Advancing Building and Construction Higher Education: The Online Real-Time Block Model's Contributions to Professional Skills, Gender Equity, and Industry Preparedness

buildings

MDPI

Article

Advancing Building and Construction Higher Education: The Online Real-Time Block Model's Contributions to Professional Skills, Gender Equity, and Industry Preparedness

Nima Izadyar [1,2,*], Le Li [1,2], Shuo Chen [1,2] and Darryl O'Brien [1,2]

[1] Built Environment and Engineering (BEE) Program, College of Sport, Health and Engineering (CoSHE), Victoria University, Melbourne, VIC 3011, Australia; le.li@vu.edu.au (L.L.); shuo.chen@vu.edu.au (S.C.); darryl.obrien@vu.edu.au (D.O.)

[2] Institute for Sustainable Industries and Liveable Cities (ISILC), Victoria University, P.O. Box 14428, Melbourne, VIC 8001, Australia

* Correspondence: nima.izadyar@vu.edu.au

Abstract: Traditional In-Person Semester-Length (IP-SL) courses often struggle with inherent time constraints, lack of flexibility, and geographic limitations, delaying effective learning and accessibility for students. Moreover, the extended duration of the Semester-Length (SL) structure reduce focus due to engagement with multiple subjects simultaneously, increased stress, and limited timely feedback and assessment. This study evaluates the Online Real-Time Block Model (ORT-BM), an intensive online model, highlighting its potential to enhance engagement, satisfaction, and inclusivity in project-based programs like construction in higher education. Building surveying as a critical field in construction is selected as the case study since professional surveyors must stay current with rapidly evolving building codes, regulations, and sustainability practices. However, the rigid structure of IP-SL courses often leaves graduates less prepared to meet industry needs. Conducting a comparative analysis of a case study, the Bachelor of Building Surveying program (NBBS) at Victoria University, the research compares three teaching models: IP-SL (2016–2018), In-Person Block Model (IP-BM, 2019–2020), and ORT-BM (2020–2023) using Student Evaluation of Units (SEU) data and Quality Indicators for Learning and Teaching (QILT) metrics. Findings, derived from SEU and QILT, reveal that ORT-BM improves student satisfaction, accelerates course completion rates, and fosters gender equity through inclusive learning environments while enhancing accessibility for geographically dispersed and disadvantaged students. By integrating advanced digital tools like virtual site visits, ORT-BM enhances professional readiness, aligning education with evolving industry standards. Future research may explore developing hybrid models to optimize cognitive load further, improve accessibility, and enhance flexibility.

Keywords: building surveying education; construction higher education; digital learning in construction; gender equity in construction; intensive online teaching; student engagement

Academic Editor: David J. Edwards

Received: 3 December 2024
Revised: 4 January 2025
Accepted: 5 January 2025
Published: 8 January 2025

Citation: Izadyar, N.; Li, L.; Chen, S.; O'Brien, D. Advancing Building and Construction Higher Education: The Online Real-Time Block Model's Contributions to Professional Skills, Gender Equity, and Industry Preparedness. *Buildings* **2025**, *15*, 165. https://doi.org/10.3390/buildings15020165

1. Introduction

In-Person (IP) Semester-length (SL) education is the most common method in higher education but faces limitations such as logistical constraints, inflexibility, and challenges during unexpected disruptions like lockdowns [1–3], which cause stress and time management difficulties among learners, affecting their focus [4,5]. These limitations are especially pronounced in male-dominated fields like construction, where traditional learning models can unintentionally reinforce gender disparities by limiting access for students who

may face greater challenges balancing personal and professional responsibilities [6–8]. This is particularly relevant for women, who remain underrepresented in the building and construction industry [9–13]. This underrepresentation is evident in global statistics, with women making up only 9% to 13% of the construction workforce in many countries, and these figures have remained relatively unchanged despite ongoing diversification efforts [14]. Moreover, the construction industry is experiencing rapid technological advancements, sustainability practices, and regulatory requirements [15,16]. As a result, educational programs must adapt to ensure that graduates possess the professional skills to meet industry standards and remain competitive, particularly in fields like building surveying, which focus on updated regulations.

To address these challenges, researchers have investigated digital solutions like online, blended, and virtual collaborative learning [17,18]. Asynchronous (e.g., pre-recorded lectures) and synchronous methods, e.g., live online lectures or Online Real-Time (ORT), have been introduced as alternatives to the IP method [19]. Despite the growing adoption of intensive and online learning, there is a lack of comprehensive evaluation of their combined effects on student outcomes, particularly in professional programs like building surveying. These alternatives can improve flexibility, learning quality, and student engagement [20], although challenges like technical issues, accessibility concerns, and assessment integrity continue in online content delivery [21,22]. The Block Model (BM) is an intensive teaching approach in higher education and tertiary institution settings, where students focus on a single subject or unit at a time, typically delivered over a condensed timeframe (e.g., one month instead of one semester), rather than studying multiple subjects concurrently across a semester [23–25]. Unlike Semester-Length (SL) courses, which distribute learning across a longer duration with multiple units running simultaneously, BM provides a concentrated learning experience, allowing students to immerse themselves fully in one subject without the distraction of competing coursework. This approach offers an engaging learning experience that accelerates course completion and boosts engagement across diverse student demographics, including first-year and disadvantaged students [26,27]. Although BM demonstrates significant potential in enhancing educational outcomes [28], research on integrating BM with online educational methods remains limited, requiring further investigation into their combined efficacy.

In response to this gap, this paper introduces the Online Real-Time Block Model (ORT-BM), which combines online and intensive delivery methods, and evaluates its impact on teaching and learning environments, gender equity, engagement, and course progression. This research is crucial for informing educational practices in higher education, especially in fields requiring practical, regulatory knowledge like building surveying. By understanding the impact of the ORT-BM, institutions can make informed decisions about implementing more effective, accessible, and equitable educational strategies. The focus is on the Bachelor of Building Surveying (NBBS) course at Victoria University, comparing it with two other delivery methods: In-Person Semester-length (IP-SL) and In-Person Block Model (IP-BM), used for the same content and institution. This article comprises six sections. After this introduction, Section 2 reviews the relevant literature, then Section 3 outlines the methodology and describes the case study course and selected units. Section 4 presents the results of the study and provides a detailed discussion. Section 5 addresses the limitations of the research and suggests future directions. Finally, Section 6 draws conclusions based on results and findings.

2. Literature Review

This section examines three interconnected themes throughout the literature to introduce online and intensive approaches (i.e., IP-BM and ORT-BM) in higher education,

particularly for higher education in project-based industry fields like construction. These teaching and learning modes are investigated as alternatives to traditional IPSL in order to address the abovementioned issues. Section 2.1 explores the role and evolution of online learning in higher education, highlighting its impact on accessibility, flexibility, and student engagement, as three main limitations of IPSL. Section 2.2 investigates intensive teaching methods in literature and the previous results on adopting BM as an alternative to traditional SL approaches. Section 2.3 examines the integration of online and intensive teaching.

2.1. Online Learning in Higher Education

The integration of online learning in higher education has influenced teaching and learning practices, particularly in the post-COVID-19 era [29–31]. This shift, characterized by electronic communication, has encouraged researchers to investigate the applications of technology and digitalization in education [32–34]. The literature highlights challenges in adapting to new digital technologies and pedagogies, which are particularly pronounced in fields requiring in-person experiences, such as construction education [35], as well as opportunities to enhance student engagement [36,37]. Two primary online delivery modes have emerged and been studied extensively: asynchronous (pre-recorded lectures) and synchronous (live online lectures or ORT) [38]. Consequently, it is essential to examine how these modes can be utilized to address existing challenges and capitalize on emerging opportunities for enhancing student engagement and learning outcomes.

Both asynchronous and synchronous modes offer benefits, such as flexibility, improved learning quality, student satisfaction, and increased enrolment [39–42]. However, challenges remain in the online delivery of lab-based or project-based content, like building and construction courses [43,44], and managing the cognitive load [38,45]. Despite these concerns, these online modes have demonstrated the potential to support interactive and student-centered approaches such as flipped classrooms, collaborative learning, and problem-based learning [42,46–49]. Asynchronous modes offer flexibility and accessibility, while synchronous modes enhance interactivity, catering to varied learning contexts [50–52].

The literature emphasizes that both pre-recorded lectures and ORT have been successful in distance learning [50,53], with ORT being particularly beneficial for students with disabilities due to the interaction possibilities between students and instructors [54–56]. In contrast, ORT methods may result in a lower cognitive load for students [38], highlighting the need for innovative strategies that consider course content, learning outcomes, teaching modes, and student demographics [57–59]. Both of these online learning modes have shown promise in advancing gender equity in male-dominated fields like construction by providing flexibility and accessibility that reduce barriers faced by women, such as balancing professional and personal responsibilities, while mitigating gender intimidation in in-person settings and fostering a more inclusive and diverse workforce [60]. When applied to construction education, characterized by project-based learning [61,62], ORT methods face unique challenges, such as replicating hands-on experiences and collaborative project environments and facilitating effective interactions between students and instructors. By carefully integrating digital tools, educators can replicate hands-on experiences virtually, thereby bridging the gap between theoretical concepts and practical application.

Designing online curricula to meet specific course needs, such as integrating digital tools and Virtual Reality (VR) to bridge theoretical and practical learning gaps [63,64] and analyzing learner experiences through case studies [65], can foster a more learner-centered environment. Building on these insights, future research should systematically examine how the combination of online delivery and intensive methods influences learning outcomes across diverse student cohorts and industry-focused disciplines.

Building on these insights, Cognitive Load Theory (CLT) emphasizes the importance of designing education models that balance cognitive demands with learner capacity [66,67]. Integrating intensive delivery methods like BM with online strategies has been shown to improve cognitive retention by structuring content into manageable blocks and supporting diverse student demographics, including disadvantaged learners [68]. Preparatory online modules, designed with CLT in mind, have shown the potential to remove unnecessary distractions and focus on the key skills and knowledge learners need, enabling students to learn more effectively and perform better in assessments [69]. This approach helps students perform better in practical, skill-based tests. However, accessibility challenges persist, particularly for students in regional areas or those with limited access to technology, emphasizing the need for institutional support and hybrid strategies [70,71]. Intensive teaching approaches are increasingly viewed as promising alternatives or complements to traditional in-person and online SL formats.

2.2. Intensive Teaching in Higher Education

The intensive learning and teaching approach, also known as the BM [72,73], immersive scheduling [25,74], or intensive delivery mode [75], is a method of education that delivers course content in a condensed and focused timeframe, rather than over a traditional semester. This approach has been implemented in various education settings [23,24,76–80] and is becoming increasingly popular in higher education globally [23,81]. It has proven effective, particularly for first-year undergraduates, repeating students, and those from disadvantaged backgrounds [73,81–85]. By condensing content into shorter, focused learning periods, the BM enhances engagement, retention, and accessibility [86,87].

The BM presents the potential for project-based fields like construction education, where hands-on experience, collaboration, and iterative learning are essential. By condensing course content into shorter, focused timeframes, the BM allows students to deeply concentrate on a single subject or project without the distractions of competing coursework, fostering engagement and reducing cognitive overload for complex construction-related tasks [87]. Its immersive nature supports collaborative learning and iterative feedback, aligning well with the practical demands of construction training. Furthermore, the BM may enhance gender equity in male-dominated fields like construction by reducing scheduling conflicts for women balancing professional and personal responsibilities, thereby improving inclusivity for underrepresented groups. However, the condensed schedule may limit opportunities for essential on-site or hands-on activities, posing a challenge for developing technical competencies, necessitating supplemental strategies such as simulations, virtual labs, VR, or Augmented Reality (AR) tools to replicate real-world scenarios, alongside supportive measures like online options and flexible scheduling [88,89]. These approaches can help bridge the gap between theoretical knowledge and practical application while ensuring the effectiveness of the BM in project-based disciplines.

2.3. Integration of ORT and BM for Construction Higher Education

Integrating ORT with BM combines the flexibility and accessibility of ORT with the immersive and focused learning of BM, making it a powerful approach for addressing barriers in male-dominated fields like construction [7]. This dual strategy reduces the need for frequent physical attendance, easing scheduling conflicts and geographic constraints, while creating a supportive and inclusive learning environment that helps students, particularly women, balance professional and personal responsibilities. By offering a less intimidating and more adaptable educational pathway, ORT-BM not only broadens access but also equips learners with the skills and confidence needed to thrive in project-based disciplines, ultimately encouraging greater female participation in the construction industry [90].

In construction education, where hands-on learning and practical application are vital [35], the integration of ORT and BM can maintain the depth and rigor required for developing industry-relevant skills while improving flexibility. ORT facilitates access to live, interactive sessions for discussing real-world scenarios, while BM enables focused, immersive learning experiences that encourage deep engagement with complex topics. These methods are particularly effective in Architecture, Engineering, and Construction (AEC), where balancing theoretical knowledge with practical skills is essential for professional success [2,91].

The building and construction industry, characterized by rapidly evolving standards, sustainability practices, and regulatory requirements, requires graduates equipped with up-to-date, industry-relevant skills [15,16]. Previous findings confirm the BM's effectiveness in improving learning and teaching quality [79,92,93], suggesting that integrating the BM with digital and flexible delivery strategies like ORT-BM could address these gaps while advancing inclusivity and preparing students for the challenges of a modern workforce.

Building surveying, as a critical component of construction education, serves as an excellent case study for examining the integration of ORT and the BM. This discipline demands proficiency in interpreting intricate regulatory codes, conducting thorough inspections, and utilizing advanced digital tools such as Building Information Modeling (BIM) [94–96]. The reliance on continuously updated construction codes, such as the National Construction Code (NCC) of Australia, further underscores the need for an adaptive and dynamic educational approach. Recent innovations, such as VR and AI tools [97,98], offer additional opportunities to enhance ORT-BM's effectiveness by simulating practical, industry-relevant scenarios. Leveraging ORT-BM allows students to stay current with industry standards, access virtual simulations for compliance training, and participate in collaborative learning activities, ensuring they are well-prepared for the demands of the workforce.

This literature review highlights the transformative potential of online and intensive teaching approaches in higher education, particularly in construction education. It examines the challenges of traditional IPSL models and demonstrates how ORT and BM can individually and collaboratively address key limitations, such as accessibility, flexibility, and engagement. These strategies are particularly relevant for project-based disciplines like building surveying, which require a balance of theoretical knowledge and practical skills to meet industry demands. The integration of ORT and BM creates a learner-centered environment, enhancing inclusivity and equipping students with relevant, up-to-date skills. By leveraging these hybrid methods, institutions can prepare graduates to navigate the complexities of rapidly evolving fields while contributing to a more sustainable and diverse workforce. This article now transitions to a qualitative study on the NBBS course at Victoria University, Melbourne, to provide practical insights into the implementation and impact of ORT-BM in construction higher education.

3. Methodology and Case Study

This study adopts a case study approach to evaluate the NBBS program at Victoria University over seven years (2016–2023). The methodology is designed to compare three delivery approaches: (1) IP-SL (2016–2019), (2) IP-BM (2019–2020), and (3) ORT-BM (2020–2023), focusing on their impact on student engagement, satisfaction, and teaching quality.

The study is structured around three key objectives:

1. Objective 1: Compare student engagement across the three instructional models.
2. Objective 2: Analyze satisfaction trends using SEU and Quality Indicators for Learning and Teaching (QILT) metrics to assess teaching quality and learning outcomes.
3. Objective 3: Evaluate gender equity and accessibility in the NBBS program.

Data collection included SEU feedback, aggregated annually for reliability, and QILT metrics, which benchmark the NBBS program against similar programs nationally. Descriptive statistics were used to calculate averages, variances, and trends, and visual tools like line charts and bar graphs were employed to highlight key findings aligned with each objective.

The case study approach was selected as it enables an in-depth exploration of the program within its unique context, leveraging rich longitudinal data (e.g., SEU and QILT metrics) to examine the interplay between instructional models, utilized strategies, and educational outcomes. This strategy contextualizes findings within the broader framework of construction education, where practical, regulatory, and technological competencies are critical for graduate success, and aligns with the study's objective to inform effective teaching strategies in professional education. The methodological framework is summarized in Figure 1.

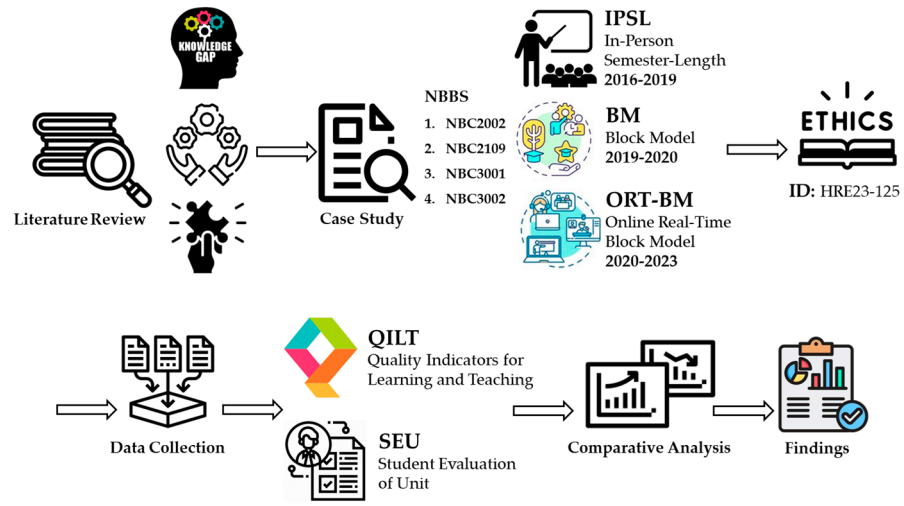

Figure 1. Methodology flowchart.

Figure 1 outlines the research methodology and incorporates symbolic icons for clarity:

1. Literature Review includes three main parts: 1—the knowledge gap represents the identification of gaps in current literature through the literature review; 2—practice, represented by interlocking gears, analyzing prior strategies to identify gaps and inform the research foundation; 3—synthesis, represented by puzzle pieces, integrating insights to form cohesive research framework;
2. Case Study signifies the case study focusing on the Bachelor of Building Surveying (NBBS) program and its selected units (NBC2002, NBC2109, NBC3001, NBC3002), with teaching models represented by icons for IPSL, the BM, and ORT-BM depicting the evolution of teaching methods;
3. Ethics Approval is represented by a book icon with an ethics label, symbolizing adherence to ethical research standards and data integrity under ethics approval (HRE23-125);
4. Data Collection is shown by a bar chart with upward-trending data. This includes data collected from QILT and Student Evaluation of Unit (SEU) feedback to assess teaching methods, student engagement, satisfaction, and teaching quality across different instructional models;
5. Comparative Analysis is shown by a bar chart and document icon, representing the evaluation of QILT and SEU data to compare teaching models and derive key findings; and

6. Findings are shown by a clipboard icon with charts and a checkmark, symbolizing the final step of the research process, where conclusions are drawn from the analysis, summarizing key insights and outcomes of the study.

3.1. Data Source

This study analyzes the effectiveness of three approaches using Student Evalua-tion of the Unit (SEU) feedback and Students' Experience Survey (SES) from QILT [98]. SEU data was selected for its comprehensive and consistent collection across all instructional models, providing reliable measures of student engagement, satisfaction, and teaching quality. This feedback mechanism captures students' perceptions of their learning experiences, enabling comparative analyses of instructional methodologies. SEU response rates and associated metrics were examined to identify trends and evaluate the impact of delivery methods.

Furthermore, QILT metrics were incorporated to supplement SEU data, offering a broader perspective on educational outcomes at a national level. QILT data benchmarks the NBBS program against similar programs in the Architecture and Built Environment disciplines. This approach facilitates the evaluation of gender equity, student access, and overall satisfaction, ensuring alignment with national performance standards. QILT indicators provide structured benchmarks for assessing key dimensions such as teaching quality, learner engagement, skills development, learning resources, and student support. These metrics enable a comprehensive evaluation of how the NBBS program aligns with broader national educational standards and addresses critical factors such as accessibility, gender equity, and professional readiness.

The SEU and QILT data were collected in adherence to standardized institutional protocols. To safeguard the anonymity and confidentiality of student feedback, ethics approval was obtained from Victoria University's Human Research Ethics Committee (Approval ID: HRE23-125). This compliance underscores the study's commitment to ethical research practices, ensuring data integrity and reliability. These datasets collectively provide robust insights into the comparative effectiveness of IP-SL, IP-BM, and ORT-BM instructional methods.

3.2. Case Study Context

The NBBS program at Victoria University, accredited by the Victorian Building Authority (VBA), fulfills the knowledge requirements for registration as an Unlimited Building Surveyor in Victoria [99]. Established in 2016, the program transitioned through three instructional delivery models: IPSL (2016–2018), BM (2019–2020), ORT-BM (2020–2023). After 2018, first-year students have been enrolled under the First Year College (FYC) model [100,101], which emphasizes foundational learning. This case study focuses on four representative units from the second and third years of the NBBS program, chosen for their alignment with core competencies in building surveying education:

- Second-Year Units: NBC2002—Building Regulations, NBC2109—Performance-Based Solutions for Buildings.
- Third-Year Units: NBC3001—High-Rise Development and Compliance, NBC3002—Advanced Building Surveying.

Table 1 summarizes the delivery, assessment, and key content of these four selected units.

Table 1. Delivery, assessments, and key content of selected NBBS units.

UNIT	Time Range	Delivery Method	Key Contents
NBC2002 Building Regulations [102]	2016–2019	IP-SL	• Understand and interpret the NCC and Australian Standards • Basics of performance-based legislation • Tutorials: on-site inspection and compliance processes
	2019–2020	IP-BM	• Interpretation of the NCC • Introduction to the Disability Discrimination Act (DDA) and accessibility • Site inspection fundamentals and communication practices
	2020–2023	ORT-BM	Same as IP-BM content with minor adjustments for online delivery
NBC2109 Performance-Based Solutions for Buildings [103]	2016–2019	IP-SL	• Introduction to performance-based building solutions • Steps for developing performance solutions • Tutorials on NCC sections (e.g., J, B)
	2019–2020	IP-BM	Same as IP-SL content with additional focus on practical implementation
	2020–2023	ORT-BM	Expanded to include "Part C" of performance codes (added in 2022)
NBC3001 High-Rise Development and Compliance [104]	2016–2019	IP-SL	• Introduction to statutory controls for high-rise buildings • Construction details and regulations • Tutorials on multi-unit building compliance
	2019–2020	IP-BM	• Integrated BIM applications • Application of regulations in high-rise building design
	2020–2023	ORT-BM	• Advanced BIM skills (Revit, Navisworks) • Digital presentation of construction details
NBC3002 Advanced Building Surveying [105]	2018–2019	IP-SL	• Interpretation of codes for Class 2–9 buildings • Safe practices for permits and site inspections • Effective communication with professionals
	2019–2020	IP-BM	Same as IP-SL content delivered in block format
	2020–2023	ORT-BM	Same as IP-BM content with added focus on real-time collaborative tools

3.3. Population, Sample Size, and Data Analysis

The study population includes all students enrolled in the NBBS program at Victoria University between 2016 and 2023. A sample of four selected units (i.e., NBC2002, NBC2109, NBC3001, and NBC3002) was selected to evaluate the instructional methodologies. These units were chosen for their relevance to core competencies in building surveying education. SEU feedback was aggregated from students enrolled in these units during the study period, and response rates were calculated annually to ensure data reliability.

To analyze the data, descriptive statistics were employed, calculating averages, variances, and trends across the three instructional models: IPSL, BM, and ORT-BM. Data visualization tools, including line charts and bar graphs, were used to highlight differences in key metrics such as student engagement, satisfaction, and teaching quality. Trends in SEU data were cross-referenced with course monitoring reports to validate findings and address potential biases.

3.4. Methodological Limitations

This study's limitations include:

- Quantitative Bias: SEU data focuses on quantitative metrics, potentially overlooking qualitative aspects such as personal interactions and adaptation challenges.
- External Influences: Factors such as the COVID-19 pandemic and evolving student demographics may have influenced findings.

Mitigation strategies included cross-referencing SEU data with acknowledging external influences and utilized technologies and innovative strategies in the analysis.

4. Results and Discussion

This section evaluates the NBBS course and its four selected units during transitions from IP-SL (2016–2018) to IP-BM (2019–2020), and then ORT-BM (2020 to present). It explores the effectiveness of ORT-BM in enhancing student learning experiences and outcomes based on Quality Indicators for Learning and Teaching (QILT) [98].

4.1. Bachelor of Building Surveying (NBBS) Course

Transitions to IP-BM and ORT-BM have significantly altered the NBBS course landscape. Figure 2 highlights the number of NBBS students and their progress rates from 2016 to the present, as the ratio of Passed Equivalent Full-Time Student Load (EFTSL) to Assessed EFTSL, representing the proportion of the assessed study load successfully completed by students. This metric provides insight into overall student progress and course effectiveness, rather than graduation rates. These trends align with Objective 1, which examines student engagement across instructional models, as the increased flexibility and focus in IP-BM and ORT-BM contributed to improved progress rates and enrollment growth.

Figure 2a illustrates a significant increase in NBBS students over seven years, with a rise from 55 in 2016 to 145 in 2019–2020 after transitioning from IP-SL to IP-BM. The shift to ORT-BM from 2020 further accelerated this trend, with a peak during the 2020–2021 lockdown. This successful implementation led Victoria University to continue offering NBBS in ORT-BM even after universities reopened in 2022, resulting in a six-fold increase in students since 2016.

The transition from traditional IP-SL teaching and learning to ORT-BM might have addressed another key parameter in the construction industry: gender equity. The analysis of the QILT data, broken down by gender, is presented in Figure 3. This aligns with Objective 3, which evaluates gender equity and accessibility, highlighting how the flexibility and inclusivity of ORT-BM contributed to an increase in female enrollment in the NBBS program.

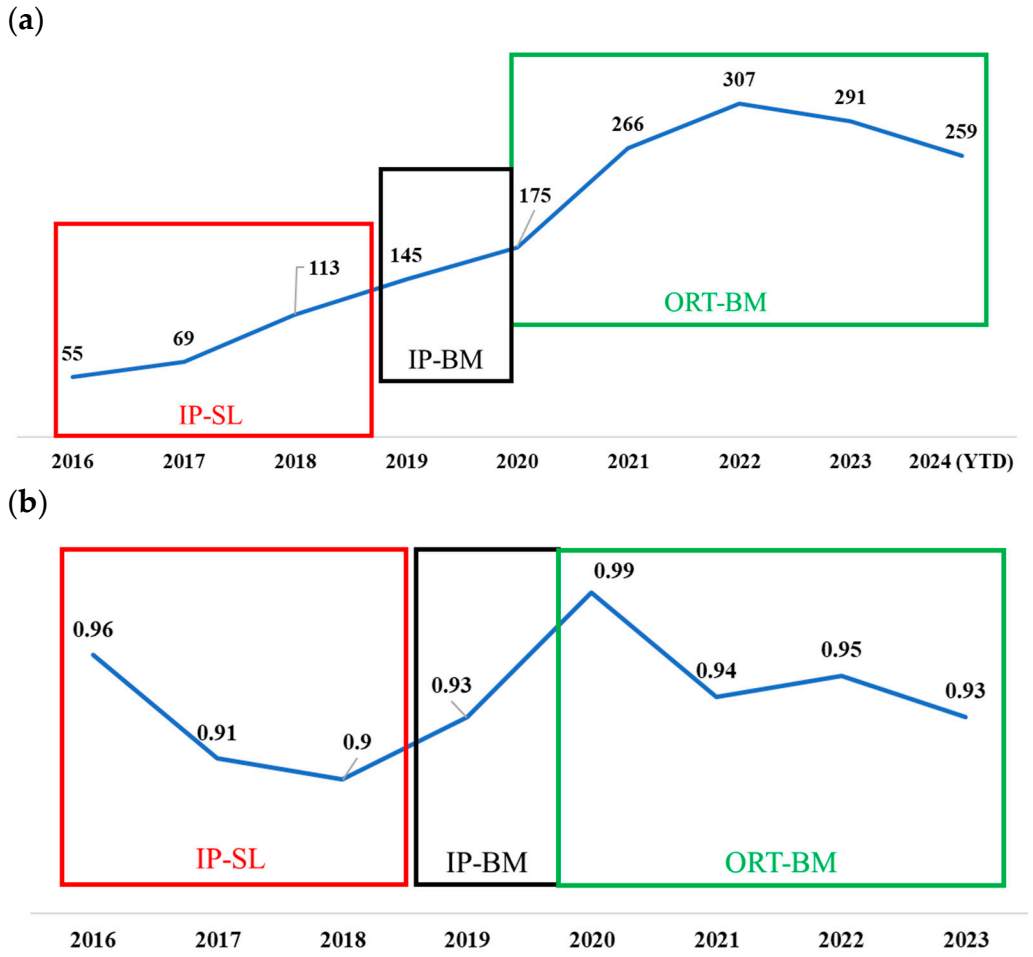

Figure 2. NBBS student numbers (**a**) and progress rates (**b**).

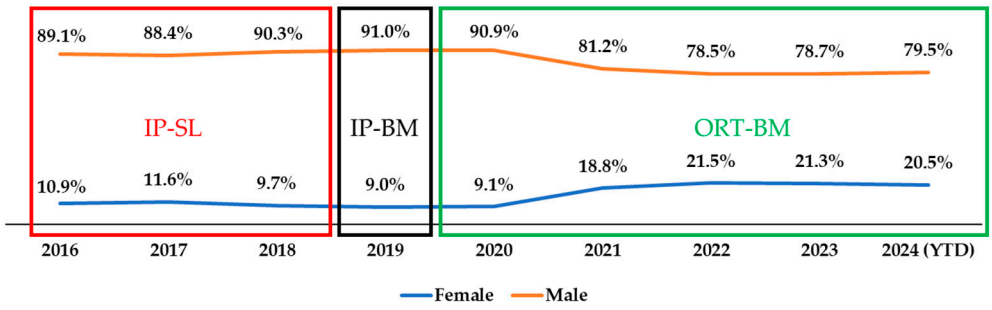

Figure 3. NBBS student percentage by gender.

Figure 3 illustrates a significant increase in female students from 10.9% in 2016 to 20.5% after ORT-BM's introduction in 2020. This rise may be due to ORT-BM's flexibility, allowing students to balance studies and personal responsibilities, and creating a more accessible environment for women in this male-dominated field [106]. On the other hand, the Women Building Surveyors Program, launched with a $6.3 million budget, notably supported this increase, enrolling 40 women through ORT-BM [107]. Victoria University has successfully enrolled 40 Victorian women through this program [108] since the ORT-BM approach enabled participants from regional Victoria to attend all classes easily. These results demonstrate ORT-BM's capacity to promote gender equity in male-dominated fields.

Over seven years, the NBBS has significantly improved performance metrics, including a substantial rise in annual course completions, per Figure 4a, and a decrease in the

average time to complete the course, per Figure 4b. These trends align with Objective 3, which evaluates accessibility, demonstrating how the introduction of ORT-BM streamlined course completion and reduced barriers, particularly those in remote areas or with diverse needs. Additionally, ORT-BM has equipped students with skills aligned with current industry requirements, such as Building Information Modelling (BIM) and project-based assessments, further contributing to student satisfaction, as outlined in Objective 2.

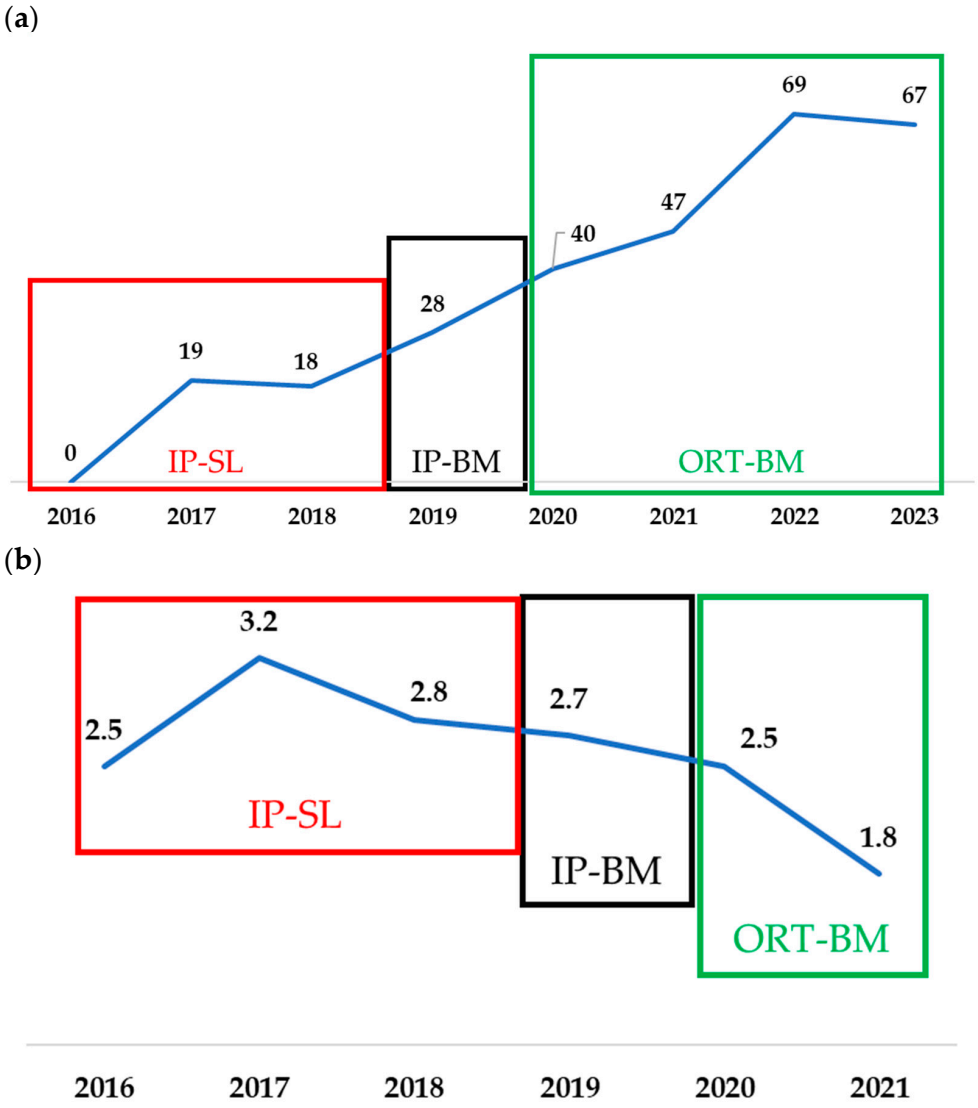

Figure 4. Completion number (**a**) and average years to complete (**b**) at the NBBS.

Figure 4a shows completion numbers rising from 19 in 2017 to 69 in 2022 with the ORT-BM's implementation. This approach, fully adopted post-2020, increased completions by offering flexibility and online access, removing geographical constraints. The slight decrease to 67 in 2023 suggests the NBBS program has reached maturity, finding its optimal size and format. Figure 4b reflects a reduction in completion times after transitioning from IP-BM in 2019 to ORT-BM in 2020, highlighting ORT-BM's efficiency.

Moreover, Victoria University's Recognition of Prior Learning (RPL) and Advanced Standing policy have significantly shortened degree completion times [109]. Victoria University has created a credit calculator page that enables future students to estimate RPL credits based on prior courses [110]. Additionally, ORT-BM's flexible scheduling (e.g., evening sessions), has attracted 71 experienced professionals since 2020, positively impacting completion rates and times.

The Students' Experience Survey (SES) from QILT data provides insights into the impact of teaching approaches on student experiences. Although SES data is not available for individual courses like NBBS, the average feedback across Architecture and Built Environment courses (NBBS, Bachelor of Building Design or NBBD, and Bachelor of Construction Management or NHCM) offers a broader perspective. The SES data align with the following teaching models and timeframes: from 2017–2018, all respondents were enrolled in courses delivered using the IP-SL teaching model; in 2019, all respondents were enrolled in courses delivered using the IP-BM; and starting in 2020, all respondents were enrolled in courses delivered using the ORT-BM, a transition that continued through 2022.

These findings align with Objective 2, which analyzes satisfaction trends, highlighting how ORT-BM sustained improvements in key areas such as Learner Engagement (LE), Learning Resources (LR), Skill Development (SD), Student Support (SS), and Teaching Quality (TQ). Notably, NBBS continued with ORT-BM after 2022, while others reverted to IP-BM. Figure 5 presents third-year students' SES responses on these dimensions between 2017 and 2022.

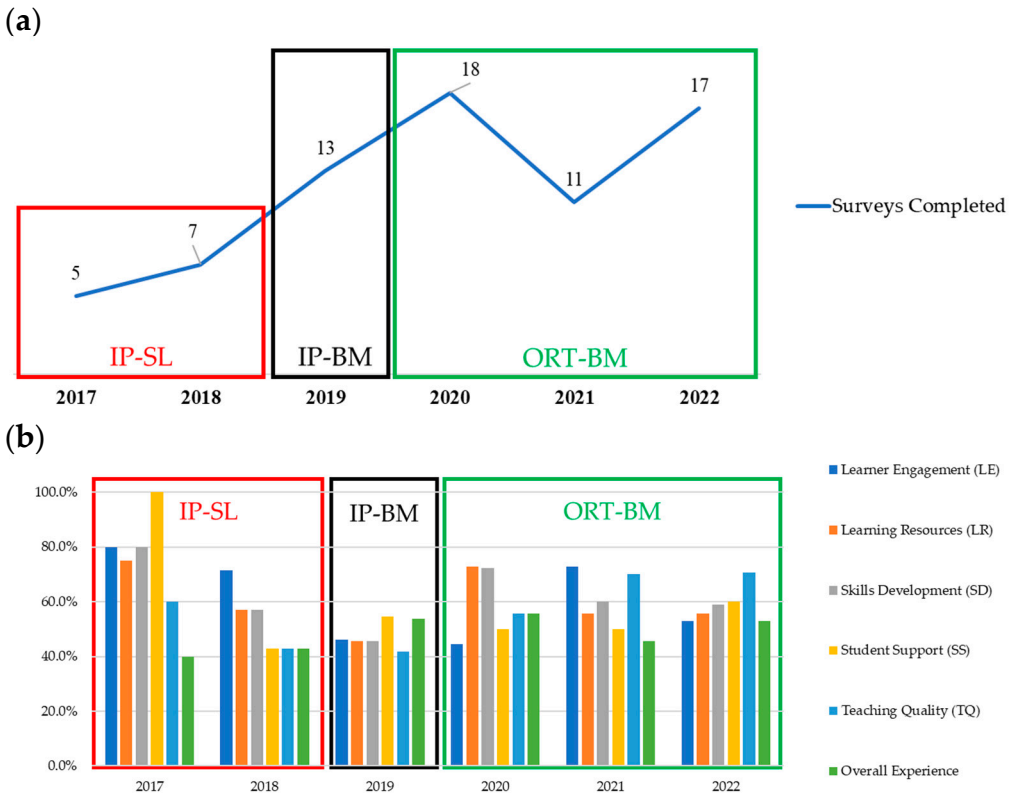

Figure 5. Number of completed surveys (**a**) and SES feedback (**b**).

Figure 5a demonstrates the SES survey response rates were lowest in 2017, increasing from 5 to a peak of 18 in 2020, suggesting improved data reliability. Figure 5b reveals that while traditional IP-SL scored well in SS and LE, it was rated poorly in overall experience, reflecting a gap between expectations and reality. The shift to IP-BM in 2019 saw declines in LE, LR, and SD, but improved the overall experience. With the introduction of ORT-BM in 2020, teaching quality has increased, while the overall experience remained moderate at around 50%, suggesting a need to enhance the "sense of belonging".

To investigate SES results in more detail, each criterion (i.e., LE, LR, SD, SS, and TQ) between 2016 and 2022, the latest available data are illustrated in Figure 6. These insights align with Objective 2, providing a detailed analysis of student satisfaction trends over

time and highlighting how instructional approaches, particularly ORT-BM, influenced key aspects of the student experience.

Figure 6. *Cont.*

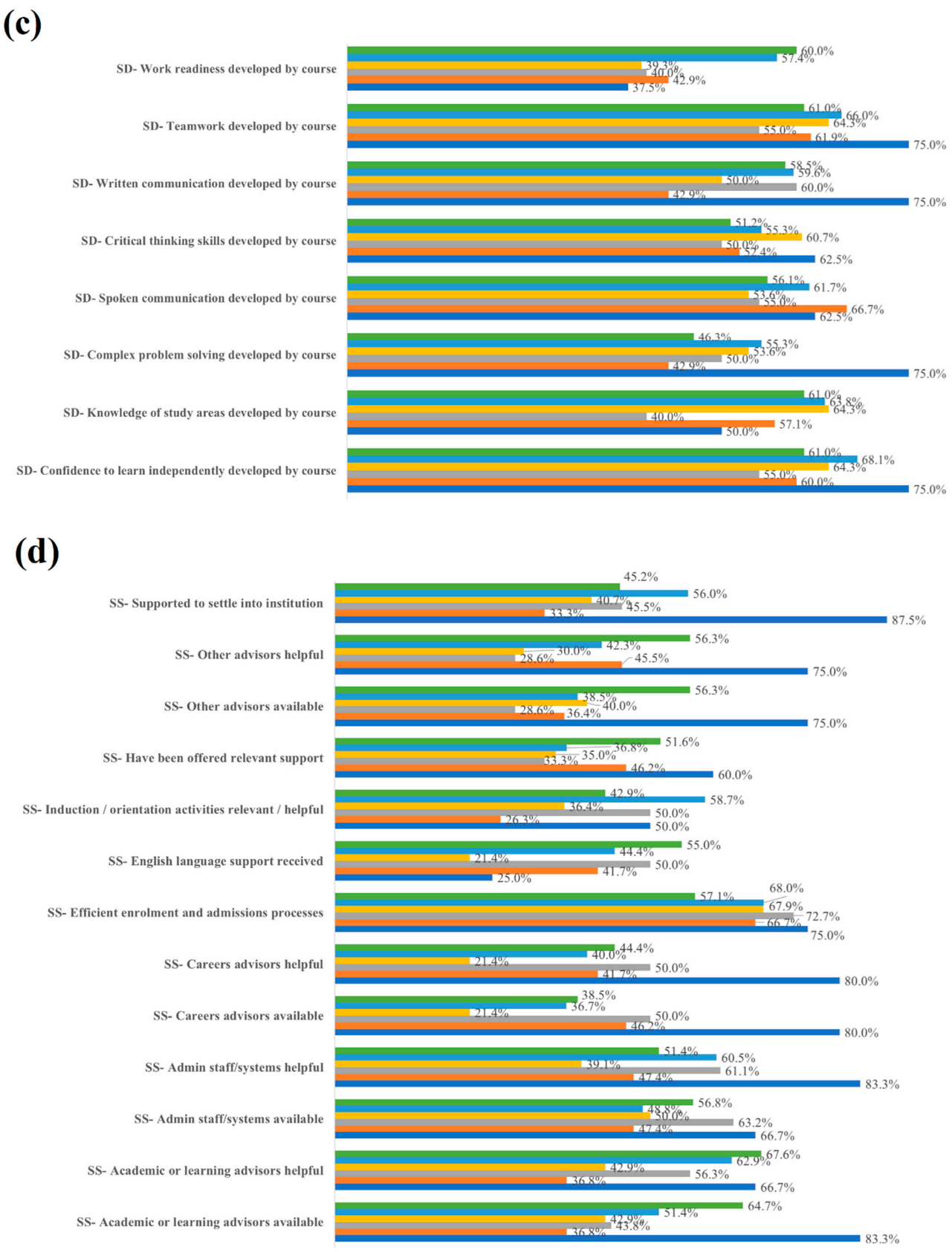

Figure 6. *Cont*.

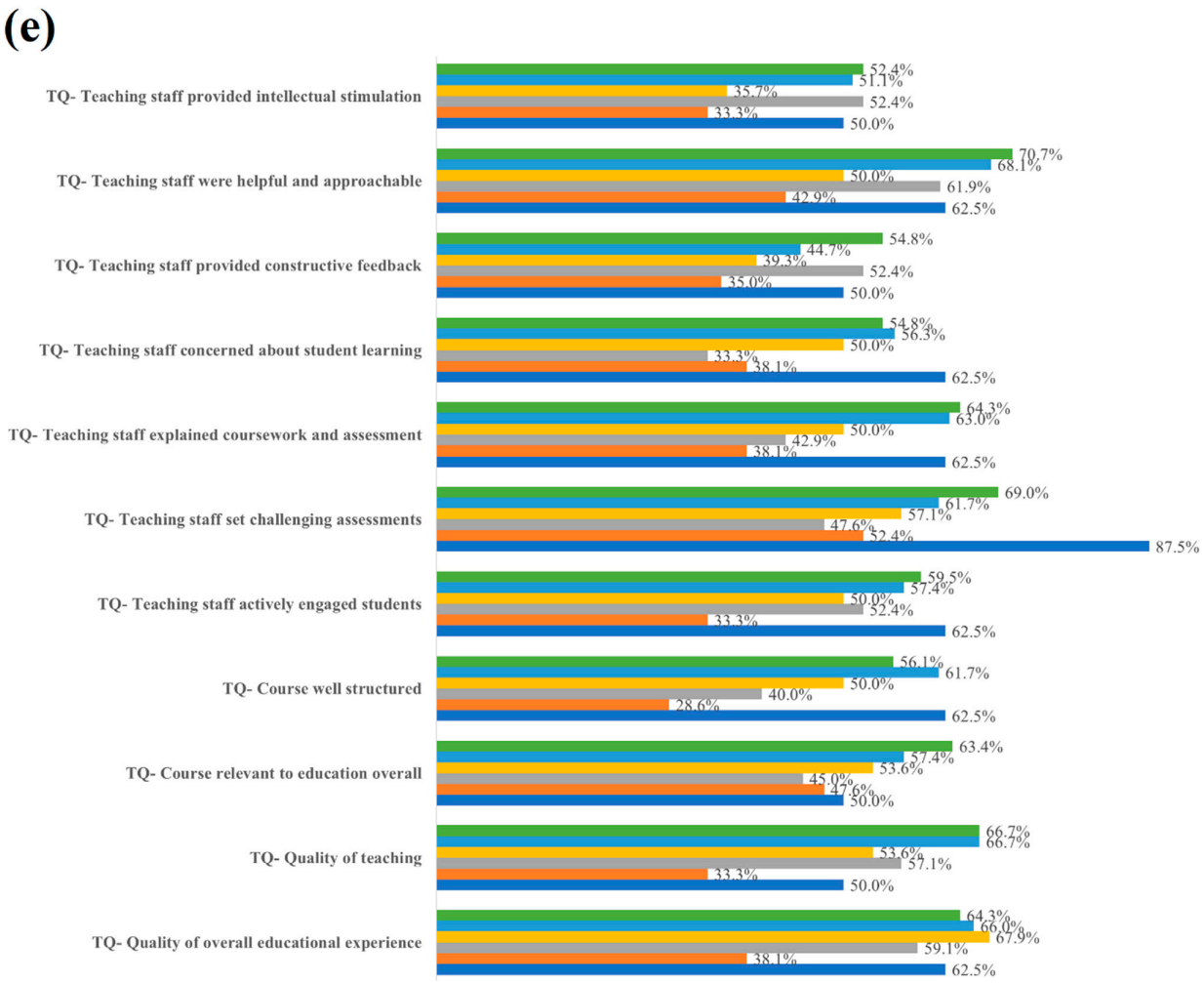

Figure 6. Completing students' feedback regarding five SES criteria: learner engagement (**a**), learning resources (**b**), skill development (**c**), student support (**d**), and teaching quality (**e**) from 2017 to 2022.

Figure 6a indicates low satisfaction with "student interaction outside of study," "sense of belonging", and "opportunities to interact with local students" under LE, especially after transitioning to ORT-BM in 2020. In response, Victoria University enhanced online platforms with real-time Q&A sessions and established the Built Environment Student Club in 2023 to boost engagement. High satisfaction with "online learning platform quality" in 2021 and 2022 reflects ORT-BM's technological success. Future implementations could incorporate structured peer collaboration tools, moderated discussion forums, and virtual co-curricular activities to improve these outcomes.

Figure 6b shows the lowest satisfaction in "Laboratory or studio equipment—quality" across all teaching approaches, indicating a need to update resources. To address this, the Built Environment team developed VR simulation tools [28,111] integrated into units like Building Development and Compliance. These tools have made complex concepts more tangible and received positive feedback.

Figure 6c reveals low satisfaction in "complex problem solving", "knowledge of study areas", and "critical thinking", key employability skills. Victoria University responded by integrating real-world data and scenarios into assessments and launching the "Industry Collaboration Project", providing hands-on experience with actual industry problems like serving as cadet building surveyors.

Figure 6d shows student support consistently lagging in satisfaction. Despite Victoria University's strong employability services [112], low satisfaction suggests students may

be unaware of these resources. The Built Environment team initiated online engagements, such as webinars, to facilitate direct interaction with career experts.

Finally, Figure 6e highlights challenges in receiving constructive feedback and intellectual stimulation from teaching staff. However, teaching quality improved significantly between 2020 and 2022 under ORT-BM, possibly due to curriculum updates and innovative online feedback mechanisms. Enhanced interactive sessions, including guest lectures and group projects, have stimulated critical thinking and enriched education.

4.2. Selected Units of Subject

This section examines four core units within the NBBS program: 1. NBC2002- Building Regulations, 2. NBC2109- Performance-based Solutions for Buildings, 3. NBC3001- High-Rise Development and Compliance, and 4. NBC3002- Advanced Building Surveying over three utilized approaches.

4.2.1. Building Regulations (NBC2002)

This section evaluates the annual SEU response rates across teaching approaches to highlight the impact of pedagogical shifts. Figure 7 illustrates these response rates over the studied period (2016–2023) and the average scores out of 5, providing insights into Objective 1, which examines how different instructional models influence student engagement over time. Figure 7a displays the response count and rate for each year, with the legend indicating the educational methods used (IP-SL, IP-BM, and ORT-BM). Figure 7b presents the mean scores for each criterion of the SEU, with 5 representing the highest possible score.

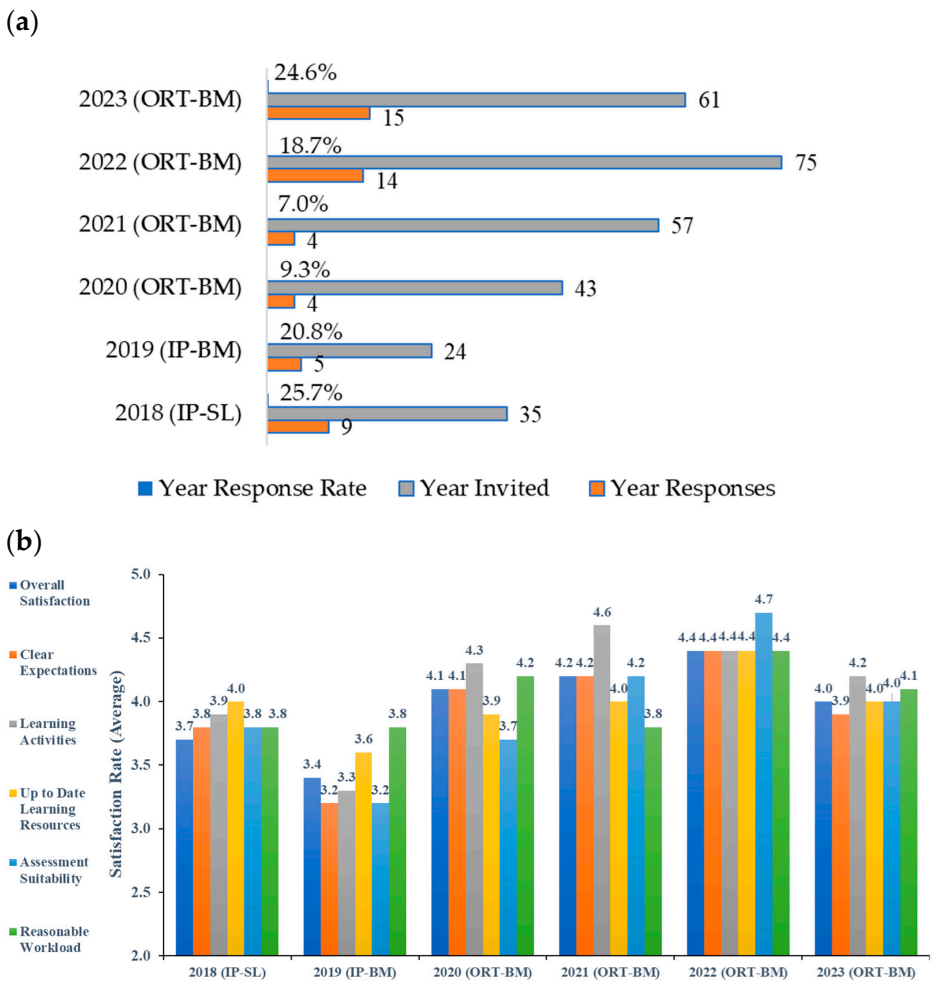

Figure 7. Response rate to the SEU (**a**) and average of SEU Score (**b**) for NBC2002.

Figure 7b shows stable growth across six criteria, overall satisfaction, clarity of expectations, learning activities, up to date learning resources, assessment suitability, and reasonable workload, despite minor fluctuations due to transitioning to IP-BM in 2019. From 2020 onwards, scores consistently exceeded 4, reflecting successful adaptation to new learning approaches. The highest satisfaction was in 2022, coinciding with the return to on-campus activities, with notable improvements in learning activities, clarity of expectations, and assessment suitability, enhanced by VR technology and project-based learning.

4.2.2. Performance-Based Solutions for Buildings (NBC2109)

This section examines SEU response rates and scores for NBC2109, shown in Figure 8, providing insights into Objective 1 by analyzing how different teaching approaches influenced student engagement and response trends. Additionally, the scores reflect Objective 2, highlighting satisfaction with teaching quality and learning outcomes.

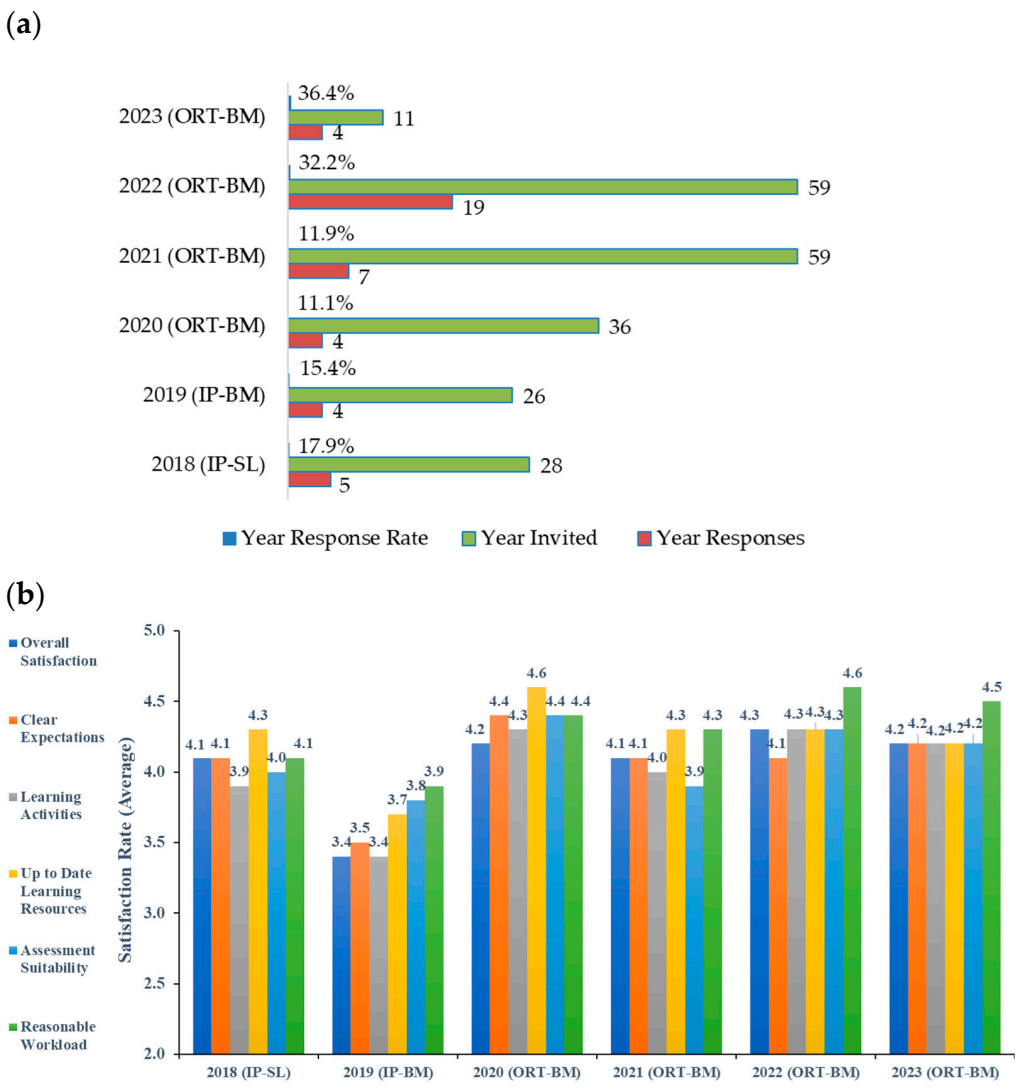

Figure 8. Response rate to the SEU (**a**) and average of SEU Score (**b**) for NBC2109.

Figure 8a depicts SEU response rates for NBC2109 from 2018 to 2023, showing recent improvements. Response rates were moderate under IP-SL in 2018 (17.9%) and IP-BM in 2019 (15.4%), reflecting modest engagement. A significant drop occurred in 2020 (11.1%), with a slight increase in 2021 (11.9%) during the ORT-BM transition. After 2021, rates improved to 32.2% in 2022 and 36.4% in 2023, despite fewer invitations, due to effective en-

gagement strategies like personalized emails, social media outreach, and staff involvement in promoting.

Figure 8b indicates a fall in student satisfaction during the shift from IP-SL in 2018 to IP-BM in 2019, likely due to the challenges of adapting to the more intense BM format. However, satisfaction improved after 2020, with all criteria scoring above 4. ORT-BM particularly enhanced satisfaction in learning activities and workload management, reflecting the effective use of digital materials and project-based learning.

In summary, implementing the ORT-BM approach for NBC2109 after the adaptation period in 2020 and 2021 improved student interaction and feedback rates. This progression may suggest the effectiveness of adaptive responsive strategies like personalized online communication and participatory educational environments, such as project-based learning, under ORT-BM.

4.2.3. High-Rise Development and Compliance (NBC3001)

This section investigates NBC3001 as another case study. Figure 9 displays the annual average response rate and mean SEU scores, addressing Objective 1 by exploring trends in student engagement across teaching approaches. The mean SEU scores also provide insights into Objective 2, reflecting satisfaction with the course's content and teaching quality.

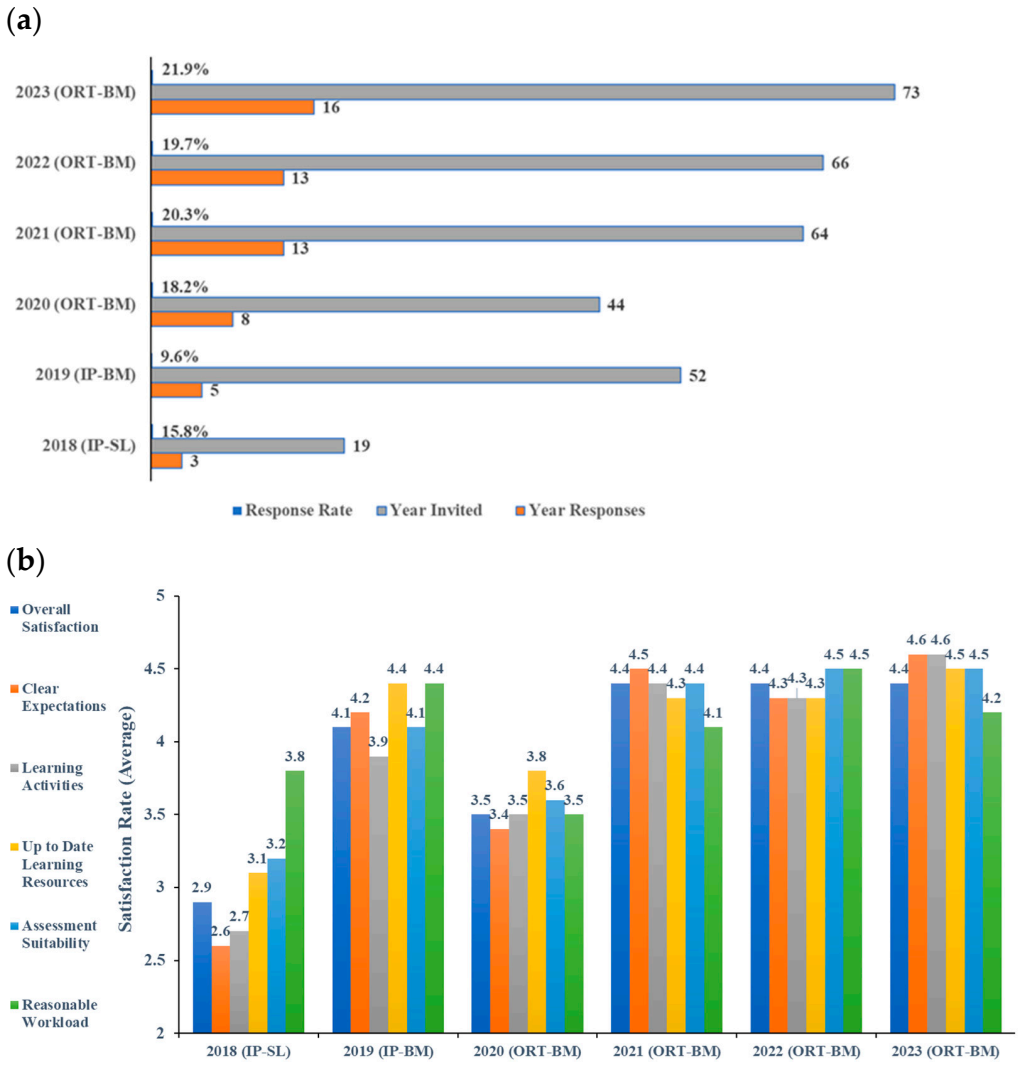

Figure 9. Response rate to the SEU (**a**) and average of SEU Score (**b**) for NBC3001.

Figure 9a highlights an increase in response rate after transitioning to ORT-BM in 2020. The anonymous online feedback and extended response time improved the quality of teaching insights, encouraging more honest and constructive feedback, which contributed to enhanced teaching quality.

Figure 9b indicates enhanced overall satisfaction for NBC3001 since 2018. The shift from IP-SL to IP-BM initially increased SEU rates, though they declined with the 2020 transition to ORT-BM. The incorporation of BIM tools like Revit and Navisworks improved student feedback on learning activities and assessment suitability. This highlights ORT-BM's strength in preparing students for industry roles requiring advanced technical proficiency. The full implementation of ORT-BM and strategies like introducing BIM applications and revising assignments led to continuous SEU rate increases. From 2021–2023, ORT-BM achieved an average satisfaction score of 4.4, enhancing learning activities and access to up-to-date resources. In conclusion, ORT-BM outperformed previous models in student satisfaction, demonstrating the effectiveness of innovative strategies.

4.2.4. Advanced Building Surveying (NBC3002)

This section explores student responses to the SEU for NBC3002. Figure 10 displays the number of SEU responses and the annual average satisfaction across six different criteria, addressing Objective 2 by highlighting trends in student satisfaction with the course's teaching quality, learning resources, and overall support.

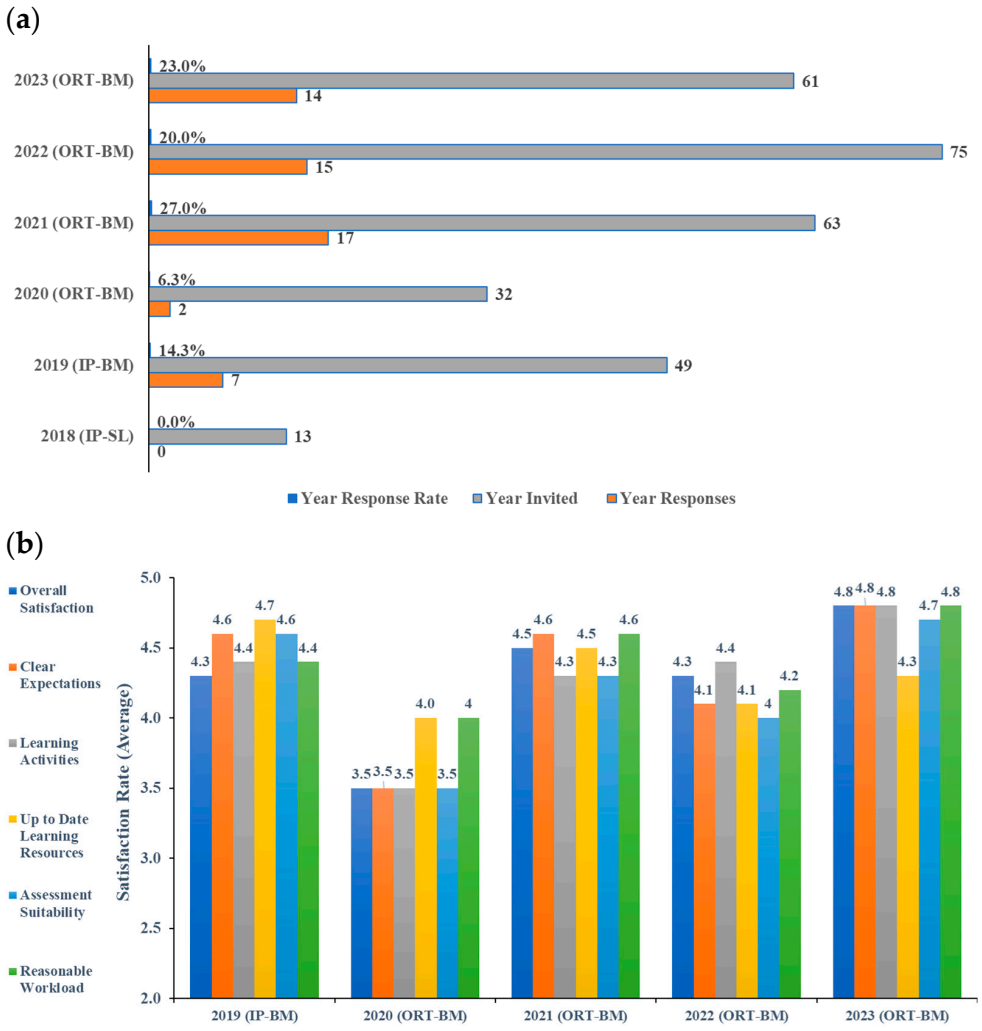

Figure 10. Response rate to the SEU (**a**) and average of SEU score (**b**) for NBC3002.

Figure 10a illustrates no SEU responses in 2018 despite 13 invitations, likely due to ineffective survey distribution. From 2019 to 2023, response rates improved, except for a drop in 2020 during the IP-BM to ORT-BM transition. Rates peaked at 27% in 2021 and 23% in 2023, following personalized invitations and increased instructor encouragement.

Figure 10b indicates continuous improvement in the student experience from 2019 to 2023, particularly after fully implementing ORT-BM in 2021, following a temporary decline during the 2020 lockdown. This improvement is evident in key areas like up-to-date learning resources, assessment suitability, and clear expectations, driven by 24/7 access to materials and a well-structured online plan

5. Limitations and Future Directions

This section discusses the limitations of the ORT-BM approach and recommends future research directions. While ORT-BM improves engagement and satisfaction, it may require adjustments for at-risk students, such as non-native English speakers or those with limited technological access. Previous studies by [113,114] highlight that intense virtual environments can overwhelm students' cognitive capacities, especially those with special needs. Therefore, adapting ORT-BM to better manage information flow and support these students' unique needs is essential. Using digital platforms might also create a digital divide, disadvantaging students without reliable technological access. Educational platforms must be user-friendly and accessible to all, regardless of technical skills or backgrounds.

Future research should explore hybrid learning models that apply CLT principles to balance cognitive demands with user-friendly and flexible environments, making digital learning more inclusive. A scaffolding approach, which breaks down complex tasks and offers structured support, could help mitigate cognitive overload and aid at-risk students in better understanding course materials. Additionally, studies should focus on designing platforms that are accessible and don't heavily rely on technical skills, ensuring inclusivity for all students.

6. Conclusions

This paper quantitatively evaluates the Online Real-Time Block Model (ORT-BM) approach for delivering the Bachelor of Building Surveying program (NBBS) at Victoria University, comparing it with traditional In-Person Semester-Length (IPSL) and In-Person Block Model (IPBM) methods. The analysis provides the following key insights:

- Higher enrolment and completion rates: ORT-BM increased enrolment and accelerated course completion rates, demonstrating its effectiveness in providing students with a streamlined and efficient educational pathway. This is particularly important in fields like construction education, where professionals must quickly acquire rapidly evolving practical and regulatory competencies to meet industry demands. This aligns with Objective 1 by demonstrating how ORT-BM enhances student engagement across instructional models;
- Enhanced student satisfaction: SEU data show improvements in satisfaction, particularly in learning activities, clear expectations, and assessment suitability. These outcomes are attributed to technology integration, 24/7 access to materials, real-world project-based assignments, and the innovative use of advanced virtual tools like VR for virtual site visits and virtual labs. These tools address the challenge of replicating hands-on experiences in online learning environments, bridging the gap between theory and practical application in project-based fields like building surveying. This directly addresses Objective 2 by analyzing satisfaction trends through SEU data to assess teaching quality and learning outcomes; and

- Increased gender diversity: The flexibility and accessibility of ORT-BM have led to a notable rise in female enrolment, addressing gender equity challenges in male-dominated fields like construction. By mitigating gender intimidation and supporting work-life balance, ORT-BM contributes to a more inclusive learning environment. This supports Objective 3 by evaluating gender equity and accessibility in the NBBS program.

There are also challenges and recommendations to improve ORT-BM based on the analysis:

- Supporting at-risk students: Some students, especially those with limited technological access or those requiring additional time, find ORT-BM challenging. Implementing scaffolding techniques, peer support systems, and targeted interventions can help ensure equitable benefits for all students, particularly in fields requiring intensive project-based learning; and
- Addressing the digital divide: Institutions must address barriers, such as inadequate technological access by providing resources and alternative learning solutions to ensure inclusivity and equity in education. For project-based fields like construction, this also means enhancing digital resources, such as simulations and virtual labs, to offer meaningful practical experiences.
- These findings collectively address all three objectives, providing a comprehensive understanding of ORT-BM's impact on engagement, satisfaction, and inclusivity in construction higher education.

The findings highlight the transformative potential of ORT-BM to reshape higher education in project-based disciplines like construction. By meeting diverse student needs while addressing industry demands for timely and practical knowledge transfer, ORT-BM integrates industry-relevant tools like Building Information Modeling (BIM) and emphasizes gender equity to equip graduates with the skills and confidence to succeed in rapidly evolving professional fields. Quantitative evidence supports the scalability and adaptability of ORT-BM across various educational contexts, especially for construction education programs, enhancing access and success in higher education.

Future research should explore hybrid learning models that balance cognitive load with accessibility and flexibility, particularly focusing on enhancing the "sense of belonging" through innovative engagement strategies such as virtual site visits, collaborative digital projects, and advanced simulation tools tailored to construction education. Incorporating qualitative insights could provide a more nuanced understanding of students' experiences and further enrich the evaluation of ORT-BM by focusing on how it enhances critical hands-on competencies in fields like building surveying.

Author Contributions: Conceptualization, N.I. and L.L.; methodology, N.I. and L.L.; software, N.I.; validation, N.I., L.L. and S.C.; formal analysis, N.I., L.L. and S.C.; investigation, N.I.; resources, N.I. and L.L.; data curation, N.I.; writing—original draft preparation, N.I., L.L. and S.C.; writing—review and editing, N.I., L.L., S.C. and D.O.; visualization, N.I., L.L. and S.C.; supervision, N.I. and D.O.; project administration, N.I. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: The data supporting the reported results in this study were extracted from Student Evaluation of Unit (SEU) feedback and Quality Indicators for Learning and Teaching (QILT) metrics. QILT data is publicly available online at [https://www.qilt.edu.au/ accessed on 3 January 2025]. SEU data is available upon reasonable re-quest, subject to privacy and ethical considerations, as per the approved ethics protocol (HRE23-125).

Acknowledgments: During the preparation of this article, the authors used AI tools to improve readability and language. After using these tools, the authors reviewed and edited the content as needed. They take full responsibility for the content of the publication.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Li, X.; Yang, Y.; Chu, S.K.W.; Zainuddin, Z.; Zhang, Y. Applying blended synchronous teaching and learning for flexible learning in higher education: An action research study at a university in Hong Kong. *Asia Pac. J. Educ.* **2022**, *42*, 211–227. [CrossRef]
2. Mushtaha, E.; Dabous, S.A.; Alsyouf, I.; Ahmed, A.; Abdraboh, N.R. The challenges and opportunities of online learning and teaching at engineering and theoretical colleges during the pandemic. *Ain Shams Eng. J.* **2022**, *13*, 101770. [CrossRef]
3. Thomas, M.; Yager, Z.; Widdop Quinton, H. 'You need to be flexible normally, and here, even more flexible': Teaching academics' experiences and perceptions of COVID-19 disruptions to teaching, learning, and assessment. *J. Furth. High. Educ.* **2023**, *47*, 215–228. [CrossRef]
4. French, S. *The Benefits and Challenges of Modular Higher Education Curricula*; Technical Report for Issues and Ideas Paper; Melbourne Centre for the Study of Higher Education: Melbourne, Australia, 2015; pp. 1–12.
5. Seamon, M. Short-and long-term differences in instructional effectiveness between intensive and semester-length courses. *Teach. Coll. Rec.* **2004**, *106*, 852–874. [CrossRef]
6. Huang, X. *A Study of STEAM Instruction and Its Impact on Female Students' Underrepresentation in STEM Fields*; University of Windsor: Windsor, ON, Canada, 2021.
7. Carnemolla, P.; Galea, N. Why Australian female high school students do not choose construction as a career: A qualitative investigation into value beliefs about the construction industry. *J. Eng. Educ.* **2021**, *110*, 819–839. [CrossRef]
8. Simon, L.; Clarke, K. Apprenticeships should work for women too! *Educ. + Train.* **2016**, *58*, 578–596. [CrossRef]
9. Sharif, A.A.; Alshdiefat, A.S.; Lee, A.; Rana, M.Q.; Abu Ghunmi, N.-A.M. Gender equality in architecture and construction: An assessment framework at the institutional and sectoral levels in Jordan. *Buildings* **2024**, *14*, 764. [CrossRef]
10. Ghanbaripour, A.N.; Tumpa, R.J.; Sunindijo, R.Y.; Zhang, W.; Yousefian, P.; Camozzi, R.N.; Hon, C.; Talebian, N.; Liu, T.; Hemmati, M. Retention over attraction: A review of women's experiences in the Australian construction industry; challenges and solutions. *Buildings* **2023**, *13*, 490. [CrossRef]
11. Yan, D.; Sunindijo, R.Y.; Wang, C.C. Analysis of Gender Diversity Initiatives to Empower Women in the Australian Construction Industry. *Buildings* **2024**, *14*, 1707. [CrossRef]
12. Oo, B.L.; Lim, B.T.H. Women Workforces' Satisfaction with Personal Protective Equipment: A Case of the Australian Construction Industry. *Buildings* **2023**, *13*, 959. [CrossRef]
13. Paramasivam, S.K.; Mani, K.; Paneerselvam, B. Unveiling Gender-Based Musculoskeletal Disorders in the Construction Industry: A Comprehensive Analysis. *Buildings* **2024**, *14*, 1169. [CrossRef]
14. PlanRadar. Women in Construction: Statistics, Challenges, and Success Stories. Available online: https://www.planradar.com/gb/women-in-construction/ (accessed on 21 December 2024).
15. Casini, M. *Construction 4.0: Advanced Technology, Tools and Materials for the Digital Transformation of the Construction Industry*; Woodhead Publishing: Sawston, UK, 2021.
16. Vagtholm, R.; Matteo, A.; Vand, B.; Tupenaite, L. Evolution and current state of building materials, construction methods, and building regulations in the UK: Implications for sustainable building practices. *Buildings* **2023**, *13*, 1480. [CrossRef]
17. Bilal; Hysa, E.; Akbar, A.; Yasmin, F.; Rahman, A.u.; Li, S. Virtual learning during the COVID-19 pandemic: A bibliometric review and future research agenda. *Risk Manag. Healthc. Policy* **2022**, *15*, 1353–1368. [CrossRef] [PubMed]
18. Farouk, A.M.; Naganathan, H.; Rahman, R.A.; Kim, J. Exploring the Economic Viability of Virtual Reality in Architectural, Engineering, and Construction Education. *Buildings* **2024**, *14*, 2655. [CrossRef]
19. Chau, H.T.H.; Bui, H.P.; Dinh, Q.T.H. Impacts of online collaborative learning on students' intercultural communication apprehension and intercultural communicative competence. *Educ. Inf. Technol.* **2023**, *29*, 7447–7464. [CrossRef]
20. Naamati-Schneider, L.; Alt, D. Online collaborative Padlet-mediated learning in health management studies. *Front. Psychol.* **2023**, *14*, 1157621. [CrossRef]
21. Gamage, K.A.; Silva, E.K.d.; Gunawardhana, N. Online delivery and assessment during COVID-19: Safeguarding academic integrity. *Educ. Sci.* **2020**, *10*, 301. [CrossRef]
22. Shah, S.; Mahboob, U.; Junaid, S.M.; Siddiqui, S.; Jamil, B.; Rehman, S. Challenges faced by teachers of postgraduate health professions blended learning programs: A qualitative analysis. *BMC Med. Educ.* **2024**, *24*, 251. [CrossRef]
23. Davies, W.M. Intensive teaching formats: A review. *Issues Educ. Res.* **2006**, *16*, 1–20.
24. Ghapanchi, A.; Purarjomandlangrudi, A.; Miao, Y. Does students' adoption of block mode of teaching boost positive learning outcomes in tertiary sector? In Proceedings of the Thirty-Seventh Information Systems Education Conference ISECON, Virtual, 9 October 2021; pp. 68–77.
25. Goode, E.; Syme, S.; Nieuwoudt, J.E. The impact of immersive scheduling on student learning and success in an Australian pathways program. *Innov. Educ. Teach. Int.* **2022**, *61*, 263–275. [CrossRef]

26. Oraison, H.; Konjarski, L.; Young, J.; Howe, S.; Smallridge, A. Staff experiences of Victoria University's First Year College during the implementation of block mode teaching. In Proceedings of the 6th International Conference on Higher Education Advances (HEAd'20), Valencia, Spain, 2–5 June 2020; pp. 45–51.
27. Zhang, J.; Cetinich, R. Exploring the Learning Experience of International Students Enrolled in the Southern Cross Model. *South. Cross Univ. Scholarsh. Learn. Teach. Pap.* 2022. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4053193 (accessed on 3 January 2025).
28. Victoria University. VU BLOCK MODEL (Experience a Smarter, More Engaging Way to Study with the VU Block Model®). 2023. Available online: https://www.vu.edu.au/study-at-vu/why-choose-vu/vu-block-model (accessed on 3 January 2025).
29. Coman, C.; Țîru, L.G.; Meseșan-Schmitz, L.; Stanciu, C.; Bularca, M.C. Online teaching and learning in higher education during the coronavirus pandemic: Students' perspective. *Sustainability* **2020**, *12*, 10367. [CrossRef]
30. Imran, R.; Fatima, A.; Salem, I.E.; Allil, K. Teaching and learning delivery modes in higher education: Looking back to move forward post-COVID-19 era. *Int. J. Manag. Educ.* **2023**, *21*, 100805. [CrossRef]
31. Martin, F.; Sun, T.; Westine, C.D. A systematic review of research on online teaching and learning from 2009 to 2018. *Comput. Educ.* **2020**, *159*, 104009. [CrossRef] [PubMed]
32. Carrillo, C.; Flores, M.A. COVID-19 and teacher education: A literature review of online teaching and learning practices. *Eur. J. Teach. Educ.* **2020**, *43*, 466–487. [CrossRef]
33. Deroncele-Acosta, A.; Palacios-Núñez, M.L.; Toribio-López, A. Digital Transformation and Technological Innovation on Higher Education Post-COVID-19. *Sustainability* **2023**, *15*, 2466. [CrossRef]
34. Kemp, N.; Grieve, R. Face-to-face or face-to-screen? Undergraduates' opinions and test performance in classroom vs. online learning. *Front. Psychol.* **2014**, *5*, 1278. [CrossRef]
35. Wong, P.; Perera, T.; Abbasnejad, B.; Ahankoob, A. Towards applying virtual reality techniques in fostering blended learning of the construction technology. In *EASEC16: Proceedings of the 16th East Asian-Pacific Conference on Structural Engineering and Construction, Brisbane, Australia, 2019*; Springer: Berlin/Heidelberg, Germany, 2021; pp. 2107–2117.
36. Adtani, R.; Neelam, N.; Raut, R.; Deshpande, A.; Mittal, A. Embracing ICT in academia: Adopting and adapting to the new normal pedagogy. *Glob. Knowl. Mem. Commun.* **2023**. [CrossRef]
37. Forde, C.; OBrien, A. A literature review of barriers and opportunities presented by digitally enhanced practical skill teaching and learning in health science education. *Med. Educ. Online* **2022**, *27*, 2068210. [CrossRef]
38. Hung, C.-T.; Wu, S.-E.; Chen, Y.-H.; Soong, C.-Y.; Chiang, C.P.; Wang, W.M. The evaluation of synchronous and asynchronous online learning: Student experience, learning outcomes, and cognitive load. *BMC Med. Educ.* **2024**, *24*, 326. [CrossRef]
39. Brent, R.; Prince, M.; Felder, R. Promoting and managing student-student interactions in online STEM classes. *Int. J. Eng. Educ.* **2021**, *37*, 797–813.
40. Martínez, P.J.; Aguilar, F.J.; Ortiz, M. Transitioning from face-to-face to blended and full online learning engineering master's program. *IEEE Trans. Educ.* **2019**, *63*, 2–9. [CrossRef]
41. Paudel, P. Online education: Benefits, challenges and strategies during and after COVID-19 in higher education. *Int. J. Stud. Educ.* **2021**, *3*, 70–85. [CrossRef]
42. Persada, S.F.; Prasetyo, Y.T.; Suryananda, X.V.; Apriyansyah, B.; Ong, A.K.; Nadlifatin, R.; Setiyati, E.A.; Putra, R.A.K.; Purnomo, A.; Triangga, B. How the education industries react to synchronous and asynchronous learning in COVID-19: Multigroup analysis insights for future online education. *Sustainability* **2022**, *14*, 15288. [CrossRef]
43. Han, C.; Zhang, Y.; Yang, H.; Yu, L.; Zhang, L. The construction and measurement of an online learning evaluation system based on ACSI mode. In Proceedings of the International Symposium on Emerging Technologies for Education, Ningbo, China, 22 October 2020; Springer: Berlin/Heidelberg, Germany, 2020; pp. 294–305.
44. Abbasnejad, B.; Soltani, S.; Wong, P. A systematic review of online learning and teaching strategies during the COVID-19 pandemic: Implications for the construction management sector. *Smart Sustain. Built Environ.* **2024**, *13*, 934–959. [CrossRef]
45. Adhikari, S.; Mosier, R.; Langar, S. Challenge of delivering construction courses in an online environment based on faculty experiences. *EPiC Ser. Built Environ.* **2021**, *2*, 451–459.
46. Brown, K.T.; Watson, M.K.; Barrella, E. Beyond continuity of instruction—Innovating a geomatics course using problem-based learning and open-source software. In Proceedings of the American Society for Engineering Education National Conference, Online, 26–29 July 2021.
47. Chopra, K.; Chitranshi, J. Developing synchronous and asynchronous online learning models for engineering college students in India: A grounded theory approach. *J. Eng. Educ. Transform.* **2022**, *35*, 70–81. [CrossRef]
48. Jara-Troncoso, V.; Saavedra-Acuna, C.; Quezada-Espinoza, M. Analysis of academic performance in continuing education programs: An evaluation of synchronous and asynchronous online platform usage. In Proceedings of the 2022 ASEE Annual Conference & Exposition, Minneapolis, MN, USA, 26–29 June 2022.
49. Shim, E.; Inti, S. Effectiveness of the Synchronous Online Flipped Classroom on Students' Learning During the COVID-19 Pandemic. *EPiC Ser. Built Environ.* **2022**, *3*, 670–678.

50. Alzahrani, H.A.; Shati, A.A.; Bawahab, M.A.; Alamri, A.A.; Hassan, B.; Patel, A.A.; Ahmad, M.T.; El Maksoud, W.A.; Alsaleem, M.A. Students' perception of asynchronous versus synchronous distance learning during COVID-19 pandemic in a medical college, southwestern region of Saudi Arabia. *BMC Med. Educ.* **2023**, *23*, 1–6. [CrossRef]
51. Fabriz, S.; Mendzheritskaya, J.; Stehle, S. Impact of synchronous and asynchronous settings of online teaching and learning in higher education on students' learning experience during COVID-19. *Front. Psychol.* **2021**, *12*, 4544. [CrossRef]
52. Lytvyn, V.; Akimova, O.; Kuznetsova, H.; Zenchenko, T.; Stepanenko, O.; Koreneva, I. The use of synchronous and asynchronous teaching methods in pedagogical education in COVID-19 terms. *Int. J. Health Sci.* **2021**, *5*, 617–629. [CrossRef]
53. Scheiderer, J. *What's the Difference Between Asynchronous and Synchronous Learning*; Ohio State Online: Columbus, OH, USA, 2021; Volume 24.
54. Akram, H.; Yingxiu, Y.; Aslam, S.; Umar, M. Analysis of synchronous and asynchronous approaches in students' online learning satisfaction during Covid-19 pandemic. In Proceedings of the 2021 IEEE International Conference on Educational Technology (ICET), Beijing, China, 18–20 June 2021; pp. 203–207.
55. Dahlstrom-Hakki, I.; Alstad, Z.; Banerjee, M. Comparing synchronous and asynchronous online discussions for students with disabilities: The impact of social presence. *Comput. Educ.* **2020**, *150*, 103842. [CrossRef]
56. Wang, J.; Wang, Y. Compare synchronous and asynchronous online instruction for science teacher preparation. *J. Sci. Teach. Educ.* **2021**, *32*, 265–285. [CrossRef]
57. Hershock, C.; Melville, M.C.; Stimson, J.; Dwyer, H. How effective is asynchronous, online training for graduate and undergraduate student instructors? *J. Appl. Res. High. Educ.* **2022**, *15*, 1440–1453. [CrossRef]
58. Jung, S.; Shin, H.W.; Gohary, A.; Chan, E.Y. Benefits and challenges of online collaborative learning from the perspectives of non-traditional event management students: A comparison between asynchronous and synchronous learning. *J. Teach. Travel Tour.* **2023**, *23*, 109–129. [CrossRef]
59. Rehman, R.; Fatima, S.S. An innovation in Flipped Class Room: A teaching model to facilitate synchronous and asynchronous learning during a pandemic. *Pak. J. Med. Sci.* **2021**, *37*, 131. [CrossRef]
60. Omrany, H.; Mehdipour, A.; Oteng, D. Digital Twin Technology and Social Sustainability: Implications for the Construction Industry. *Sustainability* **2024**, *16*, 8663. [CrossRef]
61. Leite, F. Project-based learning in a building information modeling for construction management course. *J. Inf. Technol. Constr.* **2016**, *21*, 164–176.
62. Sepasgozar, S.M. Digital twin and web-based virtual gaming technologies for online education: A case of construction management and engineering. *Appl. Sci.* **2020**, *10*, 4678. [CrossRef]
63. Hernandez-Carrasco, L.H.; Hernandez-Sanchez, M.D.; Rodriguez-Paz, M.X. The academic and emotional impact of virtual construction site visits on students during a Pandemic Period. In Proceedings of the 2021 ASEE Virtual Annual Conference Content Access, Virtual, 26 July 2021.
64. Kanetaki, Z.; Stergiou, C.; Bekas, G.; Troussas, C.; Sgouropoulou, C. Creating a metamodel for predicting learners' satisfaction by utilizing an educational information system during COVID-19 pandemic. In *Novelties in Intelligent Digital Systems*; IOS Press: Amsterdam, The Netherlands, 2021; pp. 127–136.
65. Twigg, S.; Little, A.; Gallegos, M. *Cognitive Load Theory*; Education Theory Made Practical; Medical College of Wisconsin: Milwaukee, WI, USA, 2022; Volume 4.
66. Barker, R.D. *Examining Engineering Students' Ability to Interpret Information by the Usage of the Students' Critical Thinking Skills and Cognitive Load*; Northcentral University: Scottsdale, AZ, USA, 2023.
67. Times Higher Education. How Block Teaching Supports Students from Underrepresented Groups. Available online: https://www.timeshighereducation.com/campus/how-block-teaching-supports-students-underrepresented-groups (accessed on 11 November 2024).
68. Gutierrez, G.; Lunsky, I.O.; Van Heer, S.; Szulewski, A.; Chaplin, T. Cognitive load theory in action: E-learning modules improve performance in simulation-based education. A pilot study. *Can. J. Emerg. Med.* **2023**, *25*, 893–901. [CrossRef]
69. Magunje, C.; Chigona, A. E-learning policy and technology-enhanced flexible curriculum delivery in developing contexts: A critical discourse analysis. *Crit. Stud. Teach. Learn. (CriSTaL)* **2021**, *9*, 83–104. [CrossRef]
70. Alias, N.F.; Razak, R.A. Revolutionizing learning in the digital age: A systematic literature review of microlearning strategies. *Interact. Learn. Environ.* **2024**, *32*, 1–21. [CrossRef]
71. Watson, C. Instructional ideas for teaching in block schedules. *Kappa Delta Pi Rec.* **1998**, *34*, 94–98. [CrossRef]
72. Loton, D.; Stein, C.; Parker, P.; Weaven, M. Introducing block mode to first-year university students: A natural experiment on satisfaction and performance. *Stud. High. Educ.* **2022**, *47*, 1097–1120. [CrossRef]
73. Goode, E.; Roche, T.; Wilson, E.; McKenzie, J.W. Implications of immersive scheduling for student achievement and feedback. *Stud. High. Educ.* **2023**, *48*, 1123–1136. [CrossRef]
74. Harvey, M.; Power, M.; Wilson, M. A review of intensive mode of delivery and science subjects in Australian universities. *J. Biol. Educ.* **2017**, *51*, 315–325. [CrossRef]

75. Ajayan, S.; Balasubramanian, S. Block mode delivery in an andragogic environment: Challenges and strategies. *Int. J. Manag. Educ.* **2021**, *15*, 116–139. [CrossRef]
76. Dixon, L.; O'Gorman, V. 'Block teaching'–exploring lecturers' perceptions of intensive modes of delivery in the context of undergraduate education. *J. Furth. High. Educ.* **2020**, *44*, 583–595. [CrossRef]
77. Mitchell, M.; Brodmerkel, S. Highly intensive teaching in tertiary education: A review of recent scholarship. *Stagnancy Issues Change Initiat. Glob. Educ. Digit. Age* **2021**, *15*, 190–210.
78. Samarawickrema, G.; Cleary, K. Block mode study: Opportunities and challenges for a new generation of learners in an Australian university. *Stud. Success* **2021**, *12*, 13–23. [CrossRef]
79. Turner, R.; Webb, O.J.; Cotton, D.R. Introducing immersive scheduling in a UK university: Potential implications for student attainment. *J. Furth. High. Educ.* **2021**, *45*, 1371–1384. [CrossRef]
80. Ambler, T.; Solomonides, I.; Smallridge, A. Students' experiences of a first-year block model curriculum in higher education. *Curric. J.* **2021**, *32*, 533–558. [CrossRef]
81. Buck, E.; Tyrrell, K. Block and blend: A mixed method investigation into the impact of a pilot block teaching and blended learning approach upon student outcomes and experience. *J. Furth. High. Educ.* **2022**, *46*, 1078–1091. [CrossRef]
82. Huber, E.; Davila, Y.C.; Thomson, A.C. Designing intensive mode science subjects: Improving the student and teacher experience. *J. Univ. Teach. Learn. Pract.* **2022**, *19*, 04. [CrossRef]
83. Klein, R.; Kelly, K.; Sinnayah, P.; Winchester, M. The VU way: The effect of intensive block mode teaching on repeating students. *Int. J. Innov. Sci. Math. Educ.* **2019**, *27*, 47–59.
84. McCluskey, T.; Smallridge, A.; Weldon, J.; Loton, D.; Samarawickrema, G.; Cleary, K. *Building on the VU Block foundations: Results from the Inaugural First Year Cohort*; Higher Education Research and Development Society of Australasia, Inc.: Hammondville, NSW, Australia, 2020; pp. 61–72.
85. Chau, H.-W.; Jamei, E.; Li, M. Block mode delivery for studio design teaching in higher education. *Innov. Educ. Teach. Int.* **2023**, *60*, 346–356. [CrossRef]
86. Thi Thao T, N.; Purarjomandlangrudi, A.; Ghapanchi, A. Uncovering Insights Gained from Applying Block Mode of Teaching: Case of Higher Education. *J. E-Learn. High. Educ.* **2022**, *2022*, 1–16. [CrossRef]
87. Shojaei, A.; Ly, R.; Rokooei, S.; Mahdavian, A.; Al-Bayati, A. Virtual site visits in Construction Management education: A practical alternative to physical site visits. *J. Inf. Technol. Constr.* **2023**, *28*, 692–710.
88. Eiris Pereira, R.; Gheisari, M. Site visit application in construction education: A descriptive study of faculty members. *Int. J. Constr. Educ. Res.* **2019**, *15*, 83–99. [CrossRef]
89. Parra-Martínez, J.; Gutiérrez-Mozo, M.-E.; Gilsanz-Díaz, A. Inclusive higher education and the built environment. A research and teaching agenda for gender mainstreaming in architecture studies. *Sustainability* **2021**, *13*, 2565. [CrossRef]
90. Sirror, H.; Abdelsattar, A.; Dwidar, S.; Derbali, A. A review on virtual reality for architecture education. In Proceedings of the 11th Annual International Conference on Industrial Engineering and Operations Management, IEOM 2021, Singapore, 7–11 March 2021; pp. 944–950.
91. Wilson, E.; Goode, E.; Roche, T. Transforming assessment policy: Improving student outcomes through an immersive block model. Southern Cross University Scholarship of Learning and Teaching Paper. *Preprint* **2024**.
92. Muscat, A.; Thomas, M. Teaching on the Block. *J. Block Intensive Learn. Teach.* **2023**, *1*, 32–48. [CrossRef]
93. Kim, K.P.; Freda, R.; Nguyen, T.H.D. Building information modelling feasibility study for building surveying. *Sustainability* **2020**, *12*, 4791. [CrossRef]
94. Pikulski, P.; Wójtowicz, M.; Zieliński, R.; Dolny, P. Classification of data capturing and building surveying techniques in the context of selecting the optimal method of creating 3D BIM and HBIM models of existing buildings. *Int. J. Conserv. Sci.* **2024**, *15*. [CrossRef]
95. Özacar, K.; Ortakcı, Y.; Küçükkara, M.Y. VRArchEducation: Redesigning building survey process in architectural education using collaborative virtual reality. *Comput. Graph.* **2023**, *113*, 1–9. [CrossRef]
96. Tan, Y.; Xu, W.; Li, S.; Chen, K. Augmented and virtual reality (AR/VR) for education and training in the AEC industry: A systematic review of research and applications. *Buildings* **2022**, *12*, 1529. [CrossRef]
97. Paszkiewicz, A.; Salach, M.; Dymora, P.; Bolanowski, M.; Budzik, G.; Kubiak, P. Methodology of implementing virtual reality in education for industry 4.0. *Sustainability* **2021**, *13*, 5049. [CrossRef]
98. QILT. *Student Experience Survey (SES)*; QILT, Ed.; QILT: Sydney, Australia, 2024.
99. Victorian Building Authority (VBA). What Is Building Surveying Work? Available online: https://www.vba.vic.gov.au/registration-and-licensing/building-practitioner-registration/what-is-building-surveying-work (accessed on 3 January 2025).
100. Howe, S.; Konjarski, L.; Oraison, H.; Smallridge, A. Trials, tribulations & triumphs of the First Year Model. In Proceedings of the STARS Conference Proceedings 2019, Vienna, Austria, 19–23 August 2019.
101. McCluskey, T.; Weldon, J.; Smallridge, A. Rebuilding the first year experience, one block at a time. *Stud. Success* **2019**, *10*, 1–15. [CrossRef]

102. Victoria University. NBC2002 Building Regulations. Available online: https://www.vu.edu.au/units/building-regulations-nbc2002 (accessed on 3 January 2025).
103. Victoria University. NBC2109 Performance Based Solutions for Building. Available online: https://www.vu.edu.au/units/performance-based-solutions-for-building-nbc2109 (accessed on 3 January 2025).
104. Victoria University. NBC3001 High Rise Development and Compliance. Available online: https://www.vu.edu.au/units/high-rise-development-and-compliance-nbc3001 (accessed on 3 January 2025).
105. Victoria University. *NBC3002 Advanced Building Surveying*; Victoria University: Sydney, Australia, 2024.
106. Alghamdi, A.; Karpinski, A.C.; Lepp, A.; Barkley, J. Online and face-to-face classroom multitasking and academic performance: Moderated mediation with self-efficacy for self-regulated learning and gender. *Comput. Hum. Behav.* **2020**, *102*, 214–222. [CrossRef]
107. Victoria State Government. Women Building Surveyors Program. Available online: https://www.localgovernment.vic.gov.au/grants/women-building-surveyors-program (accessed on 3 January 2025).
108. Victoria University. Vu Backs Program to Train More Women for Construction Roles. Available online: https://www.vu.edu.au/about-vu/news-events/news/vu-backs-program-to-train-more-women-for-construction-roles (accessed on 3 January 2025).
109. Victoria University. Applying for Credit (Advanced Standing). Available online: https://www.vu.edu.au/study-at-vu/courses/credit-for-skills-past-study/applying-for-credit-advanced-standing (accessed on 3 January 2025).
110. Victoria University. Credit Calculator. Available online: https://www.vu.edu.au/study-at-vu/courses/credit-for-skills-past-study/credit-calculator/#/home (accessed on 3 January 2025).
111. Victoria University. VU Digitalisation in Construction—H&S Education. Available online: https://www.youtube.com/watch?v=aLg5WB1SKUE&list=PLFw3VaotkpPO7ofiXvYcxTFK1Vr9WqFz9&index=1 (accessed on 3 January 2025).
112. Victoria University. VU Employ—Careers Service & Support. Available online: https://www.vu.edu.au/current-students/careers-opportunities/vu-employ-careers-service-support (accessed on 3 January 2025).
113. Skulmowski, A.; Xu, K.M. Understanding cognitive load in digital and online learning: A new perspective on extraneous cognitive load. *Educ. Psychol. Rev.* **2022**, *34*, 171–196. [CrossRef]
114. Errey, C.; Ginns, P.; Pitts, C. Cognitive load theory and user interface design: Making software easy to use. *Perform. Technol. Group PTG Glob.* **2006**, *14*, 1–9.