Chapter 5
Blended Learning Needs Blended Evaluation

John Willison

Abstract There are many evaluation frameworks for blended teaching; however, there are few suitable frameworks for Blended Learning (BL). This chapter presents an evaluation framework that was designed to span school and university BL, including Initial Teacher Education (ITE). An appropriate evaluation framework must show how effective each BL design and implementation is, at the level of a term or semester of study, and at the larger scale, such as across primary, middle, or secondary school, or programmes of study such as an ITE bachelor or master’s. This chapter first identifies eight features from the literature that are necessary for a BL evaluation framework, and shows that existing models do not satisfy these requirements. Next, the chapter introduces the Blended and Engaged Learning Zones (BELZ), designed specifically for BL across schooling and university studies, and that satisfies these eight features. An example follows of a version of BELZ used to evaluate BL in the years prior to a substantial three-term long inquiry task. BELZ addresses the imbalance in the literature, as well as the needs in teaching practice, for an evaluation framework for BL across schooling and university study.

Keywords Blended evaluation · Blended learning · Higher education · Professional development of educators · Teacher education

5.1 Introduction

The provision of online learning environments in schools and universities globally during COVID-19 shutdowns has left students and educators alike appreciating both the potential and the pitfalls of online-only learning. As students return to classrooms, they are likely to experience a more intentional blending of face to face and e-learning than previously. However, how effectively will blended provisions enhance educational outcomes? This chapter critiques existing frameworks that are used to determine the effectiveness of courses that blend learning and proposes a bespoke
framework that was designed to evaluate and enhance school, university, and ITE student learning outcomes in blended learning environments.

The most important Blended Learning (BL) occurring in universities is, arguably, that which is designed and delivered during ITE. ITE not only provides for the learning of PSTs, but also acts for them as a model for how teaching may occur when in schools during their professional experience and after graduation. A substantial impact on the effective use of educational technologies for early career teachers is known to be mediated by their experiences in ITE (Hasse, 2017). These experiences include access to relevant technologies and especially the nature of facilitated learning about, and through, the use of educational technologies while at university and during school placements (Stone, 2017). Early career teachers who have already developed blending-savvy pedagogies are especially well placed to have a substantial influence on the schoolwide use of learning technologies (Jansen & van der Merwe, 2015). BL in ITE, therefore, has a substantial rippling of influence from university into schooling.

The blending of e-learning with other modes of learning is almost ubiquitous in schools and universities in various regions and countries but varies in effectiveness (Vo, Zhu, & Diep, 2017). Evaluation frameworks have emerged from face-to-face traditions and e-learning traditions, but blending these is something different again and bespoke blended-savvy evaluations are needed. An evaluation framework must capture the effectiveness of the blend, not just of the parts that are blended. In addition, an evaluation of BL in ITE requires a framework that spans school sectors and university study, and thus provides insight into outcomes of both ITE student learning and ITE graduates’ own school students’ learning. Given the diversity of implementations across numerous school types and countries, it is not surprising that studies have found substantial variability in the effectiveness of BL initiatives (Selwyn, Nemorin, Bulfin, & Johnson, 2017; Zhang & Zhu, 2017). Frameworks to evaluate BL are a crucial part of ensuring that the blend works for students and not incidentally tangled but rather intentionally braided. Each mode in BL must not only be effective, then, but it must also interact with other modes. For example, if an online virtual laboratory is used to augment a hands-on experiment, a corroboration of equipment, terminology, and aims that connect both modes must be evident to students. BL modes should mutually reinforce and strengthen what would otherwise be offered in one mode only.

In this chapter, the working definition for BL is the co-existence or integration of e-learning and other modes of learning, accounting for blended design that ranges from coincidental to pedagogically entwined. This definition suits the range of experience in schools globally; because while e-learning is virtually ubiquitous in many countries (OECD, 2015; Paiva, Morais, Costa, & Pinheiro, 2016), the level of integration of the blending varies markedly. BL may be as simple as students engaging with a digital reading in a physical classroom or a digital pH meter hooked up to a computer in a physical laboratory. BL may also involve multiple aspects pedagogically blended together, for example, students with tablets controlling robots via their own programming, recording this digitally, and uploading their results for others to peer review, post comments, and then discussing as a whole class face to face.
This chapter proceeds to consider existing evaluation frameworks that may be used for BL, and their shortcomings. It then presents a framework for evaluating BL that overcomes these shortcomings and an example of its use in school education.

5.2 Existing Evaluation Frameworks for BL

Numerous studies have evaluated BL at universities (Boelens, De Wever, & Voet, 2017; Bowyer & Chambers, 2017; Chmiel, Shaha, & Schneider, 2017) and in ITE specifically (Francom & Moon, 2018; Zhou & Chua, 2016). A variety of approaches and pedagogies inform BL design including those involving problem solving, critical and creative thinking, evidence-based decision-making, researching, inquiring, investigating, puzzle-based learning, challenge-based learning, and project-based learning, to name a few, as well as blending that happens without a clear approach or planning. These varied approaches emphasise differences in student learning outcomes (Coates, 2016); however, there is sophisticated thinking in common among them, thinking that requires cognitive and affective skills (Willison, 2020), and these skills are explored in more detail later in the chapter.

While frameworks suitable for guiding pedagogy and evaluation have been emerging for e-learning over the past three decades (Laurillard, 2005) and for BL in the past two decades (Derntl & Motschnig-Pitrik, 2004), there are several limitations to these frameworks that reduce their capacity to provide teachers and schools, lecturers and universities with adequate information to improve student learning via blended modes. This chapter looks at the deficits of existing frameworks and then presents a model that has an ancestry spanning twentieth-century and twenty-first-century educational research, which was crafted to explicitly capture and guide pedagogy for, and evaluation of, BL. This chapter aimed to overcome the current limitations of evaluation frameworks for BL by presenting a Blended and Engaged Learning Zone (BELZ), a framework with an ancestry and currency for providing insights into diagnosing and improving student learning.

5.2.1 Issues for, and Characteristics of, BL Evaluation Framework

There are numerous issues identified in the literature that concern BL and its evaluation, and these must be heeded and accommodated in a BL framework that has the following characteristics.
5.2.1.1 Focuses on Student Learning Rather Than Design Inputs

The first issue regarding existing frameworks that may be otherwise suitable to evaluate BL is that many of them consider the evaluation of inputs but pay insufficient attention to learning processes and outcomes. For example, a recently published guide on BL (Cleveland-Innes & Wilton, 2018) noted that the following four general factors must be represented in the design and evaluation of BL: the pattern of delivery mode, which sequences and combines activities; the materials, technology, and media used; the use of varying pedagogical models; and the temporality of synchronous and asynchronous methods. This is heavily input oriented. In the peer-reviewed literature, the trend is the same. BL evaluation frameworks have focused on inputs such as a rubric for course design (Smythe, 2012) and, more recently, ‘a flexible and transferable evaluation framework that can be used to support the introduction and implementation of BL…’ (Chmiel et al., 2017, p. 177).

The propensity to focus on inputs for BL evaluation leaves us with insufficient evaluative power to determine the actual effect of BL in terms of student learning. Moreover, a literature review of BL evaluation (Cappi et al., 2019) noted an over-reliance on student self-evaluation and that observed performance correlates poorly with such self-evaluation. The review concluded that a more rigorous evaluation of learning outcomes of BL is needed in terms of student skills and their application to practice. Another study concluded that BL evaluation should be ‘focused on the learning process …’ (Pombo & Moreira, 2012, p. 208, italics added). A focus on student learning processes suggests evaluation that is incremental and cumulative, rather than merely end-on or input-oriented. A recent book, Essentials for blended learning: A standards-based guide, (Stein & Graham, 2020, p. 92), notes that blended learning courses need to determine ‘student attainment of learning outcomes by examining student performance either directly (e.g. by observation) or indirectly (e.g. by an exam)’. Yet in a section on a ‘Strategy of iterative development’ (p. 73), evaluation of the blended learning programme is noted as important but relies on student surveys.

Well resourced, brilliantly designed, blended courses can have a powerful evaluation of inputs but fail to deliver the learning outcomes sought. In a student learning-focused BL, evaluation can help diagnose aspects of blending that require attention. Evaluation of cohort learning outcomes feeds back, or should feedback, into the course inputs, but with far more nuance and sophistication than a design merely set in motion could provide. Evaluation questions include ‘what is the learning movement of a cohort over time?’ and ‘where is the evaluation loops in which various forms of data are fed back in?’

Several popular frameworks that could inform Blended Learning evaluation are very effective for thinking about curriculum design, but are not effective for the evaluation of student learning outcomes. The SAMR model (Hamilton, Rosenberg, & Akcaoglu, 2016; Puentedura, 2013) provides thought-provoking and helpful guidance to teachers about the design of e-learning. However, it does not provide evaluative guidance about how effectively students may have worked at the top ‘redefined’ level of SAMR. While ‘redefined’ is a pedagogical attempt to make the most of the
potential latent in e-learning, the actual learning that results may be powerful and multifaceted, or it may be fuzzy and weak. Likewise, a well-designed activity at the SAMR level of ‘substitution’ may merely swap some e-learning into a teacher’s previously well-designed face-to-face only task, but still may provide powerful learning that fosters multifaceted learning for students. In other words, the SAMR framework guides the teacher and is effective for the evaluation of inputs, but it does not provide for an evaluation of the effectiveness of the design in terms of student learning outcomes. Building on pedagogical content knowledge (Shulman, 1986), the technological pedagogical content knowledge (TPCK) model (Mishra & Koehler, 2006) guides the thinking that teachers use to acquire and design effective e-learning alone and as BL. With its focus on pedagogy and teacher design, similar to SAMR, TPCK is not suitable as a BL evaluation framework that provides insights into learning outcomes.

5.2.1.2 Spans Paradigms and Theoretical and Pedagogical Perspectives

The second issue concerning BL and its evaluation is that theoretical and conceptual frameworks, when used intentionally, determine the nature of BL. For example, Cognitive Load Theory (Sweller, 1988; Sweller & Paas, 2017) and Direct Instruction (Stockard, Wood, Coughlin & Rasplica Khoury, 2018) portray the vital role of structured learning that is prescribed by the informed teacher who knows what students are to learn and how they may best inculcate that learning. Knowledge acquisition as foundational, and sequentially prior, to all other aspects of learning is emphasised. This knowledge-as-foundation heavily influences the e-learning provided and its intersection with other modes of learning. Cognitive Load Theory and Direct Instruction act as conceptual frameworks for BL design and evaluation, whereby students are thought of as less able to engage in autonomous learning until a certain amount of minimum knowledge and skill sets are acquired.

From a very different perspective than the above, Social Constructivism (Piaget, 1964; Varthis & Anderson, 2018; Vygotsky, 1980) and Connectivism (Siemens, 2005; Wang, Anderson, & Chen, 2018), both provoke the scope and creativity of being led by student curiosity, intrigue, passion, challenge, or problems. The high level of student autonomy emphasised by these conceptual frameworks means that knowledge predetermined by the teacher is not a foundation or sequentially first, rather knowledge is sourced when required from less predictable locations. From this perspective, student knowledge construction is non-linear, unpredictable, and not hierarchical. The term ‘higher-order’ learning invokes a hierarchy for more substantial, effective, and sought-after learning, from bottom to top, for example from knowledge to evaluation in Bloom’s (1956) taxonomy. However, learning may be considered richer when multifaceted. Multifaceted thinking involves a variety of sometimes inseparable cognitive skills and affective elements (Willison, 2020), and is discussed below.

As Cognitive Load Theory and Constructivism sit at different ends of an education theory spectrum, supporters of each are wary of the others (Kirschner, Sweller, &
Clark, 2006; Hmelo-Silver, Duncan, & Chinn, 2007); however, both perspectives may provoke powerful learning outcomes from well-designed BL. An evaluation framework must accommodate both ends of this spectrum and anywhere in the middle because these diverse theoretical and conceptual perspectives are current, prevalent, and heavily influential. An in-common evaluation framework enables each perspective to speak to the others, and such conversation may open new and more effective ways of BL. Moreover, a framework that spans perspectives can provide insight into the strengths and weaknesses of practical applications of each theoretical perspective.

5.2.1.3 Designed a Priori to Determine the Effectiveness of BL

Another issue for the evaluation of BL is that an evaluation framework needs to be designed from the beginning with blended learning in mind, requiring the following:

(a) *Categories do not separate e-learning and other modes of learning*

   A framework to evaluate BL should have e-learning and face-to-face aspects blended together, not as separate components. It is the way that e and non-e components work together to inform and influence student learning because the blending provides more than the sum of the parts.

(b) *Not hierarchical*

   Hierarchical frameworks favour a more linear and direct approach than engagement in sometimes unpredictable blended environments. For much BL, *multifaceted* thinking (Willison, 2020) may be a more appropriate term to convey ‘sophisticated thinking’ than *higher-order thinking*. This is because *higher-order* implies a linear, teacher-directed movement towards the top rung, whereas *multifaceted* thinking is richer, more balanced, and true to the complexities of learning, which requires several facets to be addressed simultaneously. Hierarchical models are not suitable for some of the messy, recursive learning that happens online and even less so when this is blended with other modes of learning. For example, Bloom’s (1956) Taxonomy of the Cognitive Domain has, as its foundation, knowledge as a starting point from which students build. However, there are many other starting points with online access that require ‘higher levels’ of cognition, and online theorists see knowledge as distributed and accessible just-in-time (Siemens, 2005), rather than as a starting foundation.

(c) *Not sequential*

   Many models are not hierarchical, but they follow a specific sequence that includes models that are ‘cyclic’, such as Kolb’s Learning Cycle (Stice, 1987), which is, in effect, four steps and repeat. Sequential models are useful for teacher planning and introducing students to processes; however, they do not capture the non-linear, recursive, and unpredictable nature of BL as engaged in by students, meaning a BL evaluation framework must not be locked into a predictable ‘building-on’ approach.

   An explicit pedagogy for blending is of paramount concern, and the conceptualisation of how to determine the effectiveness of this blending is a crucial factor in
this pedagogy. Across education, e-learning and other modes of learning are difficult to untangle in the timeframe of a day, week, term, semester, or year. Blending is not necessarily a conscious choice by teachers and so the question becomes ‘how effectively is e-learning blended with other modes of learning?’ Does the blend of various modes of learning lead school, ITE, and other university students to engage in multifaceted, sophisticated thinking and doing?

5.2.1.4 Accounts for the Cognitive and Affective Domains

The seminal works that differentiated and separated the cognitive and affective aspects of learning, Bloom’s two taxonomies (Bloom, 1956; Krathwohl, Bloom, & Masia, 1964), recognised that this was an artificial distinction, useful for teacher understanding but not true of learning: ‘The fact that we attempt to analyse the affective area separately from the cognitive is not intended to suggest that there is a fundamental separation. There is none’ (Krathwohl et al., 1964, p. 45). In the ensuing decades, many have maintained the delineation as a reality, which has led to fundamental misunderstandings about the nature of learning, how learning takes place, measurement of learning, and evaluation of courses.

All learning requires a nuanced synergy of the cognitive and affective domains (Krathwohl et al., 1964) including in digital environments (Kiili & Ketamo, 2017) and in learning that blends the digital and physical (Černá, 2017). Therefore, determining the impact of educational technologies on learning environments that blend digital and physical learning requires a conceptual framework that can meaningfully encompass not only the digital and physical, but also the cognitive and affective.

5.2.1.5 Fruitful Across Subjects and Disciplines as Well as Across Educational Sectors, Initial Teacher Education, and in-Service Teacher Education

A BL evaluation framework must provide insight, not only into school student learning and in-service teacher professional development, but also into ITE, which in Australia occurs at both the undergraduate and master’s level. For ITE master’s students, the effectiveness of the blending in their undergraduate discipline-specific degree is of great importance. Likewise, for undergraduate ITE, undergraduate double degrees are common, where students study a discipline-oriented degree in addition to education, such as Arts, Business and Management, Engineering and Maths, or Science. Therefore, an evaluation framework must span the education sectors, subjects, and disciplines. An evaluation framework for ITE must also be flexible enough to accommodate learning in these broader contexts. The need for a blended pedagogy raises questions also about in-service teacher professional development. Therefore, evaluation must include how effectively ITE and in-service teachers’ own learning is facilitated in blended environments (Francom & Moon, 2018), both as a modelling process and towards ITE students’ and teachers’ own enhanced blended pedagogy.
5.2.1.6 Does not Define Complex Skills with Other Complex Skills

The trend to develop digital literacy or digital capability descriptions (e.g. Dede, 2010) has resulted in frameworks with a mixture of characteristics and a complex bundle of skills. For example, typical digital literacy frameworks delineate the concept into sets of still-complex ideas (Littlejohn, Beetham, & McGill, 2012; Mishra & Pandey, 2019), almost always including information literacy (Bundy, 2004). However, information literacy is such a complex and contested term that merely adding it to a framework as an element leaves no realistic way of determining whether students achieve it and, therefore, no method of effective evaluation. Defining complex concepts like digital learning with other complex concepts, such as information literacy, does not provide a basis for an effective evaluation framework. Rather, such nested definitions mask the overlap between complex concepts and do not articulate processes students actually engage in or what the tangible outcomes of their learning may be.

5.2.1.7 Incorporates Explicitly Twentieth-Century and Twenty-First-Century Learning Models

While contemporary learning must be strongly foregrounded in twenty-first-century BL, much twentieth-century research still has descriptive power to explain a raft of learning. More importantly, however, is that twentieth-century understandings are still framing much of contemporary BL. Evaluation may be informed by observations of teachers or others, self-evaluation, and perceptions gleaned in surveys or focus groups.

Whatever the data and methodology employed, the need for a broad evaluative framework informed by both centuries is demonstrated by the concept of data analytics, where lots of data can be sourced via online participation and performance; however, the analysis depends on the analytical framework and questions asked. Early research in online-only learning highlighted the crucial nature of teacher presence for effective learning (Garrison, 2007), a finding that has been consistently backed up (Baker, 2010; Song, Kim, & Park, 2019), and thus data analytics should be treated as a tool for, not a dictator of, BL evaluation. The tendency towards an automisation of evaluation, such as in data analytics, risks a depersonalisation of teaching and learning, whereas learning is a deeply social activity and depersonalisation is a big risk factor for student ownership of learning (Song et al., 2019). The use of twenty-first-century learning models heightens this risk, and a BL evaluation framework that is savvy of pertinent twentieth-century models may balance out the risk of the impersonal.

Capturing, generating, or having lots of data about student engagement and performance is not, in itself, analytics. Data analytics involves the asking of intelligent question and answering these questions with reference to a variety of student and cohort data. Data sets can and do give rise to questions; however, the questions asked are
never neutral but rather influenced consciously or subconsciously by learning theories. The collection of data for data analytics may result in a lot of data but little knowledge about the effectiveness of BL in terms of tangible student learning outcomes unless it has a sound conceptual basis. To capture the diversity of what comprises blended learning, an evaluation framework, informed by a variety of learning models, is needed to inform the process.

### 5.2.1.8 Accommodate Student Need for Teachers or Experienced Peers to Be, at Times, Close by Pedagogically and More Removed at Other Times

Vygotsky’s (1980) Zone of Proximal Development (ZPD) provides an understanding of how students may operate at higher conceptual levels via the ‘proximity’ of a teacher or experienced peer to provide the necessary guidance. At the same time, the ZPD suggests some ‘distance’ from the teacher or experienced peer to enable the student to make the learning their own. Connecting to Sect. 4.2.1.2 above, different learning theories give different emphases on proximity or distance. An evaluation framework for BL must account for proximal and distal parts of the zone.

Each of these eight aspects of the evaluation of BL must be accounted for, with the BELZ presented next as a bespoke model suitable for BL pedagogy and, most importantly, for the evaluation of the BL experiences of students.

### 5.3 Blended and Engaged Learning Zone

The BELZ (Table 5.1) is a conceptual framework that was devised specifically to inform and evaluate environments. It blends physical and digital learning and was designed to span primary school to postgraduate education (Willison, 2020; Willison & O’Regan, 2005). BELZ has a pedigree informed by some of the most broadly used educational research from 20 Willison, twentieth-century research (Biggs & Collis, 1989; Bloom, 1956; Kelly, 1955; Piaget, 1964, Vygotsky, 1980) and is a synthesis of these ideas as well as research that has strongly informed twenty-first-century learning in digital environments (Bundy, 2004; Siemens, 2005). BELZ is an adaptation of a well-cited (Willison & O’Regan, 2007), demonstrably effective (Willison, 2012), and constantly evolving framework called the Models of Engaged Learning and Teaching (Willison, 2020).

BELZ represents six facets of BL, each of which comprises a pair of cognitive skills, a guiding question or questions, and an affective aspect (see Table 5.1). These six facets are elaborated along the zone of learning autonomy in the matrix-shaped version to make the complete BELZ (see Table 5.2).

Drawing on Vygotsky, the ‘zone’ in Models of Engaged Learning and Teaching (MELT) is shown in Table 5.2, where the columns are from ‘proximal’ where there is close, directed support from teachers or informed peers, to ‘distal’ where students are
Table 5.1  BELZ facets comprising cognitive and affective elements

| BELZ cognitive facet, associated questions, and details | Affective exemplar (Deficit) / (Excess) |
|--------------------------------------------------------|---------------------------------------|
| **Explore and clarify** What is our purpose? How can we stay safe? Students clarify their direction and determine their purpose for using digital technologies. Students anticipate ethical, cultural, and social issues including e-protocols, e-safety, digital well-being, profile, and footprint | Empathetic (disengaged) / (besieged) |
| **Select and generate** What will we use? Students select information and generate data and ideas using appropriate methods Choose fit-for-purpose digital technology | Experimental (narrow-minded) / (dithering) |
| **Evaluate and reflect** What do we trust? What is effective? Students determine the trustworthiness of sources, information, data, and ideas, as well as the appropriateness of different tools Students make their own thinking processes visible to understand and improve them | Discerning (gullible) / (pedantic) |
| **Organise and manage** How do we arrange? Students organise information and data to enable patterns/themes to emerge. Students manage themselves and team function using strategies and digital systems | Harmonising (slapdash) / (manipulative) |
| **Analyse and synthesise** What does it mean? What can we make? Students perceive themes or trends in information/data and synthesise new knowledge to produce coherent individual/team understandings. Students create mashups with physical and digital techniques to create new products, understandings, and solutions | Creative (unimaginative) / (esoteric) |
| **Collaborate and communicate** How do we relate? Students consider their teams and the audience to discuss, chat, listen, write, perform, respond to feedback, and present processes, knowledge applications, and implications of their artefacts. Students engage the audience through their products as well as using these for personal benefit | Connected (aloof) / (pandering) |

themselves driving the learning. The part of the zone close to the teacher is labelled with the verb *emulate*, whereas the part that is more removed from the teacher is called the *initiate*. The in-between part of the zone is called *improvise*, typically with learning scaffolds and where the students have scope to *improve* within their teacher’s parameters, much like jazz musicians work within the parameters of the score when they improvise. The student-oriented MELT representation of the ZPD,
Table 5.2 Matrix version of BELZ showing the six facets elaborated along the continuum of learning autonomy (simplified version)

| Emulate | Improvise | Initiate |
|---------|-----------|----------|
| **Biplatform** | **What is our purpose?** | **What will we use?** |
| Explore & Clarify | Students respond to prompts that are prescribed. | Students work within parameters, to explore... |
| Select & Generate | What is effective? | Students show the learning to... |
| Evaluate and Reflect | What do we trust? | Emulate, improvise, initiate |
| Organise and Manage | How do we arrange? | and this parallels the standard teacher-centric version of ‘model, scaffold, fade’ (Lane, Hays, Core, & Auerbach, 2013). The MELT focus is on capturing what students do in the fullness of learning, thus providing a continuum of learning autonomy as an operationalisation of ZPD that is suited to learning generally and BL process and outcomes in particular.

This consideration of learning autonomy is a major design feature for BELZ to be used across formal education, including schooling, undergraduate and master’s-level ITE, and in-service teacher PD. This is because ‘autonomy’ is not an attribute to be acquired (Willison, 2020), but is concerned with the relationship between each student, their learning context and teacher, and the concepts and skills to be used or developed. BELZ represents the essential nature of recursive movement in learner autonomy much like the ocean, from low tide to high tide and back to low tide (Willison, Sabir, & Thomas, 2017).

BELZ allows for the evaluation of student learning autonomy, not as an absolute entity or a characteristic of a learner, but rather as a sense of movement from low autonomy to high autonomy and back again as appropriate and as occurs across the many years of formal education. In BL, there is an opportunity to provide kindergarten students with the scope to operate at a high level of autonomy for a while and when it is safe. Some students will make the most of this and initiate learning, others will seek for some parameters and improvise within them, and some may want prescriptions to follow. One of the implications is that BELZ is effective for determining a shift in student autonomy and on that basis determining how effectively the BL environment helps students take ownership of their learning in a specific context. BELZ firmly
places highly guided learning, where students emulate, as part of the engaged learning continuum, as part of the zone in which students initiate. The question becomes ‘how much structure and guidance do students need at any one time?’

BELZ explicitly addresses the eight vital aspects of an evaluation framework needed to be suitable for BL, as shown in Table 5.3. Using BELZ in terms of a blended inquiry mode, teachers are provoked to thoughtfully diagnose where students are situated for each facet in terms of student autonomy. The range of student capacity for inquiry mode in this diagnosis raises numerous questions.

Evaluative questions include how effectively the experienced curriculum promotes

1. Student cognitive and affective outcomes.

2. Student metacognition:
   a. How well does the curriculum promote student awareness of their own thinking processes as individuals and as teams?
   b. How well does the curriculum promote student regulation of their thinking processes, especially to improve their learning and ultimately the things they make and do?

3. Student meta-affection (awareness of their values, attitudes, and emotions):
   a. How well does the curriculum promote student recognition of the affective domain (including deficits and excesses) and its role in their learning?
   b. How well does the curriculum promote student recognition of their own deficits and excesses in the affective domain?
   c. How well does the curriculum promote student regulation of and growth in the affective domain?

The focus of this chapter was on evaluation; however, BELZ can be used to inform pedagogy, prompting the planning of curriculum with reference to student autonomy. Versions might also be used directly with students to inform their thinking about their online learning (see Fig. 5.1).

### 5.3.1 Example of BELZ Use for Evaluation

A version of BELZ was introduced in a two-hour workshop to teachers of the three-term long personal project in the International Baccalaureate (IB). The teachers’ Year 9 students were poised to commence this major research project. The teachers were asked to use their professional judgement of the readiness of students to engage in their personal projects with relation to BELZ facets and learner autonomy. Table 5.4 provides an indicative example of a teacher’s reflection on their class preparedness for the Research Project. There was in each workshop a large variation, teacher by teacher, in the percentages for emulate, improvise, and initiate, facet by facet.
| Feature required in a BL evaluation framework (identified above) | Features of BELZ |
|---------------------------------------------------------------|------------------|
| i. Focus on learning outcomes, not design inputs               | The facet verbs convey what students do. The facet questions guide their thinking, planning, acting, and creating as outcomes and the evaluation of learning outcomes. As each facet is elaborated along the continuum of learning autonomy, BELZ provides the continuum mentality of OBE. |
| ii. Spans paradigms and theoretical and pedagogical perspectives | The BELZ zones accommodate a wide range of epistemological and pedagogical positions in a non-value laden way. |
| iii. Is designed a priori to determine the effectiveness of BL and is not hierarchical or sequential | Each individual facet has e-learning and face-to-face learning incorporated. BELZ has no fixed configuration, with the pentagon version (Fig. 5.1) portraying no sequence or hierarchy and just a guiding motto ‘when in doubt go to the centre’. |
| iv. Accounts for the cognitive and affective domains            | Each facet explicitly incorporates cognitive and affective domains, where each speaks to, and reinforces, the other. |
| v. Is fruitful across subjects and disciplines as well as across educational sectors, ITE, and in-service TE | Has been used extensively in undergraduate, master’s, and Ph.D. (Willison, 2020), and more recently in primary and secondary schooling. This scope across formal education was designed and portrayed from the beginning (Willison & O’Regan, 2005). In university studies, BELZ has been used and evaluated from Accounting to Zoology and in-between (Willison, 2012) and interdisciplinary (Venning & Buisman-Pijlman, 2013). |
| vi. Accommodates student need for teachers/experienced peers to be close at times or more removed at other times | Learner autonomy in BELZ is explicitly portrayed as a continuum from *emulate* to *improvise* and *initiate*. *Emulate*, the teacher or experienced peer is close and the student has a lower level of autonomy. *Improvise*, the teacher is distant and the student has a higher level of autonomy. |
| vii. Does not define complex skill sets with other complex skill sets | The six BELZ facets, while interconnected, have minimal overlap when compared to complex skill sets such as digital capabilities and information literacy. |
| viii. Incorporate explicitly twentieth-century and twenty-first-century learning models | Design includes Dewey (1904), Kelly (1955), Piaget (1964), Vygotsky (1980), Bloom (1956), Krathwohl, Bloom, & Masia, (1964) and Sweller (1988) from the twentieth century. Includes Bundy (2004) and Siemens (2005) from the twenty-first century. |
Percentages varied greatly context by context, and teacher by teacher (Table 5.4). The evaluation of student readiness to engage in blended investigative learning provoked thoughtful evaluative considerations including:

- The suitability of the curriculum and teaching up to the time of the workshop (e.g., end of the second term of Year 9) to prepare students for a major investigative project.
- The extent to which modelling and scaffolding may need to be provided to some students.
- How to manage such differentiated outcomes of student learning up to that point?
- What needed to be adjusted in the curriculum for subsequent cohorts?

Using BELZ to consider student learning outcomes with reference to an impending and major task prompted the prospective and retrospective evaluation of the curriculum and pedagogy. This was retrospective, in that it provided information on what the curriculum had done for students in preparing them for a major inquiry. The evaluation illuminates what needed to happen differently for the next cohort if more students were to be thoroughly prepared. Just as important, prospectively, the curriculum to support the students during their research project could also be scrutinised with respect to how well it would address the needs of those students. For example, the teachers could ask what was in place from term 3 to support those students who were perceived to be unable to initiate the identification of an issue to investigate, and would need teacher guidance and modelling for the students to...
### Table 5.4 An indicative teacher evaluation of a specific year 9 Cohort’s preparedness for major inquiries of three terms length

| Blended and engaged learning zones (BELZ) | Digital facets | Emulate (%) | Improvise (%) | Initiate (%) |
|------------------------------------------|----------------|-------------|---------------|--------------|
| Explore and clarify                      |                | 60          | 20            | 20           |
| Select and generate                      |                | 30          | 30            | 40           |
| Evaluate and reflect                     |                | 70          | 20            | 10           |
| Organise and manage                      |                | 80          | 10            | 10           |
| Analyse and synthesise                   |                | 20–80       | 20–40         | 20           |
| Collaborate and communicate              |                | 20          | 40            | 40           |

emulate. This evaluation also frees up resources if the student who can innovate can act as a peer model.

### 5.3.2 Possibilities for BELZ Use

Informed by BELZ as a conceptual framework, data collection tools may include

- Pre- and post-questionnaires, each informed by the six BELZ facets, which explore participants’ self-assessment of their cognitive skills in the context of BL. This provides data that shows statistically significant changes over time and student attribution to the causes of those changes. This strategy was part of the triangulated data collected in a study across five universities in numerous disciplines (Willison, 2012) and in engineering (Missingham, Shah, Sabir, & Willison, 2018).
• Analysis of artefacts of student work produced by school students and ITE students at university. This analysis using BELZ has been conducted within schooling (Willison, Bennet, Daughtry, & Suh, 2019).
• Individual and focus group interviews eliciting views about the effectiveness of learning in the BL environment.
• Structured lesson observations (Willison, Conlon, Gianni, & Pierce, 2018).
• Analysis of artefacts of work produced by schoolchildren in classes taught by a treatment group and a control group (Willison et al., 2019). Moreover, student artefacts produced by direct engagement with BELZ (see Fig. 5.1) may be analysed.
• Interviews with those who completed a programme of study and analysed using BELZ to identify cognitive and affective outcomes for graduates (e.g. Ain, Sabir, & Willison, 2019; Wilmore & Willison, 2016).

5.4 Conclusion

This paper aimed to show that while BL has become the norm across formal education, most evaluation frameworks that exist focus, in effect, on blended teaching. The Blended and Engaged Learning Zones—BELZ—was introduced as a framework for the evaluation of BL that prioritised student learning processes and outcomes rather than teacher and technology inputs. BELZ satisfied the eight characteristics of an effective BL evaluation framework presented in this paper and thus is a candidate for use across education to inform BL. BELZ was detailed in terms of its six facets of sophisticated thinking elaborated along zones of student autonomy, in which students emulate, improvise, and initiate. An example of the use of BELZ, focusing on cohort preparedness for subsequent inquiry learning, provided a provocative evaluation of the BL curriculum and environment that students had experienced up until that point, to provoke student-oriented changes to the curriculum. Just as important, the evaluation of the cohort was also suggestive of changes to the curriculum that awaited them, so that ‘evaluation’ with BELZ looks back to improve and looks forward to anticipate.

Research on the effectiveness of BELZ is required, including rich, fine-grained studies of curriculum improvement informed by BELZ and quantified studies that look broadly, especially across multiple BELZ uses, to guide improvement over the timeframes of multiple terms/semesters and years. For the ITE context, a substantial benefit of BELZ is that it has a pedigree and design for school as well as university education. Therefore, if BELZ is used in ITE courses for evaluation, students can be informed about BELZ, both for their own evaluation of school classes when they are observing or teaching, as well as a pedagogical model to inform their teaching to enhance the learning of their students.

Acknowledgements The author thanks Associate Professor Mathew White for his critical review of the book chapter. Thanks are also due to Associate Professor Mathew White and Professor Faye McCallum for their technical editing of the manuscript.
References

Ain, C. T., Sabir, F., & Willison, J. (2019). Research skills that men and women developed at university and then used in workplaces. Studies in Higher Education, 44(12), 2346–2358.

Baker, C. (2010). The impact of instructor immediacy and presence for online student affective learning, cognition, and motivation. Journal of Educators Online, 7(1), n1.

Biggs, J., & Collis, K. (1989). Towards a model of school-based curriculum development and assessment using the SOLO taxonomy. Australian Journal of Education, 33(2), 151–163.

Bloom, B. S. (1956). Taxonomy of educational objectives. Vol. 1: Cognitive domain (pp. 20–24). New York: McKay.

Boelens, R., De Wever, B., & Voet, M. (2017). Four key challenges to the design of blended learning: A systematic literature review. Educational Research Review, 22, 1–18.

Bowyer, J., & Chambers, L. (2017). Evaluating blended learning: Bringing the elements together. Research Matters: A Cambridge Assessment Publication, 23, 17–26.

Bundy, A. (2004). Australian and New Zealand information literacy framework: Principles, standards and practice (2nd ed.). http://www.caul.edu.au/info-literacy/InfoLiteracyFramework.pdf.

Cappi, V., Artioli, G., Erika, N., Ferrari, S., Guarnieri, M. C., Martucci, G., et al. (2019). The use of blended learning to improve health professionals’ communication skills: A literature review. Acta Bio Medica: Atenei Parmensis, 90(Suppl 4), 17.

Černá, M. (2017). Deployment of cognitive and affective determinants in blended learning-case study. International Conference on Blended Learning (pp. 464–474). Springer.

Chmiel, A. S., Shaha, M., & Schneider, D. K. (2017). Introduction of blended learning in a master program: Developing an integrative mixed method evaluation framework. Nurse Education Today, 48, 172–179.

Cleveland-Innes, M., & Wilton, D. (2018). Guide to blended learning. Retrieved from http://oasis.col.org/handle/11599/3095.

Coates, H. (2016). Assessing student learning outcomes internationally: Insights and frontiers. Assessment & Evaluation in Higher Education, 41(5), 662–676.

Dede, C. (2010). Comparing frameworks for 21st century skills. 21st century skills: Rethinking how students learn, 20, 51–76.

Dewey, J. (1904). Significance of the school of education. The Elementary School Teacher, 4(7), 441–453.

Derntl, M., & Motschnig-Pitrik, R. (2004, March). Patterns for blended, person-centered learning: Strategy, concepts, experiences, and evaluation. Proceedings of the 2004 ACM Symposium on Applied Computing (pp. 916–923). ACM.

Francom, G., & Moon, A. (2018). Enhancing educational technology confidence among teacher candidates. Journal of Information Technology Education Research, 17, 423–440.

Garrison, D. R. (2007). Online community of inquiry review: Social, cognitive, and teaching presence issues. Journal of Asynchronous Learning Networks, 11(1), 61–72.

Hamilton, E. R., Rosenberg, J. M., & Akcaoglu, M. (2016). The substitution augmentation modification redefinition (SAMR) model: A critical review and suggestions for its use. TechTrends, 60(5), 433–441.

Hasse, C. (2017). Technology literacy for teachers. Oxford Review Education, 43(3), 365–378.

Hmelo-Silver, C. E., Duncan, R. G., & Chinn, C. A. (2007). Scaffolding and achievement in problem-based and inquiry learning: A response to Kirschner, Sweller, and Clark. Educational Psychologist, 42(2), 99–107.

Jansen, C., & van der Merwe, P. (2015). Teaching practice in the 21st century: Emerging trends, challenges and opportunities. Universal Journal of Educational Research, 3, 190–199.

Kiili, K., & Ketamo, H. (2017). Evaluating cognitive and affective outcomes of a digital game-based math test. IEEE Transactions on Learning Technologies, 11(2), 255–263.
Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist, 41*(2), 75–86.

Kelly, G. (1955). *Personal construct psychology*. New York: Norton Press.

Krathwohl, D. R., Bloom, B. S., & Masia, B. B. (1964). *Taxonomy of educational objectives: Handbook II. Affective domain*. New York: David McKay.

Lane, H. C., Hays, M. J., Core, M. G., Auerbach, D. (2013). Learning intercultural communication skills with virtual humans: Feedback and fidelity. *Journal of Educational Psychology, 105*(4), 1026–1035.

Laurillard, D. (2005). E-learning in higher education. In P. Ashwin (Ed.) *Changing higher education* (pp. 87–100). London: Routledge.

Littlejohn, A., Beetham, H., & McGill, L. (2012). Learning at the digital frontier: A review of digital literacies in theory and practice. *Journal of Computer Assisted learning, 28*(6), 547–556.

Mishra, C., & Pandey, S. (2019). An assessment of digital capability training programs among higher education institutions in India. *Library Philosophy and Practice*, 1–23. Retrieved from [https://search.proquest.com/docview/2216869072?accountid=8203](https://search.proquest.com/docview/2216869072?accountid=8203)

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054.

Missingham, D., Shah, S., Sabir, F., & Willison, J. (2018). Student engineers optimising problem solving and research skills. *Journal of University Teaching and Learning Practice, 15*(4), 8.

OECD (2015). *Students, computers and learning: Making the connection*. Paris: PISA, OECD Publishing. Retrieved from [http://dx.doi.org/10.1787/9789264239555-en](http://dx.doi.org/10.1787/9789264239555-en).

Paiva, J., Morais, C., Costa, L., & Pinheiro, A. (2016). The shift from “e-learning” to “learning”: Invisible technology and the dropping of the “e”. *BJET, 47*(2), 226–238.

Piaget, J. (1964). Part I: Cognitive development in children. *Journal of Research in Science Teaching, 2*(3), 176–186.

Pombo, L., & Moreira, A. (2012). Evaluation framework for blended learning courses: A puzzle piece for the evaluation process. *Contemporary Educational Technology, 3*(3), 201–211.

Puentedura, R. R. (2013). *SAMR: Moving from enhancement to transformation*. Retrieved from [http://www.hippasus.com/rrpweblog/archives/000095.html](http://www.hippasus.com/rrpweblog/archives/000095.html).

Selwyn, N., Nemorin, S., Bullin, S., & Johnson, N. F. (2017). Left to their own devices: The everyday realities of ‘one-to-one’ classrooms. *Oxford Review of Education, 43*(3), 289–310.

Shulman, L. (1986). Paradigms and research programs in the study of teaching: A contemporary perspective. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed., pp. 3–36). New York: MacMillan.

Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning, 2*(1). Retrieved from [http://www.itdl.org/](http://www.itdl.org/).

Smythe, M. (2012). Toward a framework for evaluating blended learning. *Future challenges, sustainable futures*. Proceedings of Ascilite Conference (pp. 854–858). 25–28 November 2012, Wellington.

Song, H., Kim, J., & Park, N. (2019). I know my professor: Teacher self-disclosure in online education and a mediating role of social presence. *International Journal of Human-Computer Interaction, 35*(4), 448–455. [https://doi.org/10.1080/10447318.2018.1455126](https://doi.org/10.1080/10447318.2018.1455126).

Stein, J., & Graham, C. R. (2020). *Essentials for blended learning: A standards-based guide*. Routledge.

Stice, J. E. (1987). Using Kolb’s learning cycle to improve student learning. *Engineering Education, 77*(5), 291–96.

Stockard, J., Wood, T. W., Coughlin, C., & Rasplica Khoury, C. (2018). The effectiveness of direct instruction curricula: A meta-analysis of a half century of research. *Review of Educational Research, 88*(4), 479–507.

Stone, J. A. (2017). The impact of technology exposure on student perceptions of a 1:1 program. *Education and Information Technologies, 22*(5), 2281–2309.
Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257–285.

Sweller, J., & Paas, F. (2017). Should self-regulated learning be integrated with cognitive load theory? A commentary. *Learning and Instruction, 51*, 85–89.

Varthis, S., & Anderson, O. R. (2018). Students’ perceptions of a blended learning experience in dental education. *European Journal of Dental Education, 22*(1), e35–e41.

Venning, J., & Buissen-Pijlman, F. (2013). Integrating assessment matrices in feedback loops to promote research skill development in postgraduate research projects. *Assessment & Evaluation in Higher Education, 38*(5), 567–579.

Vo, H. M., Zhu, C., & Diep, N. A. (2017). The effect of blended learning on student performance at course-level in higher education: A meta-analysis. *Studies in Educational Evaluation, 53*, 17–28.

Vygotsky, L. S. (1980). *Mind in society: The development of higher psychological processes*. Harvard: Harvard University Press.

Wang, Z., Anderson, T., & Chen, L. (2018). How learners participate in connectivist learning: An analysis of the interaction traces from a cMOOC. *International Review of Research in Open and Distributed Learning, 19*(1).

Willison, J. W. (2012). When academics integrate research skill development in the curriculum. *Higher Education Research & Development, 31*(6), 905–919.

Willison, J. W. (2020). *The models of engaged learning and teaching*. Springer.

Willison, J. W., & O’Regan, K. (2005). 2020 vision: An information literacy continuum for students primary to postgraduation. Research and Development in Higher Education: Proceedings of the Higher Education Research and Development Conference. Sydney, 3–6 July 2005.

Willison, J., & O’Regan, K. (2007). Commonly known, commonly not known, totally unknown: A framework for students becoming researchers. *Higher Education Research & Development, 26*(4), 393–409.

Willison, J., Bennet, R., Daughtry, J., & Suh, A. (2019). *The models of engaged learning and teaching (MELT) in STEM and special education*. Paper presented at the Australian Association for Research in Education Conference, Brisbane, 1–5 December 2019.

Willison, J., Conlon, A., Gianni, B., & Pierce, D. (2018). Integrating science, technology, engineering and maths through thinking skills in common. Paper presented at the Australian Association for Research in Education, Sydney, 2–6 December 2018.

Willison, J., Sabir, F., & Thomas, J. (2017). Shifting dimensions of autonomy in students’ research and employment. *Higher Education Research & Development, 36*(2), 430–443.

Wilmore, M., & Willison, J. (2016). Graduates’ attitudes to research skill development in undergraduate media education. *Asia-Pacific Media Educator, 26*(1), 113–128.

Zhang, W., & Zhu, C. (2017). Review on blended learning: Identifying the key themes and categories. *International Journal of Information and Education Technology, 7*(9), 673–678.

Zhou, M., & Chua, B. L. (2016). Using blended learning design to enhance learning experience in teacher education. *International Journal on E-Learning, 15*(1), 121–140.

**John Willison** Ph.D. is a Senior Lecturer and Director of the Bachelor of Teaching (Middle) in the School of Education at the University of Adelaide. He teaches into undergraduate and Masters programmes of the School, and supervises higher degree students who engage in classroom-based research. His own research began when he was a high school science teacher and continued at university when he ran the Graduate Certificate in Higher Education for academics from all disciplines. The shift from a science focus to one across all disciplines caused John to broaden his research agenda to search for something in common: representations of how all educators may facilitate their students’ sophisticated thinking skills. Over time, these representations came to become known as the Models of Engaged Learning and Teaching (MELT). Successful uptake of the MELT in multiple faculties inspired John to lead federally funded Innovation and Development grants and a fellowship, all involving multiple universities. One grant focussed on course-level
implementation of the MELT, the second on programme-level implementation, and the fellowship focused on Masters Programmes implementation towards AQF9. He held a National Senior Teaching Fellowship, completed 2018, to consolidate use in undergraduate, Masters, and Ph.D. studies across all disciplines and to bring the research ‘full-circle’ to explore high schools’ use of the MELT in science, and interdisciplinary STEM and HASS. His most recent publication is a sole authored research book *The Models of Engaged Learning and Teaching* published by Springer in 2020.