

# Surface Hub Teaching Session 26<sup>th</sup> July 2018

---

This document presents a description of a teaching session delivered between two sites by Surface Hub on 26/07/18. It aims to provide an analysis of this configuration and its effectiveness, particularly in terms of involving students in active participation during the session. This is the long version of a forthcoming shorter document that will form part of a series of examples of good practice in the use of the Surface Hub.

Author: Julian Cook

1	Introduction .....	1
2	Setup, participants and seating .....	2
3	Session structure.....	2
4	Interaction.....	3
4.1	Overall patterns and variations .....	3
4.2	Scaffolding and support for student thinking.....	6
5	Participation.....	8
6	Balance of interaction between the Far End and the Near End .....	9
6.1	How the NE tutor and FE TA negotiated which one of them would speak.....	9
6.2	Possible effects of the medium and differences in the interaction between students and the FE TA compared to that with NE tutor .....	11
7	Use of audio/visual media .....	12
8	Picture and Sound.....	13
9	Some observations and conclusions.....	13
9.1	Team teaching across sites .....	13
9.2	Interaction and participation .....	13
9.3	Task design.....	14
9.4	Use of media .....	14
10	Some recommendations and conclusions following this session.....	15

## 1 Introduction

This is an account of a teaching session delivered between two sites using a Microsoft Surface Hub on July 26<sup>th</sup>, 2018. The near end (where the lead tutor was located) was at the Bristol Royal Infirmary Hospital in Bristol, and the far end was at the Department of Physiology, University of Bristol. Observation of the session was from a video recording made using a laptop joined to the video conference.

This account will focus on the format of the session, the patterns of interaction between students and teachers, the ways in which the 2 teachers worked together, ways in which the Surface Hub and how it was used may have influenced this. It presents analysis of selected extracts from the session.

## 2 Setup, participants and seating

The near end was a classroom equipped with a Surface Hub and chairs arranged around the back of the room in a horse-shoe shape. These were occupied by 12 2<sup>nd</sup> year students. The tutor at the near end (to be referred to as *NE tutor*) was a Clinical Teaching Fellow based at South Bristol Clinical Academy. He stood and sometimes sat in front of the Surface Hub, to one side.

The far end was the University of Bristol, Department of Physiology's simulation centre, which is a classroom containing the Surface Hub and some chairs stacked at the back of the room. Sitting two or three feet away, and at times standing in front of the Surface Hub was a Teaching Associate of the Department of Physiology (to be referred to as *FE TA*), who is a doctor with specialist expertise in Physiology.

Next to her was a clinical simulation mannequin. The software for this was controlled from a laptop by a technician seated at the back of the room, in the picture. There were also two other teaching colleagues present, and one medical student, all sitting out of the picture.

## 3 Session structure

This was a small group teaching session on interpreting Arterial Blood Gases (ABGs). It aimed to help students to integrate background scientific knowledge with clinical skills.

The purpose of using the Surface Hub was to enable the session to include teaching from an expert in the background science located at a separate geographical location.

The overall duration of the session was just over 90 minutes. At the beginning the NE tutor introduced the topic and invited the FE TA to introduce herself. The FE TA explained her role and also introduced the colleagues who were present at her end. The NE tutor then emphasized the importance of her contribution (that she would bring in sound physiology). He then invited the 12 students to introduce themselves (just by saying their first name). As they did this he repeated each one, and then he checked that the FE TA had caught all these. [3 minutes]

The NE tutor then gave an overview of the content of the session by reading the learning objectives from a PowerPoint slide. He checked the students' existing experience of interpreting ABGs.

He then reviewed the concept of pH and how it is calculated, and students practiced doing this with several examples. After this the FE TA took over and looked at the importance of Acid/Base levels in the body and the basic principles of how this operates.

The FE TA continued and presented ways in which the body regulates pH. [12 minutes]

The NE tutor then presented 3 cases and helped the students to interpret what was going on with the patient based on their ABG and on a photograph. With each case, scaffolding and support provided by the tutor was reduced. The FE TA interjected at times to add further detail about the physiology involved in each case. [40 minutes]

There was then a 10 minute break in the videoconference while the staff at the simulation centre prepared the mannequin and software. After this there was a simulation task led by the FE TA in which real time data was shown to the students including pH, respiratory rate, paO<sub>2</sub>, PaCO<sub>2</sub> and SpO<sub>2</sub>. Students were invited to work out what was going on with this patient and what to do to resolve it. They could then see the results of their choices reflected in the simulator. [10 minutes]

The session concluded with a chance for students to ask any questions arising from the material. [5 minutes]

## 4 Interaction

Almost all the interaction during the session broadly took the form either of the teacher presenting supported by visual material, or of Socratic dialogue where the teacher asked questions addressed to the whole group and students self-selected to respond. Most of the session followed the latter format, with some variations which will be described below.

The pattern of interaction was therefore all teacher-student or student-teacher, with some brief moments of teacher-teacher. There was no structured student-student interaction although there may have been some sotto voce comments exchanged that were not audible on the recording.

### 4.1 Overall patterns and variations

#### 4.1.1 Classic IRF

The most common pattern of interaction in this session was a classic Initiation, Response, Feedback (IRF) sequence. This is where the tutor asks a question, a student responds, the tutor gives feedback on the student's response, and then often asks a follow up question, for example:

##### Extract 1

NE tutor: *So first of all - what is pH? – so this idea of pH - does anybody know what that actually is?*

Student J: *[inaudible]*

NE tutor: *Perfect, yes exactly that – it's the measure of hydrogen ions in the blood – and do you know what the actual equation for pH is?*

Student A: *minus log or something like that?*

NE tutor: *Exactly that, perfect – so it's the...pH is the minus log of the concentration of hydrogen ions*

#### 4.1.2 Didactic explanations

There are also some sequences where the tutor explains in a more didactic lecture style, in this example checking student understanding with a closed question, for example:

##### Extract 2

NE tutor: *so what's actually happening there, is that the concentration of these hydrogen ions are increasing, so in this case you can actually see that the concentration of hydrogen ions are actually doubling, so although this little jump from 7.1 to 7.4 – (I mean) from 7.4 to 7.1 seems quite little, in reality what's happened is there's actually a very large change in the absolute concentration of hydrogen ions, and that's because of that issue with the log – do you appreciate that? Yeah? Ok, good.*

#### 4.1.3 IRF variation – student questions

Another pattern was during the cases, where the tutor invited the students to suggest questions to ask the patient, for example:

##### Extract 3

NE tutor: *We've got a 72 year-old man who comes in short of breath. What specific questions would you ask him initially?*

Student B: *When did the shortness of breath start?*

NE tutor: *Good, when did it start?* [the tutor evaluates the question and repeats it]

Student A: *is it on exertion and...*

NE tutor: *Ok, yes so he has had shortness of breath for a long time but it's now suddenly got worse in the last day*

[the tutor does not respond to the 2<sup>nd</sup> question, presumably to indicate to students that he will answer each question first, before they should suggest the next one]

Student A: *What was he doing in the last day?*

NE tutor: *Erm nothing really just minding his own business, but it's just come on really quite bad – anything else?*

Student B: *Is there anything that makes it feel better?*

NE tutor: *Erm he normally has some puffers but they're not making him feel better – good question*

Student B: *Does he have any other medical conditions?*

NE tutor: *He does, he's got some kind of problem with his lungs, but he can't really remember what it is*

[So far all the questions have come from one side of the room so the tutor says: ]

NE tutor: *I'm going to move over here now*

[and he turns to face the other side of the room.]

Student J [on the other side of the room]: *Is he a smoker?*

NE tutor: *He is a smoker yeah*

#### 4.1.4 Individual student task

In this activity a nominated student carries out a task in front of the group with support from the tutor, for example:

##### Extract 4

NE tutor: *Good so here's our ABG – I want someone to volunteer – just have a read of it – out loud to the group – and let us know what you think – is someone happy to do that? .....thank you student E [uses name] go ahead – take us through it*

Student E: *His pH is quite low erm his oxygen level .. that's his PaO<sub>2</sub> does look very low*

NE tutor: [writing onto the Surface Hub] *Good – very low – nice*

Student E: *His PaCO<sub>2</sub> is high, sats are very low .... [inaudible] ...bicarb high – calcium normal – glucose fairly high*

[.....]

NE tutor: *So [Student E by name] what have we got here?*

Student E: *He has a negative base excess so he is acidotic*

NE tutor: *Good and you can also tell he's acidotic because his pH is low – good so he's acidotic – what kind of acidosis does he have?*

Student E: *so his bicarb is high and also his PaCo<sub>2</sub> and we know he's a respiratory patient so*

NE tutor: *Good so you've got to use the clinical context*

Student E: *So respiratory acidosis?*

NE tutor: *Good so the clinical context is that he's got some respiratory problems he's got a respiratory acidosis, but how can you tell from the blood gas itself?*

Student E: *So respiratory acidosis means that he is acidotic because he has got too much carbon dioxide in his lungs so that's why that's high – so he is probably breathing fast to get that out*

By the end of the sequence NE tutor's questions had guided the student to make quite detailed inferences about the patient's physiological processes. NE tutor's last question was arguably aimed at the analysis level of Bloom's taxonomy.

## 4.2 Scaffolding and support for student thinking

The sub-structure of each section often involved beginning with simple factual recall and progressing to more in depth thinking and analysis. Both the tutors provided scaffolding to facilitate this.

In the first example we see how the NE tutor asks a question (whether kidney compensation is quick or takes a long time) that draws students' attention to a feature that allows them to make their own deduction.

### Extract 5

NE tutor: *His bicarb is high to try and compensate for that acidosis – now how - what is compensating - what is compensating for it?*

Student E: *His kidney*

NE tutor: *His kidney good – and is that something that's quick or is that something that takes a long time?*

Student E: *No so you know it's been going on for a while*

NE tutor: *Super so you know his acidosis been going on for a while and because he's got COPD he's probably always had a degree of high CO<sub>2</sub> in his blood*

Similarly, in the following example the FE tutor draws students' attention to relevant information (that the PaCO<sub>2</sub> is low) that allowed them to deduce the answer to her original question. The FE TA's question was initially met with no response – although she only waited a very short time – but she then prompted and guided the students towards the answer by providing more scaffolding and this immediately elicited a response from several of the students. (Note however that although both the questions require more than just knowledge from the students, but are at least at Bloom's level of Understanding, they are both quite closed questions because the students only had to choose from a very limited range of options – see later discussion in Section 4.4.2)

## Extract 6

FE TA: *So his pH is 7.24 at the moment so that's quite acidotic – and that's what you'd expect isn't it? - what kind of acidosis is that?*

[silence]

FE TA: *given his PaO<sub>2</sub> is incredibly low*

Students [several all at once]: *Respiratory*

FE TA: *Very good – and his PaCO<sub>2</sub> is very high – so what kind of respiratory failure is he in?*

Students [several all at once]: *Type 2?*

FE TA: *Type 2 very good - so it's ventilator failure which we know because he wasn't breathing*

In the following extract we see how the NE tutor's question [*What do you think could be depressing someone's resp rate that low?*] provided the scaffolding that enabled the student to deduce the solution to the problem, again by focusing their attention to the most pertinent feature.

## Extract 7

FE TA: *What would you like me to do now?*

Student F: *Listen to his chest*

FE TA: *Yeah sure [...] - and I listen to his chest*

[there is silence – were we supposed to hear breathing sounds?]

Student F: *You might want to go back and check his airways*

[laughter]

FE TA: *So his chest sounds clear to me [FE TA is laughing as she says this] but he's breathing slowly – was that another suggestion from someone?*

Student F: *I was just saying his respiratory rate is quite low – I'm not sure about that value but I'd be quite concerned –*

FE TA: *Yeah – so what else might you do at this point I think you said recheck the airway which is great so [FE TA's assistant – by name] what do you reckon about the airway?*

[FE TA's assistant leans towards the mannequin]

FE TA's assistant: *Ivan – can you hear me?*

[a sound simulating the patient's response is played by the simulator]

FE TA: *So he's still making some noise – he's quite drowsy*

Student F: *Then perhaps insert an adjunct*

FE TA: *An adjunct yep – we don't actually have any, but great idea - if we had one we'd certainly put one in – he may not tolerate it, he may spit it out if it was oropharyngeal – what else could you use?*

Student D: *Nasopharyngeal?*

FE TA: *Nasopharyngeal – yeah excellent – ok any other ideas?*

Student D: *Is he asthmatic?*

FE TA: *Yeah? I've looked at his notes – he's got no history of asthma that we know of – good thinking though*

NE tutor: *What do you think could be depressing someone's resp rate that low?*

Student: *Morphine – has he injected himself with heroin or something?*

FE TA: *He hasn't but he has had an operation on his bowel*

Student: *So check how much morphine has been given*

FE TA: *Yeah ok great*

[It turns out that the patient had been given high doses of morphine and fentanyl, so the solution was to give naloxone, an antidote to morphine overdose. The NE tutor's question seems to have been what enabled the students to 'solve' this simulation]

## 5 Participation

It was difficult to ascertain from the recording which students were talking and therefore not easy to tell how many of the students participated actively during the session. However, the impression is that most of the students answered some questions but that there were a small number (perhaps 3 or 4) who answered more than others. This is perhaps fairly typical of a small group teaching session presented in this way.

There were times when tutor questions, particularly those from the far end, were met with silence and required further prompting from the tutor (see for example extract 6 above). There were other questions where several (or possibly all) of the students answered in unison (also see extract 6 above).

The NE tutor was able to manage participation by moving his position to encourage contributions from all parts of the room (see extract 3 above). This tactic was obviously not available to the FE TA.

## 6 Balance of interaction between the Far End and the Near End

### 6.1 How the NE tutor and FE TA negotiated which one of them would speak

This session was different from other Surface Hub sessions we have observed in that it involved 2 teachers at 2 different sites working in close concert with each other. This section looks at how this was managed between the 2 tutors, at how they negotiated in real time how to pace the session, and which of them would answer questions etc.

Sometimes the hand over between tutors was in response to a student question, for example:

#### Extract 8

Student F: *Why would that be useful as well as the pH? Surely if you had the pH then you'd know...(..)*

NE tutor: *That's a very good point – [FE TA's name] – is it any more useful than a pH?*

FE TA: *It is useful – it's partly historical – it's how they'd work out the pH using litmus paper they'd actually try and get it back to neutral – but it's also useful in that it tells you something about compensation.....*

Sometimes the NE tutor introduced a concept but then handed over to the FE TA for more detailed explanation, for example:

#### Extract 9

NE tutor: *Now there's this high potassium here as well – now anybody have any ideas of why that occurs?*

Student A: *[inaudible]*

NE tutor: *Yeah exactly – exactly that balance between hydrogen ions and potassium – FE TA [uses name] do you want to tell us a bit more about the hydrogen ions? ..*

FE TA: *Yeah – So I don't know if you've got a diagram of this – probably not – ok so as I said already, potassium and hydrogen are very closely linked to each other – so what's your main intracellular cation so your main positive ion inside the cell? Anyone know?*

Sometimes the FE TA interjected spontaneously to expand or explain in a different way, for example:

#### Extract 10

NE tutor: *Do you know what the hormone is that we have to compensate if we increase our amount of haemoglobin?*

Student J: *EPO*

NE tutor: *EPO superb, brilliant well done – great – so.....*

FE TA: *Do you know what it's called having a high Hb because of low oxygen? Actually, for any reason? [no answer - waits 2 seconds] – have you come across polycythaemia? No?*

NE tutor: *polycythaemia?*

Student: *No*

NE tutor: *ok you've come across it now – great*

FE TA: *Great*

NE tutor and FE TA speak simultaneously: *[inaudible]*

NE tutor: *[to students] So you've got respiratory acidosis because they're retaining their CO<sub>2</sub> .....*

Some sections of the session had been prearranged between the NE tutor and FE TA, the most obvious example being the simulation activity, but also others, for example:

#### Extract 11

NE tutor: *Now there are lots of different causes of metabolic acidosis, and one of the ways of working that out is by calculating something called an anion gap - Has anybody ever told you that idea or have you heard of that before? .... Would you like.... do you want to tell us? [Looks at Student E with inviting arm gesture]*

Student E: *Oh, I don't really know much about it I just [inaudible]*

NE tutor: *you just remember what it is? Ok – fine alright so FE TA [uses name] why don't you*

*tell us about the anion gap?*

FE TA: *So the anion gap - moves on nicely actually from what we just discussed with sodium potassium and hydrogen ...*

## 6.2 Possible effects of the medium and differences in the interaction between students and the FE TA compared to that with NE tutor

Overall there is an impression that the amount of student-teacher interaction (teacher questions, students answers or student questions) was less with the FE TA compared to with the NE tutor.

A number of the FE TA's interventions took the form of providing additional explanation and involve little direct interaction with the students. In this example, in a 2 minute extract the FE TA only asked students one questions, and this was addressed at Bloom's knowledge level (the lowest level in the taxonomy).

Extract 12:

NE tutor: *Now there's this high potassium here as well – now anybody have any ideas of why that occurs?*

Student A: *[inaudible]*

NE tutor: *Yeah exactly – exactly that balance between hydrogen ions and potassium – FE TA [uses name] do you want to tell us a bit more about the hydrogen ions? ..*

FE TA: *Yeah – So I don't know if you've got a diagram of this – probably not – ok so as I said already, potassium and hydrogen are very closely linked to each other – so what's your main intracellular cation so your main positive ion inside the cell? Anyone know?*

Student F: *Sodium?*

FE TA: *Sodium? Inside the cell?*

Student unidentifiable: *[inaudible]*

NE tutor: *Potassium – good*

FE TA: *Potassium, yeah – so if this is your cell [drawing on WB] inside it you have a lot of potassium and outside you have a lot of sodium ok? [continues explanation for 90 seconds] ..... ok? So that's what's going on with potassium [moving back from the Surface Hub and sitting down]*

NE tutor: *[to students] Do you understand that?*

Student C: *Does that happen in respiratory acidosis?*

NE tutor: *Does that happen in respiratory acidosis?*

FE TA: [overlapping with NE tutor] *in respiratory acidosis – there's no reason why it wouldn't so yes probably*

There is an impression that interaction with the FE TA involved fewer open questions, and more use of simple questions that require one-word answers addressed to students' knowledge rather than eliciting more complex reasoning. Interaction with the NE tutor also involved more extended sequences of question-answer interaction where one idea built upon another (as for example extracts 4 and 5 above). There are also fewer questions. For example, compare the end of extract 9 with extract 4.

An additional observation is that when she asked a question, the FE TA seemed to wait less time than the NE tutor for the students to respond before further prompting or supplying an answer (see for example extract).

Extract 13:

FE TA: *Have you come across that before with COPD? A few nods, excellent, back to you [NE tutor] [uses name]*

As we saw in extract 7 above, at times it was the NE tutor who provided the closely calibrated support for the students' thinking that allowed them to resolve problems presented by the FE TA.

## 7 Use of audio/visual media

At the NE the main visual support for the tutor was a set of PowerPoint slides containing text and diagrams. The tutor used the Surface Hub to annotate these at times. The students also had paper handouts containing data from the 3 cases presented by the NE tutor.

The FE TA did not seem to be able to see the PowerPoint slides so did not know whether the students could see the relevant slide and had to ask whether the NE tutor had changed slides.

The FE TA used mostly the electronic whiteboard to write text summaries and draw simple sketches.

During the simulation exercise the simulation software appeared on the NE Surface Hub. It occupied two thirds of the screen, with the remainder showing the video picture of the FE.

The simulation software seemed to have some idiosyncrasies which had to be explained to the students so that they were not misleading – for example that the simulator showed some data that would not normally be available in real time in the clinical setting, and that some of the readings used a different scale to the one normally used in the UK.

In addition there were some accessories that were not as they would be in the clinical setting, for example the breathing mask available in the simulator was of a different type to the one appropriate to this patient in the simulation. These features make the simulation slightly less realistic.

## 8 Picture and Sound

As usual the picture quality with the Surface Hub was excellent. However, the configuration of the Surface Hub screen meant that the picture of the students that the FE TA was very small so she could not see them individually or tell which one of them was speaking. Similarly, the picture of the FE TA at the NE was small, but this had less effect as it was only of one person (the FE TA) for most of the session.

However, with this set up of participants and seating, there were some problems with sound. Because the NE students were sitting some way from the Surface Hub, and the only microphones at the students' end were those in the Surface Hub, the FE TA often could not hear their answers to her questions and on several occasions the NE tutor had to repeat them. This, combined with the small video picture meant that she could not tell which student had answered her question. This factor may have had a significant impact on the richness of the interaction between students and the FE TA – see section 1.6.2 above.

Another less significant sound problem was that when someone writes on the Surface Hub screen it makes a sound that is audible at the opposite end of the call. This interferes with the echo cancellation and means that sound from the opposite end cannot be heard at the local end. It means that if someone at the opposite end tries to say something to the local end they may not be heard. This makes it more difficult to write on the Surface Hub and hold a conversation with the opposite end at the same time.

## 9 Some observations and conclusions

### 9.1 Team teaching across sites

Overall this was a very successful session and proves the concept of team teaching across multiple sites. There were a number of ways in which the FE TA and NE tutor synchronized and coordinated their work together, and most of these worked well. Overall it didn't seem that the medium interfered with or acted as a barrier to the team teaching approach. The tutors were able to hand the focus back and forth between each other without difficulties, only very occasionally overlapping, and they were both able to make ad hoc interjections.

### 9.2 Interaction and participation

Interaction in the session was all either teacher-student or student-teacher, meaning that for

almost the whole session only one student could speak at a time. It is hard to see from the recording what the distribution of student participation was – whether all students actively took part or whether it was a small number of students answering all the questions. Feedback received by the tutor after the session included a comment that the session was ‘a bit slow’. Could it be that this referred to the fact that only one student could effectively take part at any one time?

The overall impression is that student interaction with the FE TA was not as rich as it was with the NE tutor. The impression is that the FE TA asked fewer questions, students’ answers to her were fewer and shorter, that overall fewer students participated, and that there were fewer instances of questions and answers at higher levels of Bloom’s taxonomy. However, a more complete analysis of the session would be needed to verify this. If it is the case, it could be for a number of reasons, but the important question for our purpose is to what extent it is the nature of the Surface Hub/videoconferencing medium that affects student and teacher behaviour.

One significant contributing factor is likely to be that it was difficult for the FE TA to hear the students because of the limitations of the Surface Hub onboard microphone. However, there are a number of other features which may also have an effect. The small video picture meant that the FE TA could not tell which student is speaking, or make individual eye contact with the person speaking, and she could not use gestures or position herself to indicate that she was speaking to particular individuals. This lack of individual contact is perhaps also illustrated by the fact that the FE TA did not name any of the students individually even though they had introduced themselves at the start.

### 9.3 Task design

It seems likely that overall student participation might have been richer and more evenly distributed if there had been some student-student tasks, for example where students in small groups worked on interpreting an ABG. Other Surface Hub sessions that have been observed have involved the students carrying out tasks standing at the Surface Hub, for example drawing diagrams and annotating slides on it. These activities were observed to involve a high-level of participation by all students. While clearly the task design needs to be appropriate to the subject matter, it is worth considering whether an element of this might have been a fruitful way to maximize student engagement, especially in a long session such as this.

The section of the session where interaction between students and the FE TA was richest was during the simulation exercise. It may be that the structure of the simulation task provides greater support for the question-answer exchange and so mitigates the limitations imposed by the technology.

### 9.4 Use of media

Use of the whiteboard competed for space with the NE tutor’s PowerPoint slides, which were not shared with the FE TA, and she could therefore neither see them nor annotate them. It would have made better use of the screen space to use only one medium (probably the PowerPoint slides) that both tutors could annotate.

The location of the simulation mannequin at the far end of the video call creates certain effects that may limit its impact as a teaching aid. These are designed to give students practice in hands-on clinical skills, but with this approach students cannot interact with it as they would face to face. These all create a greater sense of distance and non-reality and it is hard to see what the mannequin contributes. The only feedback students receive is from the tutor and from the simulation software.

## **10 Some recommendations and conclusions following this session**

1. Team-teaching across multiple sites can be very effective and with some planning can be coordinated fairly seamlessly.
2. More microphones are needed at the near end in particular so that the FE tutor can hear students at the near end.
3. Surface Hub users, in particular teachers, should be aware that writing on the Surface Hub can have an impact on how effectively sound can be transmitted between the two sites.
4. More experience with improved microphone set up is needed to be conclusive on this point, but it seems that the NE tutor has an important role in facilitating and smoothing interaction between students and the tutor at the far end.
5. Consider incorporation of student-student activities to maximize student involvement and participation, especially those that involve hands-on use of the Surface Hub.
6. Consider making the contributions of the FE TA more task-focused, as in the use of the simulation task, to help to structure the interaction with the students.
7. Give further consideration to how to make best use of the simulation mannequin in a session of this kind.