HYFLEX CHALLENGES AND STRATEGIES FOR MATURED LEARNERS: CONSTRUCTION ENGINEERING HIGHER EDUCATION IN NEW ZEALAND DURING THE PANDEMIC

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ABSTRACT

The idea of remote learning has allowed many learners to overcome the barriers of social distancing during the COVID-19 pandemic in fulfilling learners' expectations. This study aims to investigate the challenges and strategies mature students, especially those career changers, were facing in construction engineering programmes during the pandemic by establishing an inclusive HyFlex collaboration model between two different organisations, namely one Polytechnics (the higher education institute) and an online learning platform institute (the online institute). A questionnaire survey was developed and distributed to all the 16 mature learners joining this Hyflex pathway in New Zealand. Both quantitative and qualitative methodologies were used, and all students were asked to respond to a questionnaire on the HyFlex route using a Likert scale. To ensure the accuracy of the findings, the reliability of the data collected by a questionnaire survey was assessed using Cronbach's alpha.

It was found that students were satisfied with their academic performances and knowledge building for career changes with learning through this model; interaction, empathy and connection between learners and facilitators play a key role in the success of the inclusive HyFlex model. The current study adds to the body of knowledge by highlighting challenges and strategies for reducing COVID-19's impact on mature learners studying construction engineering programmes. The findings are critical for industry practitioners and teachers responsible for establishing and upgrading pre- and post-pandemic construction engineering learning programmes to upskill and solve the skill shortage problem in the shortest period possible.

Keywords: *Remote learning, collaboration, engineering, student engagement, higher education, pathway*

Before COVID-19, the higher education system relied on classroom teaching as it was regarded as the most favourable way to ensure quality teaching standards for learners (Beatty, 2019). In 2020, the pandemic brought an urgency for revolutions in the learning mode of construction engineering education in New Zealand. COVID-19 has changed how teachers teach and how students learn by remote learning. Traditional face-to-face study mode has been replaced with online learning and blended learning to reduce the possibility of virus transmission. The new study models include the substantial use of new technologies and apps, such as Zoom and MS Teams, to deliver the asynchronous course

through video-conferencing software. These online learning models can ensure learners can continue learning without interruption to keep education running. In addition, these models have devised new interaction methods between teachers and students, students and students, teachers and teachers (Moorhouse, 2020; Van Nuland et al., 2020). The responsive actions were taken by organisations which included working from home. Also, they facilitated the transition from static models to innovative, flexible, and personalised working and learning models according to users' preferences and strengths (Beatty, 2019).

In early March 2020, New Zealand initiated a lockdown and adopted an elimination strategy to combat the virus. All teaching and learning in New Zealand's higher education suddenly stopped (Collignon, 2011; De Wit et al., 2016). Education started to explore a new way of teaching they had never imagined before to overcome the impact of the pandemic. Lecturers and teachers began to find ways to adopt a new teaching model, the Hybrid-Flexible (HyFlex), and learners also changed their ways of learning remotely (Hollander et al., 2020). Learning Management Systems (LMS) provided by the online institute platform and Zoom were used to allow students to participate in courses synchronously with their original timetable or asynchronously with pre-recorded lessons, while most studies are about how the Hyflex model can be adopted for the full-time students (Kohnke & Moorhouse, 2021; Raman et al., 2021; Verrecchia & McGlinchey, 2021). During the pandemic, many learners in New Zealand earned a living by taking up a new role as essential workers who needed to work on a shift in multiple locations and on very long working hours. There is also a strong demand for new construction practitioners to cope with skill shortages in New Zealand. The introduction of HyFlex may give learners, especially those career changers, a chance to continue their studies (Beatty, 2019). Studies show that students working and studying full time obtained lower academic performance; combining working with studying simultaneously also has adverse effects on academic performance (Sanchez-Gelabert et al., 2017).

This study investigated the effectiveness of the HyFlex model in construction engineering education in New Zealand during the pandemic by understanding the challenges and opportunities learners faced in their learning process. The paper introduced a case study of how the traditional structure of the construction engineering programme in New Zealand was transformed into the HyFlex model using purely online delivery—the online institute. Quantitative and qualitative methods were adopted, where all learners were invited to complete a questionnaire based on the Likert scale to collect their feedback about the HyFlex pathway. Four open-ended questions were also included to explore the challenges and strategies when attending the HyFlex programme. This study aims to fill the research gap by establishing an inclusive HyFlex model to deliver a construction engineering programme and how this can be achieved within the shortest time for those busy learners with family commitments and full-time jobs. The previous study shows that students working full time and studying part-time need to sacrifice their academic performance for job opportunities (Sanchez-Gelabert et al., 2017). The value of the study is to evaluate the effectiveness of the model for mature students who work full time with family commitment and study construction engineering education for the first time without any construction background during the pandemic (Stewart & Bishop, 2022). The result is analysed according to student satisfaction and their quantitative and qualitative feedback and aimed to find the HyFlex pathway adopted targeting at construction engineering industry, which is facing long-term skill shortages in New Zealand. The success of the model could demonstrate an excellent example to equip full-time workers with new construction engineering skills to solve current skill shortage issues.

ONLINE ENGINEERING PEDAGOGIES BEFORE PANDEMICS

Prior to the pandemics, certain engineering course materials were kept on a Moodle page, which is a campus online platform that allows for flexible and self-directed learning. Participants may participate in as much or as little of the course as they like, but there are incentives to complete a range of learning objectives in badges or a certificate of completion. Students who were absent from class may review the materials on their own to catch up on what they missed.

Face-to-face classes adhere to the same curriculum as online courses, with slight differences for

different audiences. For example, since all students are obliged to enrol in full-time on-campus study, more information is explicitly related to Christchurch, New Zealand. They were developed in partnership with online learning specialists by tutors with expertise in the construction engineering courses they teach to use course materials within an effective online learning framework to supplement face-to-face on-campus education. Regular human interaction in class was the primary source of engagement with the pupils.

> However, because of the social distance and various restrictions in pandemics, previously unavailable and trustworthy video-conferencing software was made available to both staff and students in response to the need to switch to online studies rapidly. In this synchronous online course delivery style, as compared to in-person or even non-synchronous online forms, the effectiveness of the teaching and learning experience remains to be seen (Zhang et al., 2018).

HYFLEX MODEL

HyFlex is a new study model offered as an alternative to traditional face-to-face teaching. COVID-19 acts as a catalyst to drive the digital transformation of teaching delivery which usually took years, but it happened within a few days, with construction engineering education having no exception (Shin, 2021; Strielkowski, 2020). Online learning has developed into an essential part of higher education. Complete online and blended learning models like HyFlex have their strengths and weaknesses (Broadbent et al., 2018; Houston & Thompson, 2017). Construction engineering courses the online institute adopted into a fully online learning environment are not required to be live according to the schedule. Furthermore, they are not required to attend school, thus easing the time constraints and location restrictions and reducing travel costs and time. Blended learning of the HyFlex model offers greater flexibility for both learners and teachers with online and on-campus teaching. This is crucial to a practical curriculum like construction engineering courses. Learners can learn much better if given a chance to do concrete mixing, steel bending, software application, and site surveying on-site theodolite lesson. Such experiences can only happen on campus to fill in the gap where fully online programmes have. Comparing face-to-face to online learning, HyFlex can offer greater flexibility for learners and teachers to enable both parties to study and teach with diversified methods that can respond to different needs and expectations (Van Doorn & Van Doorn, 2014). Despite all these benefits, such transformation can bring equivalent challenges to the users. One of the key challenges teachers and students face is to adapt to the new technology, as the HyFlex model expects learners to lead more self-directed learnings. Teachers are also expected to learn new teaching methods and prepare new teaching materials to keep learners engaged with their studies and support learners remotely (Paris & Paris, 2001; Peacock et al., 2010).

Compared to face-to-face teaching, learners are expected to study more independently and proactively to succeed in the courses (Serdyukov & Hill, 2013). The new HyFlex model combining online, face-to-face, and workshops into one attracts learners to have flexibility without losing the practicality element of the construction engineering programme (Alem et al., 2014). According to researchers studying how to run effective online courses, students' engagement levels in tutor-learner, learner-learner, and both verbal and non-verbal student content interactions can determine their perception of distance from their learning environment and enhance their satisfaction (Weiser et al., 2018). However, these kinds of interactions may be more challenging for matured students working full time and studying part-time in the HyFlex model; we can only presume that these assumptions are accurate for Hyflex learning in the absence of any actual or empirical data or investigation on the matured learners using this pathway to study construction engineering programme in New Zealand. It is vital to determine how satisfied students are with this strategy and to have more in-depth knowledge of student experiences in this kind of environment. The current case study hopes to examine the student experience of HyFlex by asking the following research question:

RQ 1. When given a choice to study in a blended model, what factors do students consider when deciding to join this Hyflex pathway?

RQ 2. What are students' perceptions of HyFlex as matured students?

PATHWAYS FOR HYFLEX MODEL

The following alternative pathway for HyFlex consists of three HyFlex courses designed by the online institute. This is where most courses can be cross-credited, while the only introduction to Legislative and Social environment, Estimating and Programming, are ready for delivery online. The NZ Diploma QS/CM face-to-face programme structure is shown in Figure 1, while the revised HyFlex pathway is in Figure 2. One course is delivered remotely in the year one semester with some modules under the courses offered on campus; in year one, semester two could be Campus teaching.

METHOD

Context of the Study and Participants

This study involved learners in a New Zealand Diploma in Construction HyFlex pathway offered by the higher education institute with the collaboration of the online institute on the compulsory courses: Introduction to Legislative and Social Environment, Estimating, and Programming. Each course has 10 2-hour sessions delivered every week through Zoom. In addition, the Programming course has four sessions in the PC lab workshop on campus during the weekend. The courses focused on topics such as estimating, scheduling, and software applications in construction.

The courses were delivered in a HyFlex format. Some lessons were provided face-to-face in a physical workshop on the institute's main campus in New Zealand, and others had asynchronously through Zoom. In this study, the tutor utilised Zoom to facilitate and offer a live broadcast of the lesson over the weekend, then uploaded the video to a shared drive so that students could either attend the live session or watch the recording afterwards. Physical workshops were accessible in a specific practice, such as MS project applications or concrete lab classes, that students may attend in person or watch the recording on-demand.

The teacher was directed to focus on providing the lesson through Zoom and uploading the recordings to ensure that all students received the same instruction. In other words, students attending courses in various forms, including face-to-face and online, synchronous and asynchronous, may communicate with one another on the platform by visiting the LMS forum regularly. The teacher utilised Zoom's multiple features throughout the course to allow and encourage participation, including a breakout room where students could converse and socialise. Students who live distant from college and cannot attend a session on campus may still interact with their peers.

Students' performance was assessed with both summative and formative assessments including tests or assignments on an academic subject. The author of this paper initiated this HyFlex model and taught the Estimating and Programming courses. Students in the study were invited to complete an online questionnaire and respond to

Figure 1 NZ Diploma in QS/CM Face-to-Face Programme Structure

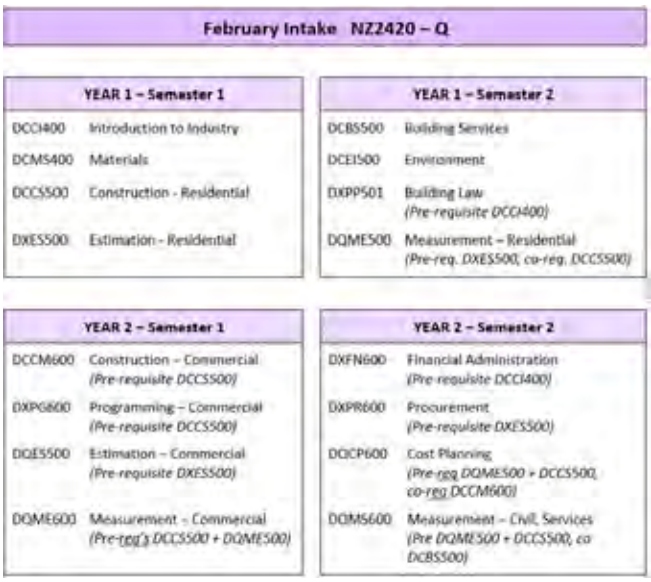
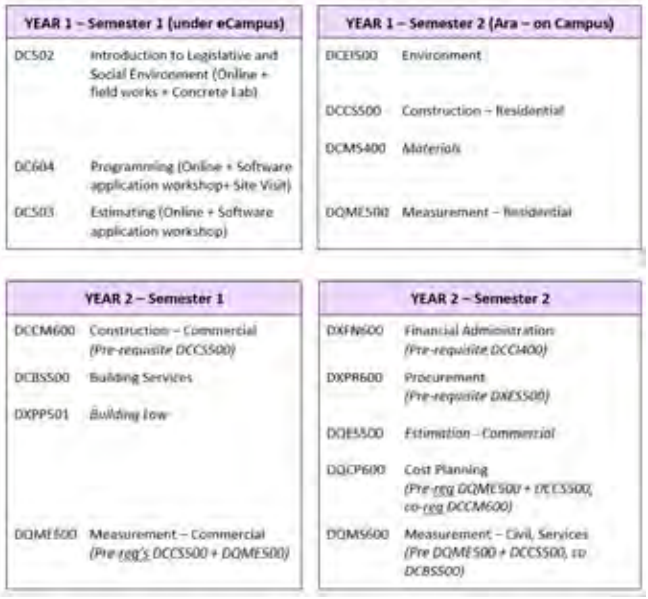


Figure 2 HyFlex Pathway (with Year 1 S1 Online Plus Workshop Under the Online Institute)



open-ended questions to help assess their experiences, challenges they faced, level of satisfaction, and strategies they used in this particular Hyflex pathway. Approximately 110 students in total (face-to-face and Hyflex model) were enrolled overall studying to obtain a New Zealand Diploma in construction, in which 21 students, equivalent to around 20% overall, chose the Hyflex model pathway. All these students were mature students. The remaining students chose the traditional face-to-face teaching. Since the Hyflex model was new to New Zealand and the institute in the study was the first polytechnic in New Zealand to adopt the Hyflex model to run construction engineering programmes during pandemics, the 21 students enrolled represents the whole population of the sample available. Table 1 lists the age profile of all 21 students participating in the Hyflex model pathway. The youngest is 24 years old, and more than half of learners are 30 years old or above.

Table 1 Student Age Profiles

	Number	Percentage
25-30	7	33%
31-40	8	38%
41-50	5	24%
51 or above	1	5%

Though several emails were sent to remind those students to fill in the questionnaires, only 10 students, representing 47.6% of the total qualified group, answered the questionnaires.

The small number of qualified groups reduced the sample size available for analysis and potentially different opinions from the nonqualified group; therefore, extra care is needed to judge the representativeness when making the final estimates (Fellows & Liu, 2021). On the other hand, since the targeted population agrees with the topic being investigated and is the first study in its scope to the author's knowledge, issues due to non-respondent bias can be lessened (Franzen & Lazarsfeld, 1945). Therefore, the results were convincing.

A questionnaire is composed of four sections. The first section was about the demographic background of respondents. It was used to identify how challenges and opportunities varied with differing backgrounds and analyse the strategies used or potentially introduced. The second section targeted to determine the precise level of opinion on the factors of flexibility, motivation to continue, convenience, active engagement in learning, course design, ease of access, access to video conferencing software, and communication pathway before and after joining the Hyflex pathway. Respondents were invited to rate the factors under a Likert scale ranging from *least important* (1) to *most important* (5). This allowed the author to identify the factors influencing their choices and explore the challenges they faced during the learning. The third section identified the level of satisfaction over academic performance, learning opportunities, flexibility, chance to share and knowledge building. Respondents were asked to rate their satisfaction level over each of them from *least satisfied* (1) to *most satisfied* (5) before and after joining the Hyflex pathway. This allowed the author to understand which areas worked well and assess the impact of change on students' performance under the new learning model. The last section was the qualitative part; the students were asked the following broad questions:

- What did you find the most useful about Hyflex Pathway's new learning model and why?
- What did you find most challenging about Hyflex Pathway's new learning model and why?
- What strategies did you use and why?

This allowed the author to identify the strategies successfully implemented to facilitate their studies. Information collected was significant for the successful implementation of the Hyflex model in New Zealand. The New Zealand government plans to roll out initiatives to increase the accessibility and flexibility of construction education for the people who cannot study face-to-face lessons under a fixed timetable.

Cronbach's alpha was used to measure the trustworthiness of the data acquired via a questionnaire survey to confirm the reliability of the results (Fellows & Liu, 2021). The data was regarded as reliable for values more than 0.6 (Hinton et al., 2014); otherwise, the questionnaire should be revised or not used.

In numerous project management literature (Tan & Ghazali, 2011), the Relative Importance Index (RII) determines the most significant aspects

among those individual predictors and *t* functions. The following is the RII formula:

Where: I is the weight of importance of a given score, H is the highest value of importance given (in this case, 5), N is the total number of respondents, and f is the frequency of the i-th response.

Table 2 lists the characteristics of the respondents. Most learners are career changers, accounting for 40% of the total respondents, 30% migrants, 20% tertiary graduates and returning Kiwis, where none of them is a school leaver. School leaver refers to those completing/have completed at a New Zealand high school in 2020 and were studying tertiary education for the first time in 2021. Tertiary graduates recently graduated from polytechnics or universities without a full-time job. Career changers refer to those currently working full time in an industry other than the construction-related industry or those whose jobs are being made redundant, or those with jobs at risk of disappearing due to some other reasons; both want to change their career to construction-related one. Migrants are those migrating from other countries to New Zealand with or without construction experience. Finally, returning Kiwis are those New Zealanders who normally live or work overseas and recently returned to New Zealand permanently looking for a job. Those mature learners have the most say in the survey content, thus demonstrating the survey results' validity for career changers or mature learners showing the relevance and value of the research results.

Table 2 Respondent Profiles

	Number	Percentage
School leaver	0	0%
Tertiary Graduate	2	20%
Career Changers	4	40%
Returning Kiwi	1	10%
Migrants	3	30%

The courses were taught in a HyFlex manner, with instruction delivered online using Zoom and the online institute's LMS platform and in-person sometimes for lab class at the higher education institute's main campus in Christchurch. The teacher used Zoom to lecture and facilitate the session over the weekend throughout this study. The teacher took advantage of Zoom's many features to encourage and facilitate student participation throughout the course, including breakout rooms where students could communicate with the facilitator and other students.

Students used learning management systems (LMS), such as an online portal with a built-in Zoom capability, to ask and answer questions on course content, resources, and presentation videos that were streamed throughout the class. The teacher used these tools to make the most of the technology to foster a feeling of community among the pupils and provide opportunities for cooperation and reflection(Garrison, 2011; Lazareva, 2017).

Quantitative and qualitative approaches were determined to be the best means of obtaining rich knowledge through in-depth interviews for this study (Creswell & Garrett, 2008). The author used a convenience sample strategy, inviting people enrolled in the course to participate. The first author also acted as a facilitator, creating quantitative and qualitative questionnaires to extract information about the participants' experiences.

The purpose of the questionnaire and the survey respondents' selection is to compare their expectations of HyFlex before and after completing the pathway courses. A statistical comparison of the data from the legitimate questionnaires received was made, and a list of the differences between the two levels, the difference rate (division difference by the level of expectation), and the ranking based on the amount of the difference were created (as shown in Table 5).

The proposed six-step approach was applied to identify and analyse the difficulties and causes (Braun & Clarke, 2006). The author read and reread the transcripts to better understand the facts. The author then programmed independently, resulting in initial codes that were shared, disputed, clarified, and discussed with other team members. Flexibility, motivation to continue, convenience, active engagement in learning, course design, ease of access, access to video conferencing software, and communication pathway were identified as eight criteria impacting students' choice of the Hyflex learning model during the analysis (Heilporn & Lakhal, 2021). Knowledge building, academic achievement, learning opportunities, flexibility in choosing a learning environment, and the opportunity to share were all linked to satisfaction criteria. Excerpts from the interviews

highlight the individuals' experiences and show their knowledge's breadth (Geertz, 1973).

RESEARCH FINDINGS

Factors Influencing Student Choice

When asked how they decided which learning environments to participate in for each class and during the course before joining the HyFlex pathway, the data in Table 3 revealed that students' decisions were primarily influenced by three factors: flexibility and motivation to continue, and convenience. As demonstrated in Table 4, after joining the pathway, the ranking of characteristics such as ease of access, access to video conferencing software, and flexibility changed.

Table 3 Factors Ranking: Level Expected Before Joining the Pathway

Factors	Level expected before joining the pathway (RII), Cronbach's alpha: 0.940
Flexibility	0.900
Motivation to continue	0.875
Convenience	0.867
Active engagement in learning	0.850
Course Design	0.850
Ease of Access	0.850
Access to video conferencing software	0.825
Communication Pathway	0.800

These were significant considerations because some students worked full-time and had inadequate time to travel to destinations outside of campus. For instance, one of the students indicated flexibility and the ability to work (access) around his other full-time work from home. Another student who opted to join the HyFlex pathway said, "It is very convenient and flexible. As a mother and a full-time worker, I appreciate this flexibility." These are strong evidence to support work/live/study balance for working families with the HyFlex model that has been shown to reduce study barriers due to gender and socio-economic disadvantage.

One student added, "Being able to start and stop learning whenever I wanted. Also, I could take time off whenever I needed it."

These deciding criteria were expectations, particularly among students who preferred HyFlex sessions. According to a previous study,

Table 4 *Factors Ranking: Level After Joining the Hyflex Pathway*

Factors	Level after joining the Hyflex pathway (RII); Cronbach's alpha: 0.860
Ease of Access	0.960
Access to video conferencing software	0.960
Flexibility	0.880
Course Design	0.880
Motivation to continue	0.860
Convenience	0.860
Active engagement in learning	0.860
Communication Pathway	0.840

flexibility and convenience have been identified as characteristics that influence student preferences, particularly in online learning (Northrup et al., 2002). This part may be separated into subheadings to provide a clear and concise discussion of the experimental data, their interpretation, and the possible empirical inferences.

Level of satisfaction with HyFlex Courses

Students were asked to score their satisfaction with the HyFlex learning experience on a Likert scale ranging from 1 (*low*) to 5 (*high*). Learners expressed high levels of satisfaction based on the flexibility to choose a learning environment, which scored first at 0.92, and academic performance, which ranked second at 0.88. The opportunity for knowledge building and learning is rated at the same level as 0.84.

Learners said that having the freedom to choose their learning environment was the most satisfactory. One student said, "the flexibility of self-time management and unlimited accessibility to course material." Both show significant improvements, namely 8.4% and 6.7%, after joining the Hyflex pathway when asked about academic performance and knowledge building. Another student felt that, "Tutorials were essential to supplement the course knowledge and ground them online."

However, after joining the class, there was a reduction in satisfaction when asked about the opportunity to share what the HyFlex environment provided them. Overall, learners give the chance to share a 0.8 rating, which is high. Sharing thoughts, personal reflection and various discussions are encouraged across learning contexts, yet there is potential for development compared to others.

Table 5 Changes in Learners' Satisfaction Before and After Joining the Pathway

Satisfaction	Level after joining the pathway (RII); Cronbach's alpha: 0.942	Level expected before joining the pathway (RII); Cronbach's alpha: 0.895	Change in Satisfaction
Knowledge building	0.840	0.775	8.4%
Academic Performance	0.880	0.825	6.7%
Learning Opportunities	0.840	0.800	5.0%
Flexibility to choose the learning environment	0.920	0.900	2.2%
Chance to share	0.800	0.825	-3.0%

STUDENT DESCRIPTION OF THE HYFLEX LEARNING CHALLENGES AND STRATEGY

Challenges

Chance to share. All respondents appreciated the opportunity to have their learning sessions on Zoom and receive workshop support. On the other hand, learners also found some challenges in their HyFlex learning. In terms of having the chance to share, one student said, "Difficult to do group activities." While the online mode was an added benefit, one student mentioned the communication challenge "I can't ask or show questions to my tutor face-to-face with paper in my hands, so we have to email back and forth." Being able to have work/life/family balance, one student who is a mother and full-time worker said, "I think it would be managing distractions at home when studying."

Technical difficulties. In terms of access to learning materials, learners who attempted the interactive activities named a few technical difficulties such as a dead link or wrong format or wrong formula with errors in a few examples and the inability to access specific resources (LinkedIn, YouTube video). These were the challenges of participation in learning activities embedded in the online delivery model.

It is found that their choice to engage in a different learning mode at any time is the factor determining their academic performance and knowledge building in the course. One student noted that the lack of difference in learning was due to the quality of course facilitators for HyFlex environments, "the lack of information background in this field but I had plenty of support from the course facilitators."

In the future, it may be feasible to include additional discussion activities that need group participation to promote more interactions in the online course and raise students' desire to participate and contribute regardless of the delivery method. It is fully acknowledged that the circumstances and technology resources available to each teacher will influence how they choose to use this unique method and how students react to them.

Strategies

Being actively involved in learning. When students participated in mixed-mode education, communication and teamwork challenges were involved in completing the actual lessons, which appeared to push them to pursue alternate learning ways. Meanwhile, while some students saw this effort as increasing their workload, others saw it as an opportunity to learn from others. "I used plenty of additional materials available online, and I often communicated with the course facilitators," the learner said. "I work for myself from home and can simply transition between study and job," they added, indicating that they are actively immersed in learning. "I didn't need a strategy because I had the time to commit to studying."

Control over learning. A well-organised lifestyle facilitates learning using the HyFlex model; one learner mentioned that he was "trying to keep a set schedule time to go through the materials and keeping time set aside to do the assessments." The HyFlex model encourages learners to plan their lives better; as one said, "I try and allocate a time every week to read my notes." Participants expressed that the flexibility offered by HyFlex gave them control over their learning. As stated by these students, "I also make sure I join all Zoom classes."

Interaction with other learners. Students stress the importance of interaction with other

learners as one of the benefits of the HyFlex model. There are opportunities for learners to discuss and share ideas through online discussion activities, e.g., breakout rooms. Students are also keen to use social media as a platform to exchange ideas. One student said, "Getting into a routine is vital. I found the course planners showing what you should be completing each week (including assignment tasks) very handy. Chatting to other students was good - it might be an idea to have a more social forum available, maybe something akin to a Facebook group where everyone can get to know each other."

DISCUSSION

Most students work full time with family commitments or live outside the city. Thus, it would be difficult for them to join the on-campus programme. Several studies have shown that multiple delivery models provide students with different pathways by enabling them to find a balance between their studies and their other responsibilities. The flexibility increases the relevance of learning to individual circumstances, thus motivating learners to learn and keeping them engaged with the course without affecting their other commitments (Dumford & Miller, 2018).

Several implications for teaching and learning could be drawn for applications in polytechnics and universities.

EMPATHY AND INCLUSIVITY

Empathy is needed now more than ever to assist everyone through remote or hybrid learning. The reality is that success is and has been eclipsed by unprecedented levels of fear, stress, and anxiety.

Since the pandemic in the last year, learning has changed dramatically, and e-learning has transformed global education. It is imperative to build empathy in the digital space and support learners to become more adaptive to this scenario through distance and remote learning tools. Teachers also play a crucial role in maintaining the connection with the learners at the same level as in a physical classroom. The HyFlex model can offer new ways to engage with learners to broaden their perspectives, without losing the fun of the learning experience (Lohmann et al., 2021).

In addition, the Zoom session offered can allow learners and teachers to develop an empathetic interaction with each other and meet people from all over the world. The cooperative tasks designed in HyFlex can encourage collaboration and empathy among the learner groups, where kindness and empathy grow naturally without missing the social aspects of interactions.

GLOBAL CITIZENS FOR INTERNATIONAL EDUCATION

During COVID-19, many international students are stuck overseas, though they want to study in New Zealand. HyFlex allows them to study for one or two semesters online and then return to campus teaching after the lockdown is complete. Education is currently facing one of the most challenging times because of COVID-19 and systemic injustices that are once again being exposed. During this critical moment for the field, many education institutes recognise the pivotal impact of education professionals committed to making a difference and creating equitable and transformative learning opportunities. Offering programmes to international students overseas through the HyFlex model can allow international education to keep running.

The HyFlex model can also allow international students overseas to gain professional skills and theoretical knowledge, access to renowned faculty, and a network of education leaders who share a mission of transforming the field. Through the HyFlex model, they will have immense flexibility to pursue their degree while also experiencing a rigorous and innovative curriculum specifically designed for online learners.

RESPONSIVENESS TO KIWI'S AND REGIONAL NEEDS

During COVID, Southland has the largest percentage of essential workers, with more than 27% of its workforce continuing to work in their place of employment under alert level 4. Auckland, the region where the current cases have been located, has the smallest number of essential workers going to work of any region, with just under 15%. Wellington has the second-lowest level of essential workers operating from their place of employment at just over 15%. More than 100,000 essential workers who work from their usual place of employment under alert level 4 are Māori or Pasifika.

Some learners joining the pathway were essential workers who stayed working around the clock to keep the whole of New Zealand going during the lockdown. HyFlex allowed them to progress and study without being deprived of the right to equip themselves with future career skills.

SKILL SHORTAGE

HyFlex can allow for a more flexible vocational education and training system, allowing for employees to be rapidly trained. The qualifications can further be broken down into a small block of learnings at the course level, i.e., learners enrolled on face-to-face/online courses within one semester according to their preferences and even at the assessment level, i.e., learners enrolled on different modules of courses (see Figure 4). Learners are free to choose those modules of the courses from other disciplines if they holistically fulfil the graduate profile; at the time of writing this paper, some learners, especially those with family, essential workers at level 4 during COVID-19, or those living remotely, have adopted this type of learning modules to improve skills matching and upskill their construction engineering knowledge. These micro-credentials under the HyFlex model can formalise soft and hard skills required at work. The HyFlex model gives us a sustainable and win-win approach that allows learners to acquire necessary construction skills and knowledge rapidly, as well as incentivise employers to sponsor their staff to upskill at a reasonable cost within the shortest time to cope with the demand due to skill shortage.

CONCLUSION

To the author's best knowledge, this study is the first study to identify the challenges and strategies of mature students to study construction engineering programmes through the Hyflex model in New Zealand. The most challenging areas were the lack of chance to share or interact with other learners and the technical difficulties they faced during their learning journey. The challenges can be attributed to the fact that most mature students are working full-time while studying full-time; that's why they cannot attend the online lessons synchronously with the fixed schedule. They also took a long time to learn new learning technologies like Moodle, MS Teams and Zoom. Strategies suggested in the study are to take more proactive approaches in learners' interactions and lifestyle changes during the transition to the Hyflex model. It is also found that support from course facilitators is critical from learners' perspectives. The author recommended that tertiary institutions promote the Hyflex model in construction education because this pathway can provide potential mature learners with opportunities to upskill to solve the skill shortage issue in New Zealand (Koskinen, 2018). It can also promote quality international education overseas regardless of distance and time zone. Because this Hyflex model is new, all the respondents were from the same tertiary institute. As soon as more tertiary institutes in New Zealand adopt the Hyflex model in construction education, a study on a larger scale should be conducted. Future research should examine how various strategies support different types of students to study construction programmes in the Hyflex model.

INSTITUTIONAL REVIEW BOARD STATEMENT

The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Ara Ethics Subcommittee.

DATA AVAILABILITY STATEMENT

The data presented in this study are available on reasonable request from the corresponding author.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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