

# Blended Agile Learning of Computer Architecture under COVID

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**Abstract.** The COVID-19 pandemic presented unique challenges. 2021 was an interesting year because we had overcome the worst of the teething problems of remote learning but were able to resume some in-person activities. I present experiences from a second-year computer architecture course that I have taught since 2014 to illustrate that some lessons from operating under pandemic conditions can apply to running courses under more normal conditions. 2021 was an interesting year because we reintroduced in-person pracs partway through this course, allowing students to reflect on the difference this made. Reflection on what did and did not work in the course points to possible improvements in pedagogy in more “normal” times. In isolation, the very positive feedback in a course survey may be flattering but there are useful insights to be drawn from what worked. Drawing on ideas from the social construction model of education, where students should be actively involved in learning, and agile software development, results in some insights that may generalize. The kind of feedback that is part of agile development can be layered on top of formative assessment. Empathy with difficulties faced by a class can make a class more involved in the strategy for course delivery. In 2022, without COVID constraints, some of the lessons were applied with positive outcomes.

**Keywords:** COVID-19, Computer Architecture, blended agile learning.

## 1 Introduction

I have taught a second-year computer architecture course since 2014, using my own book-length notes (the book is self-published and available on Amazon [10]). Given lengthy experience with this course, it presented a useful opportunity to research the effect of pandemic interventions particularly those that pointed to post-pandemic improvements in pedagogy.

Two factors made for relatively easy adaptation to COVID conditions: it is my own material so I can adapt it easily and I had no need to concern myself about criteria for career advancement, so I could neglect research and other factors unrelated to the course. Consequently, I was able to try a range of strategies without concern for the cost in extra time.

What made it challenging to structure presenting the course as a research exercise was the changing environment. For this reason, I do a retrospective analysis of factors

that influenced outcomes and build a model of what happened after the event. Usually, a research project starts from a research question or hypothesis to test, a research method that fits the problem and a literature review to ground the project in known art. In this case, a retrospective study works the other way around. I study practices developed during the course as a way to define a research approach that elucidates lessons for future courses.

The 2021 run of the course built on lessons from 2020, where students were sent home just before the course started. 2020 was a disaster for several reasons. Notes were printed for students and no one thought to advise them to pick them up before they left. Rhodes University had a big increase in NSFAS students, with about 70% of new science students the year before being in this category, and assuming everyone could go home and use Zoom was far from the reality of that category of student.

Once the students were sent home, plans were made to purchase laptops for NSFAS students out of their textbook allowance and free data was negotiated with cell networks for campus IP addresses. Students were also given a monthly data allowance. It took a good fraction of the 4 weeks allocated to the course to work through all these issues so the 2020 instance of the course had a smaller practical component.

One of the problems in 2020 was that the “free” access to our own sites turned out to apply only to TCP/IP traffic and live video generally – and specifically the Big Blue Button (BBB) system – uses UDP [5, 17]. Replaying videos, on the other hand, did use TCP/IP and hence was free. We had initially chosen BBB specifically as we could host it on our own system and hence put it into the range of IP addresses included in free traffic. Consequently, when students were off campus and had limited data, using BBB was only really useful for reviewing recorded question and answer sessions.

In 2021, these problems were mitigated as those students who needed lab facilities, including Computer Science, were permitted back on campus though at first not with full in-person contact. Classes where a sufficiently large venue was not available to accommodate 50% occupancy were run as alternating in-person and online sessions: half of the class at a time was allowed into the lecture, and the rest could follow on BBB. BBB in this situation worked better because students were mostly on campus, so they did not need free data. Halfway through the course, in-person pracs were allowed so we could transition to this in the last two out of four weeks.

The course ran for four weeks from 3 May 2021 to 28 May 2021. That presented interesting challenges as the course ran during a dip in COVID infections that took off again with the Delta variant [18] before the June exam session. On 1 March, the country went down to alert level 1, On 31 May, alert level went up to 2 then level 4 on 16 June. It went down to 4 on 16 June and up again to level 4 on 28 June, then down to level 3 26 July–12 September [16].

Fig. 1 (adapted from [18]) illustrates how timing of the Delta variant varied across the country over March–September 2021.

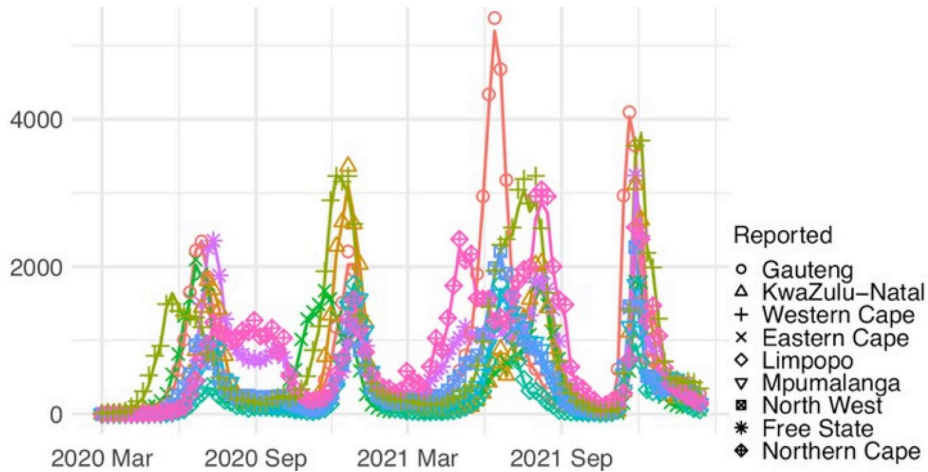


Fig. 1. Timing of COVID cases per 100,000 population in 2021.

Blended learning captures the essence of the approach used. However, since the underlying reality kept changing, I could not plan the whole thing out in advance. Instead, I constantly reviewed the approach as events unfolded. In effect what developed was a kind of agile blended learning.

Although my focus was on the class not on doing research, I did obtain ethics clearance for a survey for the 2021 run of the course, in anticipation of being able to share lessons.

Outside the pandemic scenario, an agile blended learning approach would be useful to develop further so I outline some of the lessons arising from problems and resulting solutions.

## 2 Applicable Theories and Models

I start from reviewing educational theory and how it can apply in a situation of a diverse class with a rapidly changing learning context. From this start, I review agile methods in software development for insights into how an adaptive educational strategy can be developed.

The social construction model of education turns out to be a good fit to the core ideas of agile software development.

### 2.1 Educational Background

There are many theoretical approaches to education. One of the earliest applied to Computer Science is Piaget's theory of learning stages starting from the sensory-motor preverbal stage and ending with formal operational stage, where children learn to form abstract concepts and to think logically and form plans [13], Though Piaget's work focused on children, with the last stage starting at about age 12, it has become

the basis for the constructivist approach to education in Computer Science, which emphasizes building mental models [3].

Constructivism at heart assumes that the main learning task is constructing a mental model but does not take into account the context of learning. Social constructivism does take context into account and considers interactions between learners and educators [2].

In a highly diverse class, particularly one where the educator is from a very different background than many members of the class, context and communication matters.

To go a step further, the social construction model starts from social interactions and assumes that all knowledge is created by interpersonal interaction [9]. Very little work in Computer Science education has built on this idea; one study has explored the role of dialog in bridging socio-cultural gaps between learner and teacher [15]. The pedagogic approach in this study, PRIMM is based on a feedback-based method with the following steps:

- *Predict* what given code does
- *Run* it to test the predictions
- *Investigate* how the given code is structured
- *Modify* the given code
- *Make* a new program based on the learned structures

In the context of a COVID-constrained class, particularly one with very different demographics to the last in-person class, how can any of these ideas apply?

An educational philosophy has to be operationalised: how is it put into practice? The PRIMM approach is one example. In the COVID context, where differences in ability to access technology and the playing field altered as regulations relaxed, a multimodal approach was needed.

Blended learning, with a mix of modalities and technologies, is one approach that has seen increasing favour, particularly as mixed-mode learning has been forced by the COVID pandemic [8]. Some say that the name is inaccurate as it is a teaching rather than a learning strategy [12]. This may seem to be a distinction without a difference since whether an approach is seen as a teaching or learning strategy is simply a matter of the orientation of the observer. However, a better way of looking at it is to see blended learning as a way to operationalise a given education model.

The simplest teaching technology, chalk and talk, does not imply a specific educational model. A lecturer who mumbles incoherently whilst illegibly scrawling on a board clearly has a different model of pedagogy in mind than one who challenges a class to answer hard questions and writes up a summary.

Without entering into a debate as to whether blended learning is misnamed, it can be taken as the technology adopted; how to make best use of it is especially difficult in the COVID context as reality kept shifting. The approach I adopt for this course is rapid informal review of how well the strategy is working, with micro-adjustments based on observing how the class is doing. Specific details of this approach are not generalisable as the conditions are not repeatable. However, the general idea is similar to that of agile development with rapid review and feedback cycles. There have been

studies of how well agile development held up over COVID conditions including lockdowns; unsurprisingly, teams that were co-located had the worst negative effects [14]. However another study shows that these effects could be mitigated in some cases producing better outcomes, resulting in support for a future blended approach, in which co-location was only required if really necessary [11].

Putting all these ideas together, a COVID-constrained class has to take into account rapidly changing circumstances, student diversity that may be harder to gauge from a distance than with personal interactions and rapid reviews of the effectiveness of any approach are useful.

All of this is easy to propose as a basis for an educational strategy after the event but, during the class, since unexpected developments kept arising, rapid reviews were reactive, rather than planned. It is also important to keep in mind that students are neither customers nor pedagogy experts so feedback cycles have to be based on this reality.

However, lessons from the class suggest that a feedback-based approach, generalised from PRIMM, would be worth using even outside of the pandemic context.

## **2.2 Fitting Agile Development to Pedagogy**

Agile development is a well-established approach to software projects. Pedagogy is not the same thing as developing software so not all ideas will apply. Nonetheless agile software development (ASD) has proved to be a useful approach for adaptive software development, avoiding locking in decisions that are hard to undo at a later stage.

A recent analysis of the theoretical core of ASD identifies the essential idea as the ability to “anticipate, create, learn from and respond to changes in user requirements through a process of continual readiness” [1]. That is a very generic description that can apply to any scenario where change is a factor. This description is further amplified as being achieved by:

- incremental design with iterative development
- cycles of inspection and adaptation
- continuous involvement of the customer
- collaborative and cooperative work with close communication

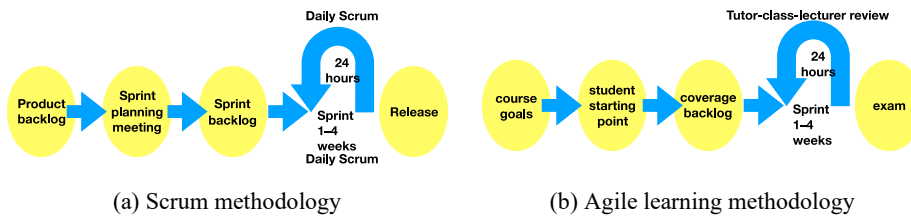
This generic framework can fit a course situation well, if there is a need to adapt rapidly to changing circumstances. The biggest difference is the relationship between the teacher and student, which is not that of developer and customer. It is also important to remember that students have many demands on their time, so review and feedback should not take a form that puts extra demands on them.

Tactics I used to approximate to rapid feedback cycles included putting mini-quizzes on our online Moodle platform, which helped me to assess how well the class was keeping up. I did not advertise them for this purpose but rather made them available for the class as formative assessment. Another tactic was frequent discussion with tutors on how hand ins were going, and whether any of their group would benefit

from extending a deadline. I also kept in close communication with the class through their WhatsApp group.

None of these interventions exactly fit the agile model but are in the spirit of rapid feedback and adjusting the strategy to fit observed reality.

The approach of rapid feedback cycles also draws on some of the ideas of social construction: making the class feel that they are part of the process of shaping assessments brings them closer to the community of practice that they aspire to join.



**Fig. 2.** Agile software development vs. education.

Fig. 2 shows how educational practice can be mapped onto the Scrum approach, one of the more popular approaches to Agile development [7]. A key difference is that education is not about creating an artifact but about changing the learner’s abilities. Hence, there is not as clear an endpoint so I replace that by the exam.

To dig deeper into agile development than this would not be a good fit to pedagogy as we are not trying to create a software artifact.

### 2.3 Putting it all Together

Returning to the idea that knowledge is socially constructed, the teacher in this situation, while partially in the role of the “developer” in ASD terms, is also trying to bring the student to their level of understanding. Feedback cycles involving the “customer” – in this case, the students – is a good fit to social construction.

This is a useful insight not just for the changing ground of a pandemic but also for pedagogy in general. Treating the class as an integral part of feedback cycles rather than as consumers of knowledge is consistent with the social construction model. However, a key difference from ASD is that students should be developing their understanding to be closer to that of the lecturer, rather than retaining a distinct role (the customer or end user is not trying to become a developer).

## 3 Differences in the course across years

The course was last run without COVID conditions in 2019; in 2020, it was run right after students were sent home. In 2021, lessons of 2020 could be applied even as restrictions reduced while in 2022 restrictions were mostly eased.

A key differentiator of 2019 as well was that it was the last year before changes in the terms of the National Student Financial Aid Scheme (NSFAS) resulted in a big majority of the students (about 70%) at Rhodes University being on NSFAS and hence from relatively poor households.

In 2019, as with previous years, the course was run over 4 weeks with 5 lectures and one prac per week, totalling 4 pracs. Each prac consisted of shorter questions to hand in before the end of the session and one or more to be completed no later than the day before the next prac. I generally did not give extensions as doing so impacts on other courses and time to do the next prac, as well as delaying publishing solutions.

In 2020, everything was set up to run the course in the normal way, including printing lecture notes for students. When the university decided to send all the students home, there was very little time to react and as a result the class went home without their notes. The initial proposal was to run classes on Zoom but the reality of NSFAS students not going home to fast Internet or a home computer sank in and there was a scramble to organize free data and to buy computers out of the NSFAS book allowance. Logistics of this took up much of the time for the course, so I adjusted the pracs to be possible to do without a computer. For the reasons noted in the Introduction, I made short videos to substitute for the lectures, aiming to make each no more than 25 minutes. The idea behind this: a longer video is harder to watch without losing concentration. If a student viewing a shorter video finds something hard to follow, it is reasonably easy to backtrack to play it again. Each video was about as much material as I would put into a 45 minute lecture; the option to replay made it reasonable to explain relatively rapidly.

Since streaming video was not available as part of the free data allocation, I ran Q&A sessions on BBB and recorded them, so those who relied on free data (particularly in 2020 when all the students were at home) could view them later.

As an indication of trust, in all three years, the class included me in their own WhatsApp group.

I adjusted to fit the scenario where students with poor connectivity struggled to keep up by being more flexible on deadlines and taking the best 3 out of 4 prac marks.

In 2021, with the class equipped with computers, it was possible to plan a rerun of the course reusing the lecture videos and to aim to do more complete pracs. However, as the start of term approached, the university decided to allow Computer Science students (and others doing lab subjects) back on campus.

2021 started out looking almost like the latter half of 2020, except that once students were allowed back on campus, we could rely on adequate connectivity. Only 50% of seats could be filled and our lecture venue was too small to allow this for the whole class, so we alternated which half of the class was physically present and the other half was supposed to follow online (I used BBB and recorded the session for those who missed it). Changing to in-person pracs partway through required an adjustment. The announcement was too late to change the third prac question, but the fourth one reverted to the pre-COVID model of tutorial-style questions to be answered before leaving the lab. While we could do full in-person pracs in the second half, we continued with the 50% split of the lecture venue. As with 2020, I was flexi-

ble on deadlines and took the best three out of four prac marks as students were still struggling more than in a normal year to keep up.

In addition to the lectures (50% in person), video lectures and pracs, I also ran BBB Q&A sessions.

Given the big differences between years, I do not over-analyze. Class demographics changed particularly between 2019 and 2020 and managing COVID was very different in each year. Class results were reasonably comparable, but assessment strategies also changed from year to year.

## 4 Reflections

Had the run of the course been intended as a research project, I would have kept a reflective diary. Unfortunately I cannot draw on detail from the students' WhatsApp group as that is not covered by ethics approval.

A course survey (using Google Forms – see the Appendix for the questions, excluding those not answered; the first page is shown in Fig. 3) was completed by 23 members of the class of 73, 31.5%. This is in line with expectations for a return rate [4] if no special steps are taken to encourage participation [19].

A self-administered anonymous online survey is limited by factors that may bias students towards or against participation. Generally selection bias of this type is more likely to skew positive, though the overall effect does not necessarily invalidate conclusions [6]. The possibility of such bias, however, is another reason not to over-interpret the results.

### Computer Architecture under Covid – Philip Machanick 2021

This form allows you to give feedback on my computer architecture course; it does not collect any information that identifies you and you can withdraw any time. There is no reward for taking part or penalty for not doing so or for withdrawing.

The results may be used in research or a promotion application. This research is approved by the Rhodes University ethics approval process (ethical clearance certificate number 2021-5127-6190).

\*Required

1. Do you give consent to use your response in research? \*

Mark only one oval.

- Yes  
 No

2. Is this your first time doing this course? \*

Mark only one oval.

- Yes Skip to question 9  
 No – repeating; did it in 2020 Skip to question 3  
 No – repeating from another year Skip to question 8

**Fig. 3.** First page of student survey is shown in printable format for compactness.



One bias I could detect: 8 students were repeating the class from 2020 but none of those responded on the survey (there is a question to check for this).

Students responded from 21 July 2021 to 9 September 2021; 19 out of 23 responses were received no later than 25 July. 9 September was the exam date, postponed from June because of COVID. The last two responses were the afternoon after the exam. Two responses are not insufficient to assess post-exam perceptions.

#### 4.1 Responses

**Constrained responses.** Most questions took the form of selection from options. I summarize here some of the most interesting responses.

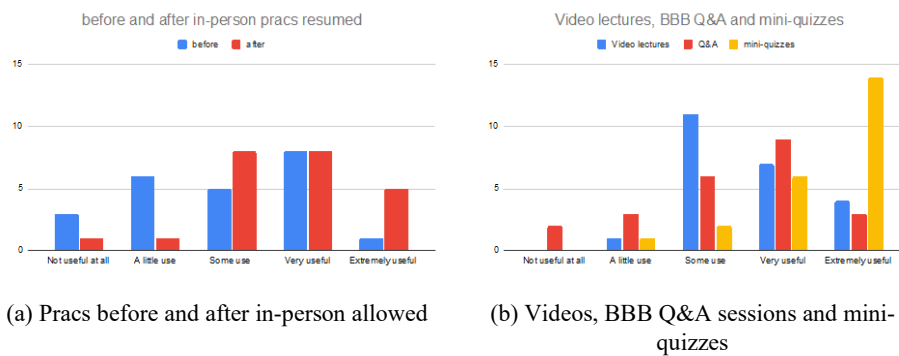


Fig. 4. Adjustments in presentation.

I graph responses on novel approaches introduced for COVID in Fig. 4. Response to the effectiveness of pracs before and after full in-person pracs were introduced (4a) show a clear bias towards full in-person pracs being better, which is no surprise. More interesting is the responses on how useful video lectures, BBB Q&A sessions were and mini-quizzes are. It is possible that responses were biased towards attitudes of those more inclined to fill in an online form, but it is a bit surprising that mini-quizzes are the intervention seen most positively. My previous experience is that formative assessments are mostly ignored (“Is it for marks?” requires a “Yes” to motivate students); possibly pitching them as preparation for other assessments helped.

Of these adjustments, Q&A sessions are the one least obviously useful outside of a pandemic situation as students are in principle free to consult their lecturer outside of lecture times. However, it is my experience that very few do so. Given how positively these online Q&A sessions were viewed by this class, it could be worth doing these in future: they differ from face-to-face consultations in being less personal and also benefit from being recorded for later review.

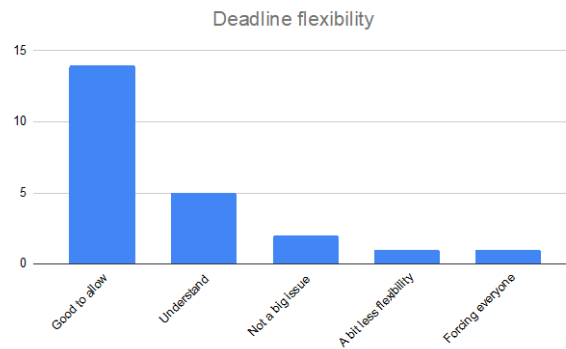
Flexibility on deadlines could be seen as COVID-specific. The question “How was timing of deadlines?” offered the following choices:

- Good to allow flexibility for those who needed more time

- Understand allowing flexibility for those who needed more time but did not suit me
- Not a big issue for me
- A bit less flexibility would be better

Forcing everyone to work to deadlines is best

Responses (Fig. 5) are heavily skewed towards supporting the concept; only one respondent was strongly opposed to flexibility. However, outside the COVID context, it is not clear that this sort of flexibility would be advantageous. The related idea of assessing pracs as best 3 out of 4 means that it is possible for class members to skip content, which is not necessarily helpful for preparation for other assessments or meeting course objectives.



**Fig. 5.** Responses on deadline flexibility.

**Written responses.** For responses to a write-in question, “I tried to get through material reasonably fast then allowed time to catch up. Please say a few words about how this did or did not work for you.”, I manually coded the responses as negative, neutral and positive. Of the 23 responses, 3 were negative, 5 were neutral and 14 positive. I scored a response as positive if it supported the approach unconditionally, neutral if it included positives and negatives and negative if it noted no positives.

The biggest source of unhappiness was going too fast; too much content was also mentioned as were inadequacies of tutoring or tutors.

At the end of the survey, I asked two open questions: “Overall positive comments” and “Overall negatives and areas for improvement”. 17 of the 23 positive comments focused on the way the course was presented or the lecturer. Comments included patience with students, understanding the difficulties of online learning and differences in individual circumstances. Compared with previous surveys, the level of interest and positivity is far stronger, including the desire to study the subject further.

Negatives covered a number of areas: whether there was too much content or it was too fast at the beginning, whether the video lectures could have more detail and

quality of tutoring. A complaint in common with previous years was the absence of extra tutoring that we call ADP (academic development programme) that is only offered to first-year students. ADP is supposed to be a catch-up programme for those with inadequate schooling and is never offered in second year.

On the whole the negative comments are not much different from a typical year.

Tutoring issues could have been separated more cleanly if this was asked more specifically in the survey. Negatives about tutoring were not coupled with complaints about the course or lecturer. The most serious complaint about the course was pacing – while some appreciated going fast at first then slowing down, others felt that there was too much content.

## 4.2 Course Results

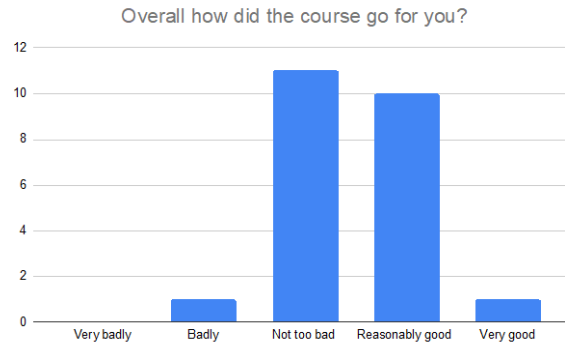
Table 1 compares the class mark across years. Since the architecture module is examined as part of a bigger course (CS201, the first semester of second year Computer Science), we do not have separate exam results on record for the module. The higher class mark in 2020 may reflect a dramatic cut in the practical content (students who were sent home could not be assumed to have a computer). 2019 was the last year before a big increase in NSFAS students and was not run under COVID conditions. 2021 and 2022 are the most similar in terms of cohort; the dip in results in 2021 reflects refining the approach under partial COVID conditions and the result in 2022 shows that the lessons learned paid off once COVID restrictions were eased, with a similar result to the 2019 class who were on average from a much strong socio-economic demographic.

## 4.3 Putting it all together

Overall student responses were far more positive than in any other survey I have run. There are various reasons for this. Being able to put other things aside for the course, many years of experience with education, a deliberate attempt at developing empathy with the class and the general desire at uncertain times to feel supported.

**Table 1.** Summary of Outcomes.

<b>Year</b>	<b>Class mark %</b>
2019	54.4
2020	57.2
2021	46.3
2022	54.4



**Fig. 6.** Overall response on the course.

The effect as seen by respondents is positive overall, as indicated in Fig. 6. To put this in context, all previous courses use relatively high-level languages like Java and Python; coding at machine level is quite a culture shock.

Some of the experience is not repeatable. The strange situation in 2021 of partially being under COVID restrictions and partly not is unique. Some accommodations made for the circumstances would not apply outside that scenario. Students may feel disconcerted by sudden changes in strategy in more “normal” times.

However there is something to learn from this experience about reading a class. The tricky part is formalising this. A strategy like agile development in which feedback is in formal stages would be difficult to implement without imposing extra work on students, a particularly problematic issue with those who are struggling and already time-poor.

Table 2 summarizes lessons from this course that could generalise. Creative strategies like mini-quizzes that provide formative assessment in small doses help to take the pulse of a class. Encouraging participation in formative assessment is tricky; promising that the results *could* be used as summative assessment works though those who want curriculum to be a rigid contract may be offended.

**Table 2.** Summary of Lessons.

<b>Approach</b>	<b>Assessment</b>
Listening to class	Good but complaints may not be representative
Small online quizzes	Great for feedback if they are done
Flexibility on deadlines	Good for weaker students
Dropping lowest assessment	Reduce need for weaker students to catch up
Keep class guessing what counts	Encourages participation in formative assessment
Don't treat teaching as a rigid contract	Rapid feedback cycles imply adaptation

## 5 Conclusions

2021 was a relatively successful year despite the complications of COVID and rapidly changing circumstances. At the start of the course, the class was on campus, but in-person lab sessions were not yet permitted. We did not have a lecture venue big enough for the entire class so we had to split the class into alternating in-person attendance with the rest of the class participating either live on BBB or able to watch the recording later. Halfway through the course, we switched to in-person pracs, with lectures remaining as alternating between in-person and online.

While the class was very diverse, the difficulties of 2020, when many went home without a computer or good Internet, were mitigated. Students being able to return to campus and hence good Internet, as well as having their own computer by that time.

Given all the variations from year to year, a comparison is difficult. In 2022, when I reused the same ideas, the overall average for CS201 was 64%, up from 59% in 2021. As illustrated in Table 1, the architecture class mark in 2022 was the same as the class mark for 2019, with a class with a much lower NSFAS component, illustrating that the lessons from the COVID years worked well with COVID-related obstacles removed.

An obvious question to ask is whether the things that worked well in 2021 translate to more “normal” times. When students are dealing with a difficult situation, empathy goes a long way. A former colleague quoted Anne Galloway from Victoria University of Wellington as saying: “Best advice I got when I entered academia: ‘We’re all smart. Distinguish yourself by being kind.’”<sup>1</sup> Is that such a bad thing to aim for?

In a situation where everyone else is struggling and you have the time on your hands to look after students better, it is not that difficult to distinguish yourself in this way. However, a bit of empathy for students can always work.

How about adapting agile ideas, and the social construction model?

Tactics I used like mini-quizzes as a way of keeping touch with how the class is doing can work. The trick is how you use them. If you see them as feedback points to adjust your strategy, you can sell them to the class as preparation for other assessments (like class tests).

Encouraging the class to engage with you on tactics also builds in the ideas of the social construction model. Rather than seeing education as filling a vacuum in students’ heads, the social construction model makes them active participants in learning.

It would be useful to rerun some of these ideas with a finer-grained survey to understand student attitudes as each idea is developed. However, it is important to remember that the more challenged a student is, the more time-poor they are. One approach could be to offer a programme like ADP in a class where you are attempting to understand better where the problems are, and use feedback from ADP to improve pedagogy. Online Q&A sessions, recorded for later review, can also be helpful.

<sup>1</sup> The original quote is from Twitter but ironically, considering the message, the author has been banned from Twitter.

An agile approach to blended learning can be a good fit to the social construction model.

The big challenge is to include novel strategies without creating an imposition on the students who most need improved pedagogy. Integrating feedback on the approach into additions to the course that aid students may take some imagination but as my 2021 experience shows, such strategies can produce worthwhile results.

The biggest single lesson? Empathy goes a long way. It is hard with students whose background is significantly different from your own but to the extent that you can put yourself in your students' shoes, you can be nimble in adapting to changing or challenging circumstances.

### **Ethics approval**

This research is approved by the Rhodes University ethics approval process (ethical clearance certificate number 2021-5127-6190).

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## Appendix: Student Survey Questions

1. Do you give consent to use your response in research (Yes | No)?
2. Is this your first time doing this course? (Yes | No – repeating; did it in 2020 | No – repeating from another year)?

*Questions about repeating from 2020 and previous years are skipped as no one answered them; students would not see these unless they said that they were repeats from previous years.*

9. How was the pace of the course? (Very slow | Slow | About right | A bit fast)
10. I tried to get through material reasonably fast then allowed time to catch up. Please say a few words about how this did or did not work for you. (*written answer*)
11. How was timing of deadlines? (Good to allow flexibility for those who needed more time | Understand allowing flexibility for those who needed more time but did not suit me | Not a big issue for me | A bit less flexibility would be better | Forcing everyone to work to deadlines is best)

12. How useful were video lectures? (Not useful at all | A little use | Some use | Very useful | Extremely useful)
13. How useful were Q&A sessions on Big Blue Button? (Not useful at all | A little use | Some use | Very useful | Extremely useful)
14. How useful were pracs BEFORE we allowed the in-person option? (Not useful at all | A little use | Some use | Very useful | Extremely useful)
15. How useful were pracs AFTER we allowed the in-person option? (Not useful at all | A little use | Some use | Very useful | Extremely useful)
16. How useful were mini-quizzes for encouraging learning? (Not useful at all | A little use | Some use | Very useful | Extremely useful)
17. How useful was the class test for encouraging learning? (Not useful at all | A little use | Some use | Very useful | Extremely useful)
18. How much do you believe you have learnt about MIPS assembly programming? (Nothing | A little | Some | Reasonably good amount | A lot)
19. How much do you believe you have learnt about logic (circuits and proofs)? (Nothing | A little | Some | Reasonably good amount | A lot)
20. How much do you believe you have learnt about logic (circuits and proofs)? (Nothing | A little | Some | Reasonably good amount | A lot)
21. Does humour from a lecturer help with interest in the course? (Nothing | A little | Some | Reasonably good amount | A lot)
22. How well do you think I understood your problems in working remotely and tried to work around them? (Nothing | A little | Some | Reasonably good amount | A lot)
23. How well did this course motivate you to learn more? (Not a subject I like at all | Not my favourite subject | This is enough | I would like to learn more | I would like to do an advanced course or research in the area)
24. How well did this course help with other courses? (Nothing applies to other courses | A little applies to other courses | I see where it applies but it did not help a lot with understanding other courses | It helps with some parts of other courses | I helped me understand useful parts of other courses)
25. Overall how did the course go for you? (Very badly | Badly | Not too bad | Reasonably good | Very good)
26. Overall positive comments (*long written answer*)
27. Overall negatives and areas for improvement (*long written answer*)