[MUSIC PLAYING]

KAREN FOLEY: Hello, and welcome back to The Student Hub Live. Well, I'm sorry that break took a bit longer than we anticipated. This is a live show and things do go wrong occasionally, and we had a bit of a technical issue we needed to sort out. But don't worry. It's worth the wait.

Now, you guys have been doing some interesting things. And I just wanted to touch on this breakout room, because some of you have noticed that there's another tab coming up in the chat. And if you aren't in there, go to the Watch and Engage option and you can go in there.

It started off with Hazel talking about some vanilla syrup, which got us running out for lattes, to be completely honest. And now the Disabled Students Group are having a chat in there. So if you'd like a quieter time to chat, often about anything relating to a session or just after session, check out the breakout room. Just select the other tab and you can go in there, where people are now offering help and support from the Disabled Students Group. But we're going to have some activities in there later, so I'm glad you found that, and sorry for not pointing it out before.

Mark, welcome to the studio.

MARK HIRST: Hi, Karen. Hello, everyone.

KAREN FOLEY: Science and life science is something we love. We've been doing a lot of science lately. But here we're going to be talking about something a little bit different from the planetary science and volcanoes we've been talking about earlier.

MARK HIRST: That's right, yes.

KAREN FOLEY: Tell us what this is all about.

MARK HIRST: So most of the science students who are about to start are going to do most of the practical work and their investigational work in a thing called the Open Science Lab. And the Open Science Lab is like a portal where students go to work on different types of instruments and different types of experiments. So they go from their online study planner directly into the lab.

So biologists will go to things like microscopes. Geologists will go to rock microscopes. The

physicists will go to things like telescopes and things like that.

So that's been running now for three or four years, and very successfully. And so most of the online courses that students are doing in science, they'll be going and becoming very familiar with a thing called the Open Science Laboratory.

So now there's been a recent development, so you've had probably the astronomers on before, where they can access live telescopes. So there's a telescope, for example, in Tenerife. There's also a telescope here on campus at Walton Hall. And the students go in, they have a tutorial, and then they actually do a real live experiment on a live instrument.

On the back of that practise effectively, we've moved to actually developing live instruments for the other areas of science. So one of the things we're looking at is developing all sorts of analytical instruments. They're housed here on campus. And rather than being very sophisticated pieces of software that students use, they're actually real live instruments. So these effectively are taking real labs to the students wherever they are in the world.

And at the moment we're in the testing phase and they'll be rolled out over the next few years into the different modules, across science. And I think we're going to try and do a live demonstration, which is why we were a little late coming through. And one of the things we're going to show you is, I think we had a widget? We had a question?

KAREN FOLEY: We do. We've got two widgets. And the two questions are, what do you think this is a close-up of? You obviously can't say until you see it, but what do you think it is a close-up of? And then we're going to have a vote for a quick trip around one of the following.

So yes, we've seen that some of these, anyone can access. So some of them like the virtual microscope, anyone can access. But these are specifically for science students.

MARK HIRST: Yes. So if you go to the Open Science Lab, any student can access about 40% or 50% of the different apps that are in there, including things like the microscopes. The little picture that we asked on the widget was what do you think it was? And actually, it's a fruit fly, so I've actually got some of the little creatures here.

KAREN FOLEY: They're little, yeah.

MARK HIRST: So these are the little things if you've ever had a banana and you've left it out in the garden or on your windowsill.

KAREN FOLEY: I wondered what that was. OK.

MARK HIRST: The old joke goes that time flies like the wind and fruit flies like the banana. So these are actually fruit flies from the lab. One of the PhD students gave me them this morning.

So actually, what the view on the widget was was a close-up using an electron microscope. So in a light microscope, effectively you're shining light and you're capturing an image. So the digital microscopes students currently use are effectively looking at very high-resolution images that pre-exist.

The switch to a live microscope is effectively the student can control what they look at, when they look at, and how they look at. And the electron microscope, rather than using light uses a beam of electrons. So effectively, it can get to much, much, much higher resolution. So the picture on the widget was something like a 2,000 or 3,000 times magnification of an eye.

And I'm hoping that what we have on screen in front of us is actually a live connection to the live scanning electron microscope. So this is actually a closeup of a fruit fly's eye -

KAREN FOLEY: Oh, I see it now.

MARK HIRST: - slightly zoomed out from the widget view. And down in the bottom corner, there's a little scale bar to give you an indication of the size. So that's actually 0.1 of a millimetre in size, so that's quite small.

It will go to about 50,000 times magnification, which is probably not very much use for the biologists, because most of the things we use these microscopes for is to look at very large surfaces. So we can look at the surfaces of eyes. We can look at plants. And we can look at all sorts of interesting surfaces, make measurements, capture images.

So the fruit fly here is for example. And what we can do is we can change all sorts of aspects of it. Or we can also go and look at other things. So the physical scientists are particularly interested in looking at the surfaces of rocks, the surfaces of electronic items and things like that. So if I can just reach around and show you a couple more examples of the types of things we can look at, we asked, this, for example, will take a little minute to refresh.

This is actually the surface of a CCD chip. So each one of these little squares here is actually an individual pixel. This is a chip from a CCD camera. So in this case, the pixels actually look remarkably similar to what you'd see on a fruit fly's eye, these round light-sensitive cells.

So the physical scientists will look at things like this. If I just need to get round, reach around and just, if I can get the mouse to work, I can actually tell the microscope to actually go away and actually find that image. And we'll actually do this live, which is why it's always an interesting challenge.

So what's happening now is this instrument is actually sat not very far away from me. It's only about 100 metres the other side of a brick wall. And the microscope has actually now gone away.

And this is actually the live view of that chip. So we can actually zoom in and out, and we can change various commands. I can ask it, we're currently designing this for a user-friendly interface, so I've asked it to auto-focus, which focusing on these microscopes is very, very difficult. So actually, this is a great way for students to go in and look in this case at the surface of a CCD chip.

KAREN FOLEY: Wonderful.

MARK HIRST: So it's a great tool for students to use.

KAREN FOLEY: Excellent. Now, Nick Braithwaite is currently in the chat, so if you've got any questions, then ask Nick and he will do his best to answer them in the main room. And we've also been taking votes, not the kind you were doing the other night, Sophie. But we've been voting for a quick trip around one of the following. Would you like to know who's in the lead?

MARK HIRST: OK.

KAREN FOLEY: It's changing all the time.

MARK HIRST: I think we had rice weevil, which is a very ugly little thing.

KAREN FOLEY: Yeah.

MARK HIRST: Red blood cells.

KAREN FOLEY: Yeah.

MARK HIRST: And -

KAREN FOLEY: Spider's leg.

MARK HIRST: Spider's leg.

KAREN FOLEY: What do you think the winner is?

MARK HIRST: I think the spider's leg will be the winner.

KAREN FOLEY: Nope.

MARK HIRST: No?

KAREN FOLEY: No.

MARK HIRST: Disappointed.

KAREN FOLEY: Yeah. No. I mean, I don't know. We've had a lot of STEM students today. But we're going to show you the results now, so let's see.

Red blood cells in the lead with 70%. Spider's leg coming in at 26, oh, 28%. And rice weevil's a very poor 4%. What's wrong with rice weevils?

MARK HIRST: Disappointing.

KAREN FOLEY: I would have voted for that. Isn't it?

MARK HIRST: It's probably because most people have never seen a rice weevil. And they're actually quite pretty to look at. But the - shall I get to the red blood cells so we can actually see them?

KAREN FOLEY: Yeah. Yeah. Yeah. Poor rice weevils. Lesser of two weevils isn't it.

MARK HIRST: This is a live experiment. I'm just going to turn this round so I can actually see where I'm going.

KAREN FOLEY: OK. Yes. We will find the red blood cells.

MARK HIRST: So we have them pre-loaded.

KAREN FOLEY: Red blood cells.

MARK HIRST: And so now if I turn that back, the machine is now going to go find the red blood cells. And there they are.

KAREN FOLEY: It's a bit well-behaved?

MARK HIRST: Actually live. So this is a live image. We've just moved from that CCD chip straight to the red blood cells.

KAREN FOLEY: OK.

MARK HIRST: So these are actually human red blood cells. And I'm guessing people chose them probably because they've seen them in either of the courses they've done, or that they're just interested to know what they look like. So this is a zoom in, quite high magnification, about 3,000 or 4,000 times larger.

So this is what's pumping round your blood. And they're classically a concave type of shape, so they squeeze through small blood vessels. And so what you see on screen is effectively this concaved, squashed cells.

They get a little bit misshapen on a scanning electron microscope. So effectively what these samples are doing is they're sat in a vacuum. So you can imagine if you pull a vacuum off a sample they can get slightly distorted. But also, in order to see a biological sample unlike the chip, which is a very hard physical surface, to see anything biological, we have to actually coat them with gold. So they've actually gone through a process of being put on a little piece of metal, coated with gold, and then effectively dried, put in a vacuum, and then fired at.

And what you have is effectively a way of either looking at the surface, we're looking at them on what they call back scatter. No, we're not. We're looking at secondary electron, which is a little bit like shining a light and then making a note of what comes back at you. It gives you a very nice surface topography.

And of course, red blood cells, you can actually see their concave shape. So anybody studying any basic biology, particularly human biology, will get used to looking at red blood cells.

KAREN FOLEY: Now, how good is this an indication of what you might do in a real laboratory. A lot of these techniques are excellent simulations, without, of course, the disadvantage of having to wear a coat. How like the real thing is it?

MARK HIRST: Well, of course, this is a real microscope. This isn't a simulation. This is a microscope that's sat in the next room.

So effectively, the students can make various choices. You'll be able to go in and choose where to look, what to look at. And as a teacher, what it means is I can go in there tomorrow and change the samples. I can change them every hour so that when students go in, they're not looking at the same samples.

So actually opens up the possibilities of doing all sorts of interesting project work and things like that. So it's actually, so this is real live instruments, not simulations. And we have about 10 different types of analytical instruments. Some of them run live experiments, so we'll actually be going to our live studio over in Science and doing a live experiment, broadcast rather like this is through stadium, and effectively doing a live experiment on these types of instruments, and then leave them open for students to come in and sort of collect data, take photos, make measurements and things like that.

KAREN FOLEY: And obviously with so many students, you can get a lot of data. Everyone can count them and pull those often into wikis and you can then start analysing some of those, can't you, as you're going through in the tutor groups.

MARK HIRST: Yes.

KAREN FOLEY: I know Nick is being absolutely bombarded with questions. Sophie, how's he doing?

SOPHIE: Very well, actually. He seems to be keeping up quite well. Better than me. Loads of questions going on. People seem to be really interested, which is really nice.

KAREN FOLEY: Lovely. We'll leave Nick answering all your questions. And hopefully, he can stay around for a little bit after the session as well to talk, because science is a very, very popular way of doing things. And these sessions are always really, really great.

So students are going to come in. They're going to participate in some of these. They might contribute to things as part of their coursework. And I guess these are fairly self-explanatory in terms of operating. You're looking at different magnitudes. You're selecting different slides, et cetera, as you're going through.

MARK HIRST: It depends upon how they're going to be used. I think the first use for biologists will actually be in tutorials where we ask ALs to lead sessions around these types of instruments. So the model system that's been used over the years is the access to the telescopes, where individual students will go on and have a very long tutorial, several hours, before they can demonstrate they know how to use the machine, because these are big expensive machines.

And then they would be allowed to go in and in that case design their own experiment.

So for the biosamples, it may well be a matter of loading the instrument with 10 or 12 different sets of samples and effectively letting the students either as a tutor group go in and sample and choose what they want to look at, or actually design their own experiment. We'd like to see these rolled out as project courses for Level 3 students so they can actually design and do a study and do a literature survey as a type of finish-off project for your degree.

So that's where we'd like to go. That's probably a few years off yet. Initially, students will probably see them in live demos and then in tutorials. And then hopefully they'll be integrated into modules over the next few years.

KAREN FOLEY: So you show us this and it looks really self-explanatory and easy to use. But I know when I used to teach on some science modules and we used to do some cell counting, for example, there was quite a lot of anxiety for students around finding this, accessing it, and doing it. How is the experience? What do students sort of tend to say about these sorts of things?

MARK HIRST: Well, at the moment, very few students have actually had access to these. I think where they have had access to the remote instruments, things like the telescope and things like that, I think once they get, once they've been through it and shown that they generally can't destroy it, they're used to using the online simulations effectively, and you can't break those. But even so, when they first start to use them there's a real hesitancy that if I push this button and push that button, something will stop working.

KAREN FOLEY: Well, because it's live, isn't it?

MARK HIRST: Yeah. But these are a little bit more sophisticated, and they are designed so that you can do anything with them, but you wouldn't actually physically break them from that perspective. So it's a matter of confidence. I mean, that's one thing about doing a degree is you don't get only the knowledge and understanding of the skills, but you also have the confidence to work as a scientist, so actually having the confidence to use instrumentation is something that goes along with it.

And often, OU students don't get access to that type of an experience you get from working with real instruments. So it's a great seller and it's a confidence booster. And it's also something great to say to an employer, that you've actually used remote instruments.

KAREN FOLEY: Yeah. So really good to I guess put on your CV and have that experience of doing so.

MARK HIRST: Yeah. Absolutely.

KAREN FOLEY: Well, Nick is in the chat saying that we've missed a bit of a trick here with the rice weevils. He says they're absolutely awesome.

MARK HIRST: He wants to see the rice weevils.

KAREN FOLEY: He wants to see the rice weevils.

MARK HIRST: OK. I shall turn this round.

KAREN FOLEY: I don't think we do, but he does.

MARK HIRST: He wants to see the rice weevils.

KAREN FOLEY: Why are they so awesome then?

MARK HIRST: I guess it's just because they're kind of scary to look at to a certain extent.

KAREN FOLEY: OK. Let's check out the rice weevils.

MARK HIRST: I'm hoping this machine -

KAREN FOLEY: Oh my goodness.

MARK HIRST: So this should have actually gone and zoomed in. I'm hoping you can see that rather a wobbly laptop. And effectively what I can do is, so I'm just going to turn it round again, because unfortunately the way the screen's worked is -

KAREN FOLEY: While you find that, Sophie, what's going on about the rice weevils? Is it a popular view?

SOPHIE: It's not at the moment. I've just changed my vote to the rice weevil. I think I need to see this now.

But they are raving about it in there, apparently. I suppose red blood cells the sort of things, I think we did that in school. So a rice weevil, I think that'd be something a little bit different. So I'm urging people to change their vote. Let's get the rice weevil on.

KAREN FOLEY: Well, the rice weevils has got up to 23%. So it does show we can influence things. But I

wonder, because we've got a session on Nursing and Social Work next whether we've got lots of nursing students and that was the red blood cell. So that's my other hypothesis.

32%. 35%.

SOPHIE: Oh, it's rising.

KAREN FOLEY: It's rising.

Right.

MARK HIRST: That's kind of an example of what a rice weevil actually looks like close up. It looks a little bit like an armoured tank. It spends its life crawling around grains of rice. So again, you're looking at something there about half a millimetre across.

KAREN FOLEY: Wow.

MARK HIRST: And it's unusual in contrast to the fruit fly, it has a very, very small eye. It really doesn't need to see where it's going. It's not flying around looking for bananas and flowers and things like that.

KAREN FOLEY: OK. Well, you've impressed our audience. They're now at 47%. Still under 1/2, I must point out if we're doing the science.

MARK HIRST: OK.

KAREN FOLEY: But yes, it's going very well. OK. So we like this.

MARK HIRST: Good. I'm glad. So we can actually zoom in and see all sorts of interesting things.

KAREN FOLEY: Like what?

MARK HIRST: But I think technology is just limiting at the moment.

KAREN FOLEY: What sorts of things might you be able to see?

MARK HIRST: You can zoom in and see these tiny little sensory hairs on the outside of the insect, where it's kind of sensing the chemical environment, like sniffing equivalent.

KAREN FOLEY: Yeah. Yeah.

MARK HIRST: And that's how it walks around. And it has a long snout on the front, in which it will taste the

rice.

KAREN FOLEY: So can anyone go and have a look at this now?

MARK HIRST: Probably not. If we had somebody at the other end of the microscope, we could actually show people around. But we've got some pictures. We can put them up on the website afterwards.

KAREN FOLEY: Yeah. We'll put some resources up on the website. So you can check that out by going to TheStudentHubLive.kmi.open.ac.uk. And then we will have the Resources tab there and we'll put some pictures up later so you can go and have a look at them. I think everyone will.

MARK HIRST: Yeah. And maybe I'll put one of each of the ones we asked people to vote for, plus a few more, and you can have a play and have a look around.

KAREN FOLEY: Ah, excellent. That would be really, really brilliant. Thank you for that.

OK. So this is good. There's obviously a lot going on in terms of new stuff that you're doing, how you're feeding this into teaching, et cetera. What are you most excited about in terms of what's coming up?

MARK HIRST: I think for me, it's the actual opportunity. So a lot of the remote instrument is coming through a new master's course in space sciences, which is a new course that's starting. And that's what's driven this whole development of these sensor instruments. So they have a Mars Rover site on campus and the students will be navigating around and effectively collecting samples. So actually, the electron microscope will be used probably first to look at rock samples by those students before the undergraduates get a chance to play with it.

For me, the excitement is allowing students that don't get the experience of being in a real lab to use very, very sophisticated instruments. Very few undergraduates anywhere would actually get to play on these types of microscopes or the other types of analytical instruments. So for me, I'm really pleased that we can offer our students that.

And the other thing really is science is getting bigger and bigger. So you consider something like the Large Hadron Collider, the Diamond Light facility in Oxford, scientists are accessing these instruments remotely all the time in their day job. So actually accessing and controlling, collecting data remotely is the way of doing a lot of science in the future.

So it's a skill that will enable our students to get good jobs. Employability aspects are fantastic.

So I'm very excited that I'll have a chance to show them and they'll have a chance to actually go in and do something really good and really exciting.

KAREN FOLEY: Ah. Well, Mark, thank you so much. And Nick in the chat also, thank you for answering people's questions. I hope you can hang around, Nick, because I'm sure there are lots more questions.

And I'm sure Supernova, if you're still in the chat, you'll be interested in that. We had a talk on space last night. We were looking at some moon rocks. Simon Kelly was showing us that. We were looking at the virtual microscope.

So yeah, space is always a big hit with students. But as you say, there is plenty of scope and different ways in which you're applying this sort of technology to a whole range of science subjects. So thank you, Mark, for showing us that.

MARK HIRST: Thank you very much.

KAREN FOLEY: And we'll look forward to seeing all those pictures on the website later. OK. We'll put those up. You can check that out on the Resources page a little bit later.

We're going to have a short break now. And then we will be back for some geocaching with Social Work and Nursing. So we'll see you very soon after this short video break.

[MUSIC PLAYING]