. 2015; Kozan & Richardson, 2014; Shea, 2006).

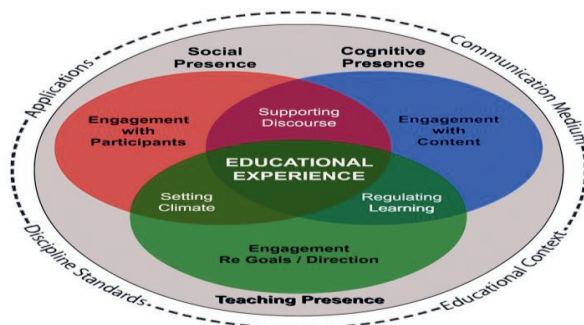


Figure 1: Community of Inquiry Framework³

³ Image used with permission from the Community of Inquiry website and licensed under the CC-BY-SA International 4.0 license (<https://creativecommons.org/licenses/by-sa/4.0/>). The original image is located at <https://www.thecommunityofinquiry.org/framework>

The definition of cognitive presence

Cognitive presence is explained as “the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry” (Garrison et al. 2001, p. 89). This involves a level of engagement that can be considered as the student’s investment directed towards understanding the content and constructing knowledge (Gutiérrez-Santisteban et al. 2015). Important here, in the understanding of cognitive presence, is the aspect of ‘sustained communication’ since this implies social presence as a causal factor (Garrison & Kanuka, 2004). Indeed, students’ experience of isolation, leading to a lack of online interaction and hence disconnection from content, results in higher dropout rates and students’ perception of inferior learning experiences (Choi & Kim, 2018; McKenna et al. 2020).

The definition of teaching presence

“Teaching presence is the design of the course, the facilitation of academic discourse, and direction of cognitive and social processes with the aim of realising personally meaningful and academic learning outcomes” (Garrison et al. 2000, p. 89). Designing the course involves planning and preparing for the course including its materials, values, and overall approach (Anderson et al. 2001). Additionally, facilitation has a large impact on evoking and sustaining social presence which, in turn, stimulates cognitive processes (Zilka et al. 2018). Where facilitation continues into more personal support, the teacher’s own social presence becomes apparent through immediacy (Zilka et al. 2018, p. 106). The ability to establish the teacher as ‘being there’ further reduces students’ risk of isolation, and henceforth increases students’ social presence (Li, 2022; Sheybani, 2019). Whereas social presence is a psychological state that students may or may not experience, teacher immediacy, as a facet of teaching presence, in particular the teacher’s social presence, is a set of behaviours that a teacher may employ (Lee, 2020).

As configured by the COI framework, the three presences outlined are interconnected, working synergistically to evoke a meaningful learning experience (Garrison et al. 2000). The COI framework is a leading theoretical lens for research in online learning and blended learning, since it affords an understanding of the dynamics of all three presences, in particular how social presence can be leveraged as it relates to teaching presence and cognitive presence.

Theme 2: The impact of convergence

The second theme is a theme more commonly found in literature pertaining to blended learning as it discusses how content and activities are divided across both modes. Convergence is where there is a categorisation of activities according to the most appropriate learning mode: online or f2f (Kjærgaard, 2017; Hodges et al. 2020). Indeed, as explained by Murray et al. (2016), convergence in blended learning, where there is both a f2f mode and an online mode, entails a complementary and dynamic utilisation of both modes.

Challenge of choosing between f2f and online modes

With most students being used to traditional f2f teaching, research shows that students are wary of utilising the online mode of the learning environment (Owston & York, 2018). This is particularly the case when students feel disconnected from peers (Andel et al. 2020), or when the strength of the online mode is not effectively implemented (Richardson et al. 2017), resulting in students failing to see the relevance of online interaction, and hence refrain from said interaction (Hodges et al. 2020; King & Arnold, 2012; Murray et al. 2016). To this extent, Czaplinsky & Fielding (2020) suggest a blended learning instructional model, or contextual framework, in order to improve online interaction, since the salient aspect of blended learning is the ability of the online mode to foster interaction (King & Arnold, 2012).

The salient challenge of convergence for course designers is deciding which learning content and activities to place online, which to implement f2f, and how to engage the student in the online mode of the learning

environment in order to evoke desired learning processes (Czaplinsky & Fielding, 2020). As Murray et al. (2016) explain, effective learning processes in blended learning can only be established when there is a clear understanding of how each delivery mode can best be exploited, whereby the need for interaction both online and f2f should become particularly relevant. As such, effective f2f and online learning strategies should be chosen to balance the number, type and duration of activities, without taking away from either mode (Kjærgaard, 2017).

Convergence falters when activities and content pertaining to a course are not categorised according to the most appropriate f2f and online learning modes (Kjærgaard, 2017; Murray et al. 2016; Yin & Yuan, 2021). Where there is no clear convergence, both delivery modes may become reduced, as such adversely affecting the learning environment, and henceforth impairing the learning process (Hodges et al. 2020).

The lens used for the systematic literature review on social presence will be the three presences as framed within the COI framework. With regard to convergence, whilst there is very little literature on the topic, it seems logical to consider the combination of both the 'online mode' and 'f2f mode' as a theoretical lens.

AIMS AND RESEARCH QUESTIONS

To explore both identified key challenges, this study consists of a systematic literature review that investigates the themes of social presence and convergence, from which insights can be had on how online interaction can be leveraged as it relates to these themes. Since no studies as of yet have merged the two themes in design principles that promote online interaction, the results shall be synthesised accordingly.

This present study is aimed at blended learning design principles that put said challenges into motion. Henceforth, the main question is to be elaborated into the following sub-questions as they emerge from said studies:

How can online interaction in blended learning courses in higher education be leveraged through social presence and convergence?

- (1) How is social presence leveraged in blended learning courses in higher education?
- (2) How is convergence established in the f2f and online modes of blended learning courses in higher education?
- (3) How can social presence and convergence be synergised into blended learning design principles for higher education?

METHODOLOGY

This systematic literature review follows the guidelines of the Campbell Collaboration (Kugley et al. 2017), and was conducted according to the quality standards through the PRISMA statement (Moher et al. & The Prisma Group, 2010). Additionally, we report on the data source and literature research, the literature coding and analysis, and the systematic literature review methods used.

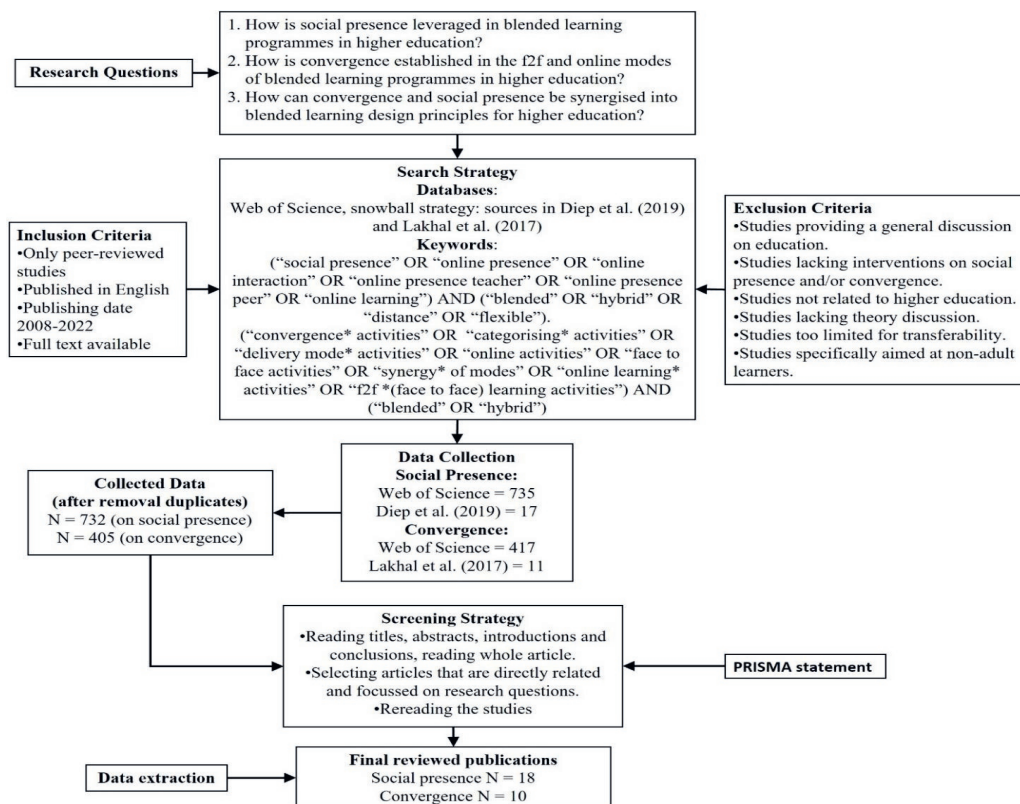


Figure 2: Flow Diagram of the Systematic Literature Review Process

Literature search strategy

In line with the guidelines of the Campbell Collaboration (Kugley et al. 2017), multiple search strategies for each factor were used to arrive at potentially relevant studies: entering search terms in databases, and using the snowball sampling strategy (Cohen et al. 2013). The search terms entered in databases were kept as broad as possible, in order to get the most possible hits. Through a discussion between the first researcher and the second researcher a set of search terms were arrived at that were considered the most informative, whilst not excluding potentially relevant search terms. The chosen search terms followed the concepts in blended learning arising from previous literature on the subject, namely online interaction, technology-mediated education, web-facilitated learning, and learning delivery modes. The systematic search for both factors included the search terms as displayed in the flow diagram (Figure 2) at 10:45 AM, 12 October 2020. It was decided that the search terms should appear in the title, abstract, or keywords of the document. The Timespan was defined as 2000 to 2022, Document Type as Article, and Language as English.

Using the first strategy, both systematic searches relating to the two factors were conducted through the Web of Science database, from which 735 hits in relation to social presence emerged, and 417 in relation to convergence. As a second strategy, sources cited ($n=17$) in the extensive review by Diep et al. (2017) in relation to social presence, and sources cited ($n=11$) in the elaborate review by Lakhal et al. (2017) in relation to convergence were consulted. Both studies provided a full overview of studies relating to said topics.

The multiple-faceted strategy was used to find relevant and potentially relevant studies that aid towards answering the research questions (Arksey & O' Malley, 2005). Duplicate papers were removed, which included 20 titles in the selection on social presence, leaving 732 titles for further selection, and 23 titles in the selection on convergence, leaving 405 titles for further selection. A database of a total of 1.137 titles was created in MS Excel.

Eligibility criteria

To refine each search into the most relevant studies, both systematic literature searches have been conducted using a search protocol. The protocol has been designed along the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines (Moher et al. & The PRISMA Group, 2010). The PRISMA flow diagram in particular enables the display of the selection process: filtering out appropriate studies through guided steps such as removing duplicate papers, screening on title, screening on abstracts and conclusions, and arriving at screening whole texts. The screening process is guided through inclusion and exclusion criteria.

The inclusion and exclusion criteria are based on a selective approach. Since the research questions of this study pertain to the topics of social presence and convergence in higher academic education contexts, studies that fell outside of this scope were excluded. Figure 2 displays the type of studies that were excluded. It was furthermore considered crucial to include studies up to 12 years old since this would allow for articles that were published when blended learning increased in popularity and new insights on the topic were had, as well as the increasing use of the COI framework which was first established in 2000, and which allowed further discussions and expansion of the concept of social presence. In instances where studies tapped into the results of the same study, the study that was deemed most informative and extensive was included in the analysis.

In both searches into social presence and convergence, the first researcher performed an initial screening using first titles, then abstracts, followed by complete texts, in order to exclude papers based on said exclusion criteria and to include papers based on the inclusion criteria. After this process, both researchers discussed the eligibility of the various studies. The inter-rater agreement of 50 randomly selected studies rated by both researchers was 97.0%, Cohen's $K=0.884$, $P<0.001$. The discrepancies were resolved through a focused discussion until agreement was reached. Accordingly, 18 studies remained in the study pertaining to social presence and 10 studies remained in the study pertaining to convergence. The number of hits per exclusion item in relation to the search on social online presence is presented in Appendix K. The number of hits per exclusion item on convergence is presented in Appendix L.

Analysis

A coding scheme to systematically analyse the retrieved studies was developed in two phases. In the first phase, a first version of the coding scheme was established based on the above-mentioned conceptual framework and research questions. To answer research question 1, we analysed how social presence was established through the three presences of the COI framework, how these three presences related to each other, and how social presence could be increased. To examine research question 2, we analysed how the online mode and the f2f mode should be categorised, both in terms of learning content and learning activities. In a second phase, this coding scheme was applied to the selected articles.

To ensure reliability, the first researcher and the coder coded one publication together, followed by a discussion on the coding strategy, after which the remaining 28 articles were reviewed independently by both coders. After the operational definitions, all the five variables were further clarified and discussed until full agreement was reached. After all papers were analysed according to the defined codes, both the first researcher and the independent coder openly discussed any differences upon which full agreement

was had, see Appendix M for the coding scheme and operational definitions. Next, the findings were synthesised into an elementary form of design principles as further described below.

Co-designing blended learning design principles

In order to arrive at blended learning design principles, a co-design approach was adopted through participatory design. A participatory design includes a teacher, the researcher and a stakeholder (here: a student), combining all the relevant parties in order to reach a robust design (Könings et al. 2005; Könings et al. 2014; Könings & McKenney, 2017). Involving students' perspectives in particular, optimises the construct (e.g., Kirschner, 2015; Könings et al. 2005).

To avoid bias, all participants in this study were instructed to focus extraction and design solely on the results of the studies, regardless of personal experiences and opinions. To this extent, the said themes, including overarching extracted requirements (conceptual, theoretical, and empirical) from the studies in which they appeared were selected based on the inclusion threshold: the requirement is considered in three papers at least. It was decided between the participants of this co-design that the requirements extracted through the present study would then be synthesised into formulated design principles along the lines of Van den Akker (1999). Van den Akker (1999) explains that designed interventions for a specific purpose or goal should be characterised or identified through specific procedures for reasons given. As such, the design principles that follow from this present study are defined following this structure: characteristic of intervention, procedure, reasons to include goal or purpose. Application of Van den Akker's (1999) formulation of teaching strategies has been successfully implemented in previous studies in the domain of higher education (Noroozi et al. 2012; Spelt et al. 2009; van Ginkel et al. 2015). Additionally, deriving design principles from design requirements is in line with Design Based Research where the previously derived design requirements inform the design principles (Laurillard, 2013). Next, the design principles were shared with four other teachers for feedback, leading to further insights, upon which final design principles were developed. This process was repeated until full agreement was reached.

RESULTS AND DISCUSSION

We will first present a discussion on the results of the contexts of the selected studies as we relate the results to each of the three research sub-questions, in order to answer the main research question. See also Appendix N for contextual information on each study.

(1) How is social presence leveraged in blended learning courses in higher education?

In examining the results on social presence, the first point that becomes apparent is that whilst studies relate learning to the social constructivist theory or another form of social learning (Wei et al. 2012), and hence embrace collaborate activities or group projects, the students themselves are not keen on collaboration (Hajibayova, 2017), in particular outside of the f2f session (Martin & Bolliger, 2018). This could partly be due to collaborative assignments or group projects lacking in structure (Hajibayova, 2017; Östlund, 2008; Pan, 2022), or the student factors not having sufficiently been considered in the design of the programme (Biggs, 2003). Henceforth, it would be presumptuous to conclude that students prefer not to collaborate without examining the collaborative activities. It may well be that the activities lack meaning, structure, fail to deepen their knowledge, or have no relation to real-world issues (e.g., Konstantinidou & Nisiforou, 2022; Lowenthal & Dunlap, 2018; Martin & Bolliger, 2018; Oyarzun et al. 2018).

Additionally, a discussion forum is frequently used in the online environment to establish social presence and cognitive presence, however, this does not always tally with students' preferences as they either feel

that it takes away from their time and adds to their workload (Östlund, 2008), or not everyone participates unless it is graded, often resulting in unrelated comments (Ke, 2010). However, the quality of discussions improves when structured in terms of clear assignment of roles and responsibilities of the participants (Armellini & De Stefani, 2015). It should therefore be noted that students need to have structured activities that are meaningful (Lowenthal & Dunlap, 2018; Martin & Bolliger, 2018; Oyarzun et al. 2018), relate to real-world issues (Konstantinidou & Nisiforou, 2022; Martin & Bolliger, 2018), and expand or deepen their knowledge (Cuesta Medina, 2018; Morueta et al. 2016; Serrano et al. 2019). A structured and guided online discussion where the teacher remains present and visible through active participation, prompting, guiding, and contributing (Armellini & De Stefani 2015; Kim et al. 2016; Owston & York, 2018; Oyarzun et al. 2018), may help students see the value of the discussion forum and experience social (and cognitive) presence, especially when structured for small-group participation (Hajibayova, 2017; Li, 2022; Östlund, 2008;).

Another notable point here is that whilst peer-evaluations are considered an effective way of evoking social and cognitive presence (Lowenthal & Dunlap, 2018; Oyarzun et al. 2018), these activities should not add unnecessarily to students' workload (Hajibayova, 2017; Östlund, 2008), especially, it seems, for graduate students (Martin & Bolliger, 2018). Again, these reservations may effectively be dealt with when considering student factors (Biggs, 2003) in designing blended learning courses. It should nevertheless be noted that students will refrain from interaction if they fail to see the relevance of an activity (Gómez & Duarte, 2012). As such, without interaction there is no social presence as social presence evolves from interaction (Phelps & Moro, 2022; Zhao et al. 2014).

Furthermore, teaching presence in this regard is leading in evoking both social presence, and henceforth cognitive presence, as the teacher designs, facilitates, and monitors learning, which would include, among others, creating meaningful and structured assignments. Moreover, the teacher's *social* presence through self-disclosure, humour, and overall visibility is perceived as evoking social presence, a central element in cognitive presence (Amoozegar et al. 2022; Belt & Lowenthal, 2021; Oyarzun et al, 2018). Table 1 provides a detailed overview of the affordances, from which both the relation between the various presences as per the COI framework, and the relation between online and f2f modes becomes clear.

Table 1

Affordances social presence and convergence derived from the literature review

REQUIREMENTS	IN STUDY (No.) See the study no. per authors appx N)	ON INCREASING SOCIAL PRESENCE			ON INCREASING CONVERGENCE	
		Social Presence (sp)	Cognitive Presence (cp)	Teaching Presence (tp)	F2F	Online
Have an initial f2f meeting	2, 17, 18, 19	Establishes sp		Through course design	Establishes contact and facilitates future online contact	
Plan (small) structured group discussions, class discussions	1, 7, 8, 11, 12, 13, 14, 15, 19, 23, 24, 26	Establishes sp	Evokes cp	Through course design, facilitation, and direction	Start in one mode	Continue in the other

Allow for a choice of communication tools	2, 28	Evokes sp		Through facilitation		
Plan peer-feedback	2, 6, 11, 12, 13, 18, 20	Establishes sp	Evokes cp	Through course design and facilitation	Elaborate on online feedback	Include a clear assessment rubric
Create well-structured, meaningful collaborative activities	2, 11, 12, 13, 15, 18, 24, 28	Establishes sp	Evokes cp	Through course design, facilitation, and direction	Start in one mode	Continue in the other
Cater for different learning strategies	12		Evokes cp	Through course design and facilitation		
Have frequent formative assessments	26		Evokes cp	Through course design and facilitation		
Have a well-structured learning environment	24, 26			Through course design and facilitation		
Set high academic standards	12			Through course design and direction		
Post instructional or conversation posts, announcements and use social cues, allowing also for humour and self-disclosure: being visible through e.g. video	1, 3, 6, 7, 10, 11, 12, 13, 16, 22	Increases sp		Through course design, facilitation and teacher's sp. In particular: the teacher's sp increases sp		
Create real-world activities	5, 12, 15, 18, 20, 26	Establishes sp	Increases cp	Through course design		
Create open tasks	5	Evokes sp	Increases cp	Through course design and facilitation		
Have a clear user interface	3			Through course design		
Integrate a virtual classroom	2	Increases sp		Through course design		
Have one-on-one interactions	12			Through facilitation		
Provide prompt, individualised feedback	8, 11, 12, 15, 19, 23		Increases cp	Through course design		

Incorporate ARS or IP (Audio Response System, or Interactive Polling, for example Kahoot! and Socrative)	15, 20, 28		Increases cp	Through course design and facilitation	F2f application of ARS	Online preparation
Plan higher-order thinking, critical thinking, and deep learning activities and deepened content understanding, incorporating views and opinions	5, 9, 11, 15, 18, 19, 20	Increases sp and motivation	Increases cp	Through course design and facilitation		Online preparation through audio-visual means, web-lectures digital storytelling.
Elaborate or reinforce online learning content during f2f moments, providing immediate clarification, but avoid repetition.	14, 15, 16, 18, 19, 25, 27		Increases cp	Through course design, facilitation, and direction	Clarification, further elaboration, more complete understanding	Lectures online, basic concepts online, introduce content, and goals, preparation for f2f
Allow for self-paced learning	3, 11, 14, 15, 16, 20, 21, 26			Through course design, facilitation, and direction		e.g. literature review. Basic concepts online, practice exercises, quizzes, instructor-led learning, digital storytelling
Plan for 50% online and 50% f2f learning	17			Through course design and facilitation	50%	50%

Note: See Appendix N for studies per number, including contextual information

(2) How is convergence established in the f2f and online modes of blended learning courses in higher education?

In studying which online and f2f considerations should be made to establish convergence in blended learning, one notable aspect is that lectures should be moved to the online environment to free up the f2f environment for deep learning and higher-order thinking activities (e.g. Kjærgaard, 2017; Park & Bang, 2021; Serrano et al. 2019). The essence is that students prepare in the online environment through input of basic concepts and theory, be that lectures, quizzes, or reading material, then engage with other students through guided and structured discussions or collaborative activities, before connecting to the f2f environment through inquiry, analysis and evaluation of theory, small group discussions, group work,

prompt feedback, and answering questions (e.g. Cuesta Medina, 2018; McKenna et al. 2020; Park & Bang, 2021; Serrano et al. 2019). To strengthen the connection between both environments, a teacher could select notable comments from the discussion forum for further elaboration during f2f, or even the other way around: a discussion started in the f2f environment could be continued in the online environment (McKenna et al. 2020; Yin & Yuan, 2021), as both modes should be structured chronologically and not overlap (Cuesta Medina, 2018).

Another method used to connect to the online environment during the f2f session is through the use of Automatic Response Systems (ARS) or Interactive Polling (IP) as this encourages participation and motivates active learning (Phelps & Moro, 2022; Serrano et al. 2019). Examples of ARS or IP are Kahoot!, Mentimeter, and Socrative. Whilst it may seem obvious that the teacher is visible and present during f2f sessions, it should not be overlooked that even in blended learning, where the online environment is less dominant than in distant learning, the teacher's presence is still essential in encouraging students to interact with this mode of the learning environment (Armellini & De Stefani, 2015; Belt & Lowenthal, 2021). This not only entails teaching presence as in design, facilitation, and instruction, but also through the teacher's social presence in terms of 'being there' (Belt & Lowenthal, 2021; Lowenthal & Dunlap, 2018). Such visibility can be extended to providing video feedback (Belt & Lowenthal, 2021). An overview of the affordances of convergence is shown in Table 1.

(3) How can social presence and convergence be synergised into blended learning design principles for higher education?

The third research question can now be answered through synergising the results of the systematic literature review on social presence with those on convergence into the blended learning design principles as given. Whilst in blended learning the focus may be on converging the online mode with the f2f mode, it is clear from the results that social presence particularly plays a role as far as the teacher's social presence is concerned, and teaching presence through design, facilitation, and monitoring. This is because, as explained, social presence cannot be seen as a concept separate from cognitive processes and teaching presence.

In order to synergise the findings, the insights obtained from the studies were carefully summarised according to the procedure described above into the following blended learning design principles that foster online interaction.

1. Initial Meeting. Have an initial f2f meeting so that students can get to know one another, form groups, and get to know the teacher. Connect with students through humour and self-disclosure: setting the climate (e.g. Cuesta Medina, 2018; McKenna et al. 2020; Owston et al. 2013).
2. Collaborative Activities. Create well-structured, meaningful collaborative activities for groups of not more than 4 or 5 students. These activities should expand or deepen their knowledge. This includes considerations such as a shared goal, positive interdependence, considerable interaction, individual accountability, social skills, and group evaluation (Oyarzun et al. 2018). These collaborative activities can extend from the online mode to the f2f mode (Yin & Yuan, 2021). Students may in fact already be reasonably familiar with collaborative learning due to previous group learning experience, which is an important factor, according to Fransen et al. (2013).
3. Planning Feedback. Plan clear feedback moments for the online environment, and provide prompt feedback in the f2f environment, thereby helping students to understand the relevance of both environments (e.g. Hajibayova, 2017; Lowenthal et al. 2018)
4. Discussions. Start clear, guided discussions in one environment and continue them in the other. If the discussion is to start or continue in the online environment, ensure teaching presence

through further prompting and questioning. It is important to remain visible, also in the online environment (e.g. Kim et al. 2016; McKenna et al. 2020).

5. Self-paced learning. Allow a small scope for self-paced, individual learning in the online environment through presenting basic concepts and theory, preferably through audio-visual means, such as web lectures, videos or screencasts, ensuring clear navigation facilities (e.g. Amoozegar et al. 2022; Serrano et al. 2019; Wei et al. 2012). These can be elaborated on during f2f moments. NB when creating assignments through audio-visual means, multimedia learning principles should be applied. It is recommended to use Mayer's (2017) 12 design principles (see Appendix O).
6. Online Posts. Post instructional or conversational posts online on a frequent basis, adding sometimes humour and emoticons, but maintain one-on-one contact with students by mail, online meetings or telephone, thereby acknowledging to students that they are 'seen' online (e.g. Baragash, 2018; Ke, 2010; Kim et al. 2016).
7. Peer Evaluations. Plan peer-evaluations using a clear assessment guide, keeping in line with students' workload (e.g. Serrano et al. 2019; Zhao et al. 2014).
8. Real-world Activities. Create real-world activities that are meaningful to students. This will increase student involvement (e.g. Konstantinidou & Nisiforou, 2022; Martin & Bolliger, 2018; Morueta et al. 2016).
9. Deep Learning. Plan higher-order thinking activities (analysing, synthesising, evaluation, creation) that connect to the online preparations through inquiry, higher-order thinking, critical evaluation, academic discourse, elaborating on concepts, and debate, hence facilitating deep learning e.g. Hoey, 2017; Morueta et al. 2016).
10. Categorise Content. Categorise online and f2f content. Repeating in the f2f environment what is already online will indirectly send a message to students that they do not have to interact online since lessons are f2f as they have been traditionally, and to which they are accustomed. Instead, maintain the trend of elaborating during f2f sessions on the basic concepts presented online (e.g. Cuesta Medina, 2018; Kjærgaard, 2017; Park & Bang, 2021).

The design principles (dp) provided herewith have been compared in relation to recent developments on design principles in blended learning courses. Whilst the given design principles in the present study are specifically related to fostering online interaction in blended learning courses, it is interesting to note that some of these principles are verified in recent studies, notably Versteijlen et al. (2023). Versteijlen et al. (2023), in focussing on blended learning as a means to support sustainability-oriented education, explain that among the common [blended learning] principles that may support the development of sustainability competences are: community building (similar to dp 1 'initial meeting'), discussion (similar to dp 4 'discussions'), collaboration (similar to dp 2 'collaborative activities'), self-regulation (similar to dp 5 'self-paced learning'), and knowledge management (similar to dp 6 'online posts', dp 8 'real-world activities', and dp 9 'deep learning'). Other principles mentioned, perhaps more related to sustainability, are: orientation towards sustainable change, interdisciplinary collaboration, and self-awareness. These principles have no comparison to the design principles provided in the present study, but may nevertheless be interesting to take note of. Whilst their design principles are interesting, they explain 'what' and 'why', but often lack in 'how'. Furthermore, they may not necessarily provide enough context to explain the details and the flow of blended learning, as learning content and activities may flow from one learning mode to the other, and back. Blended learning has a dichotomous learning environment that should be dynamically related. The design principles provided in this present study focus on this dichotomy and, where appropriate, explain 'how' to apply given design principles.

Another comparison relates to a recent multiple case study by Lai et al. (2016). Lai et al. (2016) base their design principles on two major principles, namely consolidation and extension. In the first aspect it relates to knowledge being consolidated, in the second aspect it relates to the space of learning and

catering to students' varying educational needs. The latter is not necessarily a new phenomenon: Biggs (2003) explains that when designing education, students' educational needs and learning characteristics in addition to the learning environment should be considered, as further explained below under 'limitations'. The focus of the present study is on fostering online interaction in blended learning courses by arriving at design principles from design requirements extracted from literature. Nevertheless, in the design of any education programme, the target group must be considered. Whilst said study provides interesting insights, it does not necessarily provide design principles specifically related to the dichotomy of blended learning, whereby the online learning environment and the f2f learning environment are to work synergistically.

CONCLUSIONS, LIMITATIONS, AND IMPLICATIONS

This study aimed to understand how online interaction in blended learning courses can be fostered. Following Laurillard's (2013) understanding of teaching and instruction, design principles that leverage online interaction in blended learning courses were extracted from design requirements. By conceptualising teaching and instruction as design science, Laurillard (2013) introduces a trifecta of design requirements, design principles, and design features, aiming to develop instructional patterns and models. The first step then [in this study] is to extract the design requirements from literature upon which design principles are created. Arriving at design features would be more context specific, and includes elements such as establishing student factors (Biggs, 2003), strategies on how to motivate students, suggestions for the technology to be used, and assessment, among others. Whilst full-scale instructional design models that incorporate said elements are helpful and provide useful features, they provide a broad overview that can be adapted to specific contexts, rather than a precise set of design principles detailing exactly how to implement both modes of the learning environment synergistically in a way that fosters online interaction.

Henceforth, with the results given we are able to answer the main research question: *How can online interaction in blended learning courses in higher education be leveraged through social presence and convergence?* Online interaction in blended learning courses in higher education can best be leveraged through operationalising both aspects of social presence, in particular that of the teacher, and synergy of both modes. Tynjälä (2013) explains that the learning environment is where students interact with the learning content, with each other, and with the teacher. This interaction in the learning environment (f2f or online) is the role of the teacher through the design of the course, facilitation, and instruction (Garrison et al. 2000), one that the COI framework refers to as teaching presence. It seems correct, therefore, to place the teacher's role central in students' learning processes, since the learning processes are a result of the design of the learning environment as per Biggs' (2003) notion of 'constructive alignment'. The design principles given may help course designers in designing blended learning courses, whilst the same also help fill the gap in the current literature on blended learning designs.

Limitations

Some limitations pertain to the measure of social presence. Whilst the definition of social presence has not been narrowed in the search terms since the largest number of hits were sought after, the theory that emerged revealed different scales by which social presence is measured. Whilst the most prevalent is the COI survey, there are other scales, such as the Richardson and Swan scale (Richardson et al. 2017), which may claim to measure the same construct. Scales used may in fact capture different elements due to varying dimensions of social presence, social presence being multidimensional in nature (Kim et al. 2016). Our interpretation of social presence may therefore lack precision.

A second limitation pertains to the type of students in the various studies. Whilst all studies were selected according to the inclusion criteria, here: higher education, it was not always clear which studies focussed

on undergraduate students, perhaps the more traditional type of student that enters tertiary education for the first time after having left secondary education, and which studies focussed on graduate students. Graduate students are perhaps less traditional students that possibly have a family and are working professionals, and hence have different time availability which may influence their decision to interact online. Not all conclusions or principles in this study therefore may be applicable as there is no one size fits all.

Finally, whilst emphasis has been on the lack of online interaction from the design perspective, there may in fact be other causes that inhibit students from online interaction. Some of these factors include, inter alia, lack of ICT facilities, lack of technical know-how, and wariness of the online environment due to familiarity with traditional f2f teaching. These matters have not been addressed in this study, but should be considered when designing an online mode of any learning environment (blended or distant).

Implications

The results of this study bring with them three salient implications, namely the aspect of teacher's time, training, and student factors. Much emphasis has been placed on the teacher's (social) presence, particularly in terms of visibility, facilitation, and frequent and prompt feedback. These may optimise students' learning processes, but may in fact demand too much of the teacher's workload. Considerations should be made when designing a programme to ensure that a proper balance is maintained between the students' workload and that of the teacher's.

The suggested design principles above may assist in designing a blended learning course. We believe that the systematic approach outlined in our paper, along with the derived design principles based on social presence and convergence, can equip even skilful practitioners with robust theoretical lenses. These design principles can enable them to scrutinise their practices, reason about their designs, evaluate performance, and make necessary adjustments. However, it is recommended that full training be obtained, in particular when an entire institute decides to offer existing programmes 'blended learning style', since the design of blended learning at institute level should be properly facilitated in terms of time and training (Cuesta Medina, 2018).

Lastly, when designing a blended programme, the students' criteria, for example, level of autonomy, self-directedness, and so on, determine their learning needs and approach to education in general, referred to as 'student factors' by Biggs (2003). Designing a learning environment is only one part of ensuring learning processes as optimised. If such a design is not in line with the student factors, the desired effects may still not be had (Biggs, 2003).

5

TOWARDS TEACHING STRATEGIES ADDRESSING ONLINE LEARNING IN BLENDED COURSES FOR ADULT-LEARNERS

This Chapter is based on:

Van der Stap, N., van den Bogaart, T., van Ginkel, S., Rahimi, E. & Versendaal, J. (2024b). Towards Teaching Strategies Addressing Online Learning in Blended Learning Courses for Adult-Learners. *Journal of Computers and Education*. <https://doi.org/10.1016/j.compedu.2024.105103>

ABSTRACT: Blended learning offers a learner-centred approach that employs both in-class learning and digital technology to facilitate online learning. Such an approach is especially advantageous to adult-learners in higher education as it meets their educational needs. However, adult-learners' participation in blended learning courses remains challenging due to a general lack of online interaction, and no clear teaching strategies that address this concern. Literature relating to adult-learners' educational needs and online interaction was consulted in order to design teaching strategies that foster adult-learners' online interaction. The aim of this study is to further validate these teaching strategies, hence a multiple case study was carried out using a mixed method approach. As such, eight teachers and sixteen students from eight courses across three universities in Belgium and the Netherlands were interviewed. Additionally, a questionnaire testing a pre-defined set of variables was distributed to 84 students. The results lead to a set of validated teaching strategies that help teachers to further develop their professional skills and expertise. The teaching strategies can be grouped into three categories, namely 1) the teacher's online presence, 2) collaborative learning activities and preparatory learning activities, and 3) the distribution of learning content and learning activities across online and in-class learning. An elaborate set of validated teaching strategies is included. This study aids towards teacher professional development and adds evidence-based knowledge to teaching strategies and instructional frameworks for adult-learners in higher education.

INTRODUCTION

Literature on educational technology generally considers blended learning as a 'blending' of in-class or face-to-face (f2f) and online instructional activities, aiming to stimulate and support learning (Boelens et al. 2015). Moreover, blended learning facilitates a transformative, didactical approach aimed at increasing the levels of interaction among students through cooperative or collaborative activities, evoking higher-order thinking and deep learning (Biggs & Tang, 2007; Kjærgaard, 2017; McKenna et al. 2020). This approach is highly welcomed by adult-learners in higher education as it affords them flexibility in terms of time and place (Decelle, 2017; Diep et al. 2017; Jones & Blankenship, 2017). Despite this affordance, preliminary studies that took place in a higher education context reveal that a lack of interaction with online learning content results in an increasing number of adult-learners leaving the blended learning course prematurely (Choi & Kim, 2018; Johnson et al. 2018; Kuo & Belland, 2016), having lower learning outcomes (e.g. Cuesta Medina, 2018; McKenna et al. 2020; Serrano et al. 2019), or having poorly perceived learning experiences (Armellini & De Stefani, 2015; Kim et al. 2016; Morueta et al. 2016).

When designing education aimed at higher education adult-learners, it is important to consider their needs and learning characteristics as they relate to education (Milheim, 2011; Youde 2018), since any educational design should cater for the target group (Biggs, 2003). Whilst higher education adult-learners are self-motivated (Chametzky, 2014), and, as said, the construction of blended learning appeals to them, the implementation of an online mode to the learning environment is challenging as most higher education adult-learners are likely to be more familiar with traditional, in-class education, and need to see the meaning of the 'added' online mode (Owston & York, 2018). In particular, higher education adult-learners need to have opportunities that facilitate deep-learning (Cuesta Medina, 2018; Kjærgaard, 2017), they need to see the relevance and meaning of what they need to learn and how they need to interact with learning content (McKenna et al. 2020), and they need opportunities for self-directed learning (Zhang & Zheng, 2013). To foster interaction with the online mode, it is therefore imperative that said educational needs are considered. As online interaction is both the pillar of blended learning, and the culprit of adult-learners' de-motivation, said needs have to be aligned with the design of the dichotomy of the blended learning environment.

Previous studies have revealed two salient challenges concerning the lack of online interaction in blended learning. The first of these is related to social presence, which is "the ability of participants in a community of inquiry to project themselves socially and emotionally as 'real' people (i.e. their full personality), through the medium of communication being used" (Garrison, et al. p. 94). This involves students' awareness of other beings in the online mode of the learning environment (Andel et al. 2020; Hodges et al. 2020). The second salient challenge is related to convergence, where online learning and f2f learning are structured along the most appropriate learning mode (King & Arnold, 2012; Owston & York, 2018). When students do not experience social presence, they feel isolated and refrain from online interaction (Martin & Bolliger, 2018; Oyarzun et al. 2018). Likewise, when students do not see the relevance of the relation of the activities in the online and f2f modes, they often ignore the online environment and choose to participate in the f2f mode only, being the mode they are most familiar with (Östlund, 2008; Owston & York, 2018).

Lack of social presence and convergence between online and f2f modes are two challenges that can be met through blended learning teaching strategies⁴, in particular as they relate to the needs of adult-learners in higher blended education (Chametzky, 2014; Konstantinidou & Nisiforou, 2022;

⁴ The teaching strategies referred to in this study are a set of validated blended learning design principles in line with Laurillard's (2013) approach to Design Based Research, as further elaborated through evidence-based practices.

Vanslambrouck et al. 2019). Adult-learners' educational needs, specifically as they relate to blended learning, largely influence the way adult-learners approach learning (Konstantinidou & Nisiforou, 2022; Youde, 2018), and remain motivated (Gómez & Duarte, 2011; Martin & Bolliger, 2018). Higher education adult-learners are to be distinguished from 'hands-on' adult-learners (Boelens et al. 2018), where students generally learn by doing. This distinction is captured by the experiential adult-learning theory which explains that hands-on adult-learners learn from experience (e.g. Cercone, 2008; Milheim 2011). Typically, these students have practical knowledge, but need sufficient support and direction from the teacher (Boelens et al. 2018). In contrast, higher education adult-learners have, *inter alia*, a high sense of self-directedness, preferring a large amount of autonomy, one in which they direct and strategise their own learning (e.g. Chan, 2010; Zhang & Zheng, 2013). These differences, among others, between teacher-directedness and self-directedness, have their bearing on both social presence and convergence as course design capturing these essences should meet the needs of students (Biggs, 2003). Against this background, teaching strategies in blended learning courses specifically geared towards higher education adult-learners are essential for their engagement in learning processes (Hodges et al. 2020; Vanslambrouck et al. 2019; Youde, 2018). In the absence of such teaching strategies, teachers may fall back into traditional methods and pedagogical approaches that are generally more suited for students who have recently left secondary education, entering tertiary education for the first time (Serdyukov, 2017).

When considering teaching strategies in the design of blended learning courses, designers need to contemplate both the target group or student factors (here: adult-learners in higher education) and the teacher context, understood as the design, facilitation, and monitoring of the learning environment (here as related to: social presence and convergence). The student factors and the learning environment are two aspects that Biggs (2003) refers to as 'presage' in his 3P model. Biggs (2003) in his 3P model explains that when designing education, several aspects have to be taken into account, namely the factors of 'presage', 'process', and 'product'. The presage factor is two-fold and includes the learner characteristics and educational needs on the one hand, and the teacher context or learning environment on the other. The process factor is where the learning processes are the result of the design of a learning environment aligned with the educational needs of a specific group of students. The product factor is where the learning outcomes are the result of said learning processes. In short, the learning environment is where activities and learning content are in line with students' educational needs, and designed in order to effect learning processes that bring about targeted learning outcomes. This overall approach is understood as 'constructive alignment' (Biggs, 2003). Biggs's 3P model is particularly useful as it connects design principles to student factors, and, as such, has been successfully applied in previous research on design principles (Spelt, 2009; Noroozi et al. 2012; Van Ginkel, 2015).

Thoughtful contemplation of the design of a blended learning educational programme is necessary in order to understand what leverages students into interaction, how students should interact with the content, with whom, and according to which mode (Hodges et al. 2020; King & Arnold, 2012; Kjærgaard, 2017). Teaching strategies should therefore consider the full implications of presage to evoke the intended learning processes that in turn deliver the desired learning outcomes. Indeed, when a learning environment is not tailored to students' educational needs, learning processes may be impaired (Hodges et al. 2020; Kuo & Belland, 2016).

As a first step in creating an instructional framework encompassing blended learning teaching strategies, literature was consulted, both on higher education adult-learners' educational needs (e.g. Chametzky, 2014; Konstantinidou & Nisiforou, 2022; Zhang & Zheng, 2013), and on social presence and convergence (e.g. Garrison, 2000; Garrison & Kanuka, 2004). The findings resulted in a comprehensive set of teaching strategies. However, said set of teaching strategies are based on theory only, and have not yet been empirically validated. Against this background, this multiple case-study sets out to explore social presence

and convergence in blended learning environments tailored specifically to higher education adult-learners, and how social presence and convergence are perceived by these learners. This study will further refine the previously designed teaching strategies by learning from concrete evidence-based practices⁵ at varying universities in Belgium and The Netherlands.

More specifically, this study aims to empirically examine the teaching strategies needed to foster online interaction amongst higher education adult-learners in blended learning courses. To this extent the following question is asked:

How can online interaction be leveraged amongst higher education adult-learners in blended learning courses?

The results of this study will culminate in validated blended learning teaching strategies for higher education adult-learners as the study adds prescriptive knowledge that will help fill the gap in the current literature on the didactical uses of digital technology in education specifically in catering for higher education adult-learners. The teaching strategies are aimed at leveraging higher education adult-learners into online interaction in blended learning courses, and blended learning in general as it addresses social presence and convergence aimed at fostering interaction with the online mode. Additionally, the findings are synergised into blended learning teaching strategies that can foster online interaction which teachers can use when designing blended learning courses.

In the following sections we conceptualise the case study, followed by research questions, and the method and analysis applied. Lastly, we discuss how the findings in this study fill the gap in online interaction in the current blended learning practice as it relates to adult-learners in higher education, together with blended learning teaching strategies geared towards said students.

CONCEPTUALISING THE CASE STUDY

In following Biggs' (2003) constructive alignment as outlined above, it becomes clear that both aspects of presage (student factors and learning environment) need to be aligned before learning processes may be expected. This means that learning activities and learning content: what to do, how to do it, and according to what mode (Kjærgaard, 2017; McKenna et al. 2020) need to relate to the educational needs of adult-learners (Biggs, 2003; Milheim, 2011; Snyder, 2009). The challenge, as explained, is leveraging adult-learners into online interactions. Therefore, their needs in relation to blended learning in general, and online interaction in particular, need to be aligned. Figure 1 shows the conceptual framework of adult-learners' salient needs as it relates to leveraging online interaction, and the resulting learning processes and learning outcomes.

⁵ Evidence-based practices are those that correspond with empirical results reported in literature

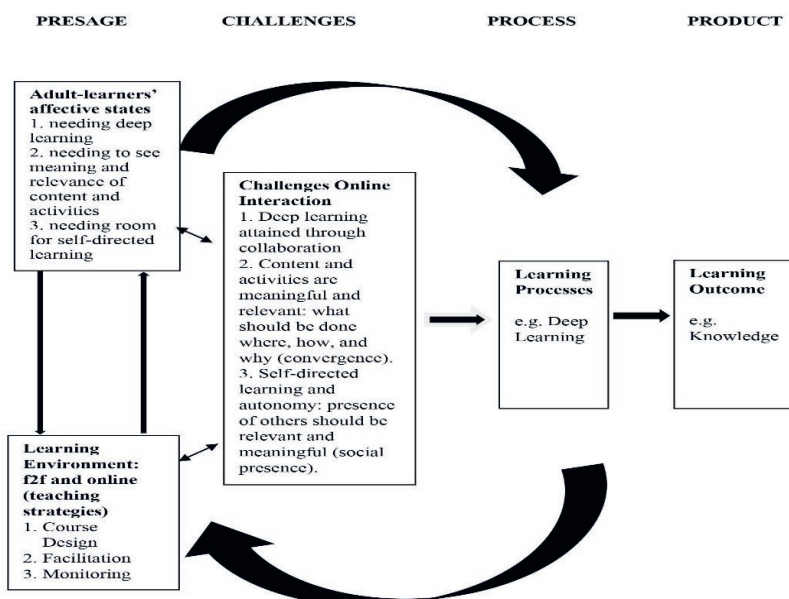


Figure 1: Conceptual Framework, Adapted from Biggs' 3P model (2003).

Adult-learners in higher education

Adult-learners in higher education, who are presumed⁶ working professionals, should be met with a different approach to learning (Chametzky, 2014; Konstantinidou & Nisiforou, 2022; Youde, 2018). To understand what such a different approach should entail, a full comprehension of the educational needs of adult-learners in higher education is required. A previous systematic literature review (Van der Stap et al. 2023) revealed the commonalities between the salient adult-learning theories as being, inter alia, (1) the need for deep learning, for example as afforded through design, i.e. where basic concepts are elaborated on into higher-order thinking activities (e.g. Biggs & Tang, 2007; Kjærgaard, 2017; McKenna et al. 2020), (2) the need for content and activities to have meaning and relevance (e.g. Snyder, 2009; Martin & Bolliger, 2018), and (3) the need for self-directed learning and autonomy (e.g. Konstantinidou & Nisiforou, 2022; Milheim 2011, 2014; Zhang & Zheng, 2013). Some of these needs are strongly related to each other, for example, deep learning and meaning, but also self-directed learning and relevance. Said aspects will be interwoven in the present case study.

Designing the blended learning environment

The learning environment is where the course design comes to fruition through students interacting with content and with each other by carrying out the learning activities that effect learning processes (Biggs, 2003; Gómez & Duarte, 2011). More specifically, a learning environment can be seen in its entirety as one that has physical, technological, psychological, social, and cultural resources (Loi & Dillon, 2006). As Piccoli et al. (2001) explain, this would include six aspects that can be used as a basis of a systematic

⁶ Traditionally Knowles' (1984) definition of andragogy rests on six assumptions that more likely would be applicable to those learners who have the life experience needed to self-direct and self-manage (Chametzky, 2014). While the adult age is normally set at age 25, from the definition it becomes likely that this can include younger learners and exclude older learners. In this proposal it is assumed that those students who study part-time, do so because of work, family, or both, and therefore presumably have the life-experience needed to be defined as adult-learners.

design of any learning environment, namely technology, pedagogical foundation, content, learning model, interaction model, and learner control.

Whilst adult-learners are self-motivated learners (Chametzky, 2014), it is important to understand what they value and need in order to avoid demotivation. In blended learning, adult-learners, being more familiar with traditional f2f pedagogy, need to see the *relevance* of the 'added' online mode (Owston & York, 2018). This requires a careful reconsideration of the blended learning course in its entirety and evokes the question: what to do online, and what to do f2f (Cuesta Medina, 2018; Kjærgaard, 2017; McKenna et al. 2020). The challenge of designing a blended learning course is to arrive at an integration of both learning modes (online and f2f) in such a way that one mode scaffolds onto the other, hence adding value (Gómez & Duart, 2011). A previous systematic literature review (Van der Stap et al. 2024) revealed that the synergy of both modes is achieved by placing basic concepts in the online mode, leaving room for higher-order thinking concepts in the f2f mode (Kjærgaard, 2017). This approach is facilitated through collaborative activities (Garrison et al. 2000), which is of particular interest to adult-learners in higher education as they facilitate deep learning (Cuesta Medina, 2018; Kjærgaard, 2017; Owston & York, 2018).

Additionally, adult-learners need to experience the *meaningful* presence of other beings in the online mode and experience being seen (Konstantinidou & Nisiforou, 2022; Owston & York, 2018), in order to remain motivated to interact online. The design of the learning environment then needs to foster interaction amongst adult-learners with others in the online mode so as to prevent them from feeling isolated (Martin & Bolliger, 2018). This requires careful consideration of the design of blended learning courses.

To provide an understanding of interaction with learning content through collaborative activities, Garrison et al. (2000) explain the concept of three presences: 1) social presence, 2) cognitive presence, 3) teaching presence. In addition to social presence, cognitive presence is explained as "the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry" (Garrison et al. 2001, p. 89). A third presence is 'teaching presence', which is defined as "the design of the course, the facilitation of academic discourse, and direction of cognitive and social processes with the aim of realising personally meaningful and academic learning outcomes" (Garrison et al. 2000, p. 89). The three presences are illustrated by the Community of Inquiry (COI) framework which focuses on learning from a collaborative point of view (Garrison et al. 2000), as shown in Figure 2.

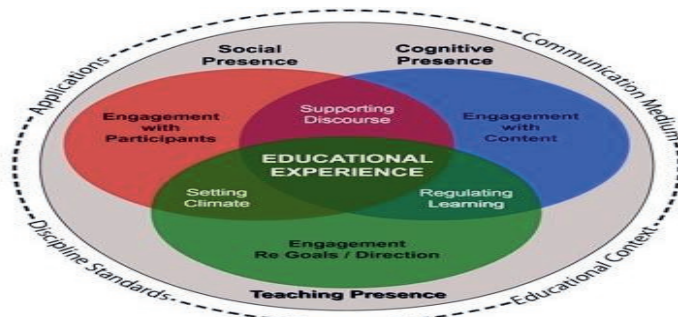


Figure 2: The Community of Inquiry framework⁷

⁷ Image used with permission from the Community of Inquiry website and licensed under the CC-BY-SA International 4.0 license (<https://creativecommons.org/licenses/by-sa/4.0/>). The original image is located at <https://www.thecommunityofinquiry.org/framework>

Within the Community of Inquiry (COI) framework, social presence plays a central role in cognitive presence. As explained by Garrison et al. (2000), "The primary importance of this element is its function as a support for cognitive presence, indirectly facilitating the process of critical thinking carried on by the community of learners" (p.89). Indeed, when social presence is established, cognitive presence is activated and more easily supported (Amoozegar et al. 2022; Gutiérrez-Santiuste et al. 2015; Kozan & Richardson, 2014; Li, 2022). Nevertheless, whilst social presence plays a central role in cognitive presence, both those presences are the result of teaching presence through design, facilitation, and direction. In other words, the learning environment, and with it the learning processes, are the result of carefully implemented teaching strategies that fully implement social presence in order to evoke and sustain cognitive presence, and through which the online and f2f modes are the results of 'thoughtful integration' (Garrison & Kanuka, 2004), which are furthermore aligned with the student factors (here: adult-learners).

The present study

To arrive at teaching strategies tailored to higher education adult-learners, it is essential to validate claims made in literature as illuminated in the previous systematic literature reviews (Van der Stap et al. 2023; Van der Stap et al. 2024). To filter out students' needs in online interaction from students' obedience or diligence, the research questions are specifically directed towards adult-learners' needs as these relate to their perceived value of online interaction, of which an understanding is sought after in this present study.

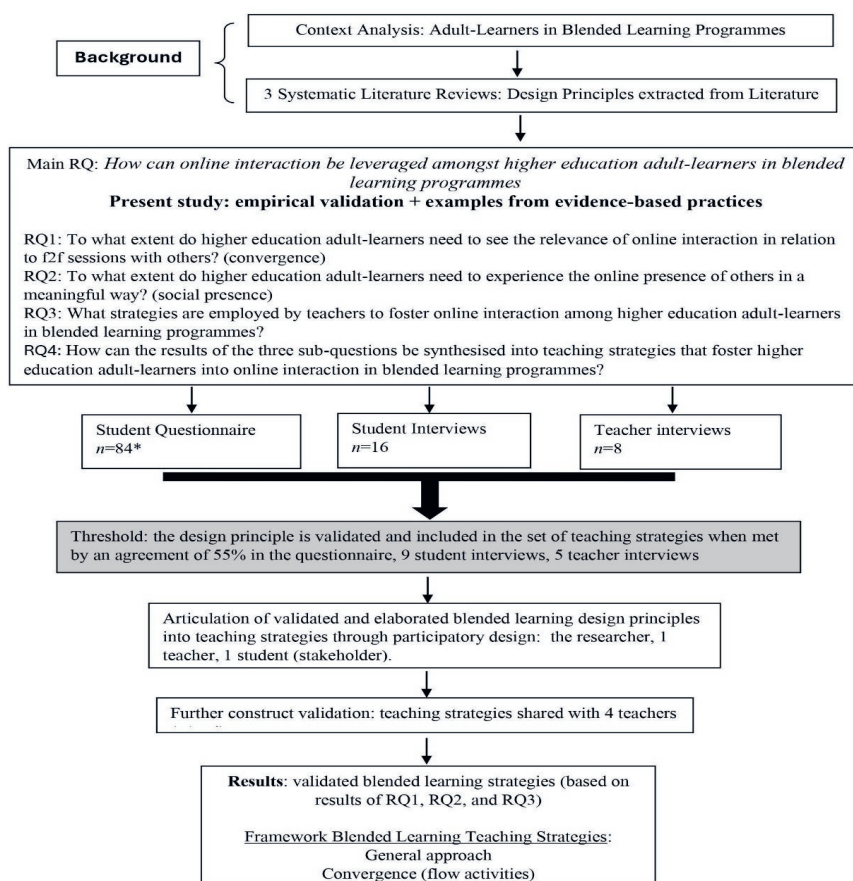
The first salient need relating to online interaction has been summarised as 'needing to see the relevance of online interaction in relation to f2f sessions' (convergence). The second need relating to online interaction has been summarised as 'needing to experience the online presence of others (peers and teacher) in a meaningful way' (social presence). Since the result of the present study is to arrive at teaching strategies geared towards fostering online interaction amongst higher education adult-learners, it is essential to understand how adult-learners' needs and learning experience relate to course design. In The Netherlands and Flanders (Belgium), where this present study was conducted, it is frequently the teacher who designs the course. It is important therefore to understand how teachers establish teaching presence through design, facilitation, and direction, and the effect this has on the adult-learners participating in their courses. The salient needs of adult-learners in higher education, as mentioned, are interwoven in the questions that are investigated. Henceforth, the following are examined:

- (1) To what extent do higher education adult-learners need to see the relevance of online interaction in relation to f2f sessions with others? (convergence)
- (2): To what extent do higher education adult-learners need to experience the online presence of others in a meaningful way? (social presence)
- (3): What strategies are employed by teachers to foster online interaction among higher education adult-learners in blended learning courses?
- (4): How can the results of the three sub-questions be synthesised into teaching strategies that foster higher education adult-learners into online interaction in blended learning courses?

METHODOLOGY

This study uses a naturalistic case study style (Stake, 1995) to document adult-learners' needs pertaining to (the lack of) online interaction, and the teacher's design choices, through a mixed-method approach. Data was collected during a regular semester through a questionnaire and interviews with students and teachers respectively, the latter who are also the course designers in Flanders (Belgium) and The Netherlands. The questionnaire and student interviews relate to the first two research questions. The

teacher interviews relate to the third research question. A description of the validation process and articulation of teaching strategies, a participatory design undertaking, is described in the discussion section in answer to sub-question 4. See Figure 3 for an extensive outline of the methodology applied, including the participatory design process and the results.



* 84 questionnaires were distributed yielding a 34.5% response rate which is deemed acceptable (Nulty, 2008)

Figure 3: Flowchart Methodology

Research setting

The present study uses a convergent design (Creswell & Plano Clark, 2011), comparing both qualitative and quantitative data sources simultaneously. For both types of data parallel constructs were used whilst data were analysed separately. The mixed-method approach enabled the assessment of personal experiences and teaching presence through both quantitative and qualitative data (Creswell & Plano Clark, 2011). The potential strengths of both qualitative and quantitative methods are therefore drawn upon.

Participants and Data Collection

Teachers

The participating teachers in this multiple-case study were eight teachers, seven female and one male. The teachers were selected based on their experience in blended learning from the researcher's own

network, either directly or through third-party reference. Basing our selection on teachers experienced in blended learning would provide for rich insights, as opposed to randomised samples. To this extent, the teachers received information letters and informed consent forms. All the teachers had an average of 8 years' experience in blended learning course design and blended learning teaching. There were two teachers in Flanders (Belgium), and six teachers in the Netherlands. Each teacher uses a Learner Management System (LMS) called Canvas through which the students interact with online content and assignments. As different teachers approach blended learning in different ways, this aspect is further expanded during the teacher interviews.

Seven of the eight teachers were teachers at teacher-training colleges, catering for a variety of programmes such as languages, maths, pedagogy, biology, geography, history, and chemistry. One teacher was a teacher of an MBA programme. Within these programmes different blended learning courses were catered for by the selected teachers. Two courses lasted for one whole semester, the other courses were all half a semester. All the programmes in which the teachers taught were graduate programmes at universities of applied sciences.

Students

There were 84 students invited to participate in a questionnaire. From the 84 students, 40 students were randomly invited for semi-structured interviews. A random selection is preferable to avoid bias and increase generalisability (Yin, 2014). A total of 16 students agreed to participate in the interview. All the students in this study were graduate students participating in four blended learning graduate teaching-training programmes from three universities in The Netherlands and Flanders. All students had at least one year experience with blended learning in different courses. This ensured that answers would be based on a broad experience with blended learning courses, as opposed to the findings of one particular teacher. All the students participated in part-time teacher training programmes which included a mandatory internship or suitable employment. The students had an average age of 39, the minimum age was 27. In view of their age and existing employment, the students were assumed adult-learners, fitting within the criteria as defined by adult-learning theories.

There were sixteen students from four different courses. The students were unknown to the researcher prior to the interviews. Approved information and consent forms with the researcher's email address were forwarded to the teachers of participating institutes for distribution to their students who could then contact the researcher themselves.

Questionnaire

To participate in the questionnaire, the aforementioned teachers were given a code generated by the survey programme called 'Crowdtech', which they then distributed to their students ($n=84$). By entering the questionnaire through a code, anonymity is guaranteed. Said code to the questionnaire was distributed to the aforementioned 84 students across four blended learning course courses at three universities. Of the 84 students, 29 students, or 34.5%, completed the questionnaire. Researchers have determined that in social science research, using online questionnaires, this is an acceptable response rate (see Nulty, 2008; Sheehan 2001).

A closed-ended questionnaire (see Appendix P) was developed since close-ended questions enable quick comparisons of answers between students (Cohen, 2013). The questionnaire was designed by the first researcher and subsequently reviewed by four members of the research team, not including the first researcher. Next a focus group consisting of two students, four teachers, and one expert ($n=7$) was invited through information letters, whereupon several discussions followed. Additionally, the questionnaire was piloted to a group of five students which resulted in a further finetuning of the

questions. This process was repeated three times until no further alterations were deemed necessary. The questionnaire included a total of sixteen questions, investigating eight variables. Each question in the questionnaire was asked twice, but phrased differently in order to increase construct validity (Cohen, 2013) as this construction double-checks the answer with the earlier question to which it is paired. The questions tally with a set of variables (see Appendix Q), which are related to the two aforementioned themes derived from literature, namely social presence and convergence as it relates to adult-learners' educational needs and learning characteristics.

The questionnaire was aimed at obtaining an overview of students' considerations for online interaction, or refraining from such. To this extent, a four-point Likert-like scale was designed in favour of the traditional five-point scale since a 'forced option' was sought after (Chyung et al. 2017). In this manner, a diversion of results due to respondents abstaining from an opinion by answering 'neutral' to a question could be avoided.

Interviews

The students agreeing to participate in this study ($n=16$) were invited for voluntary participation in semi-structured interviews (Edwards & Holland, 2013). The interviews were semi-structured to increase reliability since the structure and types of questions were the same for all candidates, whilst at the same time leaving scope for further questioning when deemed necessary (Keith, 1988). The interview protocol (see Appendix R) was designed around a set of inductively acquired, predetermined open-ended questions that allowed the interviewer to ask for more in-depth clarification (Cohen, 2013). The interview questions were drawn up with a co-researcher, then discussed in the research team consisting of three members, followed by a discussion with one focus group composed of two teachers. Following this procedure, the questions were analysed in relation to the aforementioned variables to ensure content validity. Next, the interview was piloted twice to further validate the construct. The interviews took an average of 20 minutes.

Additionally, deep interviews with the participating teachers ($n=8$) focussed on their blended learning design choices, and following a similar protocol (see Appendix R), were held. All the teachers were interviewed by the first researcher of this study. The interviews varied in time, 39 and 112 minutes, with an average of 69 minutes. After analysing the interviews it became clear that theoretical saturation appeared to have been reached (Glaser & Strauss, 2017), since after removing one or two random samples from the set of eight teachers, no insights had been lost. To avoid social desirability bias (Cohen, 2013), all interviewees were informed that there were no right or wrong answers, that anonymity would be guaranteed, and that data would be reported with full confidentiality prior to each interview. The interviewees were given the transcripts of the interviews afterwards to ensure that they had said what they had intended to say. They were free to alter, delete, or add text. Two teachers made use of this opportunity. All the interviews of the interviewees were audio-recorded with permission granted prior to each interview.

Data Analysis

Questionnaires

A total number of 30 students fully completed the questionnaire. Whilst we appreciate that this is a rather limited size of respondents, the present study seeks to validate findings from previous systematic literature reviews and to learn from evidence-based practices, the results of which therefore are not intended to be generalisable to a wider population (Cohen, 2013).

An initial step in the analysis was to clean the data (Gillham, 2000). Data cleaning in this case involved correcting contradicting data. From the 30 students, one student was inconsistent with answers,

'agreeing' on one item and 'disagreeing' on the second item to which the question was paired. It was decided with a co-researcher to remove the inconsistency this student produced. Hence, to maintain reliability, the participant's responses were eliminated from the dataset. No other contradictions were found as all the other students' responses were seen to be consistent with their answers, the only variations being between the degree upon which students either agreed or disagreed. Hence 29 participants were included in the final data set.

In the next phase of analysis, the parallel questions were added to the questions they were paired with, after which the results were totalled. This gave an overall score of 58 responses per item. Next, the total score was halved to account for the actual included number of participants, after which the percentages in relation to the variables were calculated. The results were subsequently double-checked by a co-researcher.

Interviews

To avoid harmful effects of subjectivity, content analysis was applied to all the interviews by two researchers who had read all the scripts to familiarise themselves with the content. Next, the conceptual framework that results from preliminary literature reviews (Van der Stap et al. 2024) was used in order to arrive at an initial coding scheme. Open coding was applied despite familiarity with concepts as this allowed for new, unknown themes to emerge (Corbin & Strauss, 1990). This process was followed by axial coding, and lastly concluded with selective coding. The first and second researchers discussed the coding strategy, upon which the second coder independently analysed all sixteen scripts as they pertained to the students, and eight scripts as they pertained to the teachers. After the coding was completed, the various disparities were discussed by the two independent coders until full agreement was reached.

To further guide the analysis process, the final codes that had emerged were categorised through deductive reasoning and the use of sensitising concepts (Corbin & Strauss, 1990). This process was repeated until broader categories were formed, describing the content to allow for comparisons with other responses. Each category was summarised in a discussion with the independent second researcher. Next, the summaries were drawn together and emerging patterns were analysed after which three salient themes were identified that allowed for mapping onto the previously examined factors. These salient themes were 1) leveraging online interaction through convergence, 2) leveraging online interaction through social presence, 3) teaching presence through design, 4) teaching presence through facilitation, and 5) teaching presence through direction. Mapping the themes onto the factors allowed for comparison to the number of students that shared a given opinion. All conclusions were drawn together with the co-researcher in several discussions until full agreement was reached. The final version of the coding scheme with operational definitions (see Appendix S) shows the main categories that emerged from the themes: four categories pertaining to the first two themes, eleven categories pertaining to the last three themes.

RESULTS

We first briefly present the findings of the questionnaire and the student interviews in Table 1 and Table 2 respectively, together with a side-by-side comparison of both in Table 3. Following this, we present the findings of the teacher interviews. In the discussion that follows thereafter we address the research questions.

Questionnaire results

In the questionnaire, the online environment (LMS) is referred to as Canvas. Students from the participating institutes in Flanders and The Netherlands are familiar with this term as it refers to their LMS, and might be confused if the term 'online mode' were used. The paired questions are placed together in Table 1, showing the results in comparison to their variables, where the ratings in which students can

agree or disagree have been merged in overall agree or overall disagree to allow for comparison with the results of the interviews, as so-called 'third effort' (Morgan, 1998). On the whole, only half of the students do not value working with peers online, preferring to work on their own. Students further value online activities and content to be aligned with f2f content and activities through scaffolding or elaboration during f2f lessons. Nearly half of the students agree that if no attention is given to the assignments either promptly online or during f2f sessions, they will no longer be carried out. To this extent, nearly all the students agree that studying online content and carrying out online activities should be necessitated in preparation for the f2f sessions. Nearly half of the students feel that if online content is repeated during f2f sessions, they would only consider one of them: either study online, or attend the f2f session. In terms of meaning and relevance, more than half of the students would not carry out assignments if there is no direct relation to their professional practice or assessment.

Table 1

Student Answers in Relation to Variables

Variable	Paired questions	% agree rounded off <i>N</i> = 29	% disagree rounded off <i>N</i> = 29
1. Assignments in the online platform are not carried out because there is no peer-feedback	Q 1 & 9	48	52
2. Assignments in the online platform are needed in preparation for the f2f meetings	Q 2 & 6	91	9
3. Assignments in the online platform are not carried out when there is no relation to professional practice or tests	Q 3 & 12	60	40
4. Assignments in the online platform are ignored when there is no teacher response	Q 4 & 8	72	28
5. Studying learning content in the online platform is necessary to understand the content of the f2f meetings	Q 5 & 13	98	2
6. Learning content in the online platform is repeated during f2f meetings so only one is attended to	Q 7 & 15	68	32
7. Assignments in the online platform are not carried out because no attention is given to them during f2f meetings	Q 11 & 14	63	37
8. Assignments in the online platform are not carried out because no valuable teacher feedback is experienced	Q 10 & 16	54	46

Note: See Appendix Q for the relationship between the variables and questionnaire

Student interview results

The result of the interviews in relation to students' preferences with regard to social presence and convergence (online presence of others and online/f2f synergy) are analysed according to the subsequent categories that emerged from the interviews. See Table 2.

When examining the results, it becomes evident that the majority of students value activities with others if they are meaningful. Likewise, the teacher's online feedback is highly valued. As one student said: *"I have little time. If I'm to spend my time on an assignment that the teachers consider valuable, then I would at least like to have some form of response to my effort."* Students value weekly online contact and particularly prefer working in small groups, as one student explained:

"I like small groups over large groups, in particular you can get to know each other and ask them practical questions relating to activities, such as when and how. That works much quicker than waiting for the teacher to answer or having to look it up."

In terms of collaboration, a strategy employed by the COI framework, as well as one that facilitates convergence, students ($n=12$) appreciate learning from different perspectives, feel that peer-feedback is valuable, and appreciate how collaborating helps clarify concepts. One student explained:

"online we met up as a group in relation to a case study with collaborative assignments. In class this was followed-up by exercises and further collaborative assignments that added onto the online content. It was highly structured which was great. Also, there was scaffolding. Top".

Only a small number of students ($n=4$) feel that collaboration is meaningless. Moreover, a large number of students ($n=10$) feel that collaboration is difficult to carry out and time consuming. As one students stated:

"it's okay if you want us to work collaboratively, but these type of assignments take up a lot of time. It is only worth the time if they are of any meaning to the content I need to learn."

Another student explained:

"there are some assignments that need to be carried out, but due to lack of time I decide if they are meaningful enough for me to spend my time on."

With regard to convergence, all the students feel that scaffolding of both environments is valuable, that an initial f2f meeting is valuable, and that the teacher's online resources are valuable. Nearly all the students ($n=15$) feel that it is meaningless when the f2f sessions repeat what is available online. Some comments students made were:

"when the online environment offers learning content with assignments at a certain level, it gives you the chance to come to the f2f session prepared whereby the learning content is elaborated on, which directly takes your knowledge to a higher level".

Another student stressed:

"Of all the blended learning courses, one stood out, a so-called flipped classroom course. I thought it was fantastic to prepare in the online environment and then go into the f2f session which expands and elaborates on your knowledge. It really added extra value."

This corresponds with the 'learner control' dimension of the learning environment design framework by Piccoli et al. (2001). Most students ($n=14$) feel that convergence helps clarify concepts and provides deeper learning ($n=13$).

Table 2*Student Preferences in Relation to Blended Learning Needs*

Main Category Students	Sub-Category	Number	of
<u>in relation to online presence of others</u>			
regarding meaningful online contact	weekly online contact is valuable	9	
	small groups are valuable	13	
	meaningful activities with others are valued	12	
being seen by the teacher online	the teacher's response to comments is valuable	6	
	the teacher's feedback online is valuable	13	
	the teacher's online postings is valuable	2	
	the teacher's forum participation is valuable	8	
<u>in relation to online/f2f synergy</u>			
regarding collaboration	different views give a broader picture	12	
	helps to understand or verify concepts	12	
	peer-feedback is valuable	12	
	time consuming	10	
	difficult online	10	
	self-study is valuable	7	
	collaboration is meaningless	4	
regarding online concepts/ F2f scaffolding	provides deeper learning	13	
	clarifies content	14	
	scaffolding of both environments is valuable	16	
	an initial f2f meeting to know peers is valuable	16	
	additional resources online is valuable	16	
	meaningless when f2f repeats what's online	15	
	time consuming to do both	11	

Notes: The number of students shown are the number of students that agree with the statement out of the total number of students having been interviewed (n = 16)

Next, the variables of the questionnaire and the categories that emerged after coding in relation to the student interviews are displayed in Table 3. In answering the first two research questions, this relation will be drawn upon. Interestingly, three variables relate to students' needs regarding social presence, whereas five variables relate to students' needs regarding convergence, indicating that convergence is highly appreciated.

Table 3*Relation of Variables and Categories*

Relation of variables questionnaire and categories student interviews			
VN	Variables Questionnaire	Emerging categories student Interviews	Meta themes
1	Assignments in the online platform are not carried out because there is no peer-feedback	Needs regarding meaningful online contact	Social presence
2	Assignments in the online platform are ignored when there is no teacher response	Needs regarding being seen by the teacher	
3	Assignments in the online platform are not carried out because no valuable teacher feedback is experienced	Needs regarding collaboration	
4	Assignments in the online platform are not carried out because no attention is given to them during f2f meetings	Needs f2f/online scaffolding	Convergence
5	Assignments in the online platform are needed in preparation for the f2f meetings	Needs regarding collaboration	
6	Studying learning content in the online platform is necessary in preparation for the content of the f2f meetings		
7	Learning content in the online platform is repeated during f2f meetings so only one is attended to		
8	Assignments in the online platform are not carried out when there is no relation to professional practice or tests		

*Note: VN = Variable Number***Teacher Interview results**

Table 4 shows the various components of teaching presence strategies as set out by the COI framework, together with the number of teachers ($n=8$) that have exploited the various strategies. The teaching presence strategies relate to the design of the course, facilitation, and direction of cognitive processes. Most teachers ($n=6$) provide basic concepts and theory online without repetition, however, as one teacher explained: *"I do often repeat what's online, not all of it, but I don't want to leave students behind. It's not that students don't want to interact online, it's lack of time"*. Half of the teachers provide quizzes and exercises online in order to practise comprehension of basic concepts, and half approach the dichotomous environment as circular, rather than linear, for example: after the first online/f2f sequence, further elaboration occurs online. Only half of the teachers have students collaborate online in preparation for f2f sessions. Those who do not, feel that it is too time consuming for students, as explained by one teacher: *"perhaps in the past students worked more collaboratively, but since students have to learn so much in such a short time, and with such little time, I tend to just focus on what is essential."* The majority of teachers ($n=6$) monitor students' collaboration online and answer questions students post on the forum. Likewise, the same number of teachers ($n=6$) regularly post online and provide prompt feedback. Only two teachers respond to students' online postings, i.e. when students post a general comment (see table 4 for different types of online contact). All the teachers have clear assignment guidelines and

evaluation criteria, confirm understanding, provide prompt feedback, correct misconceptions, and provide additional resources. Notably, teaching strategies that may be expected in a traditional, in-class settings, such as directing cognitive processes scored high. Teachers have considerably low results in relation to online facilitation and online/f2f sequencing.

Table 4

An Overview of the Strategies for Levering Online Interaction, together with an Illustration and Instructors' Use

Teacher's application of teaching presence (TP) strategies

Strategies	Illustration	Used by N instructors
1. Design	-	
Sequencing online/f2f	Online: theory and basic concepts are online through web lectures, reading materials, and video clips. F2F: scaffolding	6
	Online: practising theory through quizzes and exercises, F2F: scaffolding	4
	After first sequence (online/f2f) further online elaboration	4
Assignment guidelines	"Assignments are structured. It is clear what students have to do, how, and when it should be completed"	8
Evaluation criteria	There are clear criteria so students can evaluate peers, as well as themselves	8
Collaborative activities	Students work together on assignments, before returning to f2f for deeper learning	4
2. Online Facilitation	-	
Monitoring online activities	The teacher monitors how students collaborate online in forums	6
Responding on students' postings	The teacher responds to students' postings online by posting further questions for students to think about	2
	The teacher answers questions students post on the forum with or without a strategical pause	6
Regular postings online	Teachers regularly post announcements online which can be conversational, instructional or organisational	6
3. Directing cognitive process	-	
Confirm understanding	The teacher confirms if a student has understood a concept in an elaborative context	8
Prompt feedback	The teacher provides prompt feedback, both online and f2f	6
	The teacher provides prompt feedback f2f	8
Correct misconceptions	The teacher corrects misconceptions in an elaborative context	8
Additional Resources	The teacher provides additional resources for students to further self-study	8

DISCUSSION

We first address RQ1 and RQ2 in relation to the beliefs with regard to the relevance of interaction and the beliefs pertaining to meaningful presence of others. To this extent, we draw comparisons between the results of the questionnaire and the student interviews, and go into more detail in order to relate the findings to the research questions. Next, we address the third research question (RQ3). To further substantiate and illustrate the findings, each sub-section draws on quotes given by students and teachers (translated from Dutch to English). Following this, we address the fourth research questions (RQ4), and in answering the main research question we provide a table with teaching strategies.

(1) Beliefs about the relevance of online interaction in relation to f2f

Students' beliefs about the relevance of online interaction show that the relation between both modes should be meaningful, which corresponds with claims made in literature (e.g. McKenna et al. 2020; Owston & York, 2018). The results from the questionnaire and interviews reveal that students highly valued when basic concepts and preparatory activities were placed online and were further elaborated upon during the f2f session: 91% and 98% in the questionnaire, and 15 -16 students from the total of 16 students in the interviews. This corresponds with emphasis on scaffolding in literature (e.g. Gómez & Duarte, 2011; Hoey, 2017; Kjærgaard, 2017).

There were some differences pertaining to peer-feedback: for nearly half of the students in the questionnaire (item 1), lack of peer feedback was not a reason for them to ignore assignments, however, twelve students in the interviews stated this to be of value. The difference could lie in the fact that the question posed in the questionnaire was stronger, as in 'not carrying out the assignment' than the proposition in the interview 'being of value'. The students in the questionnaire may still find it valuable to receive peer-feedback even though they carry out the assignments in spite of it. The same could be said for item 7 from the questionnaire where the wording in the questionnaire might be too strong resulting in different opinions: 63% of the students would not carry out the assignments if no attention during the f2f meeting was paid to them, whilst 37% would still carry out the assignments in the absence of such, in stark contrast with all sixteen students in the interview stating the value of said scaffolding.

A similar point can be made with regard to collaborative activities: whilst slightly more than half of the interviewed students consider the collaborative activities to be time consuming ($n=10$), they nevertheless consider them to be meaningful ($n=12$). This corresponds with the general notion that higher education adult-learners in particular need to see the meaning of activities, likewise, they need to see the meaning of collaboration (e.g. Chan, 2010; Frey, 2003).

Seemingly, for higher education adult-learners, not only the content (what to learn), but also the way they are expected to learn (how to learn) should be meaningful from a learning perspective as well as personal perspectives, given the time constraints of adult-learners (Henchke, 2010; Chametzky, 2014).

(2) Beliefs about needing to experience the presence of others in a meaningful way

Students appreciated collaborative activities (as they afford both scaffolding and social presence, and can facilitate convergence) provided they were structured and meaningful (Cercone, 2008). A few students explained that they valued small groups, not necessarily for collaboration, but more for practical reasons as answers received from group members were quicker than when having to look this up (e.g. Gómez & Duarte, 2011; Hajibayova, 2017; Owston & York, 2018).

One aspect that showed high similarities in responses between the questionnaire and the interviews are the needs relating to the lack of teaching presence online, particularly as it relates to 'being seen', such as responding to assignments: for 72% of the students in the questionnaire this was a reason not to carry out the online assignment, i.e. not interact with the online environment. This corresponds with the thirteen out of sixteen students considering this to be valuable, another seven students would also appreciate a response to a posting (e.g. Hoey, 2017; Lowenthal & Dunlap, 2018; Oyarzun et al. 2018). Whilst it mattered to the students that a response was given to their online assignments in terms of teacher feedback, this feedback did not necessarily have to be valuable (54% of students felt that it should be valuable, for 46% of students this was not an issue, item 8). Placing these two results together suggests that students simply want to be seen by the teacher in the online mode, as opposed to being ignored: the value of the feedback weighed less than simply receiving it. This could also be due to the fact that students may presume their teacher's feedback to be valuable in any event, especially in a teacher-training programme where, most likely, teachers have a considerable amount of knowledge and skills in feedback-giving.

(3) Strategies employed by teachers to foster online interaction among higher education adult-learners in blended learning courses

As may perhaps be expected, most teachers at a teacher training college apply the strategies that are available. The few strategies that are not met by all the teachers will henceforth be addressed.

On the aspect of sequencing online/f2f, not all the teachers felt that this would allow the students to learn what needs to be learned. This echoes previous literature explaining that when teachers realise that students do not interact online, they feel compelled to repeat online content to ensure that students would not miss out on important learning aspects (e.g. Cuesta Medina, 2018; Östlund, 2008; Pan 2022), hence a reversion to traditional teaching results (Serdyukov, 2017). This then turns into a vicious circle when compared to the students' needs above: a large number of students (68% of the questionnaire and 15 out of 16 interviewed students) would ignore the online part of the learning environment when it tends to be repeated during f2f meetings. This phenomenon is also acknowledged in literature where it is emphasised that both modes of the learning environment should not overlap (Cuesta Medina, 2018).

Another disparity of applied strategies lies in the collaborative aspects. Not all teachers had their students work collaboratively as they felt it would impede too much on students' time. Whilst the dilemma is understandable, it should be noted that affording deep learning through, inter alia, collaboration is highly valued by adult-learners in particular, as shown above in both the questionnaire and student interviews, and as emphasised in literature (e.g., Baragash & Al-Samarrale, 2018; McKenna et al. 2020). Therefore, in considering student factors, the time aspect and the deep learning aspect (through collaboration) need to be weighed against one another.

The last strategy not fully embraced is that of online facilitation. When comparing this strategy to students' perceived value, its absence or presence did not matter much to the students either way, the only exception being the aspect of online feedback as it seems that even in a blended learning course, where presumably students meet f2f with peers and their teacher on a regular basis, they still want to 'be seen' online, preferably in the form of receiving prompt feedback to online assignments (e.g., Hoey, 2017).

(4) How can the results of the three sub-questions be synthesised into teaching strategies that foster higher education adult-learners into online interaction in blended learning courses?

In order to arrive at blended learning teaching strategies aimed at fostering higher education adult-learners into online interaction, a co-design approach was adopted through participatory design. The participatory design in the context of this study included a teacher, the researcher and a stakeholder (here: an adult-learner). Combining all relevant parties ensures a robust design (Könings et al. 2005; Könings et al. 2014; Könings & McKenney, 2017). Moreover, involving students' perspectives in the design solidifies the construct (e.g. Kirschner, 2015; Könings et al. 2005), as all three collaborate in order to evaluate the construct (Roschelle & Penuel, 2006). The purpose of the participatory design in this study is to arrive at a set of well-formulated teaching strategies as informed by findings from the literature on the one hand, (Van der Stap, 2024), and empirically validated by the teachers' experiences and the student findings in the present study on the other. To avoid bias, all participants in the co-design were instructed to focus the articulation of the blended learning teaching strategies solely on the results of the questionnaire and interviews in the present study. As such the validated principles (blended learning teaching strategies) from the questionnaire and interviews in which they appeared (see Table 5), were articulated based on the inclusion threshold: the principle is considered in the questionnaire with at least 55% agreement, at least nine student interviews, and at least five teacher interviews.

It was decided between the participants of this co-design that the principles validated through the present study would then be further fine-tuned into well-formulated blended learning design principles or teaching strategies. To this extent, the results from the present study were summarised and synthesised with the design principles from previous literature reviews on adult-learners (Van der Stap et al. 2023), and on social presence and convergence (Van der Stap et al. 2024), into formulated design principles along the lines of van den Akker (1999). Van den Akker (1999) explains that interventions designed for a specific purpose or goal should be characterised or identified through specific procedures for reasons given. As such, the teaching strategies that are derived from this present study are defined following this structure: characteristic of intervention, procedure, reasons to include goal or purpose. Application of van den Akker's (1999) formulation of teaching strategies has been successfully implemented in previous studies in the domain of higher education (Noroozi et al. 2012; Spelt et al. 2009; Van Ginkel et al. 2015).

Deriving design principles from design requirements is in line with Design Based Research (Laurillard, 2013), where the previously acquired requirements first extracted from the environment (Van der Stap et al. 2019), further informed through theory from which the design principles are extracted (Van der Stap et al. 2023; Van der Stap et al. 2024), upon which further empirical validation solidifies the design principles into the present teaching strategies. By conceptualising teaching and instruction as design science, Laurillard (2013) introduces a trifecta of design requirements, design principles, and design features, aiming to develop instructional patterns and models. To further validate the construct, the teaching strategies were shared with four other experienced teachers for feedback leading to additional insights, upon which final design principles or teaching strategies were developed. This process was repeated until full agreement was reached, resulting in teaching strategies that provide a general approach to blended learning, and teaching strategies that specifically address convergence (flow activities) in line with higher education adult-learners' needs.

(5) MRQ: How can online interaction be leveraged amongst higher education adult-learning in blended learning courses?

From the results it is clear that adult-learners need a clear sequencing from one environment to the other in a way that affords deep learning and higher-order thinking in a meaningful way. At the same time,

there should be some room for self-directed learning and autonomy (Cercone, 2008; Zhang & Zheng, 2013), as well as allowance for limited time availability (Chamtezky, 2014). Lastly, it should be noted that the activities themselves need to be meaningful to the adult-learner. In answering the fourth research question, the results of the first three research questions (RQ1, RQ2, and RQ3) were synthesised whereby a threshold was introduced to guide the validation process of the design principles. Furthermore, the articulation of the design principles were phrased along Van den Akker's (1999) approach into well-formulated teaching strategies. During this process it became clear that the empirically validated blended learning teaching strategies can be divided into a general approach to blended learning, together with strategies that are specifically aimed at convergence which would include suggestions concerning what activities can be done online and what can be done f2f as content and activities flow from one mode onto another (flow activities). Accordingly, a framework of teaching strategies outlining both the general approach to blended learning and the flow activities facilitating convergence is provided. See Table 5 below for a full overview of the teaching strategies, which may be combined into a tentative instructional framework aimed at adult-learners in blended education.

Table 5

A framework of teaching strategies facilitating online interaction in blended learning

TEACHING STRATEGIES: GENERAL APPROACH TO BLENDED LEARNING

TS 1	Have an initial f2f meeting to set the climate. This enables social presence and can facilitate community building
TS 2	Create well thought-out collaborative activities. This facilitates convergence and social presence
TS 3	Plan feedback moments online/f2f, this facilitates deep learning and social presence
TS 4	Continue a discussion from one mode into the other. This facilitates scaffolding (see also FAs below)
TS 5	Allow for some self-paced learning. This enables reflection and meets adult-learners' needs
TS 6	Post comments online and be accessible. This facilitates social presence and motivation
TS 7	Plan peer-evaluations. This facilitates deep learning, reflection, and social presence, and meets adult-learners' needs
TS 8	Create real-world, meaningful activities. This motivates and meets adult-learners' needs
TS 9	Plan higher-order activities f2f. This facilitates deep learning and meets adult-learners' needs

TEACHING STRATEGIES: FLOW ACTIVITIES FACILITATING CONVERGENCE

FA1 f2f 1	Feedback on online assignments (if not yet provided online), checking concepts through ARS (Automatic Response Systems such as Kahoot!), clarifying further, picking up comments from forum discussions
FA2 f2f 2	expanding discussions, further collaboration on assignments, peer-feedback or group-projects started online, further group discussions.
FA3 f2f 3	checking on some group activities, e.g. discussions, and elaborating to whole class. Further quizzes or ARS, further questioning and clarifying
FA4 f2f 4	starting a discussion that could be continued online, or allowing students to finish activities online, or presenting further material for students to further elaborate through self-study online (f2f4 and online 4 are optional)
FA1 online 1	input through web lectures, videos, online recordings, power points, screencasts, infographic, blend space, etc
FA2 online 2	self-study: exercises, quizzes, in-video questions. Collaborative: peer-feedback, discussion questions, group-projects
FA3 online 3	personal or group feedback, forum Q & A, guiding forum discussions, content or instructional announcements
FA4 online 4	further discussions, self-study

Notes TS: Teaching Strategy. F2f – face-to-face (in-class)

Notes FA: Flow Activity (f2f/online). Not every FA has to be carried out, simply ensure a clear division between online and f2f activities. For easy application, after the first initial f2f meeting, FA1 online 1 can be followed up by FA1 f2f1, and so on.

The strategies provided are in line with the COI framework as teaching presence (through design, facilitation, and direction), evokes social presence and cognitive presence. Teaching presence should include a clear planning that does justice to social presence in order to sustain cognitive presence. This

framework can therefore be seen as practical means to corroborate these presences. This framework is also in line with Biggs' (2003) 3P model where the design of the learning environment (teaching presence), should be aligned with the student to evoke learning processes. This framework therefore provides details on how those learning processes may be evoked as it incorporates both social presence and convergence in a way that fosters online interaction in blended learning courses.

Limitations

The students in the present study are by and large graduate students mostly in teacher-training programmes. This makes them knowledgeable on most aspects of teaching. Such a knowledgeable position may also make them extra critical. Whilst a critical perspective is highly appreciated as it gives clear insights and lifts desirability bias, at the same time it may be that their lens was too narrow, expecting more than what could reasonably be provided as teachers are restrained by the facilitations their institutes provide. Part of the challenges teachers face is not only designing their own programme, but 'fitting' their programme within the institute's facilities and restrictions. This aspect may be overlooked by students.

A second limitation stems from the type of students participating in this study. For pragmatic reasons, due to a limited availability of blended learning courses, most of the students were part of the educational domain. It could well be that a broader selection of students from various domains may result in differing experiences with blended learning.

Implications and suggestions for future research

When incorporating blended learning into a standard programme, the roles of both the teachers and students change. Learning shifts from a teacher-centred learning approach to a learner-directed and teacher-facilitator approach. When properly applied, students become more motivated and take active responsibility for their own learning process as the student is afforded more autonomy, which meets one of the needs of adult-learners. Teachers' roles, in turn, are to ensure that learning activities are structured and designed according to higher education adult-learners' learning preferences. At the same time, the teacher should facilitate collaboration and peer-evaluation. With the shift from basic concepts and theory to the online environment, for example through power points, reading material, or audio-visual material, the f2f sessions are freed-up to spend time on further collaboration, discussions, consultation, clarification, feedback, or even activities that cannot be done online. As time spent lecturing makes place for facilitation, and the teacher's role shifts from a sage on the stage to a guide on the side, it begs the question: are teachers ready for their changing role? What competences do they need to have? What do they consider valuable in learning? Future research should aim to seek answers to these questions.

Additionally, some aspects at the institutional level need to be considered. The first one is the physical learning space. Whereas an auditorium may have been useful for lecturing to a larger audience, with the shift from traditional classroom teaching to online lectures/f2f learning, some spaces may not be suitable when implementing collaborative or group-based activities. Likewise, for blended learning to be properly facilitated, teachers should rethink the amount of f2f time they need. This needs to be in line with colleagues teaching the same students so that students who are not expected to attend course A, are not required to travel to campus for needing to attend course B. Facilitation then needs to be at institutional level, or at least at cohort level, to meet students in their time management. Future research should investigate what is needed to fully facilitate blended learning at institutional level.

CONCLUSION

This study responds to a need of teaching strategies fostering online interaction amongst adult-learners in blended learning courses (e.g. Hodges et al. 2020; Konstantinidou & Nisiforou, 2022; Serdyukov, 2017;

Vanslambrouck et al. 2020; Youde, 2018). Following three systematic literature reviews relating to 1) adult-learners 2) social presence, and 3) convergence (the latter two of which are synergised), design principles were extracted from previous literature (Van der Stap et al. 2024), upon which they have been empirically validated in the present study. In addition to the validated teaching strategies, examples from evidence-based practices reveal the importance of (1) meaningful collaborative learning activities, (2) addressing online comments or questions, and (3) the sequencing of both modes of the learning environment to be relevant and meaningful. Teachers that implemented these strategies were highly considerate of the limited time adult-learners have and the choices they are therefore confronted with.

When the results from students' interviews and questionnaire are studied, it becomes clear that the relevance of f2f/online sequencing should be self-evident, i.e. one mode necessitates the other. When delving further into students' comments, the sequencing of both modes are considered relevant when online activities and content are not repeated during f2f sessions, and when activities in the online mode are followed-up during f2f, or answered through online feedback. Moreover, the sequencing becomes meaningful when online concepts are further exploited through prompting and discussions during f2f sessions as this facilitated deep learning. This echoes the examples from 'evidence-based practices', but is in stark contrast with only three quarters of the teachers interviewed implementing such a 'thoughtful integration' (Garrison & Kanuka, 2004) of the online and f2f mode, whereby content and activities are delivered according to the most appropriate learning mode (Kjærgaard, 2017; Yin & Yuan, 2021).

Additionally, the teacher's presence online in the form of feedback or direction, was highly appreciated, a teaching strategy not embraced by all the teachers, save those from evidence-based practices. Furthermore, only half of the teachers provided their students with collaborative assignments, yet the students highly value the deep learning that can be had from sharing perspectives and delving deeper into learning content through discussions. Whilst it is true that adult-learners' time is an important aspect to be considered, students are happy to put in the time provided the assignments had added value, i.e. were meaningful.

Based on the results, the teaching strategies (see Table 5) may help course designers in designing blended learning courses for adult-learners in higher education. Said teaching strategies may help fill the current gap in literature as they add evidence-based knowledge on didactical uses of digital technology in education catering for adult-learners, teaching strategies aimed at fostering adult-learners into interaction with the online mode, and blended learning in general as it solidifies a role for social presence in the online learning environment, one that is usually discussed in solely online learning or distant learning programmes, but is absent or minimised in discussions on blended learning.

6

SUPPORTING ADULT-LEARNERS' ONLINE INTERACTION IN COMPUTER- MEDIATED LEARNING

This chapter is based on:

Van der Stap, N., van den Bogaart, T., Rahimi, E., Van Ginkel, S., Nelson, T. & Versendaal, J. (2025). Supporting Adult-Learners' Online Interaction in Computer-Mediated Learning. *Journal of Computers in Human Behavior Reports*. <http://doi.10.1016/j.chbr.2024.100551>

ABSTRACT: Previous studies have revealed numerous benefits of computer-mediated learning, yet the design of such learning programmes are not always supportive for adult-learners. Studies show that higher education adult-learners are wary of the digital environment in computer-mediated courses, and hence refrain from online interaction resulting in lower learning outcomes and lower perceived learning satisfaction. Without an instructional model that supports adult-learners' online interaction, teachers may fall back on traditional in-class teaching in an effort to make up for missed learning opportunities. To remedy this, design principles, specifically supportive for adult-learners, were co-designed into an instructional model reflecting the concentric dynamics that strengthen said programmes. In order to validate and improve the quality of the model a Delphi study was carried out among experts ($n=8$) to evaluate the various components of the model, including its overall supportiveness for adult-learners in computer-mediated learning. The experts were selected based on their expertise and research in blended learning. Two evaluative rounds through surveys in the programme Crowdtech took place until full alignment of the experts' opinions was had. The resulting model is a concentric one, illustrating how activities are best distributed across the online environment and the in-class environment, and how social presence can be evoked. This study provides insights into the design of computer-mediated learning programmes tailored to higher education adult-learners as it closes the gap in literature on instructional models and blended learning design. This validated instructional model may help course designers in designing or improving computer-mediated learning programmes.

INTRODUCTION

As an increasingly popular approach to learning, blended learning courses have two modes that together make up the learning environment, one being the face-to-face mode (f2f), the other being the online mode where learning is computer-mediated (Graham, 2006). The learning environment is the allocated place where learners obtain a first understanding of learning content and carry out activities and assignments in order to effect learning processes, such as deep learning during f2f meetings (Baragash & Al-Samarrale, 2018; Kjærgaard, 2017; Yin & Yuan, 2021).

Learning in this manner highly depends on learners embracing computer-mediated learning facilities by fully interacting with the online learning mode (Cuesta Medina, 2018; Kjærgaard, 2017; McKenna et al. 2020; Owston & York, 2018). Such an approach would include learners interacting not only with the content and activities in the online mode as an individual undertaking, but also with peers through collaborative activities (Garrison, 2000), a set of behaviours crucial for deep learning in blended learning courses.

This shift from traditional in-class learning to partly online learning demands a different set of behaviours with which the adult-learner⁸, may be unfamiliar. The adult-learner in particular may be wary of embracing computer-mediated learning, and whilst they are internally motivated to learn, they can easily become demotivated when the 'added' online mode appears to only increase their workload (McKenna et al. 2020). Yet, the implementation of computer-mediated learning provides ample opportunities for taking learning to a higher level (Kjærgaard, 2017; McKenna et al. 2020; Owston & York, 2018), which particularly aligns with adult-learners' educational needs (e.g. Amoozegar et al. 2022; Chametzky, 2014; Youde, 2018).

Despite psychological challenges, blended learning is particularly appealing to higher education adult-learners who often have to combine work with family obligations, and hence embrace the flexibility that blended learning enables (Decelle, 2017; Diep et al. 2017). Yet, preliminary studies reveal that adult-learners in higher education have little interaction with the online content of the learning environment, impairing their learning opportunities (Youde, 2018; Vanslambrouck et al. 2019), resulting in poorly perceived learning experiences (Morueta et al. 2016; Armellini & De Stefani, 2015; Kim et al. 2016), lower learning outcomes (Serrano et al. 2019; Cuesta Medina, 2018; McKenna et al. 2020), or even leaving the programme prematurely (Choi & Kim, 2018; Kuo & Belland, 2016).

Previous literature addressing this phenomenon indicated two salient factors with regard to a lack of online interaction, namely 1) social presence, where learners experience the presence of others in a meaningful way, in the absence of which learners feel isolated (Andel et al. 2020; Hodges et al. 2020), and 2) convergence, the 'thoughtful integration' of learning content and activities across the f2f and online modes (Garrison & Kanuka, 2004), in the absence of which learners fail to see the relevance of both modes (Konstantinidou & Nisiforou, 2022; Owston & York, 2018; Park & Bang, 2021). When learners feel isolated in the online mode of the learning environment, or fail to see the relevance of both modes, they will likely refrain from online interaction and favour the f2f mode with which higher education adult-learners in particular are most familiar (e.g. Martin & Bolliger, 2018; Oyarzun et al. 2018). Consequently, a lack of engagement with learning in the online mode appears most prevalent among higher education adult-learners (Youde, 2018; Vanslambrouck et al. 2019). To foster online interaction, a blended learning instructional model leveraging online interaction tailored to higher education adult-learners is required (Serdyukov, 2017; Hodges et al. 2020). As of yet, there are no blended learning instructional models that are specifically tailored to higher education adult-learners' needs that can positively influence their learning behaviour by addressing both factors of social presence and convergence (Chametzky, 2014; Youde, 2018; Vanslambrouck et al. 2019). Furthermore, many of the studies on blended learning are

⁸ The term adult-learners is generally assumed to be applicable to working professionals with substantial life-experience and knowledge, and little time due to family obligations (Chametzky, 2014).

learner-focussed, few being instruction-focussed directed towards improving the instructional practice as it relates to fostering adult-learners in online interaction in blended learning courses (Hodges et al. 2020).

Improving such instructional practice in a blended learning course requires a well-designed learning environment with the aid of an instructional model that necessitates interaction with both modes - online and f2f (McKenna et al. 2020), lifts social isolation (Konstantinidou & Nisiforou, 2022; Li, 2022), and caters for the target group (Hodges et al. 2020). In the current literature on instructional models on blended learning, the synergy of both social presence and convergence is absent, yet both are integral to blended learning (Youde, 2018). Additionally, there are no instructional models that specifically relate said factors of blended learning to the needs of higher education adult-learners. Whilst there is important literature on blended learning catering for adult-learners (e.g. Boelens et al. 2018), this is aimed at 'hands on' adult-learners in vocational education, rather than higher education adult-learners whose needs are considerably different, including autonomy, self-directedness, and needing deep learning opportunities (e.g. Cercone, 2008; Chametzky, 2014; Henschke, 2010). According to Biggs (2003), a well-designed learning environment needs to be aligned with the learner factors (here: higher education adult-learners). When both the learner factors and the learning environment align, learning processes may be successfully effected (McKenna et al. 2020). There appears to be a gap in the literature on instructional models that synergise social presence and convergence in blended learning, whilst further aligning these aspects with higher education adult-learners (Amoozegar et al. 2022; Youde, 2018; Vanslambrouck et al. 2019). A well-designed learning environment that aligns with the learner factors may be facilitated through an instructional model (Hodges, 2020; Serdyukov, 2017).

In preparation for said instructional model, various studies were considered through systematic literature reviews, namely on adult-learners' educational needs and learning characteristics (e.g. Chametzky, 2014; Konstantinidou & Nisiforou, 2022; Pappas & Jerman, 2015), and on social presence and convergence (e.g. Amoozegar et al. 2022; Belt & Lowenthal, 2021; Li, 2022; Pan, 2022). From the various studies, design principles were extracted. In the present study, through participatory design (McKenney & Reeves 2012), design principles were constructed into a concentric instructional model leveraging higher education adult-learners into online interaction in blended learning education (IMABLE: Instructional Model leveraging Adult-Learners in Blended Learning Education). This last step is necessary because the model illustrates the dynamics of the dichotomy of a blended learning environment, rather than a static framework of design principles, whilst at the same time facilitating professionals in adopting a concentric approach thereby strengthening blended learning courses. However, to have a reliable, robust instructional model that strengthens the design of a blended learning environment aimed at adult-learners, the model further needs to be studied in detail by an external group of experts in order to obtain validation. As such, we aim to answer the following question:

How do experts perceive the usability of the developed instructional model for fostering higher education adult-learners into online interaction in blended learning environments?

To arrive at a validated model, a Delphi study was conducted to investigate the various components of the model, including its usability, by a representative panel of experts. Consequently, this study contributes to the existing literature on computer-mediated learning, blended learning, instructional models, and on higher education adult-learners' needs in computer-mediated learning. Additionally, it offers course designers a practical, concentric model for implementing or finetuning computer-mediated learning programmes that are supportive for adult-learners.

In the following sections we provide a theoretical framework and describe the method used to collect and analyse data. Next, we present the results and discuss the insights obtained, together with the implications and limitations as we make suggestions for future research.

THEORETICAL FRAMEWORK

In order to understand the impact on adult-learners' behaviour where part of the learning is computer-mediated, a closer look will be taken at what adult-learners need, together with the two main factors that impact learning behaviour as it relates to online interaction, namely: social presence and convergence.

Adult-learners' needs in computer-mediated education

Adult-learners' educational needs and learning characteristics may not necessarily be met by a traditional, pedagogical approach that is perhaps more suitable for learners who have just left secondary education, entering tertiary education for the first time (Youde 2018). Adult-learners are, *inter alia*, internally motivated, autonomous, and have the life experience needed to self-direct and self-manage (Amoozegar et al. 2022; Chametzky, 2014). They may therefore be better served with an andragogical approach (Merriam et al. 2007).

Whilst the term 'andragogy' is not a new one, as it was revived through Knowles' (1984) definition, Merriam et al. (2007) explain the concept as being based on a set of assumptions that include 1) self-directedness, autonomous, and independent; 2) the role of experience in learning; 3) readiness to learn what they need to know; 4) learning for application of learning content rather than for future use, being problem-centred and life-focussed; 5) internally motivated; 6) a need to know the value of what it is they are learning. Adult-learners' needs and characteristics are generally defined in adult-learning theories that aim to articulate the extent to which adult-learners are better served with an approach tailored to their specific educational needs and learning characteristics.

Whilst there are different adult-learning theories, such as the theory of self-directedness (e.g. Zhang & Zheng, 2013), experiential learning (e.g. Henschke, 2010), and transformational learning (e.g. Cercone, 2008), the salient commonalities, and which are specifically relevant in computer-mediated education (authors), are: 1) the need for deep learning or higher-order thinking, 2) the need to see relevance and meaning, and 3) the need for self-direction and autonomy. Meeting students' educational needs in general is essential for extracting those learning behaviours that lead to the aimed for learning processes (Biggs, 2003; Hodges, 2020). Biggs (2003) refers to these as a consideration of 'student factors'. It is imperative therefore, when designing computer-mediated education, that these needs of adult-learners are given first consideration.

Social Presence, Cognitive Presence, and Teaching Presence: The COI framework

Garrison et al. (2000) explain that "social presence is the ability of participants in a community of inquiry to project themselves socially and emotionally as 'real' people (i.e. their full personality), through the medium of communication being used" (p. 94). Experiencing social presence affects students' participation and motivation to interact (Andel et al. 2020; Hodges et al. 2020) because students particularly need to feel the psychological presence of others in order to prevent feeling isolated and henceforth demotivated (Ali & Smith, 2015; Bouilheres et al. 2020; Rasheed et al. 2020).

Social presence involves three factors, namely 1) co-presence, which is experiencing the salience of others; 2) intimacy, which is the extent to which people trust others, make relationships, express themselves, and physical proximity; and 3) immediacy, which entails more elaborate interpersonal relationships that include an element of psychological involvement (Dixon et al. 2017; Garrison et al. 2000).

A core aspect of social presence relates to the theory of social constructivism, an educational theory which explains that knowledge is constructed through interaction with others in a learning community. Vygotsky (1978) explains that cognitive processes are constructed and fostered through social interactions. Social

interactions become a challenge in the online mode as it endeavours to copy standard social nuances that create the sense of 'being there' and 'salience to others' (Dixon et al. 2017; Garrison et al. 2000).

A central aspect of social constructivism is collaborative learning that explains that learning is based on group work and interaction (Akpan et al. 2020). It is through collaboration that students assess and synthesise new concepts through which higher-order learning or deep learning is achieved (e.g. Mahoney & Harris-Reeves, 2019; Pan, 2022; Phelps & Moro, 2022), in contrast to memorising facts, referred to as surface learning (Biggs & Tang, 2007). Central in collaborative learning is the idea that knowledge is constructed through the sharing of perspectives within a social learning community (Johnson et al. 2017). Collaborative learning results in a learner-centred approach in which students play a central role in learning acquisition through participation in learning activities with teachers acting as facilitators (Kirschner, 2001).

When social presence is established, cognitive presence is evoked (Garrison et al. 2001). Cognitive presence is explained as "the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry" (Garrison et al. 2001, p. 89). This involves a level of engagement that can be considered as the student's investment directed towards understanding the content and constructing knowledge (Gutiérrez-Santiuste et al. 2015). An important aspect of cognitive presence is the aspect of 'sustained communication', since this implies social presence as a causal factor (Amoozegar et al. 2022; Li, 2022). Indeed, students' experience of disconnection from fellow students, leading to a reduced interaction with online content, results in higher dropout rates and students' perception of inferior learning experiences (e.g. McKenna et al. 2020).

To evoke and facilitate learning processes, the teacher has to design both modes of the learning environment in such a way that social presence and cognitive presence are fostered (Pan, 2022). Teaching presence then is the design of the course, facilitation, and direction with the aim of leveraging learning processing in order to realise learning outcomes (Garrison et al. 2000). Course design furthermore involves matters such as planning, preparing for the course content and learning activities, and making materials available (Anderson et al. 2001). Course design and facilitating learning processes have an enormous impact on evoking and sustaining social presence which, in turn, stimulates cognitive processes (Amoozegar et al. 2022; Li, 2022; Zilka et al. 2018). Where facilitation elaborates into more personal support, the teacher's own social presence becomes apparent through immediacy, a set of behaviours that a teacher may employ (Lee, 2020; Li, 2022). The ability to establish the teacher as 'being there' further reduces students' risk of isolation, and henceforth increases students' social presence and learning outcomes (Sheybani, 2019).

As configured by the COI framework, the three presences overlap, working together to evoke meaningful learning experiences (Garrison et al. 2000). The COI framework is a leading theoretical lens for research in online learning and blended learning, since it affords an understanding of the dynamics of all three presences, in particular how social presence can be leveraged as it relates to teaching presence and cognitive presence.

Convergence

Research shows that adult-learners in particular are wary of embracing the online mode of the learning environment, as they are mostly used to traditional f2f teaching (Youde, 2018; Owston & York, 2018). Wariness of the online learning environment is increased not only when students feel isolated (Andel et al. 2020), but also when the online mode is not effectively implemented (Richardson et al. 2017). An ineffective implementation of the online mode results in students failing to see the relevance of online interaction, which in turn leads to refraining from interacting online (Hodges et al. 2020; McKenna et al. 2020). Henceforth, Czaplinsky & Fielding (2020) suggest an instructional model in order to improve online

interaction, since the central element in blended learning is the ability of the online mode to leverage interaction (Andel et al. 2020).

The salient challenge of convergence for course designers is deciding which learning content and activities to place online, and which to implement f2f (Martin & Bolliger, 2018). Tantamount to this categorising of content and activities according to the most appropriate learning mode (McKenna et al. 2020), is how to engage the student in the online mode of the learning environment in order to stimulate the aimed for learning processes (Czaplinsky & Fielding, 2020), the online mode being the pillar of blended learning. Murray et al. (2016) explain that effective learning processes in blended learning can only be established when there is a clear understanding of how each learning mode can best be utilised, whereby the need for interaction both online and f2f should become particularly relevant. To this extent, effective f2f and online learning strategies should be carefully structured without duplicating either mode (Martin & Bolliger, 2018).

In sum: Towards an Instructional Model

As explained by Garrison (2000), the teacher's role (teaching presence) through the design of both modes of the learning environment, the facilitation provided both online and f2f, and the monitoring of the overall learning process, is crucial for students to experience social presence through which cognitive presence is evoked. Additionally, it is essential for adult-learners in particular to see the relevance and meaning of what they have to learn, how, and why (Martin & Bolliger, 2018; McKenna et al. 2020). Central in this is the aspect of convergence. The course designer or teacher therefore has to carefully decide which content and activities are best placed online, which content and activities are further explored during f2f sessions, and how the overall process is facilitated. See also Figure 1: Towards the Design of an Instructional Model.

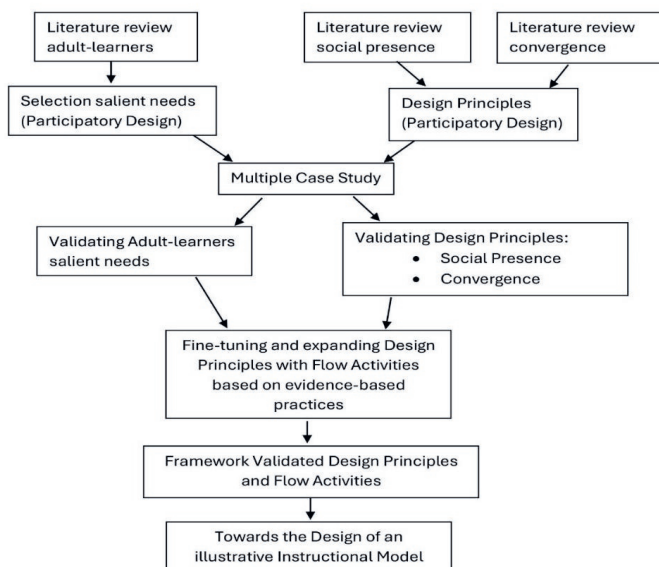


Figure 1: Towards the Design of an Instructional Model

AIMS AND RESEARCH QUESTIONS

This present study is aimed at designing and validating the concentric instructional model which is the result of a participatory design. See 4.1 on details of the participatory design and the various components pertaining to the model. It was further deemed necessary to consider the model as a whole in relation to affording social presence and its supportiveness for adult-learners in higher education. Henceforth, sub-questions were designed by a focus group consisting of four teachers and three researchers to seek validity of the model and its various purposes and components. Consequently, the following sub-questions as they relate to the various components of the instructional model are asked:

- (SQ1) To what extent are the flow activities in line with experts' views on what the sequencing flow of activities should be?
- (SQ2) To what extent are the design principles in line with experts' views on what design principles should be in relation to their construction and value?
- (SQ3) To what extent are the relations between the flow sequences and the design principles in line with expert views?
- (SQ4) To what extent does the model afford social presence according to experts' views?
- (SQ5) To what extent is the model supportive of adult-learners according to experts' views?

MATERIAL AND METHODS

Designing the Model

To assist the design of a blended learning course that is supportive for adult-learners' online interaction in computer-mediated learning, an instructional model was created. Following three systematic literature reviews, design principles were extracted (based on the inclusion threshold that the requirement was considered in at least three papers), and formulated in adherence to the guidelines put forth by Van den Akker (1999) who explains that designed interventions for a specific purpose or goal should be characterised or identified through specific procedures for reasons given. Next a subsequent multiple case study was carried out in which the design principles were validated and aligned with adult-learners' needs. The design principles that followed were: 1) Have an initial f2f meeting to set the climate. This enables social presence and can facilitate community building; 2) Create well thought-out collaborative activities. This facilitates convergence and social presence; 3) Plan feedback moments online/f2f, this facilitates deep learning and social presence; 4) Continue a discussion from one mode into the other. This facilitates scaffolding (see also FAs below); 5) Allow for some self-paced learning. This enables reflection and meets adult-learners' needs; 6) Post comments online and be accessible. This facilitates social presence and motivation; 7) Plan peer-evaluations. This facilitates deep learning, reflection, and social presence, and meets adult-learners' needs; 8) Create real-world, meaningful activities. This motivates and meets adult-learners' needs; 9) Plan higher-order activities f2f. This facilitates deep learning and meets adult-learners' needs.

Following this, an instructional model for blended learning aimed at leveraging higher education adult-learners into online interaction was co-designed through a participatory design with the researcher, one teacher, and an adult-learner in higher education (stakeholder), hereinafter referred to as 'the design team'. Such a participatory design brings together all the relevant parties in order to arrive at a robust design (Könings et al. 2005; Könings et al. 2014; Könings & McKenney, 2017). Involving students' perspectives in the design solidifies the construct (e.g. Kirschner, 2015; Könings et al. 2005).

As a last step in this process, the design team decided that in creating the model, the design principles should not only stipulate possible approaches to leverage social presence and convergence, but should also demonstrate which activities could best take place where (online or f2f), as learning flows from one mode to the other and back, to allow for a concentric approach to blended learning. To this extent, the

model (Figure 4) has two sets of features. The first set consists of the extracted design principles (see above). The second set consists of a detailed and elaborate interplay of activities that may be more suitable for either the online mode or the f2f mode (called 'flow activities'). The flow activities are further aligned with design principles that provide a more detailed suggestion of application. Additionally, as with the design principles, the flow activities were shared with four teachers for feedback. This process led to three rounds of further insights and refinement, until full agreement was reached. The flow activities, suggesting what type of activity can be done in which mode together with accompanying design principle(s), are illustrated in the model as boxes (see Figure 4).

To enable a quick overview, the model has an added section (Table 2) which provides a basic outline that simply suggests which activities and materials are best suited to the online environment and which should be considered f2f, and how to evoke social presence. See also Figure 2: The Design of the Instructional Model.

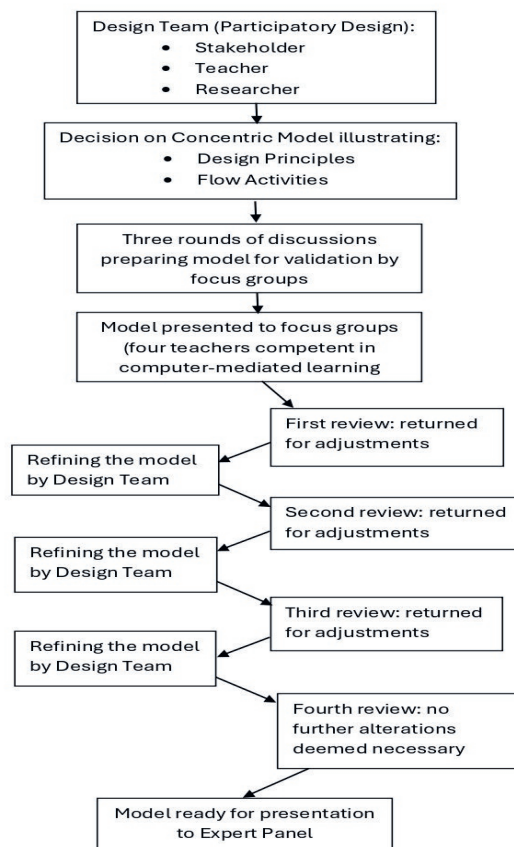


Figure 2: The Design of the Instructional Model

Validating the Model

It was considered that an external expert group should be invited to evaluate the model through a Delphi study. To arrive at an objective and valid Delphi study, two distinct groups were invited: one group that served as a focus group ($n=7$) in fine-tuning the questions for the Delphi survey, and who did not participate in the Delphi study itself, and a second group that served as a panel of experts ($n=8$) who did participate in the Delphi study. Both groups needed to be distinct from each other and remain unknown to each other, firstly in order to avoid bias, and secondly to ensure the anonymity of the panel of experts, which is necessary for a Delphi study (Mulder, 2017). See also Figure 3: Construction and Method of the Delphi Study.

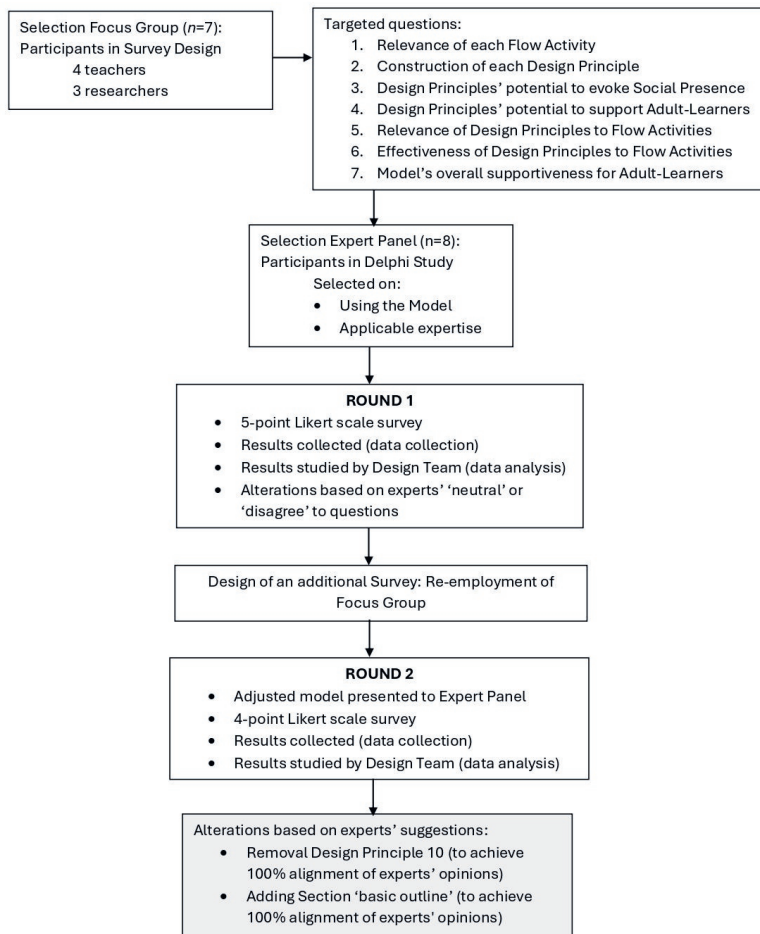


Figure 3: Construction and Method of the Delphi Study

Drafting the survey: focus groups

To arrive at a survey that could be distributed to the panel of experts who participate in the Delphi study, the model was presented to one focus group consisting of seven participants: four experienced teachers

in blended learning and three researchers, in accordance with the strategy presented by Straus and Corbin (1994). Prior to the focus group discussions, the design team (see above) created questions for the Delphi survey. The focus group was asked to check and refine the questions in alignment with the sub-questions of this study and the Model itself. The focus group discussion lasted 116 minutes until full consensus was reached on the survey questions. See Appendix T for the survey questions for round 1. The questions target: 1) the relevance of each flow activity, 2) the construction of each design principle, 3) the design principles' potential to evoke social presence, 4) the design principles' potential to support adult-learners, 5) the relevance of the design principles to the flow activities, 6) the effectiveness of the design principles to the flow activities, and 7) the Model's overall supportiveness for adult-learners (see Figure 3).

In the focus group it was decided that it was of particular importance to distinguish between the relevance of the flow activities themselves, the relevance of the design principles to the flow activities, and the effectiveness of the design principles to the flow activities. It was determined that in order to aim for a high quality model, each element should not only be relevant, but also be effective. Furthermore, in fine-tuning the questions, alignment with the sub-questions was carefully monitored..

Selecting the Experts Panel

It was considered by the research team that an external expert group should be invited to evaluate the model through a Delphi study. The Delphi procedure was carried out through the Crowdttech survey programme. Experts that participated in the Delphi study were selected based on two principles; they (a) would use the model for designing a blended learning course in their programmes, or improve existing blended learning courses, (b) have an applicable specialty, knowledge, or relevant experience in this matter, and are therefore considered highly representative. The panel consisted of eight members, which is the standard number of experts in Delphi studies where an absolute alignment of the opinion of the experts is aimed for (Mulder, 2017). The anonymity and confidentiality were guaranteed to all experts. The panel of experts was invited through information and consent forms to ensure fully informed, voluntary participation.

Procedure Rounds

In the first round, following the selection of the panel and the drafting of the questionnaire, the model was presented to the experts, together with the 5-point Likert scale survey which, as said, aimed at the experts' ratings of the model's different components and design principles, among others. After all the answers were assembled, the questions to which all the experts (fully) agreed were set aside as the responses to these questions led to no further alterations. The questions to which the experts were either neutral or (totally) disagreed were further examined after which the model was refined by the design team in readiness for the second round. See Appendix U for an overview of extended answers in round 1.

In preparation for the second round, the design team revised the model based on experts' feedback in round 1. The revised model was then redistributed to the experts, along with their previous neutral and negative responses to establish whether or not their earlier responses still held after the given revisions, and if so, to further elaborate. This method of enriching the data enabled more insight into the intricacies of professional blended learning course design, and how data regarding the instructional model can be obtained. The survey for the second round was drafted and discussed in the same focus group as above. It was decided to force an opinion by reducing the possible answers to a 4-point Likert-like scale and to leave out the option of providing a neutral answer (Chyung et al. 2017) as this allowed for a clear indication and insight in what panel experts find important. See Appendix V for the targeting questions of round 2 (see Figure 3).

Data Collection and Analysis

The experts were asked to rate the relevance of the model's different components of design principles (1st round), the flow activities (1st and 2nd round), the relevance of the flow activities and design principles (1st and 2nd round), the effectiveness of the flow activities and design principles (1st and 2nd round), the

evocation of social presence (1st round), the model's supportiveness for adult-learners in higher education (1st round), and its usefulness for implementing blended learning courses (1st round). Where experts (fully) agreed to a question in the first round, the same question was not asked again in the second round. Ratings were given on a 5-point Likert scale in the first round, adding any feedback deemed necessary. In the second round, as discussed, the Likert scale was reduced to a 4-point scale to avoid neutral responses. In this second round, to facilitate analysis, it was decided to merge the degrees of (full) agreement and, likewise, to merge the degrees of (full) disagreement since absolute alignment was sought after. Logically, someone who fully (dis)agrees, (dis)agrees in any event. To this extent, the results from the experts were analysed by the focus group in order to prepare a survey in readiness for round 2. Additionally, the results were analysed by the design team in order to incorporate the experts' findings (see Figure 3 above).

The purpose of the data analysis was to revise the model based on the ratings and feedback of the experts. After each round, the design team had to decide whether a particular flow activity, design principle, the effectiveness of the design principles and flow activities, the relation between a flow activity and related design principle, the supportiveness of the model for adult-learners in higher education, and its useability for designing blended learning courses should be revised or deleted. Such decisions were based on the experts' ratings and feedback. Within each context, the design team discussed the feedback provided by the experts and formed decisions on changes to the model. In order to reach a consensus on the overall design of the model, an absolute alignment of the opinion of experts was aimed for (Mulder, 2017).

RESULTS AND DISCUSSION

We first present the findings as they relate to each round. After that we will present the findings according to the sub-questions, upon which we answer the main research question. To further substantiate and illustrate the findings, each sub-section draws on quotes given by the panel of experts.

Results Round 1

After the first round it became evident that there was no explicit disagreement about an effective relation between the design principles and the flow activities, nor about their general relevance to the flow activities. Additionally, there was no explicit disagreement about the useability of the model for designing blended learning courses for adult-learners. There was full agreement about the design principles effectively evoking social presence, as well as its supportiveness for adult-learners in higher education. In general, the flow activities were considered to be relevant (75%), the only disagreement related to unclarity of the intention of the flow, as one expert expressed: *"I do not understand the model here. Online 4 is not connected to online 2?"* Another comment related to the flow of f2f4 to online 1 as one expert expressed: *"See earlier remark. Online 4 is in the diagram?"* The majority of the experts ($n=7$) felt that the flow from f2f 4 to online 1 was not always necessary. There was 83% agreement on the design principles being well-formulated as a whole. One expert disagreed with design principle 9: *"Is the word 'higher-order' clear for everyone?"* One last disagreement related to design principle 10 (not repeating the online content during f2f sessions) as expressed by one expert: *"I'm not sure what you mean here - do you have to categorise the content of modes to ensure you don't have repetitive modes?"* All subsequent changes made reflected the experts' responses and feedback (see Appendix U).

Table 1*Analysed Results Round 1*

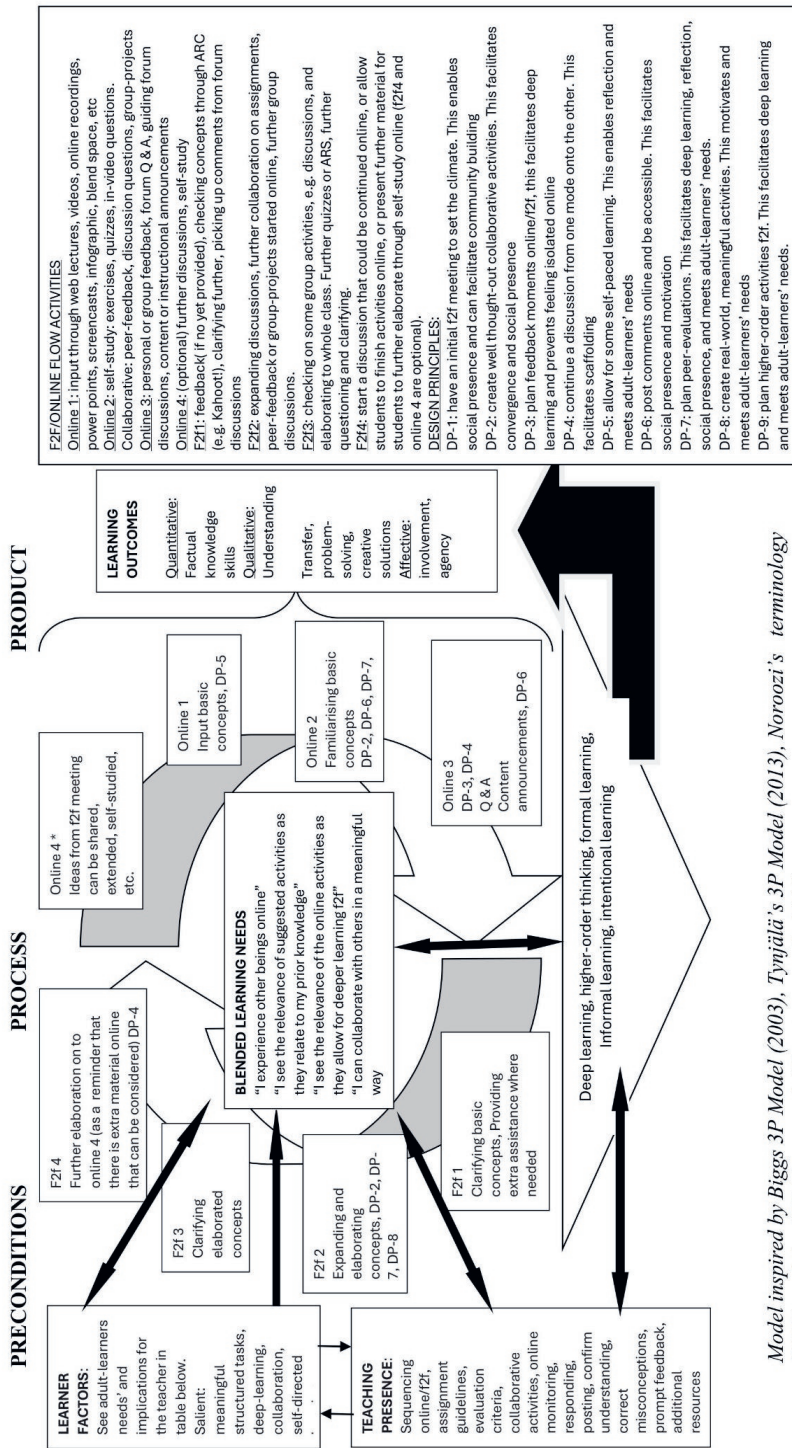
Results Round 1					
Question/ Category No.	Sub-Q (Flow Activity or Design Principle)	Disagree (no. of experts)	Neutral (no. of experts)	Agree (no. of experts)	Specific Q to which >50% did not explicitly agree
1. Each Flow Activity (FA) is relevant (8 flow activities)	1			8	
	2			8	
	3	1	1	6	
	4		1	7	
	5		1	7	
	6		1	7	
	7			8	
	8	1	7		Flow f2f 4 to online 1 is relevant
2. Each Design Principle (DP) are well-designed (10 design principles)	1			8	
	2	1		7	
	3			8	
	4		2	6	
	5			8	
	6			8	
	7			8	
	8			8	
	9		1	7	
	10	1	1	6	
3. The DPs generally evoke SP				8	
4. The DPs generally support AL				8	
5. The DPs generally are relevant to the FA			1	7	
6. Each DP is effective in relation to the FA (10 design principles)	1		1	7	
	2			8	
	3			8	
	4		1	7	
	5			8	
	6			8	
	7		1	7	
	8		2	6	
	9			8	
	10		2	6	
7. The Model overall is supportive for AL				8	

Notes FA: flow activities; DP: design principles; SP: social presence; AL: adult-learners BL: blended learning; Q: question

Note: See Appendix T for a full list of the questions

Results Round 2

After the second round it was evident that there was full agreement on all the components of the model, with the exception of the 10th design principle (carefully divide the content in the two modes as repeating content from one mode into the other nullifies blended learning). This design principle is in fact a 'do not' principle, which perhaps does not feature well among 'do' formulations. Nevertheless, 83% agreed on this principle. The one expert who disagreed expressed: *"I still don't understand what the intention is here"*. Likewise, on the relation of the 10th design principle to all the flow activities, only 83% agreement was obtained. The one expert explained: *"as I don't understand the intention of design principle 10, I cannot agree here either"*. Whilst 83% agreement was obtained on the 10th design principle and its relation to the flow activity, all the experts commented that removing the 10th design principle would not negatively affect the model. Some suggested moving the principle from the model and placing it as an extra recommendation in addition to the model itself. Accordingly, it was decided by the design team to remove the 10th design principle from the model in order to obtain absolute alignment of the experts' opinions. The 10th design principle was placed under 'basic outline pertaining to IMABLE' as a recommendation (see Table 2), and no longer integral to the model itself, in line with the experts' advice. As such, no further rounds were deemed necessary (see Figure 4 for the final version of the model and its accompanying Table 2).



Model inspired by Biggs 3P Model (2003), Tynjälä's 3P Model (2013), Noroozi's terminology (2012), and the COI Framework (Garrison, et. al., 2000).

Figure 4: IMABLE

Table 2*Basic Outline and Further Design Considerations pertaining to IMABLE (Figure 1)*

Basic Outline pertaining to IMABLE	
1.	The model could be seen as a circular roadmap, starting usually with online 1, assuming the very first f2f meeting is introductory. If you decide to start at f2f1, then you would simply move during that session to e.g. f2f3 or f2f4. The flow activities only indicate suggestions, not sessions or part of sessions.
2.	On the right side are suggested online steps, on the left side are suggested f2f steps. Not all the steps are necessary and you can move from e.g. online 1 to f2f 1 ignoring online 2 and 3. Likewise you can move from f2f 1 to f2f 4 without the intermediate steps. It's the complexity of the content, the level at which something needs to be understood and the type of activity that will determine the steps in-between. A more simplified approach to blended learning is to have basic concepts and theory online along with some exercises, and to elaborate on those basic concepts during f2f.
3.	Moving from f2f4 to online 4 is optional, pending on whether or not a certain activity is desirable to continue online, e.g. a discussion started during f2f and for which there was not sufficient time for further exploration.
4.	The design principles in the steps (shown in boxes) are suggestions, and depending on the students, content and type of skills needed, not all principles need to be implemented.
5.	Placing basic concepts and theory online allows for elaborating on the more difficult concepts during f2f (higher-order thinking/deep learning). Avoid repeating online content during f2f sessions.
6.	Building from basic theory to more complex concepts (scaffolding) can be decided through Bloom's Taxonomy (1956), see, e.g., https://bloomstaxonomy.net

Further Design Considerations pertaining to IMABLE

1.	Use Bloom's Taxonomy (1956) to determine what content and accompanying learning activity can be done online (e.g. the lower levels such as recalling), with the teacher as facilitator, and what content needs to be done f2f where the teacher is needed as expert (e.g. further analysis, evaluation, and creation). (Bloom et al. 1956).
2.	Plan carefully when to give online personalised feedback and/or when to give f2f feedback, online posting moments, participation in threaded online discussions, monitoring students' online activities – and whatever you decide: communicate this planning to the students. (McKenna et al. 2020; Oyarzun et al. 2018).
3.	Be accessible through mail, skype, synchronous sessions, digital stories and communicate to students the time span in which to expect an answer (Lowenthal & Dunlop, 2018).
4.	When designing collaborative activities bear in mind that when designing for adult-learners, the student factors must be leading (Morueta et al. 2016).
5.	Ensure that interactions between students and teacher have meaning in relation to furthering students' understanding.

We continue answering the sub-questions in relation to the main question, following which limitations and implications are considered.

(1) To what extent are the flow activities in line with experts' views on what the flow of sequencing should be?

Following the first round, this question was met positively. There was some confusion on the flow from the f2f 4 to online 1, however, this was solved by clearly stating that this flow (the continuation of

content and activities from one mode onto the other) was only optional as it allows for activities such as discussions or further self-study in the online mode where the f2f session ended.

(2) To what extent are the design principles in line with experts' views on what design principles should be?

Most of the design principles were agreed upon in round one, with the exception of design principle 10. Even after revising the model, the wording remained ambiguous and still met only 83% agreement. Removing this design principle from the main model and replacing it as a recommendation under the section 'basic outline pertaining to IMABLE' left the integrity of the model intact and implicitly met a 100% agreement. As a result, no further rounds were deemed necessary.

(3) To what extent are the relations between the flow sequences and the design principles in line with expert views?

This question was met with 83% agreement as a result of design principle 10, which, as said, was removed from the main part of the model.

(4) To what extent does the model afford social presence?

The results showed a full agreement, even after round 1. It is largely the design principles that determine the design of the activities that evoke social presence, hence the question in the survey was posed thus.

(5) To what extent is the model supportive of adult-learners?

The results showed full agreement after the first round. One teacher commented: "*this model is not only supportive for adult-learners, but also for younger learners.*"

MRQ: How do experts perceive the usability of the developed instructional model for fostering higher education adult-learners into online interaction in blended learning environments?

The aim of this study was to design a concentric instructional model that supports adult-learners in computer-mediated learning, and have this validated by an external panel of experts. The model was designed to fill the gap in literature on the challenges relating to online interaction (Belt & Lowenthal, 2021; Konstantinidou & Nisiforou, 2022; McKenna et al. 2020; Yin & Yuan, 2021), and the gap in computer-mediated learning and blended learning design models tailoring specifically for higher education adult-learners (Amoozegar et al. 2022; Vanlamsbrouck et al. 2019; Youde, 2018). We believe therefore that the validated model may contribute to said gaps.

The answer to the main research question therefore can be expressed as '*there is a 100% alignment of the experts' opinions on the instructional model being useable for course designers in leveraging adult-learners' online interaction in blended learning courses.*'

To recapitulate, during the validation process it became apparent that the model should allow for more flexibility by clarifying that not all flow activities in a given mode need to be carried out in detail, for this was considered to depend highly on the level to which differentiation was desirable:

Maybe from here onward, the teacher notices (at least that is my experience) that some learners or groups (due to their proficiency, cognitive abilities, ability to work autonomously) can keep

up with the pace and that others need some extra (physical/online) attention from the teacher. Often a face-to-face talk to check why things are not going as planned can help.

It was furthermore important to include a reference to Bloom's Taxonomy (1956) in order for teachers to assess the level at which they want their learners to understand learning content, and to provide a brief understanding of higher order thinking (see Table 2).

Whilst it was decided to move the aforementioned 10th design principle from the model itself as explained, it was considered imperative by the design team to place it as a recommendation under the model, in line with experts' advice. The recommendation simply states 'not to repeat online content during f2f sessions'. Indeed, theory has shown that when teachers notice learners' lack of online interaction, they tend to repeat during the f2f session what was presented online to avoid learners' missing out (Östlund, 2008; Martin & Bolliger, 2018). This can cause a reversion to traditional f2f teaching (Serdyukov, 2017), hence losing out on the benefits of blended learning.

Some of the comments to the question 'do you have any tips' (Table 1) related to simplifying the model. As one teacher explained: *"There is a lot of information on one A4 (in one model). It might be a lot to take in for teachers. Maybe add a simplified section to provide a first understanding."*

Based on the results and experts' comments, the model was further fine-tuned by the design team, and a simple 'basic outline' section added (Table 2). Additionally, after the removal of the 10th design principle, it can be said that there is absolute alignment of the experts' opinions on the model in its entirety. After the second round, when the alterations to the model had been incorporated according to the experts' comments (see Appendix U), experts claimed: *"The model is much clearer now. I like the simplification at the end, for this will help teachers who are unfamiliar with blended learning"*. One expert said: *"You have really incorporated all the changes well. The model is clear and easy to use"*. Another expert expressed: *"Well done on the changes, it looks good now"*. Other comments that were emphasised by several experts were captured by one expert who said: *"This is a good working model that will help teachers design blended learning courses, not just for adult-learners, but for all learners."*

The Delphi Study provides validated design principles. The design principles in question were first validated by the multiple case study with the adult-learners as actor (see Figure 1). As said validation can be seen as an internal validation, adult-learners being the subject of the various research studies, it was deemed necessary to have the model validated by an external panel of experts in the field, henceforth arriving at an external validation. The experts therefore not only doubly validated the design principles themselves, but also the flow activities and the relation between both the design principles and flow activities. Furthermore, the model's overall supportiveness for adult-learners and its useability for course designers was validated. With the added section 'basic outline' (Table 2), the model becomes useable for course designers less familiar with blended learning.

The validated concentric instructional model (Figure 4) may guide teachers and course designers in designing computer-mediated courses particularly supportive for adult-learners. The model provides clear design principles which are related to the activities that are partly online and partly f2f (flow activities). Further advice and interpretation of the model should provide extra assistance and clarity on how the model can be used to improve blended learning courses aimed at adult-learners in higher education. Consequently, the model contributes to the literature on computer-mediated learning as it illustrates how to incorporate this, on instructional models (as there is no instructional model relating the salient causes for lack of online interaction to adult-learners), blended learning (as there is no framework or model that leverages social presence in alignment with convergence), and higher education adult-learners' needs in computer-mediated learning (as no models or frameworks have been specifically designed for *higher* education adult-learners). The model may help professionals implementing or improving computer-mediated courses tailored to adult-learners.

Limitations

Whilst carefully selected focus groups and a research team was involved in crafting both the sub-questions as well as the survey questions, it may be possible that different sub-questions, and hence different survey questions, may have yielded different results. Furthermore, whilst a Delphi Study was chosen due to its anonymity of the participants, fierce discussions in trusted focus groups may equally have resulted in variations in the current model.

Another limitation relates to the transferability of the model itself. The model has specifically been designed to support higher education adult-learners as they were the students that seemed to be most inflicted as a result of poor course designs resulting in a lack of online interaction (see Chapter 2), however, such a specific design limits its transferability to other adult-learners, such as the more 'hands on' adult-learners (Boelens et al. 2018), or indeed students in non-higher education.

Much emphasis has been placed on the two factors relating to online interaction in a blended learning course (social presence and convergence), however, other aspects that may inhibit adult-learners' online interaction have not been addressed in this study. It should be noted that other reasons for refraining from online interaction may be, *inter alia*, lack of technology skills, poor online navigation facilities in the course design, and feelings of information overload. Future research could illuminate these considerations.

Another limitation relates to the rather limited number of experts. When conducting the validation study we selected a representative group of experts. Whilst saturation was reached with this group, as no new knowledge or information was received, together with the fact that a small homogeneous group may arrive at sufficient results (Skulmoski et al. 2007), the decision quality may improve when the sample size increases. To strengthen validity, future research could 'test' the model in courses.

Implications

When designing computer-mediated learning programmes there are other considerations to be made that have specific implications for learners engaging with online environments. In this study we refer to them as design considerations. The design considerations are a result from previous literature studies, and which have been considered as general advice, rather than integral to the instructional model. For completeness' sake we have appended them in in Table 2 as pertaining to the model.

Another implication relates to management issues and technological aspects that are integral to learning management systems (LMS). Learning through computer-mediated approaches requires functional, interactive platforms that can be used as dynamic communication systems. It is therefore the institute and its management that need to facilitate such designs, as implementing blended learning environments affects the entire curriculum (Anderson, 2004). Failure to facilitate the shift from traditional teaching to computer-mediated learning, such as blended learning, can result in unfocused course offerings (Östlund, 2008), merely replicating traditional f2f approaches (Serdyukov, 2017). It may further result in rejection of the integration of technology in educational settings on the one hand, or an over-valuing of technology on the other.

CONCLUSION

As the results of the Delphi Study reflect 100% alignment of the experts' opinions, it is safe to say that the model and its various components have been fully externally validated in addition to the prior internal validation of the design principles (see Figure 1). With the achievement of 100% alignment it can be concluded that the claim of a fully validated instructional model supporting adult-learners into online interaction is justified.

The research question therefore has been answered as far as it relates to higher education adult-learners. However, what needs to be emphasised, in comparison to current, significant research on the

subject of adult-learners, is that there is a distinction that needs to be made between vocational adult-learners, so called 'hands on' adult-learners (Boelens et al. 2018), and the higher education adult-learners referred to in this study. Boelens (2018) explains that hands-on adult-learners need more support and teacher-directed learning. Higher education adult-learners, however, need more autonomy and self-directed learning, among others. This distinction is important to recognise when designing education specifically aimed at higher education adult-learners (Amoozegar et al. 2022; McKenna et al. 2020). What further needs to be emphasised in comparison to current, significant research on the subject of blended learning, in particular social presence, is that it is important to recognise that social presence, traditionally considered as pertaining to solely online or distant learning, should have a firm position in blended learning, especially where it concerns online collaboration (e.g. Mahoney & Harris-Reeves, 2019; Pan, 2022; Phelps & Moro, 2022). Moreover, teaching presence should play a strong role in the design of blended learning courses, as well as in online coaching as this evokes social presence and cognitive presence (e.g. Amoozegar et al. 2022; Lee, 2020; Li, 2022).

In sum: when designing a blended learning course, the aspect of 'needing to see meaning' is specifically relevant to adult-learners in blended learning where the online mode should support the traditional f2f mode with which most higher education adult-learners are accustomed (McKenna et al. 2020). To the higher education adult-learner, the online mode should not feel as an 'added' mode or serve as a file sharing system where blended learning becomes tantamount to traditional in-class learning. Nor should the online mode cause learners in general to feel ignored and lonely as no meaningful activities discourage collaboration with peers, or where the teacher as facilitator is absent in the online mode. The model that is supplied herewith helps fill the gap in literature on computer-mediated learning, blended learning, adult learning, and instructional models. The model may further help course designers and teachers in designing and coaching computer-mediated courses, specifically as it relates to higher education adult-learners. It is expected that the implementation of the model may markedly improve higher education blended learning courses and adult-learners' perceived learning experience..

SUGGESTIONS FOR FUTURE RESEARCH

Throughout the validation process, experts commented that the model might be equally valuable for non-adult-learners. Whilst adult-learners in higher education were the target group for this research, as they specifically seemed to struggle with computer-mediated education and are wary of online interaction, we acknowledge that this is a rather select group. As suggested by the experts, the model may indeed be suitable for other target groups, in particular as it could relate to students in higher education in general, therefore, future research might consider testing the model in larger, more heterogenous groups across different cultures.

7

DISCUSSION AND GENERAL CONCLUSION

RECAPITULATION OF THE OBJECTIVES

It has been expressed that in the absence of a clear guide to design blended learning environments for higher education adult-learners, a fall back into traditional, didactical teaching methods occurs. This makes the case for more evidence-based instructional models that clearly articulate the design and implementation of blended learning courses. To this extent, this last chapter provides an overview and discussion of the various findings as presented in the five studies of this dissertation.

*The **main objective** of this dissertation is to identify the specific requirements needed to design an instructional model facilitating higher education adult-learners into online interaction in blended learning courses.*

The main objective is addressed through three objectives in order to arrive at a model which teachers or course designers can use to design blended learning courses tailored to higher education adult-learners that foster them into online interaction. To meet the main objective as addressed through three objectives, five studies were conducted, both theoretical and empirical, in order to fully understand the learning needs of the target group, the factors that pertain to online interaction, and the design and validation of an instructional model. Based on the main objective, three objectives were identified as outlined below.

Prior to undertaking the studies in this dissertation, preliminary research was carried out to identify factors that leverage or inhibit online interaction in general. Whilst these studies revealed two salient factors, namely social presence (where beings are aware of other beings online) and convergence (where content and activities are thoughtfully distributed across online and f2f modes), it became clear that claims made in these studies needed validation. Additionally, more knowledge was needed on how these factors might relate to higher education adult-learners, and how blended learning courses can meet their needs. Hence, the first objective relates to identifying adult-learners' perceived satisfaction and initial experience of blended learning courses, as well as examining their needs and learning characteristics. The second objective was related to the lack of detailed knowledge pertaining to said factors (social presence and convergence) with regard to online interaction in blended learning, the absence of which nullifies blended learning. With knowledge of the student factors (here: higher education adult-learners) on the one hand, as well as knowledge of the learning environment as it pertains to blended learning on the other, theory needed to be further validated in order to arrive at blended learning design principles catering for adult-learners in higher education. The third objective therefore was to construct evidence-based blended learning design principles that leverage higher education adult-learners into fully embracing both modes of the learning environment, phrased in line with van den Akker's (1999) formulation of design principles. Such an endeavour included a thorough understanding of the blended learning didactical design requirements needed to solidify blended learning courses (Dziuban et al. 2014; Serdyukov, 2017). In summary then, the three objectives were formulated, resulting in five research questions as explored through five studies (Chapters 2-6). First, the objectives will be revisited, followed by the related research questions per objective.

Objective 1: To investigate adult-learners' perceived satisfaction in relation to blended learning and the factors that foster their interaction with the 'added' online mode; and a thorough understanding of adult-learners' educational needs and learning characteristics derived from theory. (Chapters 2 and 3).

Objective 2: To understand the factors of social presence and convergence, and how these can be ingrained into design principles that foster online interaction. (Chapter 4).

Objective 3: To explore the specifics of an instructional model for the design of a blended learning environment for adult-learners in higher education, both theoretically and empirically, and how said principles can be actualised in a validated model. (Chapters 5 and 6).

Figure 1 presents an overview of the five studies that together meet the objectives, as well as the relation between these studies. Next, the main results of the five studies are summarised, as framed within the three objectives. Additionally, an overall summary is provided on the three objectives as they offer insights in 1) the educational needs of adult-learners in higher education, 2) the challenges related to online interaction, and 3) the specifics needed to arrive at blended learning design principles geared towards higher education adult-learners, and henceforth constructed into a validated blended learning instructional model. Following the summaries below, this chapter discusses general contributions to practice and science per objective that emerged from the five studies. Next, an overall discussion with implications for future research is provided. This section is structured around the four themes that emerged from the research, namely the fluid definition of blended learning, the changing role of the teacher, deep learning, and facilitation, followed by a discussion on limitations related to this dissertation.

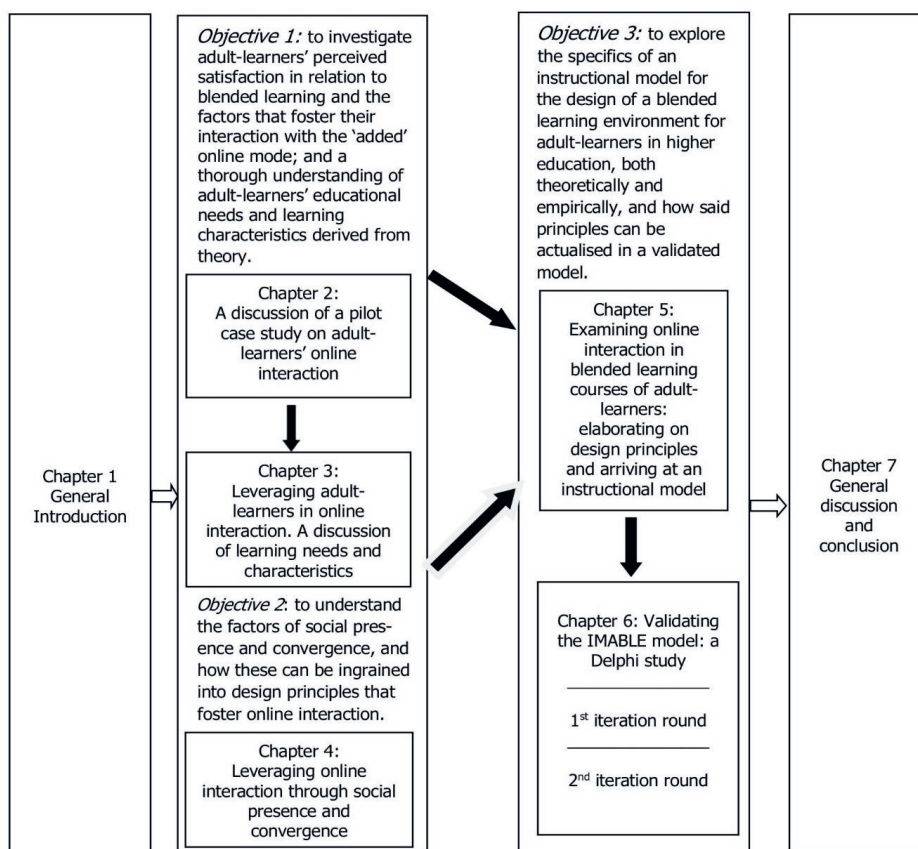


Figure 1: Overview of the dissertation structure.

OVERVIEW OF THE MAIN FINDINGS

Objective 1: To investigate adult-learners' perceived satisfaction in relation to blended learning and the factors that foster their interaction with the 'added' online mode; and a thorough understanding of adult-learners' educational needs and learning characteristics derived from theory.

The first objective revealed that more understanding was needed on higher education adult-learners' perceived satisfaction and initial experience pertaining to the previously identified factors of blended learning (social presence and convergence), as well as their educational needs and learning characteristics. To obtain more understanding, two research questions were asked: RQ1 and RQ2. Accordingly, this objective was met empirically and theoretically as research conducted through such an approach will result in knowledge about real-world difficulties, and may offer pragmatic solutions (Könings et al. 2005; McKenney & Reeves, 2012). To this extent, a survey was conducted together with interviews (van der Stap et al. 2019), and a systematic literature review was carried out (van der Stap et al. 2022). As such, two sub-questions were asked:

Research Question 1: To what extent do social online presence and convergence play a role in adult-learners' online interaction?

Research Question 2: What are the specific characteristics and needs of adult-learners in higher academic education as they emerge from the various theories on adult-learning?

RQ-1: Whilst research identified the two salient themes that leverage or inhibit online interaction (e.g. Garrison et al. 2000; McKenna et al. 2020), these studies were by and large conducted in the USA, England, and Spain, and whilst they revealed what the inhibiting or leveraging factors may be, these claims still needed to be validated in order to rule out rivalry explanations, inter alia, cultural and educational differences. To answer this research question, a survey was held among 33 students, of whom 10 participated in semi-structured interviews. The results of both the survey and the interviews were compared. The data showed that students by and large want a blended learning environment to be meaningful and not a duplication of one mode onto the other. When f2f content and online content were duplicated and not categorised according to the most appropriate delivery mode, students would consider one of the two to be superfluous and only interact with one of them. Additionally, the teacher's presence in the online environment was highly appreciated in the form of prompt feedback to online assignments, or to have them at least addressed in the f2f meetings. These results confirm the identified themes of social presence and convergence. The data furthermore showed that students had low perceptions of collaboration as this should not take up extra time unnecessarily. Students felt that assignments should be meaningful, in that they should relate to their professional practice or stimulate deep learning. Additionally, students felt that there should be room for self-direction, indicating that there needs to be sufficient flexibility to exercise autonomy. This data was a clear indication that more knowledge was needed of higher education adult-learners' needs, and that knowledge of the learning environment itself would not be sufficient. This echoes Biggs' (2003) notion of 'presage', which explains that both student factors and learning environment requirements must be aligned before learning processes can be effected and subsequent learning outcomes expected.

RQ-2: Whilst there are many studies on adult-learners' learning characteristics and educational needs, these studies are highly fragmented as they are framed by various adult-learning theories. Secondly, literature on adult-learners is not categorised according to the vocational adult-learner or the higher education adult-learner, a difference which is quite indicative for whether the approach should allow for considerable support on the one hand (Boelens et al. 2018), or more autonomy on the other. A

systematic literature review on adult-learners in higher education revealed salient learning characteristics and educational needs. The results were summarised and a framework of adult-learners' needs and characteristics, together with potential implications for teachers, was created. The framework was discussed in a focus group consisting of three experienced teachers. This led to further insights and refinements, upon which a final framework emerged. Whilst there are numerous educational needs, three commonalities that have more or less similar phrasing have been identified and used as a yardstick throughout this dissertation, namely 1) the need for deep learning and higher-order thinking, 2) the need for meaning and relevance, 3) the need for self-direction and autonomy.

Objective 2: To understand the factors of social presence and convergence, and how these can be ingrained into design principles that foster online interaction.

The second objective explicated that more insight was needed on the themes related to online interaction in blended learning courses (social presence and convergence). Understanding these themes would allow for eventual mapping onto higher education adult-learners' needs in future studies. An endeavour to understand social presence and convergence lead to RQ3 (study 3, Chapter 4). This part of the research was a theoretical approach through two systematic literature reviews (combined in one study), as this method allows for a comprehensive and precise overview in order to answer the specific research questions related to these themes (Cohen, 2013). The themes of social presence and convergence are generally not combined as the former is typically placed in a solely online or distance learning context, whereas the latter relates to blended learning where there are two modes (online and f2f). However, an understanding of students' lack of online interaction was sought after, therefore to disregard literature on social presence whilst only focussing on literature relating to convergence would have been presumptuous. To meet the objective therefore, the following research question was asked:

Research Question 3: How can online interaction in blended learning courses in higher education be leveraged through social presence and convergence?

RQ-3 The literature on the first theme, social presence, is highly fragmented due to the various definitions of social presence. Additionally, the body of knowledge in relation to convergence was scarce. Moreover, these two themes have not before been synthesised into an overall understanding of leveraging online interaction in blended learning, presumably because the first theme is considered less pressing in blended learning courses where students meet f2f on a regular basis. However, as these are both factors relating to online interaction, both needed to be understood in order for online interaction to be fully leveraged through design principles. Accordingly, the following sub-questions were asked:

(SQ-3a) How is social presence leveraged in blended learning courses in higher education?

(SQ-3b) How is convergence established in the f2f and online modes of blended learning courses in higher education?

(SQ-3c) How can social presence and convergence be synergised into blended learning design principles?

SQ-3a To answer the first sub-question, a systematic literature review was carried out, the results of which were summarised into a first set of co-designed blended learning design principles. The results showed that social presence is mostly experienced when the teacher is visible online, inter alia, through prompt feedback or responding to postings. Social presence is particularly evoked through collaborative activities in which the teacher is actively present through guidance. When social presence is established, cognitive presence is evoked. Both presences follow from teaching presence through course design, facilitation, and direction.

SQ-3b To answer the second sub-question, again a systematic literature review was carried out in order to achieve as much insight on the topic as possible, literature being scarce. As in the first sub-question, the results were summarised into a set of co-designed blended learning design principles, building on the ones that emerged from the results of the first sub-question. The results show that in blended learning the two learning modes need to be categorised according to the most appropriate delivery strategy in order for both modes to be fully embraced. Said categorisation was explained to be effected through elaboration: where basic concepts were offered online through web-lectures, video-clips, power-points, reading material, online recordings, individual and collaborative activities, and so on, upon which further elaboration was sought during the f2f moments, henceforth establishing deep learning. Elaboration therefore was effected through scaffolding one mode onto another, thereby building deep learning – or higher-order thinking – onto basic concepts. It was furthermore revealed that such an approach could be facilitated through collaborative activities, where students start online and proceed f2f, or start f2f and proceed online, hence allowing for a concentric approach.

Elaboration on SQ-3a and 3b: Both literature reviews were solely related to the aforementioned factors to obtain as many hits as possible, therefore the searches, at this point, were not defined to include adult-learners in higher education. It was decided that such an approach would not only limit possible hits, but synthesis with higher education adult-learners was yet to be carefully conducted. The results showed various approaches in which students are leveraged into online interaction, the most prominent one being that of collaboration, both online and f2f. Collaboration increases social presence which, in turn, evokes cognitive processes. Furthermore, collaboration facilitated categorisation between the online and the f2f mode, providing a meaningful context. Lastly, collaboration allowed for deep learning when categorised correctly. Both systematic literature reviews emphasised the role of the teacher, particularly in the form of prompt online feedback and coaching in both modes.

SQ-3c To arrive at an answer to the third sub-question, a design team was employed in order to co-design the design principles. First, after the results were analysed, the findings were summarised and features were selected based on an inclusion threshold: the feature appeared in at least three studies. Following this procedure, the features were further narrowed into well-formulated instructional sentences that foster online interaction. When full agreement was reached on the set of instructional sentences, they were rephrased into design principles along van den Akker's (1999) guidelines of formulating design principles.

The collaboration was a participatory design which included a teacher, a researcher and a stakeholder (the design team), and was further refined through focus groups. These design principles would serve as a basis upon which further elaboration was facilitated as a result of synergy with insights on higher education adult-learners' needs on the one hand, and with additional knowledge obtained from empirical studies on the other. This leads to objective 3.

Objective 3: To explore the specifics of an instructional model for the design of a blended learning environment for adult-learners in higher education, both theoretically and empirically, and how said principles can be actualised in a validated model.

The third objective emerged from the lack of blended learning instructional models specifically geared towards adult-learners in higher education. It was discussed that most instructional models cater for the more traditional student that has just left secondary education, entering tertiary education for the first time. It was furthermore explained that in the absence of a blended learning instructional model that caters for the target group, teachers may fall back into traditional in-class teaching methods. This third objective is partly informed through objectives one and two, however, these studies were mostly systematic literature reviews and needed further validation in an empirical investigation. To meet this

objective therefore, two research questions were composed (RQ-4 and RQ-5). RQ-4 aimed to validate claims made in literature, align design principles from study 3 with adult-learners who have substantial experience in blended learning courses designed by teachers competent in blended learning, and further expand the design principles through insights obtained from best practices. Next, a framework of design principles on social presence and categorisation was constructed. Using the validated design principles from the aforementioned framework, it was decided that a concentric instructional blended learning model for adult-learners in higher education should be further co-designed as this would illustrate the flow of learning between both modes, and would allow for a fluid implementation of the categorising suggestions (called 'flow activities', see Chapter 6, Figure 1). This led to RQ-5. The model that resulted was inspired by Biggs' 3P model (2003), as adapted by Tynjälä (2013), using Noroozi's (2012) terminology, and as further elaborated through the COI framework (Garrison et al. 2001). After the co-design of the model, it was necessary for the same to be validated.

Research Question 4: How can online interaction be leveraged amongst higher education adult-learners in blended learning courses?

Research Question 5: How do experts perceive the usability of the developed instructional model for fostering adult-learners' online interaction in blended learning environments?

RQ-4 In order to validate claims made in literature pertaining to both systematic literature reviews on social presence and convergence, as well as the systematic literature review in relation to higher education adult-learners' needs, an empirical study needed to be carried out. It was imperative for this study to be dispersed across several courses at different universities to obtain an objective understanding and external validation. To align design principles with the identified needs of higher education adult-learners, it was furthermore necessary for this study to be carried out among adult-learners who had considerable experience in blended learning courses that were designed by teachers competent in blended learning. In accordance with these basic criteria, participating teachers of eight blended learning courses in both the Netherlands and Flanders (Belgium) distributed a questionnaire to their students who met said requirements ($n=84$). Of these students, sixteen agreed to semi-structured interviews in order to obtain further insight pertaining to their needs, preferences, and attitudes in relation to online interaction. Additionally, eight teachers agreed to deep interviews to provide an understanding of the design choices made. To obtain a detailed answer, four sub-questions were composed as informed through said systematic literature reviews. Accordingly, the following sub-questions were asked:

(SQ-4a): To what extent do higher education adult-learners need to see the relevance of online interaction in relation to f2f sessions with others? (convergence)

(SQ-4b): To what extent do higher education adult-learners need to experience the online presence of others in a meaningful way? (social presence)

(SQ-4c): What strategies do teachers employ in order to leverage online interaction among higher education adult-learners in blended learning courses?

(SQ-4d): How can the results of the three sub-questions be synthesised into teaching strategies that foster higher education adult-learners into online interaction in blended learning courses?

SQ-4a To validate the claim that adult-learners need to perceive the relation of learning content and learning activities in both modes of blended learning through deep learning and collaboration, a survey

was conducted among adult-learners ($n=84$), together with semi-structured interviews held with sixteen adult-learners. The results showed that adult-learners by and large wanted the categorisation of both modes to be of meaning, and for one to scaffold onto the other. Students highly valued the deep learning opportunities that such a strategy facilitated during the f2f sessions. The perceptions of collaboration were overall positive provided collaborative activities were meaningful, not only in relation to what they needed to learn, but also in relation to the level of which learning content was to be internalised. When collaborative activities were not considered to be of meaning, they were deemed to be an unnecessary restraint on their time.

SQ-4b In order to further validate the claim that adult-learners need to experience the online presence of others in a meaningful way, through the same survey and interviews as in SQ-4a, it became clear that adult-learners mostly want the teacher's presence in the form of online feedback. In particular, teacher-feedback was highly appreciated as this informed the adult-learner that a given assignment was apparently of meaning and value to the teacher which, in turn, resulted in adult-learners' perceived value. As for needing to see fellow students in the online environment, it became evident that large groups were perhaps convenient in terms of 'checking which questions had been asked and which answers had been given', but not in terms of collaboration. Small groups, on the other hand, were valued both for practical reasons, as well as meaningful and structured collaborative assignments.

SQ-4c Whilst much insights were had from the various literature reviews, it was considered valuable to further this knowledge through examples in the field. As such, the multiple case study was extended to holding deep interviews with eight teachers that had expertise in blended learning, to ascertain their design and facilitation choices. The questions of the deep interviews were aimed at capturing the strategies as they emerge from the COI framework (Garrison et al. 2000) in relation to social presence, as well as a further understanding of convergence: how to relate to both modes of the blended learning environment. The teachers' answers varied notably. However, as these studies were held both in Flanders as well as in the Netherlands, the differences in answers could well be related to the differences in educational practices and cultures. Nevertheless, it became clear that the elaboration strategies that the online and f2f modes afford were weighed against students' limited time, where some felt that having students consider online content and activities demanded too much of students' time, yet others emphasised how this was in fact time-efficient whilst inherently facilitating deep learning, a debate which is relatively easily met through examining students' answers to the survey and interviews.

SQ-4d The design principles of study 3 were revisited and constructed into elaborate design principles mapped onto the empirical results. These elaborated and fine-tuned design principles were drawn up in a design team through participatory design. In the first step, summaries were created upon which the principles were articulated based on the inclusion threshold: the principle is considered in the questionnaire with at least 55% agreement, at least nine student interviews, and at least five teacher interviews. The extracted principles were then reconstructed into blended learning design principles according to van den Akker's (1999) formulation: interventions designed for a specific purpose or goal should be characterised or identified through specific procedures for reasons given.

Concluding SQ-1, SQ-2, SQ-3, and SQ-4. Conclusions were drawn on a comparison of survey answers and semi-structured interviews held with the students through variables and categories. The results largely confirmed claims made in literature, in particular in relation to the salient adult-learners' educational needs as expressed through the various adult-learning theories. These results also confirmed adult-learners' needs with regard to aspects that leverage online interaction. Furthermore, the results of the teachers' deep interviews provided further empirical knowledge of designing blended learning environments. The findings were summarised and designed through participatory design into blended learning design principles for adult-learners in higher education as outlined above.

RQ-5 With a clear understanding of the blended learning design principles for adult learners in higher education, it was decided that said principles should be further illustrated into a dynamic, concentric

model facilitating course designers in designing blended learning courses (see Chapter 6, Figure 1). The co-designed model contains flow activities that help a course designer or teacher decide on the most appropriate delivery mode for content or activities. Within the flow activities (rectangular boxes, see Figure 1, Chapter 6) are the design principles that detail the most logical content and type of activities per flow activity. The model comes with a legend that explicates each design principle. The model was presented to four teachers for feedback, which led to further finetuning of the model, after which it was distributed to a team of experts through a Delphi study. To clarify the usability of the various components of the model, the following sub-questions were asked:

(SQ-5a): To what extent are the flow activities in line with experts' views on what the sequencing flow of activities should be?

(SQ-5b): To what extent are the design principles in line with experts' views on what design principles should be in relation to their construction and value?

(SQ-5c): To what extent are the relations between the flow sequences and the design principles in line with expert views?

(SQ-5d): To what extent does the model afford social presence, according to the experts' views?

(SQ-5e): To what extent is the model supportive for adult-learners, according to the experts' views?

SQ-5a, SQ-5b, SQ-5c, SQ-5d, and SQ-5e. The answers to these sub-questions will be combined as the accumulated results are the content of IMABLE (see Figure 1, Chapter 6). To obtain answers to the sub-questions, a Delphi study was carried out among a panel of experts ($n=8$). The above questions provided input for the construction of a survey which served as the first round. This was followed up through enriching the data as the questions were refined and re-posed. After the second round it became clear that there was full alignment of the experts' opinions once a last design principle was removed and a 'basic outline of the approach' was added to the model (see Table 2, Chapter 6). The model was completed after all agreed that this model would work well for fostering higher education adult-learners into online interaction in blended learning courses.

To conclude on objective three therefore, the findings of the various studies were intertwined in order to co-design blended learning design principles into a concentric blended learning instructional model as it caters for adult-learners in higher education. This model was further subject of validation through a panel of experts in the field as shown in Chapter 6.

Overall summary of findings

In line with Biggs' (2003) notion of constructive alignment, the student factors (or learner factors, Tynjälä, 2013) need to be aligned with the learning environment before further alignment with learning processes and learning outcomes may be instigated. Starting with the student factors, prior to commencing the research in this dissertation, preliminary studies were carried out upon discovering adult-learners' perceived dissatisfaction with blended learning courses at the researcher's institute, in particular as it relates to online interaction. From these preliminary studies two salient themes or factors emerged, namely that of social presence and convergence. In order to validate these claims and to further understand the status quo of higher education adult-learners in blended learning courses, a case study was carried out (Chapter 2). The results of the case study exposed that thoughtful consideration of the needs and characteristics of adult-learners was necessary before proceeding. As literature was fragmented and dispersed across various adult-learning theories, a systematic literature review on higher education adult-learners' needs was carried out (Chapter 3). The salient findings were

summarised into: 1) adult-learners needing to see meaning and relevance – this can either relate to their professional context, to the learning environment, to their existing knowledge, or to understanding the subject-matter, 2) adult-learners need deep learning and require higher-order thinking (this relates to Bloom's taxonomy (1956) whereby learning is more than, for example, simple recollection), 3) adult-learners need autonomy and self-directedness – this requires a certain degree of learner-control and flexibility in the course design.

To align the student factors with the learning environment it was important to closely examine Biggs' (2003) second aspect of presage, namely the learning environment (Biggs refers to this as 'teacher context', the term 'learning environment' follows Tynjälä (2013)). Accordingly, the concepts of social presence and convergence, both of which were validated in the pilot case study, needed further investigation. Consequently, in the sea of fragmented literature, two systematic literature reviews were carried out for both themes. The findings showed that collaboration evokes social presence which, in turn, evokes cognitive presence. The results further revealed that both presences are dependent on teaching presence (Garrison, 2000) through course design, facilitation and coaching. Understanding social presence was only one factor that leverages online interaction. The other factor or theme relating to online interaction in blended learning courses was convergence. The findings revealed that convergence is of particular importance in blended learning courses where scaffolding can facilitate categorising learning content and activities from one mode onto the other. Most studies suggested that basic concepts be offered online, ideally supported with some online individual and collaborative activities as these allow room for deep learning during f2f sessions where further collaboration is fostered (Chapter 3).

Whilst insight on social presence and convergence was had, they were highly theorised and needed further validation through empirical studies in the context of higher education adult-learners with experience in blended learning. Accordingly, multiple case studies were carried out in Flanders and the Netherlands across eight courses. A survey was conducted among higher education adult-learners ($n=84$), together with semi-structured interviews ($n=16$). The results of these findings show that most claims were validated and that the adult-learners in this study were particularly interested in the teacher's presence online through prompt feedback. Whilst most appreciated collaboration (as a strategy to both establish social presence and convergence) as it facilitated deep learning, it was stressed that these activities should be well-structured and meaningful. Additionally, deep interviews with teachers ($n=8$) were held to further obtain insight into the strategies used to facilitate social presence and convergence. The results showed that some differences pertained to the teacher's online presence, but even more to the strategy of collaboration. Most teachers felt that collaboration was a useful tool which could save students time whilst affording deep learning, however, a few felt that it was too demanding on students' tight time schedule (Chapter 5).

With a thorough comprehension of both aspects of presage, it was clear that attention should be paid to how these understandings could be structured and designed in order to facilitate learning processes. It was decided that whilst Biggs' 3P model (2003) was a good starting point, it missed focus on the blended learning context. As this research is aimed at leveraging adult-learners into fully embracing the blended learning environment in general, and online interaction in particular, an allowance for the needs that relate to the blended learning context, and which precede and perhaps even determine the learning process, was essential. To this extent Tynjälä's 3P model (2013) was considered a more appropriate approach. Yet, it was decided that even Tynjälä's model lacked focus on the dynamics of the dichotomous blended learning environment. Additionally, it was determined that the COI (Community of Inquiry, Garrison et al. 2003) framework should have some bearing on a dynamic, concentric instructional model on blended learning as this is the core of the blended learning process. The model that emerged is based on Biggs' 3P model and incorporates aspects of Tynjälä's model. The model

furthermore uses Noroozi's et al. (2012) terminology and incorporates insights obtained from the COI framework. The model was the result of a participatory design that was carried out in a team consisting of the researcher, a teacher-expert, and a student, followed up with a focus group of seven participants. Such a participatory design brings together the perspectives and expertise of teachers, experts, researchers and stakeholders, leading to effects that can positively contribute to the quality of course design (e.g. Könings et al. 2005; Könings et al. 2014; Könings & McKenney, 2017). Bringing in the stakeholder's (here: adult-learner) perspective is of particular value in the overall design (Kirschner, 2015). To illustrate such a guide, a concentric model was henceforth co-designed specifically aimed at facilitating higher education adult-learners in online interaction.

To validate the model it was decided to carry out a Delphi study among a panel of experts in the field, as this method allowed for various in-depth iteration rounds in line with the educational research approach as outlined in Chapter 1. This led to further finetuning of the model, adding, deleting and altering as the iteration process proceeded. One of the major alterations that was made was simplifying the model. Whilst the original version was detailed, the details took away from its clarity. Following the various alterations, full alignment of the experts' opinions was reached on the model's useability for the purpose stated.

CONTRIBUTIONS TO SCIENCE AND PRACTICE

The research in this dissertation is designed and conducted along the guidelines of educational design research. In educational design research, new theories, artifacts, and practices that could impact education are produced through a number of steps (Barab & Squire, 2004). To this extent, the aims of educational design research are two-fold: 1) to contribute to existing scientific knowledge, and 2) to impact educational practice positively (e.g. McKenney & Reeves, 2012; Ormel et al. 2012). This dissertation therefore contributes to both science and practice, and is further informed by blended learning research (e.g. Graham et al. 2014), and learning environment research (e.g. Biggs, 2003). Additionally, most of the results can be framed within the context of education and adult-learners in higher education. Against this backdrop, the scientific contributions will be addressed, followed by the contributions to practice. The contributions will be presented per objective, derived from the main objective: to identify the specific requirements needed to design an instructional model facilitating higher education adult-learners into online interaction in blended learning courses.

Objective 1: To investigate adult-learners' perceived satisfaction in relation to blended learning and the factors that foster their interaction with the 'added' online mode; and a thorough understanding of adult-learners' educational needs and learning characteristics derived from theory.

The body of knowledge on adult-learners in higher education is highly fragmented due to differing adult-learning theories. Additionally, literature on adult-learners lacked a distinction between vocational adult-learners and higher education adult-learners, in particular as higher education studies generally have an academic element. As Boelens et al. (2015) explain, vocational adult-learners are typically 'hands-on' learners and may need more support and guidance. As the systematic literature review was filtered to only include hits based on studies and reviews placed in higher educational contexts, a clear picture emerged on the needs of adult-learners in higher education. The learning characteristics and educational needs of higher education adult-learners in particular were clarified, whereby overlap between the various educational needs could be identified and summarised into salient needs. This was done since the various adult-learning theories worded the educational needs differently yet indicated similar ideas. This study provides an overview that can be exploited for further evaluation in future studies.

In practice, these studies present suggestions available to teachers when educating adult-learners. First, insight was had on what inhibited adult-learners' online interaction with blended learning courses in the new curriculum, hence the first study was particularly valuable as it identified adult-learners' design requirements in relation to the pre-defined factors that emerged from preliminary studies. Second, in the second study, potential implications for practice were presented per educational need and learning characteristic, allowing a selection of behaviours and design requirements to be exploited. Understanding both adult-learners' learning characteristics and educational needs in general, as well as their requirements relating to online interaction in particular, a course designer for adult-learners in blended education may have a first idea of how to approach the design of the course. This would allow practitioners to create an initial set of teaching strategies that could improve or guide the blended learning designs. In line with Biggs' 3P model (2003), this study particularly contributes to the student factors course designers can draw upon.

Objective 2: To understand the factors of social presence and convergence, and how these can be ingrained into design principles that foster online interaction.

The two themes related to online interaction as presented in this research are generally not unitised. The first theme of social presence usually relates to solely online or distance learning, whilst the second theme of convergence is typically related to blended learning but is ambiguous in its definition. It was already determined that both themes are relevant in order to obtain a thorough understanding of online interaction, without a presumptuous notion that the phenomenon of social presence would not apply to blended learning environments. This study therefore particularly contributes to the body of knowledge on blended learning environments, as it synthesises both factors. Theory on the first factor was highly fragmented due to varying interpretations of social presence, and furthermore typically related to selected instances of the intricacies of solely online or distance learning. By framing the results in a blended learning situation, it reveals aspects that can improve online interaction even if there are (some) f2f sessions. The results of this study therefore help to place findings of social presence in a blended learning setting. Additionally, the literature on convergence was not only extremely scarce, but difficult to grasp as there is no clear definition of categorising content and activities along the most appropriate delivery mode. Framing the concept of convergence in the context of 'fostering online interaction' facilitates the accessibility of this knowledge for future researchers. This study then contributes to the literature on online interaction without discriminating between what is considered as traditional distance learning complexities, and which challenges are generally considered as typically relating to blended learning. By combining both factors, a comprehensive understanding of how online interaction can be fostered is had, whereupon a set of design principles relating to online interaction was co-designed. This study therefore also contributes to the theory on educational designs of blended learning environments.

In practice, this study provides a clear set of design principles that practitioners can implement in order to construct or improve blended learning environments, not yet aligned with student factors. The design principles at this stage have therefore not been finetuned to include adult-learners. This study particularly contributes to the blended learning environment course designers can draw upon, and helps them expand their didactic repertoire.

Objective 3: To explore the specifics of an instructional model for the design of a blended learning environment for adult-learners in higher education, both theoretically and empirically, and how said principles can be actualised in a validated model.

This study contributes to the literature on blended learning instructional models. Blended learning environments are dichotomous in nature, and literature on how to incorporate these various modes, as

well as facilitating learning in both modes, is highly fragmented due to the various definitions and approaches to blended learning, in particular where the role of social presence in blended learning is ignored. This study provides an overview of the affordances of blended learning and how the bipartite learning environments can be constructed in a validated blended learning concentric instructional model for adult-learners in higher education. By elaborating on the blended learning needs of adult-learners, this study adds to the theory on blended learning design principles specifically geared towards higher education adult-learners. As there are no clear evidence-based instructional models on blended learning, specifically for higher education adult-learners, this study furthermore contributes to the theory on instructional blended models, as well as on higher education adult-learners in blended learning courses.

In practice this study provides a hands-on approach for course designers and practitioners when designing, implementing, evaluating, or improving blended learning courses for adult-learners in higher education, whilst helping them expand their didactic repertoire. The model not only presents the design principles as they have been fine-tuned to meet the educational needs of adult-learners, the model also includes for the dynamic flow of blended learning showing how social presence can be evoked, and how convergence can be effected. As the design principles that are at the core of the model have been empirically validated, in addition to the model itself having been validated through a panel of experts, a solid base for course designers is provided.

Overall summary of contributions

From a scientific point of view, various challenges were identified in relation to the core of the problem, namely adult-learners' lack of fully embracing blended learning courses. Research on these aspects were not focussed in relation to *higher* education adult-learners, online interaction, and blended learning designs. The present research focussed on these three levels in order to arrive at an instructional model for the design of blended learning courses facilitating higher education adult-learners' online interaction. Throughout the different, iterative steps, design requirements were obtained, following which design principles were extracted, formulated, elaborated, and refined, in order to arrive at a validated blended learning instructional model, along the way adding to the literature on adult-learners, online interaction, blended learning environments, and instructional models. This served a dual purpose as it also facilitated the construction of said model. Using the various phases of educational design research (EDR), four iteration rounds of construction, development, and evaluation have been conducted, together with in-depth iteration of the model itself, whereupon a validated concentric, instructional model emerged. By framing and improving blended learning through EDR, this research demonstrates the valued implementation of EDR on the one hand, and places blended learning as a means for improving educational practices through EDR on the other, thereby contributing to EDR as a method for designing, improving, and validating blended learning education.

From a practical point of view various research challenges became apparent. The contributions to practice as outlined throughout this dissertation reveal that general knowledge on course design is not tantamount to knowledge on blended learning course design. By understanding the additional didactics needed when designing blended learning courses, course designers and teachers can design and facilitate blended learning courses more efficiently and more effectively as they can identify the essential considerations of designing and facilitating learning in both modes of blended learning environments. Chapter 5 exemplifies how the design and facilitation of both modes can be met. Practitioners therefore can learn from the evidence-based and validated design principles which show said design principles as they pertain to blended learning on the one hand, and the facilitation of learning processes in both modes on the other. This not only adds to the didactic repertoire of course designers and teachers, but also facilitates effective learning for students.

With regard to co-design or participatory design, throughout this dissertation, along the various iterative steps, co-design has been applied. This included teachers, designers, researchers, and stakeholders (here: the adult-learners). Through various rounds of drafting and re-drafting, interventions were created. Such a participatory design [or co-design], that brings together all the relevant parties, is a valuable approach as it contributes to a robust construct (e.g. Könings et al. 2005; Könings et al. 2014; Könings & McKenney, 2017).

The combination of various perspectives, such as in a participatory design, is expected to influence the quality of course design in a positive manner (Könings et al. 2005). Being the recipient of learning content, adult-learners' perspectives were therefore considered crucial, as illuminated by several authors (e.g. Elen & Lowyck, 1999; Kirschner, 2015; Könings et al. 2005). All construction processes throughout this dissertation were the result of said participatory design which started with identifying design requirements in relation to adult-learners in blended learning, the construction of a framework with possible implications for teachers in consideration of higher education adult-learners' needs (Chapter 3), upon which design principles on leveraging online interaction were extracted and constructed (Chapter 4), followed by synergising the constructions from the previous chapters into validated blended learning design principles for adult-learners in higher education (Chapter 5), and lastly the construction and validation of the concentric instructional model itself (Chapter 6).

The contributions to practice are theorised by Könings et al. (2014) who explain that the benefits of participatory design are: 1) effective course designs that are likely to benefit learning processes and learning outcomes; 2) reflection on learning and teaching by all the participants; 3) development of skills such as sharing own thoughts and experiences, as well as discussing incongruous ideas. The end-result of shared perspectives amounts to solid interventions (Könings, et al. 2005). Additionally, Könings et al. (2014) explain that a shared solution to a problem increases transferability, making the model that results from the research in this dissertation a solid, robust product for course designers and teachers.

With regard to the field of blended learning research in particular, several impactful contributions are made. The first contribution relates to adult-learners' needs in relation to online interaction in blended learning courses (Chapter 2). As preliminary research revealed the unfavourable effect on adult-learners when participating in a blended learning course not tailored to their needs, this was an important first step as it empirically validates claims made in literature on the one hand, and elicits design requirements and confirms the identification of the two key factors pertaining to online interaction on the other. In the second contribution, Chapter 4 elaborates on the understanding of the two key factors and brings together the various theories and most recurrent practices to deal with these factors, as further elaborated and validated in Chapter 5. Third, Chapter 6 provides a concentric instructional model that explains, guides, and illustrates how design principles on social presence and how the sequencing of modes can support higher education adult-learners in blended learning environments.

Lastly, this study contributes to the theory of social constructivism as it underlines the importance of students experiencing a social relationship with peers and teacher (reducing the transactional distance, Moore, 1989) in order to evoke cognitive processes. In blended learning such processes should not be reserved for just the f2f sessions because that would generally leave too little time for meaningful collaboration experiences during these sessions if basic concepts are to be explained first. The advantage of blended learning is that basic concepts, with some collaborative activities for an initial understanding, can take place online, leaving room for further collaborative exploration during f2f sessions. In the absence of a social community in the online mode, students, in avoiding a feeling of isolation, will refrain from online interaction whereby knowledge construction in a social community is missed in the online environment, resulting in poorly perceived learning experiences and learning

outcomes as stated earlier, and little opportunity for collaboration during the f2f sessions. This study then has illuminated the importance of knowledge construction in social (online) learning communities, especially in blended learning courses, and hence contributes to the theory of social constructivism.

OVERALL DISCUSSION

Limitations and suggestions for further research

In this dissertation, each study (Chapters 2-6) concludes with limitations inherent to that particular study. In this section we base our limitations and suggestions for further research on the whole of this research as presented in this dissertation. Following the limitations, we present suggestions for further research.

The first limitation relates to the identified key factors. Throughout this research we had our focus on key factors relating to fostering online interaction, namely social presence and convergence. Whilst preliminary studies revealed these factors as salient, which was confirmed through both empirical studies (Chapters 2 and 5), such an emphasis may have suggested that no other aspects inhibit online interaction. It may be expected that students less familiar with technological tools might have inhibitions or even difficulties using applications and web-tools. A clear guide and strong support system may help these students. Furthermore, adult-learners, as defined in this research, may be more familiar with traditional teaching and might be wary of blended learning courses, regardless of the flexibility this provides. Future research could suggest pointers that could overcome these inhibitions.

The second limitation pertains to the social constructivist theory (Vygotsky, 1978) in which this study is strongly anchored. As a leading educational learning theory it purports that knowledge is constructed in social, meaningful environments through authentic tasks in real contexts. The emphasis is on the social learning community through which knowledge is constructed and therefore, implicitly, interdependent. In determining this theory as a leading foundation, it supports collaboration, team-based activities, group projects, and expects students to construct their own understanding and educational meaning as a cognitively challenging pursuit. Anchoring this research in particular, and blended learning in general, within the social constructivist theory neglects the values of other learning theories such as, *inter alia*, cognitive constructivism where knowledge is actively constructed by the learner as it builds onto existing knowledge (Piaget, 1968). Indeed, as some teachers, or some students, may have reservations regarding collaborative activities, cognitive constructivism could provide for a different approach. Future research could reveal the possibilities of such an approach.

The third limitation results from an empirical validation of the model itself. Whilst the design principles that are the core of this model were validated through various iterations, and furthermore whilst the co-designed model was evidence-based, both theoretically and empirically, the validation process of the model itself is only related to the expert panel as set out in the Delphi study. Despite the fact that this resulted in several alterations and fine-tuning as a result of the various iteration rounds, a further empirical validation among the stakeholders is missing. The fifth study in this dissertation was conducted post-COVID as a result of which many institutes steered their students into full f2f attendance. Accordingly, blended learning as an intentional didactical approach slipped to the background, and LMS platforms became a convenient 'just-in-case' back-up. Consequently, finding true blended learning courses to test-run the model was next to impossible. Whilst this may appear to limit the transferability of the model to some extent, it should be noted that in qualitative research such as this one, transferability is increased through the richness of a real-world, descriptive and context-based approach (Yin, 2014). The four preceding studies, a combination of empirical and theoretical methods, provide a rich context-based approach needed for transferability. Moreover, as explained by Könings et al. (2014), a shared solution to a problem increases transferability, one that has been at the core of the various

consecutive constructs in the research described in this dissertation. Nevertheless, future research should pilot the model in order to determine how this model fits a particular practice.

In relation to the third limitation, the fourth limitation relates to the iterations inherent of educational design research. Despite the fact that four iteration rounds of construction, development, and evaluation have been conducted, as well as in-depth iterations of the model itself, more iteration rounds would have been highly beneficial, in particular as no practical implementation has been able to take place. More iterations could further optimise the course design, and test the model in practice. As explained by Anderson & Shattuck (2012), educational design research is an intensive process, generally taking place over a longer period of time. This implies that there are always opportunities for further improvement. Future research can continue this educational research project.

A last comment needs to be made with regard to the participatory design process or co-design. In this process the researcher has the combined position of co-designer and researcher (McKenney & Reeves, 2012). As explained by Barab and Squire (2004), "if a researcher is intimately involved in the conceptualisation, design, development, implementation, and researching of a pedagogical approach, then ensuring that researchers can make credible and trustworthy assertions is a challenge (p. 10)." As such, a certain degree of bias may be considered as a challenge. To avoid bias, all analyses were coded by an independent coder checking for reliability. To this extent, clear coding schemes were used and tested. Additionally, triangulation increased the credibility and trustworthiness of the data analysis as different data sources were utilised (e.g. Chapters 2, 5 and 6). Furthermore, throughout the design, focus groups were employed, serving as additional finetuning and validation rounds. I believe therefore that this approach lifted the risk of bias and protected the credibility and reliability of the research. Despite known risks, it was felt that the advantages outweighed any potential risk, the latter of which could be overcome, as said, through the employment of co-researchers and independent coders, focus groups, and clear, thoroughly tested coding schemes. A primary advantage then of the researcher participating in the co-design team is the advancement of research validity as the dual role allowed for extensive insights and a better understanding relating to the overall design, intrinsic assumptions, and the research context as a whole (Anderson & Shattuck, 2012; McKenney & Reeves, 2012). Furthermore, as McKenney (2012) explains, "the need and opportunities for making methodological adjustments may be more apparent to someone who deeply understands both the design intentions and the research goals (p. 150)."

Implications

Throughout this research a number of implications have passed the review without further delving into the intricacies of those implications. Here we consider the salient implications that emerged from this research, and that have not yet been thoroughly addressed, together with the implications that follow from them.

The fluid definition of blended learning

There is no clear understanding of what blended learning is. To say that a blended learning course should have at least 79% online for it to be considered as blended learning (e.g. Allen et al. 2007; Kjærgaard, 2017) is a definition that seems too narrow to maintain for a thorough understanding. Another definition considers blended learning as a time-based model where learning is defined by synchronous or asynchronous activities, regardless as to whether or not modern technologies are used (Norberg et al. 2011). Yet another approach to blended learning rather places emphasis on modern technology conceptualising blended learning in terms of different modes of delivery, including web-based instructional technology (Graham et al., 2013). Another attempt in capturing the understanding of blended learning argues that the traditional definition of blended learning merely expresses the aspect of combining f2f instruction with ICT-mediated instruction, explaining that a blended approach combines

instructional approaches or methods (Gómez & Duarte, 2011). Whilst the above interpretation of blended learning incorrectly implies that both environments are focussed on instruction only, it is interesting to note that, in the explanation of blended learning as a continuum of the teaching-learning process from one mode onto another in the learning environment (Gómez & Duarte, 2011), one might struggle with capturing a distinction from blended learning as it is generally understood as part of the learning online and part f2f. Another study suggests that there is no definite distinction between time spent online and time spent f2f in order to be considered as blended learning, there is only an ideal division between both modes, which is 50%-50% (Owston & York, 2018).

A dispersed understanding of blended learning is partly due to the fact that blended learning appears to be more of an umbrella term for different types of learning activities. However, a clear definition of blended learning brings with it some implications relating to the design of blended learning courses. Therefore, even before embarking upon the design of blended learning courses, the practicalities and facilities may first need to be addressed. As one teacher explained: *"The first thing I do when designing my course blended-learning style, is to liaise with my colleagues with whom I share the same students when they request the students to attend f2f sessions so that students do not have to travel to campus to attend only my f2f session"*.

Additionally, whilst blended learning may be considered as part technology-mediated (Graham, 2006), the selection of tools should be made carefully and not considered as a different order from the traditional mainstream tools such as textbooks or whiteboard (Kirschner, 2015; Mishra & Koehler, 2006). It is therefore the teacher that determines which tools serve the purpose and help create "effective, efficient and enjoyable learning experiences" (Kirschner, 2015, p.312).

In a sea of blended learning definitions, it seems logical to seek the commonalities between the various definitions, which appear to be that 'learning occurs across different modes'. Therefore, following Gómez & Duarte (2011), it is decided that it is not essential to consider time spent on either mode to arrive at a method that helps decide 'what to do when', or 'which is the most appropriate delivery mode for content and activities in the continuum of the teaching-learning process from one mode onto another'. The model presented here may assist in making these elementary, yet essential choices.

The changing role of the teacher

Having part of the learning content and activities online and part f2f brings with it a changing role of the teacher. Teachers who are more accustomed to traditional teaching may wrongly assume that their own online participation is not required after learning tasks and activities have been explained to the students (Montrieux et al. 2017). However, as explained through the COI framework (Garrison, et al. 2001), teaching presence in blended learning, in addition to the course design, plays a pivotal role in the online environment where it relates to facilitation such as guiding, directing, prompt feedback, and supporting. The teacher may be used to coaching students in this manner during f2f sessions, but now needs to extend such competences to the online environment. Teachers may not be familiar with this role in online activities, in particular the collaborative activities (van Leeuwen et al. 2014), and may need to expand their didactic repertoire through training in order to successfully implement collaborative online learning (Kaendler et al. 2014). A comparison between study 1 and 4 (Chapters 2 and 5) shows that when students participate in blended learning courses designed and coached by teachers with expertise in blended learning, their perceived satisfaction of collaboration vastly increases. Lack of a thorough comprehension of collaboration and online coaching may lead to a lack of understanding the impact this has on students' online interaction, resulting in a dismissal of online coaching altogether. Indeed, as one teacher explains: *"I don't coach my students online. I feel that when I see the students f2f we can pick up on the difficulties they encountered online and elaborate on that, therefore I don't really see the extra value of online coaching"*. The results in studies 1 and 4 (Chapters 2 and 5) show

that students highly value the teacher's presence online, especially in the form of prompt feedback. It has furthermore been recommended that teachers, particularly in the online environment, can evoke social presence through self-disclosure, humour, and even the use of emoticons, i.e. the teacher's *social* presence. This is not necessarily a shift in didactics or teaching skills, but implies a willingness to adopt a free attitude where the hierarchy between students and teacher may dwindle.

In short, as in-class lecturing shifts to the role of facilitator and expert, the teacher's role shifts from a sage on the stage to a guide on the side. This brings some considerations for teachers on what they value in teaching and learning, what competences they have, and what flexibility they are willing to provide as part online learning makes room for self-directed learning, and as self-disclosure and humour become more relevant.

Deep learning

The changing role of the teacher includes an understanding of Bloom's Taxonomy (1956) as deep learning is easily understood through this framework. As teachers struggle with what to move to the online environment and what to do f2f, an understanding of the lower levels of Bloom's Taxonomy (1956) which need little facilitation, and the higher levels of Bloom's Taxonomy which need the expert role of the teacher, is needed. The more autonomous and academic the learner, the more only the higher levels of Bloom's Taxonomy are to be exploited during the f2f sessions. An understanding of the levels, however, is insufficient if it is not understood how the two modes of the blended learning environment can be utilised to scaffold the learning content and the type of activities as the learner moves from one mode to another, and hence as basic concepts build towards higher-order thinking. This approach creates a continuum of the two modes of the learning environment, and as such, a continuum of the teacher-learning dynamics. In such a continuum, the collaborate activities in particular play a central role as they facilitate deep learning and social presence. However, teachers may have difficulty in understanding the value of collaboration, as one teacher explains: *"It takes my students too much time which, as adult-learners, they are challenged with. Therefore I no longer have them carry out collaborative activities"*.

Facilitation

Another implication relates to facilitation, including the choice of the LMS, teacher training, time spent on course creation, the physical learning space, and the type of blend decided upon. In blended learning, an ideal LMS platform is one that is interactive, allows for a concentric learning approach, and which can be used as a dynamic communication system. In the lack of understanding the dynamics of an interactive LMS, and with that the concentric learning that blended learning provides, teachers may see the LMS as an elaborate file-sharing system. Furthermore, facilitation should be extended to the shift from an in-class instructor to an online-facilitator/in-class expert in the form of training and time spent on course design. Whilst the model may largely assist in the process, teachers still need to receive support in 1) training in online coaching, 2) the time for proper design, 3) understanding the value and affordances of blended learning, and 4) technological tools and understanding. Failure to facilitate the shift from traditional teaching to blended learning can prompt into unfocused course offerings, resulting in a replica of traditional f2f approaches, and rejection of the integration of technology in educational settings on the one hand, or an over-valuing of technology, thereby assuming technology to be of pedagogical value, on the other. Additionally, the physical learning space needs to be considered. With the shift from traditional classroom teaching to online lectures/f2f learning, certain spaces may not be suitable, such as an auditorium, in particular as collaborative activities or group-based activities are to be implemented. Lastly, the type of blend needs to be considered: how often are students required to travel to campus and when? If this is not synchronised across an entire institute then students find themselves having to travel to campus needlessly for perhaps just one or two courses.

The suggested implications in relation to facilitation require adequate funding as successful and innovative transformations of blended learning courses can only be realised when there is institutional support for analysing programmes and their impact on teachers, students, and the institution itself (Anderson et al. 2001).

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APPENDICES

APPENDIX A: INTERVIEW PROTOCOL – STUDY 1, CHAPTER 2

1. Introduction

- Thank the participant for participating in the study
- - Explain the goals of the study: *investigate students' experiences in blended learning courses*
- - Explain the 12 questions intended for orientation
- - Emphasize that the focus is on their experiences and opinions, and that there are no right or wrong answers
- - Ask permission to record and transcribe the interview, and explain that all data will be treated confidentially
- - Sign informed consent

2. Background information

- What is your year of birth?
- How long have you been studying at the HU?
- How long have you been enrolled as a blended learning student?

3. Questions

- Can you give me an example of a video clip in which the learning content was explained by your own teacher, for example an explanation of lecture of concepts, and that you watched in its entirety?
- If watched entirely, what was the reason?
- Can you give me an example of a presentation tool, for example, ppt of prezi of youtube of weblecture or perhaps just a text that has your preference for online presentation of theory?
- What motivates you to study online content regardless of which medium or presentation tool is used?
- What is a reason for you *not* to study online content?
- What is a reason for you to carry out online assignments?
- What is a reason for you *not* to carry out online assignments?
- What type of activities has your preference for online collaboration?
- What type of activities do you prefer to carry out on your own?
- Could you give an example in which you find the connection between the LMS and the f2f session meaningful?
- With what type of assignments does teacher online feedback play a role in you carrying out the assignment?

- Should I have asked a question that I have omitted to ask, or do you have any additional comments that can help me?

3. End

- Ask whether the adult-learner has additional comments related to the themes of the interview
- Thank the participant for participating in the study

APPENDIX B: CODING SCHEME – STUDY 1, CHAPTER 2

Variable Number	Main category	Operational Definition
1	Assignments are meaningful	Assignments have a relation to test, practice, or provide a learning curve
2	Synergy of online content and f2f content	Online content is either repeated or elaborated on during f2f sessions
3	Synergy of online assignments and f2f sessions	Assignments are ignored during f2f or assignments are exploited during f2f
4	Teacher feedback	Teacher feedback on assignments is given online, f2f, or not at all
5	Peer feedback	Peer feedback is given online, f2f, or not at all

APPENDIX C: VARIABLES AND RELATED QUESTIONS IN QUESTIONNAIRE – STUDY 1, CHAPTER 2

related factors	Variables questionnaire	related questions
social presence		1. Assignments in HUBL are not carried out because there is no peer-feedback (q1 & q9)
	Convergence	2. Assignments in HUBL are needed in preparation for the f2f meetings (q2 & q6)
		3. Assignments in HUBL are not carried out when there is no relation to professional practice or tests (q3 & q11)
		4. Assignments in HUBL are ignored when there is no teacher feedback (q4 & q8)
social presence	Convergence	5. Studying learning content in HUBL is necessary in preparation for f2f meetings (q5 & q12)
	Convergence	6. Learning content in HUBL is repeated during f2f meetings so only one is attended to (q7 & q14)
social presence	Convergence	7. Assignments in HUBL are not carried out because no attention is given to them during f2f meetings (q10 & q13)

APPENDIX D: COMPARISON RESULTS QUESTIONNAIRES AND INTERVIEWS – STUDY 1, CHAPTER 2

Themes	Variables questionnaire	Categories interviews	Not attending f2f	Attending f2f	Not studying online	Studying online	Carrying out online assignment	Not carrying out online assignment	Comment
Adult-learners' needs: meaningful assignments	Online assignments are <i>not</i> carried out when there is no relation to professional practice or tests	Assignments have no relation to test or practice or provide no learning curve					I=0% Q=19%	I=100% Q=81%	I: No students would carry out the assignments if they were of "no use" to the test, professional practice or provided learning curve.
		Assignments are related to practice or part test or provide a learning curve					I=100%		
Convergence learning content	Content hub1 is repeated during f2f so only one of the two is carried out	Online content is repeated during f2f	I=75% (6 students)	25% (2 students)		I=75% (6 students)			I: all students preferred not to spend their time driving to the University for something they can do at home, and would rather 'self-direct' their learning. Two students (25%) commented to attend nevertheless out of obedience.
			Q=72% choose either, 28% attend regardless						
				100%		100%			

	online content is necessary in preparation for f2f meetings	f2f elaborates on online content	Q=47% agree, 53% disagree							
	Assignments in HUBL are needed for the f2f meetings*							Q=25%	Q=75%	
	Assignments in HUBL are not carried out <i>when</i> no attention is given to the during f2f meetings*								Q=94%	
	Assignments in hubl are <i>not</i> carried out because there is no teacher feedback	Teacher feedback is given to assignments						I=100% Q=25%		
Social presence teacher		No teacher feedback is given to assignments						I=25% (2 students)	I=75% Q=75%	I: 50% of the students carry out the assignments out of obedience
Social presence students	Q2=assignments in hubl are not carried out because there is no peer-feedback	Peer-feedback is important						I=0% Q=69%	I=0% Q=31%	I: none of the students felt that online peer-feedback was important. They rather worked independently but would (all) do the

									online assignments if this was needed to support the theme (loyalty)
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No separate category stems from the interviews since this was an intricate part throughout the interviews, one that follows from other categories.

* In the questionnaire there is one variable that measures the actual status quo, and one that measures students' attitude.

* Questionnaires (Q): 31 (participants) = 100%. Interviews (I): 9 interviewees = 100%

APPENDIX E: PERCENTAGE SCORES TO VARIABLES – STUDY 1, CHAPTER 2

		strongly		rounded off		strongly		rounded	
		agree	%	agree	%	disagree	%	disagree	%
1. Assignments in Hubl are not carried out because there is no peer-feedback	q1 & q9	7,81	23,43	31	48,43	20,31	69		
2. Assignments in Hubl are needed in preparation for the f2f meetings	q2 & q6	7,81	17,18	25	40,62	34,37	75		
3. Assignments in Hubl are not carried out when there is no relation to professional practice or tests	q3 & q11	20,3	60,93	81	10,93	7,81	19		
4. Assignments in Hubl are ignored when there is no teacher feedback	q4 & q8	29,68	45,31	75	14,06	10,93	25		
5. Studying learning content in Hubl is necessary in preparation for f2f meetings	q5 & q12	17,18	29,68	47	35,93	17,18	53		
6. Learning content in Hubl is repeated during f2f meetings, so only one is attended to	q7 & q14	25,75	46,95	72	21,85	6,25	28		
7. Assignments in HUBl are not carried out when no attention is given to them during f2f meetings	q10 & q13	37,5	56,25	94	6,25	0	6		

The percentages under the rating scores are reduced to two decimals. The percentages that divide overall agree or disagree have been reduced to whole numbers.

APPENDIX F: CODING SCHEME – STUDY 2, CHAPTER 3

Variable Number	Main Category	Operational Definition
Educational Needs		
1.		Learner-control
2.		Deep learning
3.		Real-world issues
4.		Expanding knowledge
5.		Clarity
6.		Related to life experience
7.		Collaboration
8.		Meaning
9.		Relevance
Learning Characteristics		
10.		Independent
11.		Intrinsic Motivation
12.		Autonomous
13.		Self-directed

APPENDIX G: PERCENTAGE AGREEMENT FOR EACH VARIABLE – STUDY 2, CHAPTER 3

Variable	Percentage Agreement
1	0.97
2	0.96
3.	0.84
4.	0.89
5.	0.84
6.	0.74
7.	0.86
8.	0.98
9.	100
10.	0.83
11.	0.86
12.	0.97
13.	0.91

APPENDIX H: ADULT-LEARNING THEORIES, LEARNING CHARACTERISTICS AND EDUCATIONAL NEEDS – STUDY 2, CHAPTER 3

Author and publication	Adult-learning theories	Emphasised adult-learners' characteristics *	Emphasised adult-learners' needs *
Zhang & Zheng, 2013	Self-directed	Independent, internally motivated	Learner-control, instructor facilitates
Chan, 2010	Self-directed, andragogy	Along, inter alia, Knowles' (1984) six principles	Students need to be involved in planning the learning objectives and activities and solving real-world business problems
Milheim, 2011	Self-directed learning		Several philosophical principles that include real-world issues promotes critical thinking, self-directed approach
Bedi, 2004	Student-centred (learner-centred) instead of teacher-centred, andragogy	Independent, active learner, learner-control	Involve in planning, need facilitating in learning by having learning opportunities provided that move knowledge forward; need active engagement in the learning cycle
Bolton, 2006		Adults need understanding of relevance. Adults are guided by the motivation to solve real-world. Immediate value of topic is crucial	Rubrics help adults as they reduce uncertainty; clearly articulate the issues that an instructor feels are important; and provide the student with a link between assignment, expected outcome, and learning objective.
Frey, 2003	A blend of adult-learning theories, including andragogy	Along, inter alia, Knowles' (1984) six principles	1. State clear expectations 2. Incorporate multiple forms of feedback into course 3. Provide regular communication to individual learners and the group 4. Provide learner flexibility and control 5. Incorporate motivational strategies to encourage students 6. Offer a variety of forms of learner support

Knowles, 1984	1) self-concept, 2) experience, 3) readiness to learn depends on need, 4) problem centred focus, 5) internal motivation, and 6) adults need to know why they need to know something	Model of assumptions – the adult-learning principles of andragogy	An approach that does justice to the adult-learning principles of andragogy
Birzer, 2004	Andragogy	Adult-learning principles of andragogy	1. Establish a physically and psychologically conducive learning atmosphere 2. Involve learners in mutual planning 3. Involve learners in diagnosing learning needs 4. Encourage students to formulate the learning objectives. 5. Encourage learners to identify resources 6. Involve learners in learning evaluation. Adults need to know why they should learn something; adults have a deep need to be self-directing; adults readiness to learn is tied closely with their needing to know or do something new in their life situation; Adults further need: Preparation for the learning; a climate conducive to learning; a structure for mutual planning; engagement actively in their determining their learning needs; translating their learning needs into objectives; designing a pattern of learning experiences; conducting the learning experiences; and, evaluating the extent to which their objectives have been met
Henchke 2010	Andragogy among other learning theories (chronological overview)	Learner-centred, among others, internally motivated, task-centred orientation to learning, greater volume and a different quality of learning experience than youth	Meaningful activities relate to real-world issues and an approach that does justice to the adult-learning principles of andragogy
Chametzky, 2014	Knowles' six assumption of andragogy	Internally motivated, self-directed - see also andragogy principles	

Snyder, 2009	Andragogy	Principles of the adult-learning theory andragogy, self-directed learning theory, transformation learning theory	Real life problem-solving Availability of course material and technological tools
Pappas & Jerman, 2015	Andragogy	Experienced, careers, including the principles of the adult-learning theory andragogy	Coaching
Cercone, 2008	Andragogy learning theory, self-directed learning theory, experiential learning theory, transformational learning theory	Plan, independent, goal-oriented, organise time, along with the adult-learning principles of andragogy	1. actively involve adults in the learning process 2. adults need scaffolding to be provided by the instructor 3. adults need support to work in a learner-centred programme 4. adults need the instructor to act as facilitator 5. adults need to make use of prior experience 6. adults need real life, problem-solving activities 7. adults need a learner-centred environment 8. adults need the opportunity to self-asses and self-evaluate 9. adults need a collaborative, mutual and informal working climate 10. adults need support for transformational learning 11. adults need to collaborate with other students.

Nb. Whilst presented studies provide more information, both interesting and valuable, than has been included in this study, only information relevant to this current study has been used.

** needs could be considered as an extension and resulting from characteristics*

APPENDIX I: SUMMARY OF FINDINGS OF THE INCLUDED ARTICLES WITH RELEVANT CONTEXTUAL INFORMATION – STUDY 2, CHAPTER 3

Author and publication date	Type of Study	Educational Context	Domain	Adult-learning theories	Emphasised adult-learners' characteristics*	Emphasised adult-learners' needs *
Zhang & Zheng, 2013 [1]	Descriptive	Higher Education	Information Technology	Self-directed	Independent, internally motivated	Learner-control, instructor facilitates
Chan, 2010 [2]	Descriptive	Higher Education	College of Education, Doctoral Candidate on Instructional Design	Self-directed, andragogy	Along, inter alia, Knowles' (1984) six principles	the students need to be involved in planning the learning objectives and activities and solving real-world business problems
Milheim, 2011 [3]	Descriptive	Higher Education	Department of Education	Self-directed-learning		Several philosophical principles that include real-world issues promotes critical thinking, self-directed approach
Bedi, 2004 [4]	Descriptive	Higher Education and Vocational Training	Educational Department	Student-centred (learner-centred) instead of teacher-centred, andragogy	Independent, active learner, learner-control	Involve in planning, need facilitating in learning by having learning opportunities provided that move knowledge forward; need active engagement in the learning cycle
Bolton, 2006 [5]	Intervention	Higher Education	Accelerated Business Degree Programme		adults want to know why something is important to learn. In addition, adults approach learning as real-world	Rubrics help adults as they reduce uncertainty; clearly articulate the issues that an instructor feels are important; and provide the student with a link between assignment, expected outcome, and learning objective.

Frey, 2003 [6]	Intervention	Higher Education	Information Science	A blend of adult-learning theories, including andragogy	problem solving and will not readily learn until they are ready and motivated to learn. Finally, the concept of andragogy indicates that adults learn best when the topic is of immediate value to them	Along, inter alia, Knowles' (1984) six principles	1. State clear expectations 2. Incorporate multiple forms of feedback into course 3. Provide regular communication to individual learners and the group 4. Provide learner flexibility and control 5. Incorporate motivational strategies to encourage students 6. Offer a variety of forms of learner support 7. Maintain the focus of content within units 8. Provide consistency among courses 9. Consider limitations of adults 10. Respect learner roles and life experiences
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Merriam, Caffarella, and Baumgartner (2007) [7]	Descriptive	Higher Education	Unknown	Self-directed learning and re-definition of six principles of Knowles' andragogy (1984). 1. Self-Concept: Adult learners are self-directed, autonomous, and independent. 2. Role of Experience: Repository of an adult's experience is a rich resource for learning. Adults tend to learn by drawing from their previous experiences. 3. Readiness to Learn: Adults tend to be ready to learn what they believe they need to know. 4. Orientation to Learning: Adults learn for immediate applications rather than for future uses. Their learning orientation is problem-centred, task-oriented, and life-focused. 5. Internal Motivation: Adults are more internally motivated than	problem oriented, internally motivated, independent, along with the principles of andragogy, and other adult-learning theories	An approach that does justice to andragogy and other adult-learning theories, inter alia, self-directedness and transformational
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Knowles, 1984 [8]	Descriptive	Unknown	Unknown	externally. 6. Need to Know: Adults need to know the value of learning and why they need to learn 1) self-concept, 2) experience, 3) readiness to learn depends on need, 4) problem centred focus, 5) internal motivation, and 6) adults need to know why they need to know something Andragogy	Model of assumptions – the adult-learning principles of andragogy	An approach that does justice to the adult-learning principles of andragogy
Birzer, 2004 [9]	Intervention	Higher Education	Criminal Justice Department	Andragogy	Adult-learning principles of andragogy	1. Establish a physically and psychologically conducive learning Atmosphere 2. Involve learners in mutual planning 3. Involve learners in diagnosing learning needs 4. Encourage students to formulate the learning objectives. 5. Encourage learners to identify resources 6. Involve learners in learning evaluation.
Henchke 2010 [10]	Descriptive	Higher Education	Unknown	Andragogy among other learning theories (chronological overview)	Learner-centred, among others, internally motivated, task-centred orientation to learning, greater	Adults need to know why they should learn something; adults have a deep need to be self-directing; adults readiness to learn is tied closely with their needing to know or do something

						new in their life situation; Adults further need: Preparation for the learning; a climate conducive to learning; a structure for mutual learning; engagement actively in their determining their learning needs; translating their learning needs into objectives; designing a pattern of learning experiences; conducting the learning experiences; and, evaluating the extent to which their objectives have been met	volume and a different quality of learning experience than youth				new in their life situation; Adults further need: Preparation for the learning; a climate conducive to learning; a structure for mutual learning; engagement actively in their determining their learning needs; translating their learning needs into objectives; designing a pattern of learning experiences; conducting the learning experiences; and, evaluating the extent to which their objectives have been met
Chametzky, 2014 [11]	Descriptive	Higher Education	Education	Knowles' six assumption of andragogy	Internally motivated, self-directed -see also andragogy principles	Meaningful activities relate to real-world issues and an approach that does justice to the adult-learning principles of andragogy					
Snyder, 2009 [12]	Descriptive	Higher Education	Education, Instructional Design	Andragogy	Principles of the adult-learning theory andragogy, self-directed learning theory, transformation learning theory	Real life problem-solving Availability of course material and technological tools					
Pappas & Jerman, 2015 [13]	Descriptive	Higher Education	Unknown	Andragogy	Experienced, careers, including the principles of the adult-learning theory andragogy	Coaching					

Cercone, 2008 [14]	Descriptive	Higher Education	Education	Andragogy learning theory, self-directed learning theory, experiential learning theory, transformational learning theory	Plan, independent, goal-oriented, organise time, along with the adult-learning principles of andragogy	1.actively involve adults in the learning process 2.adults needs scaffolding to be provided by the instructor 3.adults need support to work in a learner-centred programme 4.adults need the instructor to act as facilitator 5. adults need to make use of prior experience 6. adults need real life, problem- solving activities 7. adults need a learner-centred environment 8. adults need the opportunity to self-asses and self-evaluate 9. adults need a collaborative, mutual and informal working climate 10. adults need support for transformational learning 11. adults need to collaborate with other students.
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* needs could be considered as an extension of, and resulting from characteristics

APPENDIX J: FRAMEWORK ADULT-LEARNERS' CHARACTERISTICS AND NEEDS, AND POSSIBLE IMPLICATIONS - STUDY 2, CHAPTER 3

Learning Characteristics	Possible implications for the teacher's role
Independent	Allow choices
Ability to self-manage	Allow autonomy
Internally motivated	Involve students in learning objectives
Problem or goal-oriented	Providing task-oriented learning opportunities
Educational Needs	
Desire for personal growth	Incorporate differentiation and allow choices
To make sense of prior experience	Incorporate differentiation and allow choices
Instructor is facilitator	Allow autonomy
To be involved in planning learning objectives	Involve students in learning objectives
To be actively involved in learning process	Guide, coach, facilitate
Solving real-world problems	Providing task-oriented learning opportunities
Self-evaluate and self-assess	Provide rubrics and other self-assessing tools
Availability of course material	Provide transparency
Availability of technical tools	Provide an overview of tools and guide on how to use them
Tailored coaching	Guide, coach, facilitate
Conducive learning environment	Provide a tailored learning environment
Freedom to identify resources	Allow autonomy
Scaffolding to be provided by the instructor	Provide scaffolding opportunities
Make use of prior experience	Provide a tailored learning environment
Learner-centred working environment	Involve students in planning learning objectives and learning processes
Collaborative, informal working climate	Create collaborative tasks
Clear focus on the course programme	Programme-design approach - State clear expectations - Multiple forms of feedback - Regular communication to individual and group - Learner flexibility and control - Incorporate motivational strategies - Offer various forms of learner support - Maintain focus on content - Provide consistency among courses - Respect learner roles and life-experience
To know why something is important to learn	Involve students in learning objectives
Topic should be of immediate value	Provide task-oriented learning opportunities, provide a tailored learning environment
Need to have clear rubrics	Provide clear rubrics and other self-assessing tools

APPENDIX K: NUMBER OF EXCLUSION HITS SOCIAL PRESENCE – STUDY 3, CHAPTER 4

Hits per exclusion criterion social online presence

HITS PER EXCLUSION CRITERION SOCIAL ONLINE PRESENCE	
Exclusion criterion	hits
Studies providing a general discussion on education	4
Studies lacking discussion of promising interventions on social online presence	180
Studies pertaining to vocational or lower-level academic education	236
Studies that are too limited to enable transferability:	271
Studies focusing on teacher context only (41); studies relating to unique, single case studies or limited subject pools (64); studies focusing on domain-specific complexities (154); studies relating to emergency teaching (12)	
Studies incorporating pedagogical theories in non-adult learners' context	11
not peer reviewed	2
older than 12 years	7
Studies lacking theory discussion	3
Total number of studies excluded	714

APPENDIX L: NUMBER OF EXCLUSION HITS CONVERSION – STUDY 3, CHAPTER 4*Hits per exclusion criterion convergence*

HITS PER EXCLUSION CRITERION CONVERGENCE	
Exclusion criterion	hits
Studies providing a general discussion on education	7
Studies lacking discussion of promising interventions on delivery mode/convergence/categorisation	236
Studies pertaining to vocational or lower level academic education	61
Studies that are too limited to enable transferability:	82
Studies focusing on teacher context only (7); studies relating to unique, single case studies or limited subject pools (11); studies focusing on domain-specific complexities (58), studies relating to emergency teaching only (6)	
Studies incorporating pedagogical theories in non-adult learners' context	2
not peer reviewed	1
older than 12 years	5
Studies lacking theory discussion	1
Total number of studies excluded	395

APPENDIX M: CODING SCHEME AND OPERATIONAL DEFINITION – STUDY 3, CHAPTER 4

Variable number	Variable	Operational definition
1	Social Presence*	The ability to perceive others in an online environment.
2	Teaching Presence*	The actions related to course design, the facilitation, and direction of cognitive and social processes with the aim of realising personally meaningful and academic learning outcomes.
3	Cognitive Presence*	To construct meaning and critical thinking through sustained communication.
4	Online Mode	Online learning part of the learning environment
5	F2f Mode	In-class learning part of the learning environment

*Garrison et al. (2000)

APPENDIX N: OVERVIEW OF THE INCLUDED STUDIES WITH RELEVANT CONTEXTUAL INFORMATION – STUDY 3, CHAPTER 4

Study number	Authors, title & year	Country	Educational context	Type of study	Programme/ Domain	Number of students	Description of online approach or leveraging online strategies	Duration of course or study
1	Examining online teaching, cognitive, and social presence for adult learners Ke, F. (2010)	USA	Higher education	Description	Nursing, Education and Business	Groups of min. 8 and max. 25 students	Indicators of greetings, closures, comments without elaboration, addressing peers or groups, quoting or referencing to others' messages, complementing and emotional expressions.	One semester
2	Prerequisites for interactive learning in distance education: perspectives from Swedish students Östlund, B. (2008)	Sweden	Higher education	Description	Undergraduate course and a graduate course in a teacher training programme	33 students in the undergraduate group, and 29 students in the graduate group	High structured courses with directions of how and when assignments should be carried out. Three requirements for interaction (contributing, according to a present number, to discussions, providing peer-feedback). Students were given time to get acquainted. Interfaces <i>FirstClass</i> and <i>WebBoard</i> were used.	13 weeks and 20 weeks
3	A model for social presence in online classrooms Wei, C.W. & Chen, N.S. & Kinshuk, Dr. (2012)	Taiwan	Unknown	Description	-	627	Active employment of user interface, implementation and encouraging social cues effecting co-presence, immediacy, and intimacy	-
4	Participation, interaction and social presence: an exploratory study of collaboration in online peer review groups Zhao, H., Sullivan, K., P. H., & Mellenius I. (2014)	Sweden	Higher education	Description	-	18	Participating in min two online peer-review was a pre-requisite to grading: writer initiating – peer response – writer follow-up. Participation: independent statements, interaction: one-way without follow-up, collaboration: two- and multiple-way interaction (highest level of social presence)	-
5	Exploring social and cognitive presences in communities of	Spain	Higher education	Description	-	206	Collaborative activities related to real-world, and meaningful application including analysing,	Three academic years

	Inquiry to perform higher-order cognitive tasks Morueta, R. T., López, P. M., Gómez, A.H., Harris, V.W. (2016)	Uruguay	Higher education	Description			evaluating and creating: varying level of higher-order tasks according to Bloom's Taxonomy (1956)	Three academic years
6	Social presence in the 21 st century: an adjustment to the community of inquiry framework Armellini, A. & De Stefani, M. (2015)	Uruguay	Higher education	Description	Continuous professional development programme – teacher training	40	Monthly 72f sessions to promote reflection, online mode promoted focused participant-tutor and peer-communication through forum postings and private messages, using a highly structured user interface	
7	Broadening the understanding of social presence: implications and contributions to the mediated communication and online education Kim, J., Song, H. & Luo, W. (2016)	USA	Higher education	Description	Undergraduate communication programme	210	Encouraging co-presence and psychological involvement, employment of communication behaviour by the teacher to increase teacher immediacy	-
8	Students' viewpoint: what constitutes presence in an online classroom? Hajibayova, L. (2017)	USA	Higher education	Description	Graduate Information Science programme	45	Collaborative projects, collaborative platforms and small group discussions, frequent teacher's engagement and reflection in online classrooms, online assignments	-
9	Social presence in relation to students' satisfaction and learning in the online environment: a meta-analysis Richardson, J. C., Maeda, Y., Lv, J., Caskurlu, S. (2017)	USA	Higher education	Description	-	-	Longer courses, collaborative assignments, course facilitation: schedules of activities, structured activities, instructions for learner participation	Open
10	Examining the characteristics and content of instructor discussion interaction upon student outcomes in an online course	USA	Higher education	Description	13 Graduate courses in education	546	Instructors post varying in terms of frequency and content, intentional instructor communication evoking deep learning, encouraging student participation, direct and extend	May 2015 – June 2016

11	Hoey, R. (2017)	USA	Higher education	Description	Graduate programme in instructional design and technology	101	discussion on content, focussing the discussion,	Providing personalised feedback, collaborative activities, teacher's immediacy behaviours, one on one contact, personal contact, audio/video feedback, employing social media,	Three semesters
12	Engagement Matters: student perceptions on the importance of engagement strategies in the online learning environment Martin, F. & Bolliger, D. U. (2018)	USA	Higher education	Description	A variety of Graduate programmes	155		Icebreaker/introduction discussions, collaborative activities, regular announcements, email reminders, clear rubrics, working on real-world projects, structured discussions with guiding questions.	One semester
13	Instructor social presence effects on learner social presence, achievement, and satisfaction. Oyarzun, B., Barreto, D. & Conklin, S. (2018)	USA	Higher education	Description	Undergraduate programmes in Science, Health Science, Education, Business, Cultural Arts	180		Clear and explicit requirements for projects, structured collaborative assignments, instructor's social presence and immediacy behaviours	-
14	A hybrid approach to university subject learning activities Gómez, L. A. O. & Duarte, J. M. (2011)	Colombia	Higher education	Description	Regional development management programme	17		Initial F2f session, group discussions, group discussions based on self-learned online work, small group activities, developing higher-order learning (analysing, synthesising, evaluating), dynamic student-teacher interaction, assessment strategies	Two semesters
15	Face-to-face activities in Blended Learning: New Opportunities in the Classroom? Kjaergaard, A. (2017)	Denmark	Higher education	Description	Business and management programme	-		F2f activities complement online activities, collaborative activities, teachers facilitate in meaningful discourse, group work,	-

16	An empirical study of the impact of multiple modes of delivery on student learning in a blended course Baragash, R. S. & Al-Samarrale, H. (2018)	Malaysia	Higher education	Description	Undergraduate programmes	196	Online quizzes, integration of WBL for individual learning, online lectures with f2f follow-up, collaborative assignments	-
17	The nagging question when designing blended courses: Does the proportion of time devoted to online activities matter? Owston, R. & York, D. N. (2018)	Canada	Higher education	Description	Undergraduate programmes (20) in fine arts, professional, and liberal arts	1024	Time division of online and f2f set by the teacher. F2f complements online/connectedness between both modes. Group discussions	12 weeks
18	Blended learning: Deficits and prospects in higher education Cuesta Medina, L. (2018)	Columbia	Higher education	Description	-	-	Web-based individual learning, audio/visual online instructor-led activities, clear structure and guidance,	Open
19	Blended Learning: Balancing the Best of Both Worlds for Adult Learners McKenna, K., Gupta, K., Kaiser, L., Lopes, T. & Zarestky J. (2020)	USA	Higher education	Description	2 Graduate programmes	-	Initial f2f meeting, frequent online engagement, online reflection and developing, introduce content online, then engage with content f2f, frequent f2f engagement, intensive f2f time for developing content knowledge and reflection, collaboration	16 weeks
20	Technology-enhanced learning in higher education: How to enhance student engagement through blended learning Serrano, D. R., Dea-Ayuela, M. A., Gonzalez-Burgos, E., Serrano-Gil, A. & Lalatsa, A. (2019)	Spain	Higher education	Description	-	-	In class approach: ARS in relation to online preparation, self- and peer assessment, lecture recordings online	Open
21	Course satisfaction and perceived learning among distance learners in	Malaysia	Higher education	Description	-	303 questionnaires, online	Online self-regulation and self-efficacy increases course satisfaction as does teacher's social presence.	-

	Malaysian Research Universities: the impact of motivation, self-efficacy, self-regulated learning, and instructor immediacy behaviour. Amoozegar, A., Abdelmagid, M., & Anjum, T. (2022)	USA	Higher education	Evaluation	-	Systematic Literature Review	-	The teacher's social presence is important because it increases social presence and cognitive presence.	
22	Video use in online and blended courses: a qualitative synthesis. Belt, E. S., & Lowenthal, P. R. (2021)	USA	Higher education	Evaluation	-	Systematic Literature Review	-	Social presence is increased when a video is used by the instructor, in being 'visible'. Video increases the ability to see and hear others and improves social presence. It also provides an opportunity for critical self-reflection through self-modelling, hence increases cognitive presence. The background of a video a teacher uses is also important. Video feedback can improve social presence through self-disclosure.	
23	"Are you there?": Teaching presence and interaction in large online literature classes. Li, F. (2022)	China	Higher education	Description	English literature graduate programmes	116	-	Teaching presence is correlated to social presence and cognitive presence, as social presence sustains cognitive presence. This in turn correlates to learning outcomes and student satisfaction. Social presence sustains cognitive presence. Students prefer written text-based communication and working in small groups as this increases social presence. Students highly prefer timely feedback. Facilitating online sharing (e.g. group work) increases social presence.	

24	Examining the influencing factors and the functioning mechanism of online learning supporting learners' empowerment. Pan, X. (2022)	China	Higher education	Description	Undergraduate English programmes	405	Online interaction is increased through clear goals and well-structured interpersonal interactions (e.g. group work). Several factors increase online interaction, namely social presence, a student-centred approach, self-evaluation, and learning motivation. A structured learning environment increases self-empowerment and (online and f2f) learning behaviour.	-
25	Precision Teaching and Learning Performance in a Blended Learning Environment. Yin, B., & Yuan, C. (2021)	China	Higher education	Description	Computer Network Technologies	256	PPT increases all three presences as it increases self-efficacy and motivation. It is important that students know learning goals. PPT relates to BL through: Setting goals (online) Monitoring (online) Elaboration/explanation (f2f) Learning performance then is improved through design and monitoring, and understanding the flow from one environment to the next (online/f2f)	-
26	Assuring the quality of online learning in higher education: Adaptations in design and implementation. Konstantinidou, A., & Nisiforou, E. A. (2022)	Cyprus	Higher education	Evaluation	-	Systematic Literature Review	Students prefer a clear course structure, and learning objectives should be made known. Particularly adult-learning students need to have autonomy and self-regulation options. Frequent formative assessment increase cognitive presence. Students prefer online collaboration through discussions, real-world, interactive learning content with the use of audio-visual elements. Student engagement is	-

							increased through teaching presence. Web tools should be simple and serve the purpose.		
27	What are the Latent Topics Associated with Experience in Flipped Learning? An Empirical Investigation of University Students' Interview Responses. Park, K., & Bang, Y. (2021)	South Korea	Higher education	Description	-	Review of 543 interview data	Difficulties encountered online should be addressed f2f as monitoring and elaborating during f2f sessions is important for learner interaction.	2014-2020	
28	Using live interactive polling to enable hands-on learning for both face-to-face and online students within hybrid-delivered courses. Phelps, C., & Moro, C. (2022)	Australia	Higher education	Description	Undergraduate Health Science and Medicine	174	Students prefer interactive polling, e.g. Kahoot!, (online surveys using animations that can be controlled by students). IP allows for anonymous participation in discussions, providing safety whilst sharing. Interactions with peers and teacher increases student engagement and online engagement. IP increases social presence and collaboration, but too much can become tedious. For some the competition element can be stressful.	-	

APPENDIX O: MAYER'S (2017) TWELVE DESIGN PRINCIPLES ON MULTIMEDIA LEARNING⁹ - STUDY 3, CHAPTER 4

1. Use of set of mix of text and images, ensuring images clarify meaning or enhance comprehension.
2. Graphics and images should be simple, void of background music, and support the learning goals.
3. Key points should be emphasised using highlights, bold text, callouts, or arrows.
4. Minimise the use of spoken presentations in on-screen texts, focussing on images or graphics, but not mixing these with spoken presentations.
5. Keep text and visuals close together in a frame, including placing feedback next to questions or answers, and ensuring that directions and an activity are presented on the same screen.
6. Ensure that voiceovers are timed with visuals or animations and that text and pictures are on the same screen.
7. Organise content in coherent and manageable chunks, minimising the information per lesson, module, or slide, allowing users to control the pace of instruction with next buttons or speed controls.
8. Develop an introductory module explaining key concepts prior to embarking on the main programme, including a cheat sheet with terms and definitions to accompany the course, as well as an explanation of tools needed to complete tasks.
9. Rely on visuals, images and voice overs, thereby limiting the use of text. When narrating a presentation with visuals, use text only to provide directions or steps.
10. When narrating audio content, use either a professional voiceover, or, when doing this yourself, use a high-quality microphone and audio editing software.
11. Use accessible, everyday language in your content, tailored to the target group.
12. To build trust and develop connections, use talking head videos, following which relevant and meaningful images can be selected to support the learning content.

⁹ <https://doi.org/10.1111/jcal.12197>.

APPENDIX P: QUESTIONNAIRE – STUDY 4, CHAPTER 5

Number	Questions	Totally agree	Agree	Disagree	Totally disagree
1	I skip assignments in Canvas when no peer-feedback is given despite this being required as per the assignment.				
2	I carry out the assignments in Canvas when I need them in preparation for the f2f sessions.				
3	When I discover that assignments in Canvas have no relevance to my profession or any tests, I skip them				
4	I skip assignments in Canvas when generally the teacher does not provide feedback				
5	I normally do not skip assignments in Canvas if that would result in difficulty understanding the f2f sessions				
6	If I need the assignments in preparation for the f2f sessions, I carry them out				
7	If learning content in Canvas tends to be repeated during the f2f sessions, I either study online or attend the f2f sessions.				
8	If the teacher does not respond to my assignments in Canvas, I skip them				
9	I ignore the assignments in Canvas if in general I do not receive peer-feedback, even though the assignment determines that				

	peer-feedback is required				
10	If in general the teacher does not provide valuable feedback to my assignments in Canvas, I do not carry them out				
11	I ignore the assignments in Canvas when they are generally not addressed during f2f sessions				
12	I skip the assignments in Canvas when I realise they are not relevant to my test or profession				
13	I study learning content in Canvas if without it I would have difficulty understanding f2f sessions				
14	If the assignments in Canvas are generally not addressed during the f2f sessions, I skip them				
15	I either attend f2f session, or study the learning content in Canvas when generally one is a repeat of the other				
16	I do not carry out assignments in Canvas when the teacher in general does not provide valuable feedback				

APPENDIX Q: RELATION QUESTIONS AND VARIABLES – STUDY 4, CHAPTER 5

Variables	related questions
<i>1. Assignments in the online platform are not carried out because there is no peer-feedback</i>	(q1 & q9)
<i>2. Assignments in the online platform are needed in preparation for the f2f meetings</i>	(q2 & q6)
<i>3. Assignments in the online platform are not carried out when there is no relation to professional practice or tests</i>	(q3 & q12)
<i>4. Assignments in the online platform are ignored when there is no teacher response</i>	(q4 & q8)
<i>5. Studying learning content in the online platform is necessary in understanding the content of the f2f meetings</i>	q5 & q13)
<i>6. Learning content in the online platform is repeated during f2f meetings so only one is attended to</i>	(q7 & q15)
<i>7. Assignments in the online platform are not carried out because no attention is given to them during f2f meetings</i>	(q11 & q14)
<i>8. Assignments in the online platform are not carried out because no valuable teacher feedback is experienced</i>	(q10 & q16)

APPENDIX R: INTERVIEW PROTOCOL – STUDY 4, CHAPTER 5

STUDENTS

1. Introduction

- Thank the participant for participating in the study
- - Explain the goals of the study: *investigate students' experiences in blended learning courses*
- - Explain the 10 questions intended for orientation
- - Emphasize that the focus is on their experiences and opinions, and that there are no right or wrong answers
- - Ask permission to record and transcribe the interview, and explain that all data will be treated confidentially
- - Emphasize that the focus is on their experiences and opinions, and that there are no right or wrong answer
- - Acknowledge receipt of informed consent

2. Background information

- What is your year of birth
- How long have you been studying at the current level?

3. Orientation Questions

1. How often do you carry out assignments in the online environment? For example in percentages.
2. How often do you interact with peers online?
3. What are reasons to carry out the online assignments?
4. What are reasons for interacting with peers online?
5. What are reasons for not carrying out online assignments?
6. What are reasons for not interacting with peers online?
7. How often are you present during in-class sessions?
8. What are reasons for you to be present during in-class sessions?
9. What are reasons for you not to be present during in-class sessions?
10. Can you explain how online assignments play a role during f2f meetings?

3. End

- Ask whether the adult-learner has additional comments related to the themes of the interview
- Thank the participant for participating in the study

TEACHERS

1. Introduction

- Thank the participant for participating in the study
- - Explain the goals of the study: *investigate students' experiences in blended learning courses*
- - Explain the intended for orientation

- - Emphasize that the focus is on their didactical choices, and that there are no right or wrong answers
- - Ask permission to record and transcribe the interview, and explain that all data will be treated confidentially
- - Acknowledge receipt of informed consent (interview and recording)

2. Background information

- How long have you been teaching blended learning style?

3. Orientation Questions

1. How do students work together? (e.g. groups, peers – f2f/online)
2. What do students do in the online learning environment?
3. How are you present online?
4. What do students do during the f2f meetings?
5. Which aspects did you take into account when distributing content and activities across the online and f2f mode?

3. End

- Ask whether the adult-learner has additional comments related to the themes of the interview
- Thank the participant for participating in the study

APPENDIX S: CODING SCHEME AND OPERATIONAL DEFINITION – STUDY 4, CHAPTER 5

Variable number	Theme	Main category	Operational Definition
1	SP	Needs states regarding meaningful online contact	Small groups, regularly meeting online, carrying out meaningful activities with peers online is valuable
2	SP	Needs states relating to being seen by the teacher online	The teacher's response to personal comments, the teacher's feedback online, teacher's online postings, teacher's forum participation
3	SP/CO	Needs states regarding collaboration	Different views give a broader picture, it helps to understand or verify concepts, it provides an opportunity of peer-feedback, it is time consuming, difficult online, meaningless, and self-study is valued
4	CO	Needs states regarding online/f2f scaffolding	It provides deeper learning, clarifies content, clear scaffolding of both environments is valuable, an f2f meeting to know peers is value, the teacher's additional resources online is valuable, it is meaningless when f2f repeats what's online, it is time consuming to do both
5	TP:DES	Sequencing online/f2f	Basic concepts and theory is provided online, scaffolding is provided f2f, without repetition of online mode
6	TP:DES	Assignment guidelines	Assignments are clearly structured so that students know what to do, how, and when it should be completed
7	TP:FAC	Evaluation criteria	There are clear criteria whereby students can assess themselves and their peers
8	TP:FAC	Collaborative activities	Students work on assignments collaboratively
9	TP:FAC	Monitoring online activities	The teacher monitors students' online activities
10	TP:DIR	Responding on students' postings	The teacher responds to students' postings online by posting further questions for students to think about and answers questions students post on the forum with or without a strategical pause
11	TP:DIR	Regular postings online	The teacher posts regularly online, these can be instructional, conversation, or organisational posts
12	TP:DIR	Confirm understanding	The teacher confirms and elaborates on a student's understanding
13	TP:DIR	Prompt feedback	The teacher provides prompt feedback, both online and f2f

14	TP:DIR	Correcting misconceptions	The teacher corrects misconceptions and elaborates on the correct understanding
15	TP:DIR	Additional resources	The teacher provides additional resources for students to further their understanding through self-study

Notes *SP: leveraging online interaction through social presence, CON: leveraging online interaction through convergence, TP:DES: exploiting teaching presence through design, TP:FAC: exploiting teaching presence through facilitation, TP:DIR: exploiting teaching presence through direction.*

APPENDIX T: QUESTIONS ROUND 1 – STUDY 5, CHAPTER 6

Questions Expert Panel Round 1

MC	SC No.	Question
Relevance of Flow Activity		
	1.1	The flow from online 1 to online 2 is relevant
	1.2	The flow from online 2 to online 3 is relevant
	1.3	The flow from online 3 to online 4 is relevant
	1.4	The flow from online 4 to f2f 1 is relevant
	1.5	The flow from f2f 1 to f2f2 is relevant
	1.6	The flow from f2f 2 to f2f 3 is relevant
	1.7	The flow from f2f 3 to f2f 4 is relevant
	1.8	The flow from f2f 4 to online 1 is relevant
Design Principle is well-designed		
	2.1	Design Principle 1 is well-formulated
	2.2	Design Principle 2 is well-formulated
	2.3	Design Principle 3 is well-formulated
	2.4	Design Principle 4 is well-formulated
	2.5	Design Principle 5 is well-formulated
	2.6	Design Principle 6 is well-formulated
	2.7	Design Principle 7 is well-formulated
	2.8	Design Principle 8 is well-formulated
	2.9	Design Principle 9 is well-formulated
	2.10	Design Principle 10 is well-formulated
	3	The design principles in general evoke social presence
	4	The design principles in relate to adult-learners' educational needs
	5	The design principles in general are relevant to the flow activities
Design Principle is effective for Flow Activity		
	6.1	design principle 1 is effective in relation to the flow activities
	5.2	design principle 2 is effective in relation to the flow activities
	6.3	design principle 3 is effective in relation to the flow activities
	6.4	design principle 4 is effective in relation to the flow activities
	6.5	design principle 5 is effective in relation to the flow activities
	6.6	design principle 6 is effective in relation to the flow activities
	6.7	design principle 7 is effective in relation to the flow activities
	6.8	design principle 8 is effective in relation to the flow activities
	6.9	design principle 9 is effective in relation to the flow activities
	6.10	design principle 10 is effective in relation to the flow activities
	7	The model on the whole is supportive for adult-learners
	8	Do you have any tips
	9	Do you have any tips

APPENDIX U: EXTENDED RESPONSES TO QUESTIONS ROUND 1 – STUDY 5, CHAPTER 6

Responses round 1 in relation to disagree or neutral answers

Disagree	Neutral	Comment (R=respondent)
1.3		I do not understand the model here. Online 4 is not connected to online 2?
1.8		See earlier remark [1.3]. Online 4 is in the diagram?
2.9		Is the word 'higher-order' clear for everyone?
2.10		I'm not sure what you mean here - do you have to categorise the content of modes to ensure you don't have repetitive modes?
3.4		I think all the small steps seem unnecessary
	1.3	Not always necessary but could be useful in some cases
	1.4	This does not flow as well as the others, as I believe the f2f1 belongs more with the online 1 or 2 as online 4 seems to be at the end of the learning, whereas f2f1 seems to be at the start of the learning (I may be wrong). Saying that, it is still relevant to a degree as depends on where the cycle of the teaching is at that moment and whether new concepts are being taught at this part of the cycle.
	1.5	Maybe from here onward, the teacher notices (at least that is my experience) that some learners or groups (due to their proficiency, cognitive abilities, ability to work autonomously) can keep up with the pace and that others need some extra (physical/online) attention from the teacher. Often a FTF talk to check why things are not going as planned can help.
	1.6	Maybe from here onward, the teacher notices (at least that is my experience) that some learners or groups (due to their proficiency, cognitive abilities, ability to work autonomously) can keep up with the pace and that others need some extra (physical/online) attention from the teacher. Often a FTF talk to check why things are not going as planned can help.
	1.8	*Depends on the complexity of content * This does not flow as well as the others, as I believe the f2f1 belongs more with the online 1 or 2 as online 4 seems to be at the end of the learning, whereas f2f1 seems to be at the start of the learning (I may be wrong). Saying that, it is still relevant to a degree as depends on where the cycle of the teaching is at that moment and whether new concepts are being taught at this part of the cycle. * not sure I understand this one because I thought f2f 4 flowed to online 4? If you mean the flow to online 4 same answer as above - not always necessary to go to step 4
	2.2	I don't think the term presence and convergence are clear to everyone
	2.4	I'm not quite sure what it is you want teachers to do here. Move to a channel in MS Teams or use the chat option in Skype? Or combine Padlet with the use of BigBlueButton? Yes, then, I think this helps because then you can visualize complex issues.
	2.10	This one I find difficult to understand. I think I agree, but I'm not quite sure.

3.4	Possibly, but I'm not sure that is always the case
4.1	I can't see where DP1 is on the flow chart itself, but if it's under f2f1 or online 1 then it is effective
4.7	This is the one I'm not sure about
4.8	* I can't see where DP8 is on the flow chart, but if it was with online 2 or f2f 2 then this would be effective * Important but I don't know if they are important to the flow
4.10	I'm not sure about DP10 what it means and what its use is

** comments made by different experts to the same question are marked with an **

TIPS

1. I think the model would improve with some additional reference clarifying some concepts or on 'how to read' the model.
2. I feel the flow of the f2f and online should be the other way around, with online 1 then f2f1, online 2 to f2f2 etc. The input should come before the checking of concepts and picking up of discussions in my opinion.
3. There is a lot of information on one A4 (in one model). It might be a lot to take in for teachers. Maybe add a simplified section to provide a first understanding.
4. The model seems to suit a specific didactical approach (oriented towards knowledge acquisition).

APPENDIX V: QUESTIONS ROUND 2 – STUDY 5, CHAPTER 6

Questions Round 2

Q. No.	Question
1	The flow from online 3 to online 4 is relevant
2	The flow from online 4 to f2f1 is relevant
3	The flow from f2f1 to f2f2 is relevant
4	The flow from f2f 2 to f2f3 is relevant
5	The flow from f2f 4 to online 1 is relevant
6	Design principle 2 is well-formulated
7	Design principle 4 is well-formulated
8	Design principle 9 is well-formulated
9	Design principle 10 is well-formulated
10	The design principles in general are relevant to the sequencing of the flow activities
11	The model in general is useable for designing blended learning courses for adult-learners
12	Design principle 1 is effective in relation to the flow activities
13	Design principle 4 is effective in relation to the flow activities
14	Design principle 7 is effective in relation to the flow activities
15	Design principle 8 is effective in relation to the flow activities
16	Design principle 10 is effective in relation to the flow activities

Note: The questions in round 2 are the questions to which experts answered either disagree or neutral during round 1.

ENGLISH SUMMARY

Fostering Online Interaction amongst Higher Education Adult-Learners in Blended learning courses

INTRODUCTION

Many higher education institutes are exploring approaches to learning that afford more flexibility for learners, one such being blended learning (Spring et al. 2016). Blended learning is where part of the learning occurs online as it is technology-mediated (Garrison & Kanuka, 2004; Graham, 2006; Hrastinski, 2019), and part occurs face-to-face (f2f). Henceforth, blended learning offers two modes of learning: an online mode and a f2f mode. Blended learning, being a transformative, didactical approach, is particularly interesting as it offers new opportunities for evoking higher-order thinking and deep learning through cooperative or collaborative activities shared across the two modes of learning (Biggs & Tang, 2007; Kjærgaard, 2017; McKenna et al., 2020).

As part of the learning is online in a blended learning environment, this affords flexibility in terms of time and place, which is of particular interest to adult-learners (Decelle, 2017; Diep et al. 2017; Jones & Blankenship, 2017; Youde, 2018). However, despite adult-learners being high-achieving learners (Owston et al. 2013), with high self-regulatory skills and self-motivation (Cercone, 2008; Chametzky, 2014; Konstantinidou & Nisiforou, 2022), preliminary studies reveal that in particular adult-learners in higher education hardly interact with the online content of a blended learning environment. This contributes to a downward spiral where said adult-learners have poorly perceived learning experiences (Armellini & De Stefani, 2015; Kim et al. 2016; Morueta et al. 2016), have lower learning outcomes (Cuesta Medina, 2018; McKenna et al. 2020; Serrano et al. 2019), or even leave the programme prematurely (Choi & Kim, 2018; Johnson et al. 2018; Kuo & Belland, 2016). In order to compensate for the lack of interaction with the online mode, teachers tend to repeat what is online in a blind continuation of traditional teaching and learning activities in the f2f mode (Kjærgaard, 2017; Serdyukov, 2017), resulting in a dilution of both modes (McKenna et al. 2020), and a failure of learners to interact with the 'added' online mode as they fail to see its relevance (Östland, 2008; van der Stap et al. 2019).

Lack of interaction with the online mode is not a new phenomenon and has been examined in previous literature extensively. The literature reveals two salient factors, namely 1) social presence, where individuals are aware of the existence of others in the online environment (Amoozegar et al. 2022; Andel et al. 2020; Hodges et al. 2020; Ke, 2010), and convergence, where both modes of the learning environment are properly sequenced and synchronised according to their content and activities (Murray et al. 2016; Owston & York, 2018; Park & Bang, 2022), without there being an overlap from one mode onto the other (Cuesta Medina, 2018). In the absence of social presence, learners may feel isolated and may not experience the presence of others (peers or teacher), and hence will refrain from online interaction (Martin & Bolliger, 2018; Oyarzun et al. 2018). Likewise, with regard to convergence, when learners do not see the relevance of the content and activities in the online mode, or when they fail to see the relation of both modes, they will tend to ignore the online environment and resort to attending f2f only as this is the medium of education with which they are most familiar (Östland, 2008; van der Stap et al. 2023). Both challenges could be met through an instructional model (Hodges et al. 2020; Milheim, 2011). It would seem that a clear model with design principles guiding the design of the

blended learning environment would meet these challenges effectively (Hodges et al. 2020; Serdyukov, 2017; Youde, 2018).

When designing a learning environment, Biggs (2003) introduces the concept of 'constructive alignment', where 'presage' (learner factors and teacher context) align with learning processes in order to achieve a desired 'product' (learning outcomes). When contemplating such constructive alignment, both aspects of presage should be met: the student factors, and the teacher context, generally understood as the learning environment (Tynjälä, 2013). Consequently, when considering an instructional design for blended learning, the needs of higher education adult-learners should be aligned with the learning environment, in particular as higher education adult-learners have different needs and characteristics that play a critical role in the way they approach learning in the online mode (Milheim, 2011; Pappas & Jerman, 2015; Vanslambrouck et al. 2019; Youde, 2018).

The **main objective** of this dissertation is to identify, both theoretically and empirically, the qualities of a blended learning instructional model that fosters higher education adult-learners into online interaction in blended learning courses. Such identification is crucial considering that the absence of a validated instructional model that may guide teachers in designing blended learning courses geared towards adult-learners in higher education may result in them falling back on traditional teaching methods (Serdyukov, 2017), hence nullifying the blend and the benefits that both worlds (online and f2f) of blended learning affords (McKenna et al. 2020).

The general introduction of this dissertation (**Chapter 1**) provides a literature review related to the research theme. In particular it describes the salient learning characteristics and educational needs of higher education adult-learners. Next, the challenges of online interaction in blended learning are identified, including the lack of clear instructional design principles that can be used to foster online interaction. This makes the case for more evidence-based instructional blended learning designs particularly tailored to higher education adult-learners in blended learning courses. Next, the research challenges are articulated into three objectives, upon which the research design is outlined.

OBJECTIVES, CONTEXT, AND DESIGN

Objectives

Based on the three research challenges, the main objective of this dissertation is to examine, both theoretically and empirically, the specific requirements of a blended learning instructional model aimed at facilitating higher education adult-learners into online interaction.

Three objectives (RO) were formulated:

Objective 1: to investigate adult-learners' perceived satisfaction in relation to blended learning and the factors that foster their interaction with the 'added' online mode; and a thorough understanding of adult-learners' educational needs and learning characteristics derived from theory.

Objective 2: to understand the factors of social presence and convergence, and how these can be ingrained into design principles that foster online interaction.

Objective 3: to explore the specifics of an instructional model for the design of a blended learning environment for adult-learners in higher education, both theoretically and empirically, and how said principles can be actualised in a validated model.

Research Context

The research conducted in this dissertation was initiated at the HU University of Applied Sciences Utrecht as it followed a pilot programme on blended learning. Whilst promising in theory, in practice the results did not meet the expectations as many adult-learners did not interact with the online part of the learning environment. Following preliminary literature studies on the phenomenon of online interaction, two salient factors of online interaction were brought forward, namely social presence and convergence, both pertaining to the learning environment. As Biggs (2003) explains, when designing education, two first steps (presage) should be considered, namely the student factors and the learning environment. Beginning therefore with the student factors, the first study studies the status quo of the student factors (here: adult-learners in higher education). Following this initial study more theory was needed on higher education adult-learners' needs, hence a systematic literature review was carried out on higher education adult-learners' learning characteristics and educational needs (study 2).

To understand the intricacies of the aforementioned factors of social presence and convergence in relation to the second aspect of presage, the learning environment, more theory was needed, hence two further systematic literature reviews, one on each factor, were carried out (study 3). In order to work towards blended learning instructional design principles that not only contribute to the theory on blended learning and instructional design, but may also assist course designers in designing blended learning courses specifically for adult-learners in higher education, it was important to validate claims made in literature in a different adult-learning context than the author's own institute in order to avoid familiarity and to increase external validation. The research context therefore included four universities, of which two were in the Netherlands, and two in Belgium (Flanders). All the institutes used the same LMS (Canvas) enabling a clear focus on the implementation of blended learning and the level in which social presence and convergence is afforded (study 4). Lastly, a concentric instructional model was designed and different experts across different universities were asked to give their expert opinion on the instructional model which was the outcome of this research (study 5).

Research Design

In order to address the main objective of this dissertation and the subsequent objectives, the studies within this dissertation are based on an educational design research approach (Barab & Squire, 2004; McKenney & Reeves, 2012) that fits within the paradigm of qualitative research (Miles & Huberman, 1994). Educational design research aims to produce "new theories, artifacts, and practices that account for and potentially impact learning and teaching in naturalistic settings" (Barab & Squire, 2004, p. 2). Moreover, according to McKenney and Reeves (2012), educational design research consists of three main phases, namely analysis and exploration, design and construction, and evaluation and reflection, all three of which add to the iteration process. McKenney and Reeves (2012) explain that the three-phased model shows that "educational design research progresses through three main phases, each of which involves interaction with practice and contributes, directly or indirectly, to the production of theoretical understanding and the development of an intervention, which matures over time" (p. 77). Accordingly, the key outcomes of educational design research is a set of design principles derived from the literature and validated empirically. This approach fits well with the aim of this study seeking to propose an instructional model for higher education adult-learners in blended learning courses in terms of a set of validated design principles.

In the following parts of this summary, a brief description will follow on how the five studies in this dissertation have been situated within the educational design research approach, together with the specific research design chosen in each study, followed by the salient results.

OVERVIEW OF STUDIES AND MAIN FINDINGS

The first study is an empirical one (**Chapter 2**), which is situated in the exploration and analysis phase of the educational design research, and serves objective 1. An empirical, real-world, study creates circumstances that reveal strengths and weaknesses of the present design, and henceforth helps to identify initial design requirements and design principles that can be further elaborated in subsequent phases and grounded in an analysis of the literature (see Chapters 2 and 3).

This first orientation entails an understanding of the status quo of higher education adult-learners' perceptions of blended learning courses. As an initial understanding of adult-learners' beliefs and perceived satisfaction in relation to blended learning was sought after, a pilot case study was held among higher education adult-learners. In particular, a survey was conducted among 33 adult-learners, followed by semi-structured interviews with ten learners. This study further validates claims in literature resulting from the preliminary literature review (see 'introduction' of this section).

This study first illuminates educational needs that are of particular relevance to adult-learners in higher education, *inter alia*, needing content and activities to be meaningful. Secondly, the results revealed two salient aspects that prevented adult-learners from online interaction, namely the feeling of being neglected in the online environment (social presence), and failure to see the relevance of online interaction since the same was repeated during f2f sessions (convergence). Thirdly, it was concluded that in the absence of instructional models, teachers incorporated blended learning intuitively, rather than making informed decisions.

The second study (**Chapter 3**) is a theoretical one that further explores the learning characteristics and educational needs of higher education adult-learners, and which is situated in the first phase of educational design research: analysis and exploration, as well as in the second phase: design and construction. This study further serves objective 1. The empirical results of the first study needed further validation in literature as well as a further in-depth understanding of the educational needs of higher education adult-learners. As Biggs (2003) explains, a first step in designing education is considering the learner factors. This study included a first step towards a thoughtful intervention and mapping possible solutions to the problem (McKenny & Reeves, 2012) as it builds a framework of higher education adult-learners' needs and potential implications for teachers.

The literature on adult learners is highly fragmented as it is framed within adult-learning theories. Furthermore, studies specifically disclosing the needs and characteristics of adult-learners in higher education was sought after, as opposed to vocational adult-learners, a distinction that is not often considered in the literature on adult-learners. Consequently, a systematic literature review was carried out to identify the characteristics and educational needs of higher education adult-learners. From an initial 562 studies, fourteen studies remained for analysis. The results show, *inter alia*, that higher education adult-learners need real-world, problem-solving challenges; prefer scaffolding to be used to build upon basic concepts in order to provoke deep learning; need to see the meaning and relevance of content and activities as they relate, *inter alia*, to their professional practice and their existing knowledge; need deep learning; need self-paced learning; need self-directed learning; and need autonomy. This part of presage (Biggs, 2003) allowed for an initial framework of characteristics and needs of higher education adult-learners together with potential implications for teachers, and informed a first step in the design and construction phase towards an instructional blended learning model that may assist course designers (McKenny & Reeves, 2012). The framework was discussed with a focus group of three experienced teachers for further insights and refinement. As this concerned only the first part of presage (Biggs, 2003), the second part of presage (learning environment) needed further investigation in order to obtain a comprehensive understanding of presage (Biggs, 2003).

To explore the learning environment (second part of Biggs' presage), the third study (**Chapter 4**), like the second study, is a theoretical one which explores the identified factors of online interaction in a blended learning environment, namely social presence and convergence. Biggs (2003) explains that learner factors are only one part of presage, the second part being teacher context, i.e. the design of the learning environment. In blended learning this entails a comprehensive understanding of aspects that facilitate learners' engagement with both modes of the learning environment (Hrastinski, 2019; Yuan, 2021). Consequently, this study is situated in the first phase of educational design research: analysis and exploration, as well as in the second phase: design and construction, and which serves objective 2.

Whilst literature on social presence is highly fragmented due to differing interpretations of social presence, literature on convergence is scarce. Furthermore, there are no studies that consider both factors together. Whilst literature on social presence is usually related to solely online learning, rather than blended learning, it was considered presumptuous that information in these studies would be irrelevant for blended learning, specifically since an understanding of online interaction was sought after. Secondly, whilst categorising learning content and activities across both modes (online and f2f) is a relatively known phenomenon in blended learning, there is hardly any literature on this aspect. Moreover, it was decided that since both phenomena relate to online interaction in blended learning, it would be appropriate to examine both before arriving at a synthesis. Henceforth, two systematic literature reviews were carried out, one on each factor. No further reductions of the searches in relation to adult-learners has been made at this stage since the largest possible hits were sought after, and as further alignment with adult-learners would be carried out in a following stage (Chapter 5). In the first systematic literature review (social presence) 732 hits emerged, excluding duplicates, from which eighteen distinct studies were analysed. The results show that in particular the teacher's presence through design, facilitations, and direction, as well as the teacher's social presence were of particular importance in evoking social presence. In the second systematic literature review (convergence), 395 hits emerged, excluding duplicates, from which ten distinct studies remained for analysis. The results show, *inter alia*, that basic concepts are best placed online, whereupon the f2f sessions are best used for further elaboration through discussions and collaborative activities that evoke deep learning.

After analysis, the results were summarised and mapped onto possible solutions for the problem at hand, i.e. the second step in the design and construction phase as this entails constructing the educational intervention in terms of a set of design principles, henceforth expanding the instructional model. To develop interventions, a co-design approach was adopted, through which, as above, a teacher, researcher and stakeholder collaborated in order to arrive at an educational intervention (Roschelle & Penuel, 2006). The intervention resulted in a set of design principles based on the two challenges.

The fourth study (**Chapter 5**) is an empirical one, aimed at aligning both steps of presage (Biggs, 2003), namely learner (or student) factors and learning environment as they emerged from studies 2 and 3. Accordingly, a multiple case study was carried out in which blended learning courses and course designs of higher education adult-learners were examined (in collaboration with the learners and the teachers) in which claims made in literature needed validation, and a further understanding of blended learning requirements from best practices was sought after. This study is therefore situated in the first phase of educational design research as it aims to further refine our understanding of adult-learners in blended learning courses (analysis and exploration). This study is also situated in the second phase, as previous design suggestions are built upon (design and construction), and in the third phase (evaluation and reflection) since it contains an evaluative aspect of design principles as demonstrated in said best practices, as well as those that were created in studies 2 and 3, thereby giving it an iterative character (Chapter 4). This study serves objective 3.

Next, a survey was distributed among 84 learners, semi-structured interviews were held with sixteen learners, and deep interviews were held with eight teachers in a total of eight blended learning courses. The results showed that learners experience isolation (lack of social presence) when in particular the teacher does not respond to online assignments or does not provide online feedback. Learners furthermore highly appreciated when online content was elaborated upon during f2f sessions to evoke deep learning. They were most negative when f2f sessions were a repetition of what was online.

As with study 4, the results were summarised, and in a co-design process the design principles from chapter 4 were further defined and elaborated into a final set of design principles along the precepts of Van den Akker (1999).

The fifth empirical study (**Chapter 6**) is situated in the second phase (design and construction) of the educational design research framework, and the third phase (evaluation and reflection). In a co-design with a teacher, researcher, and stakeholder, the design principles from the previous studies were used to design a concentric instructional model that maps onto Biggs' 3P model (2003), as adapted by Tynjälä (2013). We further used the terminology introduced by Noroozi et al. (2012), whereby the term 'presage' is replaced by 'preconditions', which we felt more appropriately describes the salient departure point when designing education. Additionally, we framed our model within the model of the COI (Community of Inquiry, Garrison et al. 2000) framework to incorporate the concentric flow of blended learning. Such a participatory design, that combines all the parties in play, is a valuable approach as it contributes to a solid design (Könings, Brand-Gruwel, & van Merriënboer, 2005; Könings, Seidel, & van Merriënboer, 2014; Könings & McKenney, 2017). When the design of the model was completed, the last step needed was a validation of the same. This study further serves objective 3.

In the research team, followed by discussions in focus groups, a survey was constructed to serve as a first iteration round of a Delphi study. After the first iteration round, adjustments to the model were made according to the experts' opinions, whereupon a second iteration round was created. After the second round it became clear that full alignment of the experts' opinions could be reached by deleting one design principle from the model (a 'do not' phrase). This suggestion was carried out accordingly. The sixth study yields a validated concentric instructional model tailored to adult-learners in higher blended learning education: IMABLE (see Chapter 6).

GENERAL CONCLUSION AND DISCUSSION

The final part of the dissertation (**Chapter 7**) discusses and recapitulates the main findings from each study as they build towards an instructional blended learning model for higher education adult-learners. This final chapter furthermore relates the studies to each other, and thoroughly discusses the implications for theory and practice. Additionally, the limitations of this dissertation are addressed, together with suggestions for further research.

NEDERLANDSE SAMENVATTING (DUTCH SUMMARY)

Het bevorderen van de online interactie van adult-learners in het hoger onderwijs in blended leerprogramma's

INLEIDING

Veel instellingen voor hoger onderwijs onderzoeken benaderingen van leren die meer flexibiliteit bieden voor studenten, waaronder blended-learning (Spring et al. 2016). Aangezien blended-learning technologie-gemedieerd is, vindt een gedeelte van het leren online plaats (Garrison & Kanuka, 2004; Graham, 2006; Hrastinski, 2019), en een deel van het leren face-to-face (f2f). Blended-learning biedt dus twee leermodi: een online modus en een f2f modus. Blended-learning, als een transformerende, didactische benadering, is bijzonder interessant omdat het nieuwe kansen biedt voor het oproepen van hogere-orde denken en diepgaand leren door middel van coöperatieve of collaboratieve activiteiten verdeeld over de twee leermodi (Biggs & Tang, 2007; Kjærgaard, 2017; McKenna et al., 2020).

Omdat een deel van het leren online is in een blended-learning-omgeving, biedt dit flexibiliteit in tijd en plaats, wat vooral interessant is voor adult-learners¹⁰ (Decelle, 2017; Diep et al. 2017; Jones & Blankenship, 2017; Youde, 2018). Echter, ondanks het feit dat adult-learners hoogpresterende studenten zijn (Owston et al. 2013), met hoge zelfregulerende vaardigheden en zelfmotivatie (Cercone, 2008; Chametzky, 2014, Konstantinidou & Nisiforou, 2022), onthullen voorgaande studies dat adult-learners in het hoger onderwijs nauwelijks interactie hebben met de online inhoud van een blended-learningomgeving. Dit leidt tot een neerwaartse spiraal waardoor adult-learners slechte leerervaringen hebben (Armellini & De Stefani, 2015; Kim et al. 2016; Morueta et al. 2016), lagere leerresultaten hebben (Cuesta Medina, 2018; McKenna et al. 2020; Serrano et al. 2019), of zelfs het programma voortijdig verlaten (Choi & Kim, 2018; Johnson et al. 2018; Kuo & Belland, 2016). Om het gebrek aan interactie met de online modus te compenseren, neigen docenten ertoe om wat online aangeboden wordt te herhalen in de f2f modus, in een blinde voortzetting van traditionele onderwijs- en leeractiviteiten (Kjærgaard, 2017; Serdyukov, 2017). Dit resulteert in een verzwakking van beide modi (McKenna et al. 2020) waardoor adult-learners vervolgens niet interageren met de 'toegevoegde' online modus omdat ze de relevantie ervan niet inzien (Östland, 2008; van der Stap et al. 2019).

Het gebrek aan interactie met de online modus is geen nieuw verschijnsel en is uitvoerig onderzocht in eerdere literatuur, waarbij twee belangrijke factoren naar voren komen, namelijk 1) social presence, waarbij individuen zich bewust zijn van het bestaan van anderen in de online omgeving (Amoozegar et al. 2022; Andel et al. 2020; Hodges et al. 2020; Ke, 2010), en convergence, waarbij beide modi van de leeromgeving op de juiste manier worden geordend en afgestemd volgens hun inhoud en activiteiten (Murray et al. 2016; Owston & York, 2018; Park & Bang, 2022), zonder dat er een overlap is van de ene modus op de andere (Cuesta Medina, 2018).

Bij afwezigheid van social presence kunnen studenten zich geïsoleerd voelen en de aanwezigheid van anderen (mede-studenten of docent) niet ervaren en zich daardoor onthouden van online interactie (Martin & Bolliger, 2018; Oyarzun et al. 2018). Wat betreft convergence: wanneer studenten de relevantie van de inhoud en activiteiten in de online modus niet zien, of wanneer ze de relatie tussen beide modi niet zien, zullen ze geneigd zijn de online omgeving te negeren en zich te beperken tot

¹⁰ Adult-learners zijn die studenten die aanzienlijke levenservaring hebben, waarbij zij behoorlijk wat kennis hebben vergaard en vaak een studie moeten combineren met werk en gezin.

alleen face-to-face onderwijs, omdat dit het medium is waarmee ze het meest vertrouwd zijn (Östland, 2008; van der Stap et al. 2023). Beide uitdagingen kunnen worden aangepakt in een instructiemodel (Hodges et al. 2020; Milheim, 2011). Een duidelijk model met ontwerpprincipes die het ontwerp van de blended-learningomgeving leiden, kan deze uitdagingen effectief aangaan (Hodges et al. 2020; Serdyukov, 2017; Youde, 2018).

Bij het ontwerpen van een leeromgeving introduceert Biggs (2003) het concept van 'constructive alignment', waarbij 'presage' (studentfactoren en onderwijscontext) wordt afgestemd op leerprocessen om een gewenst 'product' (leerresultaten) te bereiken. Bij het overwegen van een dergelijke constructive alignment, moeten beide aspecten van 'presage' worden aangepakt: de studentfactoren en de onderwijscontext, in het algemeen begrepen als de leeromgeving (Tynjälä, 2013). Daarom moeten bij het overwegen van een instructiemodel voor blended-learning de behoeften van adult-learners in het hoger onderwijs worden afgestemd op de leeromgeving, aangezien adult-learners in het hoger onderwijs verschillende behoeften en leerkenmerken hebben die een cruciale rol spelen in de manier waarop ze het leren in de online modus benaderen (Milheim, 2011; Pappas & Jerman, 2015; Vanslamsbrouck et al. 2019; Youde, 2018).

De **hoofddoelstelling** van dit proefschrift is om zowel theoretisch als empirisch de kenmerken van een blended-learninginstructiemodel te identificeren dat adult-learners aanzet tot online interactie in blended-learningprogramma's in het hoger onderwijs. Een dergelijk instructiemodel is cruciaal aangezien het ontbreken ervan kan resulteren in een terugval op traditionele onderwijsmethoden (Serdyukov, 2017) waardoor de voordelen van blended-learning teniet worden gedaan (McKenna et al. 2020).

De algemene inleiding van dit proefschrift (**Hoofdstuk 1**) bevat een literatuuroverzicht met betrekking tot het onderzoeksthema. In het bijzonder worden de opvallende leerkenmerken en onderwijsbehoeften van adult-learners in het hoger onderwijs beschreven. Vervolgens worden de uitdagingen van online interactie in blended-learning gedefinieerd, alsook het gebrek aan duidelijke ontwerpprincipes die gebruikt kunnen worden om online interactie te bevorderen. Dit onderbouwt de noodzaak voor een meer op bewijs gebaseerd instructiemodel voor blended-learning dat specifiek is afgestemd op adult-learners in het hoger onderwijs in blended-learning programma's. Na het literatuuroverzicht worden het algemene doel van dit proefschrift, drie specifieke onderzoeksuitdagingen met drie overeenkomstige onderzoeksdoelstellingen en het onderzoeksontwerp geschetst.

ONDERZOEKSDOELSTELLING, CONTEXT EN ONTWERP

Onderzoeksdoelstellingen

Gebaseerd op de drie onderzoeksuitdagingen, is het hoofddoel van dit proefschrift om zowel theoretisch als empirisch de specificaties te onderzoeken van een blended-learning instructiemodel dat gericht is op het bevorderen van online interactie bij adult-learners in het hoger onderwijs.

Drie onderzoeksdoelstellingen (doelstellingen) werden geformuleerd:

Doelstelling 1: Het identificeren van de percepties over adult-learners in het hoger onderwijs met betrekking tot blended-learning programma's, hun leerkenmerken en onderwijsbehoeften zoals uiteengezet in theorie (Hoofdstukken 2 en 3).

Doelstelling 2: Het begrijpen van de factoren van sociale aanwezigheid en convergentie, en hoe deze

kunnen worden opgenomen in ontwerpprincipes die online interactie bevorderen (Hoofdstuk 4).

Doelstelling 3: Het verkennen van de specifieke kenmerken van een instructiemodel voor het ontwerp van een blended leeromgeving voor volwassen adult-learners in het hoger onderwijs, zowel theoretisch als empirisch, en hoe deze principes geactualiseerd kunnen worden in een gevalideerd model.

Onderzoekscontext

Het onderzoek in dit proefschrift werd gestart aan de Hogeschool Utrecht als onderdeel van een pilotprogramma over blended-learning. Hoewel het in theorie veelbelovend was, kwamen de resultaten niet overeen met de verwachtingen, aangezien veel adult-learners niet interageerden met de online modus van de leeromgeving. Na voorafgaande literatuurstudies over het fenomeen van online interactie, kwamen twee belangrijke factoren naar voren die beiden betrekking hebben op de onderwijscontext of leeromgeving, namelijk social presence en convergence. Zoals Biggs (2003) uitlegt, moeten bij het ontwerpen van onderwijs twee eerste stappen (presage) worden overwogen, namelijk de studentfactoren en de onderwijscontext (leeromgeving). De eerste studie onderzoekt daarom de status quo van de studentfactoren (hier: adult-learners in het hoger onderwijs). Na deze initiële studie was meer theorie nodig over de behoeften van adult-learners in het hoger onderwijs, vandaar dat een systematische literatuurstudie werd uitgevoerd naar de leerkenmerken en onderwijsbehoeften van adult-learners (studie 2).

Om het tweede aspect van presage - het ontwerp van de leeromgeving - te begrijpen was meer theorie nodig over de complexiteit van de eerder genoemde factoren van social presence en convergence. Twee verdere systematische literatuurstudies werden uitgevoerd (een over social presence en een over convergence) om zodoende de complexiteit van de twee modi van een blended-learning omgeving te begrijpen. Om te werken naar blended-learning ontwerpprincipes die niet alleen bijdragen aan de theorie over blended-learning en instructieontwerp, maar cursusontwerpers ook kunnen helpen bij het ontwerpen van blended-learningprogramma's specifiek voor adult-learners in het hoger onderwijs, was het belangrijk om beweringen uit de literatuur te valideren in een andere adult-learning context dan die van het eigen instituut van de onderzoeker om zodoende vooringenomenheid te voorkomen en externe validiteit te vergroten. De onderzoekscontext omvatte daarom vier universiteiten, waarvan twee in Nederland en twee in België (Vlaanderen). Alle instituten gebruikten hetzelfde Learning Management System (Canvas) waardoor een duidelijke focus mogelijk was op de implementatie van blended-learning en de mate waarop social presence en convergence werd toegepast (studie 4). Ten slotte werd in een co-ontwerp een concentrisch instructiemodel ontworpen en voorgelegd aan verschillende experts van verschillende universiteiten om hun deskundige mening te geven over het instructiemodel dat het resultaat is van dit onderzoek (studie 5).

Onderzoeksontwerp

Om het hoofddoel van dit proefschrift en de onderzoeksdoelstellingen aan te pakken, zijn de studies binnen dit proefschrift gebaseerd op een onderwijskundig ontwerponderzoek (Barab & Squire, 2004; McKenney & Reeves, 2012) dat past binnen het paradigma van kwalitatief onderzoek (Miles & Huberman, 1994). Onderwijskundig ontwerponderzoek streeft naar het produceren van "nieuwe theorieën, artefacten en praktijken die rekening houden met en mogelijk invloed hebben op leren en onderwijzen in naturalistische settings" (Barab & Squire, 2004, p. 2).

Volgens McKenney en Reeves (2012) bestaat onderwijskundig ontwerponderzoek uit drie hoofdfasen, namelijk analyse en exploratie, ontwerp en constructie, en evaluatie en reflectie, die alle drie bijdragen aan het iteratieproces. Dit drie-fasenmodel toont aan dat "onderwijskundig ontwerponderzoek drie

hoofdfasen doorloopt. In elke fase vindt interactie met de praktijk plaats. Iedere interactie draagt bij aan de productie van theoretisch begrip en de ontwikkeling van een interventie, indirect of direct, die zich gedurende de tijd verder ontwikkelt" (p. 77). Zodoende zijn de belangrijkste resultaten van onderwijskundig ontwerponderzoek een set van ontwerpprincipes die zijn afgeleid van de literatuur en empirisch gevalideerd. Deze benadering past goed bij het doel van deze studie om een blended-learning instructiemodel voor adult-learners in hoger onderwijs aan te bieden in termen van een set van gevalideerde ontwerpprincipes.

In de volgende delen van deze samenvatting zal kort worden beschreven hoe de vijf studies in dit proefschrift zijn gesitueerd binnen de onderwijskundige ontwerpbenadering, samen met het specifieke onderzoeksontwerp gekozen in elke studie, gevolgd door de belangrijkste resultaten.

OVERZICHT VAN STUDIES EN BELANGRIJKSTE RESULTATEN

De eerste studie is een empirische (**Hoofdstuk 2**), die gesitueerd is in de exploratie- en analysefase van het onderwijskundig ontwerponderzoek, en dient doelstelling 1. Een empirische, realistische studie creëert omstandigheden die de sterktes en zwaktes van het huidige ontwerp onthullen, en helpt daardoor bij het identificeren van initiële ontwerpvereisten en -principes die verder kunnen worden uitgewerkt in volgende fasen en gegrondvest zijn in een analyse van de literatuur (zie Hoofdstukken 2 en 3).

Deze eerste oriëntatie omvat inzicht verkrijgen van de percepties van adult-learners in het hoger onderwijs over blended-learningprogramma's. Aangezien een initieel begrip van de overtuigingen en waargenomen tevredenheid van adult-learners met betrekking tot blended-learning werd nagestreefd, werd een pilot case study gehouden onder adult-learners in het hoger onderwijs. In het bijzonder werd een enquête uitgevoerd onder 33 adult-learners, gevolgd door semi-gestructureerde interviews met tien adult-learners. Deze studie valideert tevens beweringen in de literatuur die voortkomen uit de voorafgaande literatuurstudie (zie 'inleiding' van dit deel).

Deze studie belicht enkele naar voren tredende onderwijsbehoeften die van bijzonder belang zijn voor adult-learners in het hoger onderwijs, waaronder de behoefte aan betekenisvolle inhoud en activiteiten. Ten tweede identificeerde de studie twee opvallende aspecten die adult-learners verhinderden om online te interageren, namelijk het gevoel genegeerd te worden in de online omgeving (social presence) en het falen om de relevantie van online interactie te zien aangezien hetzelfde werd herhaald tijdens f2f-sessies (convergence). Ten derde leek het erop dat in de afwezigheid van een instructiemodel docenten blended-learning intuïtief inzetten, in plaats van geïnformeerde beslissingen te maken. In de afwezigheid van social presence kunnen studenten zich geïsoleerd voelen en ervaren ze mogelijk niet de aanwezigheid van anderen (mede-studenten of docent), waardoor ze zich onthouden van online interactie (Martin & Bolliger, 2018; Oyarzun et al. 2018). Evenzo met betrekking tot convergence: wanneer adult-learners de relevantie van de inhoud en activiteiten in de online modus niet zien, of wanneer ze de relatie tussen beide modi niet zien, zullen ze geneigd zijn de online omgeving te negeren en zich te beperken tot alleen f2f onderwijs, omdat dit het medium is waarmee ze het meest vertrouwd zijn (Östland, 2008; van der Stap et al. 2023). Beide uitdagingen kunnen worden aangepakt middels een instructiemodel (Hodges et al. 2020; Milheim, 2011). Het lijkt veelbelovend dat een duidelijk model met ontwerpprincipes die de vormgeving van de blended-learningomgeving leiden, deze uitdagingen effectief aangaat (Hodges et al. 2020; Serdyukov, 2017; Youde, 2018).

De tweede studie (**Hoofdstuk 3**) is theoretisch van aard en verkent de leerkenmerken en onderwijsbehoeften van adult-learners in het hoger onderwijs verder. Deze studie bevindt zich zowel in de eerste fase van onderwijskundig ontwerponderzoek: analyse en exploratie, als in de tweede fase:

ontwerp en constructie. Het dient ook doelstelling 1. De empirische resultaten van de eerste studie hadden verdere validatie in de literatuur nodig, evenals een dieper begrip van de onderwijsbehoeften van adult-learners in het hoger onderwijs. Zoals Biggs (2003) uitlegt, is een eerste stap bij het ontwerpen van onderwijs het overwegen van de studentfactoren. Deze studie omvatte een eerste stap naar een doordachte interventie en het in kaart brengen van mogelijke oplossingen voor het probleem (McKenney & Reeves, 2012) omdat het een kader bouwt van de onderwijsbehoeften van adult learners in het hoger onderwijs.

De literatuur over adult-learners is zeer gefragmenteerd omdat deze verdeeld is in verschillende theorieën over adult-learning. Bovendien werd er specifiek gezocht naar studies die de behoeften en kenmerken van adult-learners in het hoger onderwijs onthullen, in tegenstelling tot adult-learners in het middelbaar beroepsonderwijs, een onderscheid dat niet vaak wordt overwogen in de literatuur over adult-learners. Daarom werd een systematische literatuurstudie uitgevoerd om de kenmerken en onderwijsbehoeften van adult-learners in specifiek het hoger onderwijs te identificeren. Van 562 studies bleven veertien kenmerkende studies over voor analyse. De resultaten tonen onder meer aan dat adult-learners in het hoger onderwijs behoefte hebben aan echte uitdagingen waarin hun vermogen om problemen op te lossen wordt aangeboord; adult-learners geven de voorkeur aan scaffolding om basisconcepten op te bouwen en zodoende diepgaand leren uit te lokken; adult-learners moeten de betekenis en relevantie van inhoud en activiteiten zien en hoe deze betrekking hebben op hun professionele praktijk en hun bestaande kennis; adult-learners hebben diepgaand leren nodig; adult-learners hebben zelfgestuurd leren nodig; en adult-learners hebben autonomie nodig. Dit deel van presage (Biggs, 2003) zorgde voor een eerste kader van leerkenmerken en onderwijsbehoeften van adult-learners in het hoger onderwijs samen met potentiële implicaties voor docenten, en droeg bij aan een eerste stap in de ontwerp- en constructiefase naar een instructief blended-learning model dat cursusontwerpers kan helpen (McKenney & Reeves, 2012). Een raamwerk werd ontworpen en vervolgens besproken in een focusgroep van drie ervaren docenten. Dit leidde tot verdere inzichten en aanpassingen totdat er volledige overeenstemming werd bereikt. Dit is slechts het eerste deel van presage (Biggs, 2003); het tweede deel van presage (onderwijscontext of leeromgeving) had verder onderzoek nodig om een volledig begrip van presage (Biggs, 2003) te verkrijgen.

Om de leeromgeving (het tweede deel van Biggs' presage) te verkennen, is de derde studie (**Hoofdstuk 4**), net als de tweede studie, een theoretische studie die de geïdentificeerde uitdagingen van online interactie in een blended-learning-omgeving onderzoekt, namelijk social presence en convergence. Biggs (2003) legt uit dat studentfactoren slechts één deel van presage zijn, het tweede deel is de onderwijscontext, oftewel het ontwerp van de leeromgeving. In blended-learning omvat dit een volledig begrip van aspecten die de betrokkenheid van studenten bij beide modi van de leeromgeving bevorderen (Hrastinski, 2019; Yuan, 2021). Daarom is deze studie gesitueerd in de eerste fase van onderwijskundig ontwerponderzoek: analyse en exploratie, evenals in de tweede fase: ontwerp en constructie, en dient doelstelling 2.

Waar de literatuur over social presence zeer gefragmenteerd is vanwege de vele begrippen omtrent social presence, is de literatuur over convergence zeer schaars. Bovendien zijn er geen studies die beide factoren samen beschouwen. Hoewel literatuur over social presence meestal gerelateerd is aan uitsluitend online leren, in plaats van blended-learning, omdat aangenomen wordt dat het fenomeen social presence irrelevant zou zijn voor blended-learning, is dat in deze studie wel onderzocht vooral omdat juist een begrip van online interactie werd nagestreefd. Ten tweede, hoewel het categoriseren van leeractiviteiten en leerinhoud over twee modi (online en f2f) een bekend fenomeen is in blended-learning, is literatuur hierover schaars. Bovendien werd besloten dat, aangezien beide fenomenen betrekking hebben op online interactie in blended-learning, het passend zou zijn om beide te onderzoeken alvorens tot een synthese te komen. Zodoende werden twee systematische

literatuurstudies uitgevoerd met betrekking tot beide factoren. In deze fase zijn geen verdere beperkingen van de zoekopdrachten opgelegd in relatie tot adult-learners, aangezien de grootst mogelijke hits werden nagestreefd, en verdere afstemming met adult-learners zou plaatsvinden in een volgende fase (studie 4). In de eerste systematische literatuurstudie (social presence) kwamen 732 hits naar voren, exclusief duplicaten, waarvan achttien kenmerkende studies werden geanalyseerd. De resultaten tonen aan dat met name de presence van de docent door middel van cursusontwerp, facilitering en sturing, evenals de *social* presence van de docent, van bijzonder belang waren bij het oproepen van social presence. In de tweede systematische literatuurstudie (convergence) kwamen 395 hits naar voren, duplicaten niet meegerekend, waarvan tien afzonderlijke studies overbleven voor analyse. De resultaten tonen onder meer aan dat basisconcepten het beste online geplaatst kunnen worden, waarna de f2f-sessies worden gebruikt voor verdere uitwerking door middel van discussies en collaboratieve activiteiten die diepgaand leren opwekken.

Na analyse werden de resultaten samengevat en in kaart gebracht op basis van mogelijke oplossingen voor het probleem, d.w.z. de tweede stap in de ontwerp- en constructiefase, omdat dit het construeren van de onderwijsinterventie in termen van een reeks ontwerpprincipes inhoudt, aan de hand waarvan het instructiemodel wordt uitgebreid. Om interventies te ontwikkelen, werd een co-ontwerp benadering aangenomen, waarbij een docent, onderzoeker en stakeholder samenwerkten om tot een onderwijsinterventie te komen (Roschelle & Penuel, 2006). De interventie bestaat uit een reeks ontwerpprincipes gebaseerd op de twee reeds genoemde uitdagingen.

De vierde studie (**Hoofdstuk 5**) is een empirische studie, gericht op het afstemmen van beide stappen van presage (Biggs, 2003), namelijk: studentfactoren, hier: adult-learners en leeromgeving: online en f2f zoals die naar voren kwamen uit studies 2 en 3. Dienovereenkomstig werd een meervoudige casestudy uitgevoerd waarin blended-learningcursussen en cursusontwerpen gericht op adult-learners in het hoger onderwijs werden onderzocht (in samenwerking met de studenten en de docenten) waarbij validatie van beweringen uit de literatuur werd gezocht en verder inzicht werd nagestreefd in de blended-learningvereisten vanuit best practices. Deze studie is daarom gesitueerd in de eerste fase van onderwijskundig ontwerponderzoek, omdat het tot doel heeft ons begrip van adult-learners in blended-learning-programma's verder te verfijnen (analyse en exploratie). Deze studie bevindt zich ook in de tweede fase, omdat eerdere ontwerpsuggesties worden opgebouwd (ontwerp en constructie), en in de derde fase (evaluatie en reflectie), omdat het een evaluatief aspect van ontwerpprincipes bevat zoals aangetoond in genoemde evidence-based practices, evenals het evalueren van de ontwerpprincipes die zijn gecreëerd in studies 2 en 3, wat daarom een iteratief karakter heeft (Hoofdstuk 4). Deze studie dient doelstelling 3.

Zodoende werd een enquête verspreid onder 84 adult-learners, semi-gestructureerde interviews werden gehouden met zestien adult-learners, en diepgaande interviews werden gehouden met acht docenten in een totaal van acht blended-learningcursussen. De resultaten toonden aan dat adult-learners isolatie ervaren (gebrek aan social presence) wanneer met name de docent niet reageert op online opdrachten of geen online feedback geeft. Adult-learners waardeerden het zeer wanneer basisconcepten in de online modus van de leeromgeving verder werden uitgewerkt tijdens f2f-sessies om diepgaand leren op te wekken. Ze waren het meest negatief wanneer f2f-sessies een herhaling waren van wat online al aangeboden werd.

Net als bij studie 4 werden de resultaten samengevat, en in een co-ontwerpproces werden de ontwerpprincipes uit hoofdstuk 4 verder gedefinieerd en uitgewerkt tot een volledige set van ontwerpprincipes volgens de precepten van Van den Akker (1999).

De vijfde empirische studie (**Hoofdstuk 6**) bevindt zich in de tweede fase (ontwerp en constructie) van het onderwijskundig ontwerponderzoekskader en in de derde fase (evaluatie en reflectie). In co-design met een docent, onderzoeker en stakeholder werden de ontwerpprincipes uit de vorige studies verder uitgewerkt tot een model dat aansluit op Biggs' 3P-model (2003), zoals aangepast door Tynjälä (2013). Vervolgens werd de term 'presage' vervangen voor de term 'preconditions' (Noroozi et al. 2012) aangezien dit het uiterste vertrekpunt voor het ontwerpen van onderwijs beter aanduidt. Als laatste werd het COI (Community of Inquiry)-framework geïncorporeerd om de concentrische stroom van blended-learning te omvatten. Een dergelijk participatief ontwerp dat alle betrokken partijen combineert, is een waardevolle aanpak omdat het bijdraagt aan een solide ontwerp (Könings, Brand-Gruwel & van Merriënboer, 2005; Könings, Seidel & van Merriënboer, 2014; Könings & McKenney, 2017). Als voorlaatste stap in het ontwerp werd het model voorgelegd aan vier docenten die ervaring hadden met blended-learning voor verdere inzichten en aanpassingen. Toen het model volledig was ontworpen, was de laatste stap de validatie ervan. Deze studie dient verder doelstelling 3.

In het onderzoeksteam werd een enquête opgesteld die als de eerste iteratieronde van een Delphi-studie diende. Dit werd daarna besproken in focusgroepen voor verdere validatie. Na de eerste iteratieronde werden aanpassingen aan het model gemaakt op basis van ontvangen feedback, waarna een tweede iteratieronde werd gecreëerd. Na de tweede ronde binnen deze Delphi-studie werd duidelijk dat volledige afstemming van de meningen van de experts kon worden bereikt door één ontwerpprincipe uit het model te verwijderen (een 'niet doen' zin). Deze suggestie werd dienovereenkomstig uitgevoerd. De zesde studie levert een gevalideerd instructiemodel op, toegesneden op adult-learners in hoger blended-learningonderwijs: IMABLE.

ALGEMENE CONCLUSIE EN DISCUSSIE

Het laatste deel van het proefschrift (**Hoofdstuk 7**) bespreekt en recapituleert de belangrijkste resultaten die worden gepresenteerd in de studies, waarin ze toewerken naar een instructief blended-learningmodel voor adult-learners in het hoger onderwijs. Dit laatste hoofdstuk verbindt de studies met elkaar, en identificeert implicaties voor theorie en praktijk. Daarnaast worden de beperkingen van dit proefschrift besproken, samen met suggesties voor verder onderzoek.

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5 Conference Contributions

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ABOUT THE AUTHOR

Nanda van der Stap was born on June 12, 1965. At the age of 16 she travelled to England and upon returning from England, where she had practiced law, she decided on a career change. After her Master of Education at the HU University of Applied Sciences, Utrecht, she completed a Master English Language & Culture and a Master Philosophy at the Radboud University, Nijmegen respectively. In 2009 she furthered her career as a teacher trainer at the HU University of Applied Sciences, Utrecht where she taught research skills, academic writing, various literature and culture courses, methodology courses, professional development, ict-enriched education, and critical thinking. She furthermore designed various courses for the master programme at said teacher trainer centre, and takes on the role of intake coordinator, product manager, and curriculum coordinator of the Regular Master Programme English. Nanda was part of the pilot on blended learning in 2014 where she spear-headed a co-design project with three other teachers on 'how to implement blended learning': a hands-on course for colleagues at the above-mentioned teacher training centre. Within this same context Nanda started her PhD trajectory on the topic of 'supporting higher education adult-learners in blended learning courses'.

ACKNOWLEDGEMENTS

I did not do this research on my own, as this project would have been impossible without the skilful help and patient assistance of others. I would like to take this opportunity of thanking some of these persons in particular.

First and foremost, I would like to thank my promotor, Johan Versendaal. Johan, I'd like to thank you for the opportunity you have given me to embark upon this research project, enabling me to grow and develop myself as a researcher. I would also like to thank you for the confidence that you have kept during the course of these years. I highly appreciate your sharp vision throughout and the expert coaching you have given me.

I would also sincerely like to thank Theo van den Bogaart who has assisted me on almost a daily basis, soldiering on even during weekends and holidays. Theo, in your dual role as coach and co-researcher you have not only helped with the content of the articles, but also with data analysis which often was a tedious and arduous undertaking. Your expertise, in-depth knowledge, patience, wisdom, logic, support, humour, and understanding have been most valuable throughout this project.

Additionally, I would like to extend a warm thanks to Ebrahim Rahimi: highly attentive and always willing to assist. Ebrahim, your in-depth expertise and skills, your amazingly sharp and extremely clever insights, and your speedy guidance and patient support have helped me overcome many challenges and steered me into the right direction. Your meticulousness has lifted this dissertation to a much higher standard than hoped for. I am highly appreciative of all your assistance throughout.

I would further like to thank Stan van Ginkel for his relentless feedback and advice on my work. Stan, with your sharp insights in general, and knowledge on Biggs in particular, you have helped transform this project from a clutter of ideas into a coherent trajectory. Your critical advice on many occasions have helped me define and refine my research. You further seem to know exactly what reviewers want and your suggestions have been most valuable in taking my articles to a higher level.

I would like to thank some of my colleagues who have most patiently assisted, reviewed, and proofread my work. In particular, I would like to extend my gratitude to my colleague and friend Tobey Nelson for her amazing patience, her willingness to assist using her expertise in research, and her diligence and meticulous care in what seems like endless rounds of reviewing my work. Tobey, I am most appreciative of all your assistance, kindness, advice, wisdom, and giving me a shoulder to lean on. You made this trajectory so much easier. I would also like to give a warm thanks to Kristina Goodnight for providing endless support, always being willing to patiently listen to my ongoing wails and laments, taking on the role of a co-researcher, and filling me in with practical details where my knowledge was lacking. Kristina, I highly appreciate your review of my final project with your wonderful sense of humour. I would furthermore like to sincerely thank Linda Gijsen for her reviews, knowledge, guidance, and expertise. Linda, you helped me jump over some challenging obstacles and provided me with fresh ideas that availed me to progress. In particular, I would like to thank Rachel Collins who has always lent me her ear. Rachel, thank you for your ongoing encouragement, patience, and understanding throughout, extending your role of a supervisor to that of a friend.

I would especially like to thank my paranympths, Josien Boetje and Philippine Waisvisz, for standing by me with practical and personal support. Additionally, I would like to thank Dominic, Ruth, Inge, Marion, Melissa, and Karen for their role and assistance in my research. I would also like to thank the many colleagues and students in the Netherlands and Flanders who were kind and willing enough to participate in various projects.

My utmost thanks goes to my family: my children for their support and understanding, even when missing out on Christmas dinner, my sisters for taking care of our elderly parents when I could not fulfil my part, and last, but most certainly not least, I would like to extend my warmest and wholehearted gratitude to my husband, Patrick Roos, whose unwavering support, wisdom, altruism, and relentless patience and understanding have helped me see this trajectory through. Pat, your highly logical and analytical approach to both the process and content of my research has helped me see clarity where my vision was blurred. It goes without saying that you were the backbone of my research.

Thank you all – without you, this dissertation wouldn't exist.

Nanda

