Encouraging Student Attendance and Engagement in Lectures & Workshops in the Pre- and Post-Covid World

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Abstract: In the post-Covid era, second-year chemistry lectures are fully flipped with all content being online. All the live lecture sessions are used for group work and are fully interactive. Students have agency in the lectures by directing what is taught in these student-led sessions. Students find the sessions very engaging and respond positively. In particular they value the agency they are given. In a second study that took place pre-Covid, workshops are changed from 1-hour to 2-hour sessions but with half the number and a much simplified timetable for students. Group work and peer-assessment with marking criteria help make the sessions engaging for students and more useful. The increased level of attendance from less than 20% to more than 70% (in the best case) is evidence of increased value to the students and success of the new format.

Keywords: Active learning · Attendance · Flipped · Group work · Peer-2-peer · Workshop

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1. Attendance at Lectures

A common moan among lecturers is that students are bad at attending lectures. Many causes are suggested. Even before the Covid pandemic, the recording of lectures was becoming standard in universities which some staff blamed for poor attendance. If anything, this is worse than ever in the post-Covid world as many rich resources, such as specially-recorded videos, were prepared and are still available for students to watch instead of attending lectures.

1.1 *Carrot or Stick*

Two common ways to try to achieve better attendance are the carrot or the stick. The stick being some sort of punishment for not attending up to and including failure of the unit concerned. This was used in our own department at one time for lab attendance. Students might be able to pass the unit purely on their exam performance, but without satisfactory laboratory attendance this pass would be withheld. Other sticks, or backward moves, that might be heard in staff coffee rooms include taking down online videos that have been prepared for the students or ending the practice of videoing lectures altogether so that students are forced to turn up.

Then there is the carrot. Faced with poor attendance the firm – if sometimes flawed – conviction that 'students will only do something if there are marks for it' many staff feel compelled to introduce 'marks for attendance'. This is often accompanied by justifications such as 'the marks only count for a small amount' and 'they have to attend if they are to learn anything'. What is more, marks for attendance can be welcomed by the students not just for the marks themselves but for the behaviour it forces upon them. Everyone's a winner. Or are they?

For many lecturers, perhaps especially in Higher Education, that marks should be given to students merely for attending is an anathema. It is marks for nothing – 'outrageous'. Furthermore, attendance says nothing about their engagement once they are present.

And it's worse even than that. Consider the bad lecturer. The one who reads out, verbatim, the bullet points on the slide while looking at the screen rather than the audience. The same bullet points are on the handout and online. Why would anyone attend such a lecture? With sufficient marks awarded for attending it might be possible to achieve a full house at these dreadful lectures but what would this have achieved educationally? The students learn nothing and it really is a waste of their time. The only beneficiary is the lecturer who can congratulate himself or herself that there is now full attendance with the added bonus that they did not need to up their game or put more effort into their teaching to get that full attendance!

While we would hope that most lecture experiences would be better than with the lecturer above, forcing attendance does risk sweeping poor teaching under the carpet. Mandatory attendance may well remain essential for some activities such as practical teaching but in an ideal world we would use neither a carrot nor a stick as the students would all turn up because they want to. Students turning up because they want to is a far better measure of the perceived education quality than those who turn up because they are forced to. And there is the rub, how do we make them want to turn up?

1.2 *Adding Value*

There must be some added value to turning up to lectures. In a world where everything is recorded, the value must be in the being there in person, live, at the time. Better still it should mean getting involved.[1,2] Watching it later is just not the same. If being in the lecture theatre means that you contribute to the experience

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and if being in the lecture theatre means you can have some agency in the direction the learning takes then perhaps it might be worth going? In our case, whatever we did had to work with a class of around 160 students. The changes described took place in a second-year undergraduate class studying organic chemistry. The lectures in question started several weeks into term.

1.3 *Flipping the Lectures*

All the lecture material was delivered online in asynchronous sessions. This took the form of narrated videos. The videos were all recorded specially for remote teaching during the Covid era and were high quality in both screen resolution and audio. The videos were typically cut into segments of about 10 minutes in length. In these videos, chemistry and reaction mechanisms were drawn freehand on an iPad or drawn into handouts that were partly populated on the iPad. The online material defined the course content and no new content was to be delivered in the live sessions. The live 'lecture' sessions took place in a traditional racked lecture theatre that has a capacity of 200.

1.4 *That's FULLY Flipped Lectures*

It was clear this year that student attitudes towards flipped lectures have changed in our student body between pre- and post-Covid. In the years before Covid, some students did not like an unfamiliar flipped format and, even in courses that only partially used flipped content,[3] questioned why they could not just have the 'normal' lectures they were used to. When, in 2022, they were presented with an entirely flipped lecture course it did not seem to perturb them in the least and they were quite receptive to different teaching styles that might come their way.

By fully flipping the lectures it meant that the lecturer was completely liberated from course content. No specific chemistry had to be covered in the live lectures. This liberation allowed time for discussion of anything that might arise and allows for fully student-directed teaching.

2. Group Work – 'Personal' Engagement without the Fear

Working in groups in a lecture theatre allows for several things –

- It allows interaction with the entire class *via* the group structure rather than just a handful of vocal individuals.
- The lecturer can learn the names of all the groups (when learning the names of every student would not be possible).[4] There is the opportunity to build rapport with the class.[5]
- We know speaking out in a large class is intimidating for students. Being part of a group reduces this fear and because the names used are the names of the group there is no fear for a student being called out individually by name.
- Often the group has a chance to discuss their ideas before speaking out thus allowing the group a chance to validate their ideas with each other first.

This is, of course, in addition to all the benefits that active learning is known to achieve.

2.1 *Grouping the Students*

When putting students into groups for teaching it is generally thought best to do this randomly or for the instructor to arrange the groups rather than letting the students decide their own groups.[6,7] In practice this was done by dividing the number of students in the class by five and then using the resulting number repeatedly to assign the groups. For instance, for one section of the lecture theatre this resulting number might be 12. Pointing at students in turn along the row and counting from one to 12 and then starting again means that every student has a number

from one to 12 and all those with the same number can arrange themselves into groups.

There is naturally quite a chaotic scene as the students arrange themselves but this is also quite good at breaking the ice in the session. The first task the newly formed groups were asked to do was to come up with a group name for themselves. This activity is an icebreaker for the students. Interestingly many students came up with names for their group that was a wordplay on the lecturer's own name!

2.2 *Format of Lecture Activities*

Students discuss things in groups and think about things individually. Answers, both correct and incorrect, are explored on the blackboard with more discussion invited. When students make suggestions, other students are invited to comment or move the argument along rather than the lecturer saying yes or no.

It is sometimes suggested that active learning is more suited to extroverts than introverts. Going directly to a discussion, particularly in the early stages, could lead to confident students speaking up before the others have marshalled their thoughts. In order to minimise this, group activities often started with an individual component before the collaborative group aspect. Thus, for a Menti quiz, students might be asked to vote individually before then discussing it in their groups and voting again. Here are some ideas for activities –

A Menti Quiz on Mechanism

Four different mechanisms are shown on paper *via* a visualiser. Students are asked to vote on Menti as to which they think is the correct mechanism (either in groups or individually first). Once this is done each potential mechanism is looked at in turn and groups asked to comment on what they liked or what they didn't like about the mechanism. Discussion ensues.

What's the Problem?

Novice thinkers have a tendency to jump for an answer before really understanding the problem.[8] Trying to understand what a problem really is before trying to answer it is explored in this example. A difficult question from a previous exam paper is shown. Students are asked to discuss in their groups something they notice or a problem they can see with the reaction. The groups are asked for their thoughts which are collected on the board at the front of the class. 'Does thinking about the problem this way get us closer to an answer?' Students are asked to comment on others' comments as we work towards the answer.

What Shall We Do Next Time?

This has to be done in the lecture to be effective. Asking the students to send an e-mail later on what they want to do next time is likely to get no responses. Setting up a Menti page in the lecture at the time will collect lots of responses.

The students may want to do something that is completely outside of the sphere of the course. This happened at the end of the first session when almost all the students said they wanted to do 'Orbitals' in the next lecture. The programme as a whole is using orbitals to explain reactivity and this is clearly something the students struggle with. This particular set of lectures, however, did not cover orbitals so it was the perfect example of student-directed teaching. That is what they wanted to do and so in the next session an interactive hour taking them from hydrogen atoms, *via* three-orbital systems and arriving at enolates allowed for orbitals to be worked into the course material and for the students to learn what they wanted to learn.

What Shall We Do Today?

This was done in the last session. Students made suggestions on Menti for what they would like to cover. With no time to pre-

pare, teaching like this may not suit every lecturer but not looking at notes and instead looking at the audience and engaging with them directly as the topic is explored led to a much more dynamic and engaging style than is usual and proved more enjoyable for lecturer and students alike. The students themselves have decided what they are doing today and by this stage are more used to speaking up with questions and comments while for the lecturer everything is fresh rather than the same old stuff that has been done exactly the same way for 20 years.

3. How Did it Go?

While there was not an increase in the number of students attending the lectures during their operation of a few weeks, there was not a decrease either. Starting this way from the start of the year would be an interesting experiment to study attrition of attendance. One student did not want to work in a group and preferred to work on her own. The issue was not forced and this student was allowed to work in 'a group of one'. As it was, this student contributed greatly to the discussion and was perfectly confident to speak up.

3.1 *Unintended Consequences*

Naturally there was lots more of students talking in these sessions than in the traditional format of lectures. Comments were invited from groups and groups who had been quiet for a while were called out by group name. It seems that all this talking by students 'broke the ice' as speaking up became the norm and it was good to see some students started to have the confidence to speak up as *individuals* rather than just when they were representing their group.

3.2 *What Did the Students Think?*

Students were asked in the lecture what they thought of the session and could comment anonymously. Firstly they were asked 'How did you find this style of delivery?' and this is what they thought –

Amazing!	20%
Pretty Good	54.5%
'Meh'	18%
Not Great for Me	6%
Just Awful	1.5%

When asked 'What do you think worked well about the sessions?' there were many comments that focused on the choice – 'I liked that we could pick our own topics', 'We had a choice of what we wanted to learn', 'asking us what we wanted to cover on Menti' and 'We chose what we covered. Even if it wasn't really to do with Paul's lectures'. Other positive comments related to how engaged they were and included – 'Much more interesting than standard lectures – was nice to have something a bit different. Sort of like a big group workshop', 'Better than traditional lectures where I get bored and fall asleep' and 'Different than most other lectures – good at keeping audience engaged'.

The negative comments were largely focused on the group aspect – 'Random grouping bit of a slow start. Awkward to be wrong', 'Would prefer if we could choose groups' and 'I wasn't likely to communicate with my group outside of class'.

3.3 *Next Time*

The random grouping was not popular with students. Given that there was no activity between the lectures (which might be up to two weeks) to reinforce the groups it became evident that the groups they had been put in did not really contribute very much. In between lectures they would talk to their original friends and then want to sit with their friends in lectures. There was some erosion of the groups between sessions. Next time students will

be allowed to arrange their own groups, offered the option to have a group of one (but they still need a group name!) and it might be fun to introduce some element of competition such as a prize for the group that contributed the most.

All in all it seems that this style was much more enjoyable for both the lecturer and students with students paying attention throughout. It's a format that works with and enhances the current IT set-up of recorded lectures rather than playing second fiddle to it.

4. Attendance at Workshops

As with lectures, attendance at workshops can be poor. Workshops were typically run with 20 students and two staff or sometimes up to 30 students with three staff. Students work through problems in the hour workshop and are assisted by staff. A very similar format is employed with both second-year chemistry students and third-year chemistry students. Curiously, attendance at the second-year workshops is very much better than the third-year workshops. In both cases the answers to the week's questions were released online at the end of the week.

The third-year workshops, however, did have some issues of their own. Third-year BSc students, who will all have final year projects, would have to stop working in the laboratory to come to an hour workshop. This might not be terribly convenient. The timetable was also rather inconsistent. Sometimes there were two workshops a week, sometimes one, or three or even none at all. Even the times and locations could vary week to week which compounded the problems of a very uneven workload.

The average attendance at workshops by week 5 was 40% and by the end of the year this was 20%. As attendance dwindled so did the life in the workshops. The students that did go did not even talk to each other. I discovered from students that there was an unwritten 'two chair rule' in which you left two vacant chairs between you and your neighbour to avoid talking. Even though staff may have the same students all year, it was not unusual for them not know any of their names. This clearly did not help the students feel valued or welcome.

4.1 *Carrot or Stick Again – They Have to Attend if They Are to Learn Anything – Don't They?*

As usual, the carrot and stick arguments from staff rear their heads. Either we should give the students marks for attending, or we should mark some of their work (summatively) for every single workshop to 'make them take it seriously'. There was even the suggestion that perhaps we should cancel workshops due to lack of interest to save everybody time.

We sought to illustrate to the students what the staff imagined to be axiomatic – that 'They have to attend if they are to learn anything' or perhaps 'If they don't attend they won't learn anything'. At the time, an electronic monitoring system meant we knew exactly which students had turned up to the workshops. We thought it would be interesting to plot exam results against the number of workshops missed. Our assumption was that a strong correlation would emerge that could be used to show students the importance of turning up. What emerged however was nothing of the kind! In fact it was very clear that there was no correlation between the two at all. A scatterplot with 'marks' on one axis and 'absences' on the other showed nothing remotely like a line or a wedge but just a random collection of spots and an R^2 value of just 0.02. The workshops were, on average it seemed, valueless. The students who chose not to come and direct their efforts to laboratory work may well have been making a *sensible* strategic decision!

Using a carrot or a stick to make them attend our apparently useless workshops would clearly not lead to a happy outcome. It would be far better to improve the value of the workshops and watch the students vote with their feet. Let that be our measure of success.

4.2 *Adding Value (and Removing Impediments)*

All the above problems needed to be addressed and we want the students to attend workshops because they were lively and fun and because they feel they learn and connect with staff.[4,5] Teamwork is a great way to invigorate teaching[7,9,10] and peer-2-peer learning can be enjoyed compared to a more passive approach.[3]

The idea of a new format had several strands. For a start we would i) start using place names (or 'name tents') so staff, as well as students, got to know student names. While this was an obvious good idea to most staff it is also backed up by compelling research from a large-enrollment science classroom.[11] We would ii) rearrange the furniture from rows of tables with chairs all facing on end of the room to groups of four tables so the students could actually sit round them and talk to each other. We would iii) change from 1hr workshops to half the number of 2hr workshops. This means we can do a greater range of activities, iv) they are more worth coming in for and a more efficient use of time and v) it brings the total number to workshops to less than the number of weeks in the year so that we can timetable one workshop a week every week in the same place. Before the workshop itself there is pre-work for the students to do. For the first half of the workshop the students work through questions as a team in groups of four or five. In the second half they attempt an exam-style question and prepare a single team answer.

Peer-discussion is encouraged and baked into the work. For example, sometimes the pre-work has different things for different students to do and they have to bring it all together in the workshop. The evidence from the science classroom on the value of peer discussion is compelling.[12]

The team answers are then marked by another team using the marking criteria available and they feedback to each other. The marking criteria are more than a 'model answer' and attempt to give insight into what the staff member is looking for.

4.3 *Enacting Change*

Persuading staff to change how things are done can require effort – particularly when something has not been working perfectly well for years! A powerfully persuasive technique is doing a pilot study. After all, it is difficult for scientists to resist 'an experiment' and if it works, and particularly if the students like it, then you are on to a winner. A pilot study of the new format was arranged and proved to be very popular with students with 90% wanting to move to the new 2hr format and, unsurprisingly, 93% agreeing or strongly agreeing with the statement 'Providing feedback and the marking criteria after the exam-type question will be helpful'. The School of Chemistry thus moved to the new format and a unified timetable was agreed. Having one workshop a week, every week in the same place at the same time can only help students get into a routine and is a world away from what we had before.

4.4 *The First Workshop*

To encourage group identity and to serve as an ice breaker for a new group of students, their very first activity is for the group to give itself a name and draw up a social contract for their behaviour within the group. The students really took to this and team names like the 'Comical Flasks' or the 'Element of surprise' emerged. The students were given a big piece of paper and pens and they had to write down their commitments. The usual things emerged – 'listening to each other', 'being respectful' and 'turning up' for example. They then all signed this and took a photo. A strong sense of community can emerge from team-based learning – videos from teambasedlearning.org document students encouraging each other with comments like, 'You have such great ideas I wish you'd come to class more'.[9] This is a very different atmosphere from that unwritten 'two chair rule'.

Students embraced the idea of feeding back to each other in groups live in the session. This comment from one student group was particularly striking, 'You were asked to draw a diagram but instead you wrote an essay so we couldn't give you any marks', and was, probably, insightful to both parties.

4.5 *Measures of Success*

One measure of success for the workshops would be attendance because if students value something they will attend. The class is divided into several workshops thus there will be six or seven at different times of day. A final-year project student conducted a study into student attendance depending on the time of day. While Covid curtailed a full study, most of the workshops had run by this time. With the exception of the 10 am slot (which has unreliable data because of some timetable rearrangements) the orange triangles (Fig. 1) show the markedly improved attendance in the 2019/20 year group (and with the 2 pm slot in particular) over the previous two years. With the new rationalised workshop timetable there are only six time slots rather than seven.
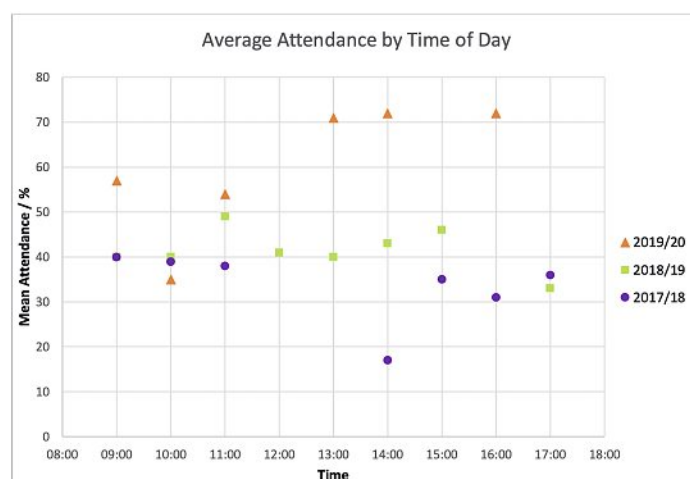

Fig. 1. Average Workshop attendance by time of day.

Before the pilot the NSS score for 'The marking criteria are clear in advance' had been 53% (and had been a tenaciously low score for years). After the workshops it was 75%. There are always lots of variables with these things but since we had done nothing else to improve marking criteria this could be put down, at least partly, to the workshops.

There are other outcomes that are difficult to quantify. I came across a group of students in the cafeteria talking animatedly. They were one of my workshop groups and were deciding who would do what for the prework. This sort of student behaviour is not something we would typically see. What also is not apparent in the numbers though is how much more fun and lively the workshops were and the dramatic impact of the place names – several times outside of the workshop I was able to address a student by name as a result of the name tents.

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