

KAREN FOLEY: Welcome back to The Student Hub Live STEM showcase. Now we're going to take a look at what's new in the computing and communication curriculum. So I'm joined by Allan Jones and John Woodthorpe.

Allan is a senior lecturer in the School of Computing and Communications, and has mostly worked on communication modules, and has recently on new electronics modules been working also. He's contributed to modules on music and also published articles on music in non-OU publications. And John is a director of teaching for the School of Computing and Communications. He's part of the team managing the curriculum and student support as the school develops a lot of new areas like cybersecurity, which is a very hot topic right now.

So you're both from the School of Computing and Communication, now quite different areas. With those two things being brought together, what would you say the main thing is that connects them, John?

JOHN WOODTHORPE: Well, computers these days are always talking to each other. It's how we are communicating with each other at the moment. And obviously, our teaching is done very, very heavily with computers.

It's not always been the case. You used to be able to have just an isolated computer and do useful things. But now, it's all about what are you communicating with? Is it other computers? Is it sensors? Is it controlling your heating? Whatever is it doing? It has to be talking to something else, otherwise it's very, very much less useful.

KAREN FOLEY: And Allan, leading from the sort of communication angle, how do you see computers and communication being connected?

ALLAN JONES: Well, of course everything John says is right. But perhaps what we're not so aware of is the way that computers are, so to speak, autonomously communicating with other computers, like sensing devices in the environment are uploading data all the time. That's the kind of thing that these days it's called the Internet of Things. It's computers just talking to a computer with data.

And from an academic study point of view, I think an interesting feature of this is the way there are certain commonalities, whether you're communicating as we are-- video and audio-- or just data, there are certain principles that right across the use. And of course, that's what we try to get to in our course material.

KAREN FOLEY: So within these sort of communications between these various things, I guess they must be sort of similar issues that are arising that we're sort of trying to solve. What sort of things might they be, Allan?

ALLAN JONES: Well, a biggie-- a biggie is errors. Before digital communications really got going, scientists had worked out that if you are communicating as we do digitally, errors would almost be inevitable. This is a strange idea, really. But it's all kind of to do with the physics.

And what I mean by errors is-- well, if I can give an analogy, perhaps the old military gag about the message that says, we're going to advance, send reinforcements. And it's misheard we're going to a dance, send three and fourpence. In the digital world, that means-- the equivalent of that is a 0-- a binary 0-- being mistaken for 1. And every so often, it's almost inevitable that that will happen.

There are ways to reduce it, but as I say, scientists have worked out it was almost inevitable. And that cuts across all kinds of fields. Now, in audio visual communication, that doesn't really matter very much. But if you're talking about internet banking, obviously you're very worried about a 1 becoming a 0 spontaneously. So that's a biggie.

KAREN FOLEY: And I guess avoiding areas like that that may be sort of fundamental is one of the sort of key challenges right now.

ALLAN JONES: Yep, that's right. There are various techniques for doing it. And the course I'm mostly involved with has-- looks into those techniques that's called error control. And it's all to do with minimising outside interference and that kind of thing, even correcting errors. It's even possible sometimes for the receiving device to know that there's an error and to correct it. So that's the kind of thing we get to in our course material.

KAREN FOLEY: Brilliant. So John, going back then in terms of the course material, so it's Allan's been talking about the sort of notion of errors and correcting those errors, and the fact that everything is sort of communicating on some level, at the moment, in terms of the Internet of Things. So how might that sort of idea be conceptualised in terms of curriculum? And what sorts of things are students learning about?

JOHN Gosh, that's a big question. How long have you got?

WOODTHORPE:

KAREN FOLEY: Not too long. [LAUGHS]

JOHN We've got a really quite broad curriculum. And we try to give students as many options as possible to cover areas
WOODTHORPE: of interest to them. So we've mentioned-- you've mentioned cyber security, which is a new area that we've started to do. But we've got other areas where we're looking at things that would be more conventional networking style, how different systems will talk to each other, how the internet works, how the web works, and that kind of thing.

But we've also got stuff around programming, software engineering, so looking at actually what you can do with the computers when you programme them. And that goes whether they a full-size sort of deskbound thing, or I've got a tiny little one here, and an even smaller one that's just powered with a battery and is reacting as I move it around. So we're looking at how you can make use of computers in a wide, wide range of those areas.

KAREN FOLEY: And computing is so fundamental in many other areas. One thing that I find quite interesting is that you've got a joint degree with business.

JOHN We've got several joint degrees. Yes, there are some with maths, some with engineering, and also with
WOODTHORPE: psychology. And I've probably missed one or two out. But that's an opportunity for students to see how the use of computers and particular aspects of computing is important in other areas.

So it does actually reinforce the point that, particularly if you're in business studies, a lot of the work that you would be doing would be using a computer, not just for meetings, and reports, and things like that, but actually to understand how the computer can help you with the things that you're doing, how you can programme for better results in whatever it is you're trying to do, automated share trading, all of those sorts of things. It just really shows that you can't separate computers from all of the other things that you're doing in life at the moment.

KAREN FOLEY: Absolutely. Well, Rachel, who is in France currently enjoying a baguette followed by a chocolate éclair, is loving her computing with maths. So she's combining those areas. And as you say, John, there are lots of different alternatives, from things like computing and electronic engineering, and you've mentioned already some various other things. But some of the new things you've done that are very topical right now are around cybersecurity qualifications. You've got post graduate and undergraduate qualifications there also, which are great.

And I must I must compliment you on your wonderful things I can see in the background as well, John-- your lovely Open University t-shirt, I think it is, and all of the wonderful Open University things in the background. And yes, lovely puzzles and stuff going on there, so there's lots to take everyone's attention. [LAUGHS]

JOHN And lots of them are driven by computers, making the lights flash and so forth. I feel I have to give people
WOODTHORPE: something else to look at rather than just staring at me in meetings. But yes, cyber security-- we've always taught aspects of the security of the computers that you use, of how the internet is at risk, and how you can keep yourself safe. But as everyone has seen, over the last few years, that's become just so important, such a big subject area with cyber attacks going on, with government trying to protect us and protect themselves, with attacks on banks, and hospitals, and universities.

So we've now put together a qualification that picks up some of our modules that have some of that content in, and adds in some new modules that cover it in much, much more detail. So we've got one stage II module starting in February next year, which we'll cover a lot of this in more detail, and give people a really thorough grounding in what goes on, and how you try to protect systems.

The following year, February 2023, we've got a stage III module starting that, when we've written it, that will give students a chance to actually try to penetrate into systems and learn about things like ethical hacking, and will lead towards professional qualifications as well as academic Open University qualification. So we've tried to put together a curriculum that would cover all of the academic understanding that people would need, and the practical skills that they would need in working in that particular area.

KAREN FOLEY: Brilliant. I was talking to someone the other day who's doing those cybersecurity modules, and he then got a job in his local police force and is putting all of that into practise right now. So it's really interesting, as you say, not just the academic side, but also those practical applications are so fantastic.

Well, we're going to go from you, John, with your fantastic bass guitar that's been spotted by our audience. Some people say, you definitely need-- well, we're questioning do you need to be human to be playing that? But I imagine it's probably preferable. Back to Allan to talk more about communications.

So communications technology is the area that you oversee, Allan. What are the sorts of things that students might learn about there?

ALLAN JONES: It ranges from basically kind of hardware stuff, like wires, radio waves, optical fibres. And they all have their quirks which people need to learn about. And then building on that, they would look at things like error control-- which was related to what I said earlier about errors and how you deal with them, how you try to minimise them-- and also how you encode audio, and video, and images for data transmission, and also in an area which is perhaps not so frequently heard about in the media that's called multiple access. That's basically how you enable multiple people to share a resource.

So you might not be so aware of this, but when you're using your mobile phone, that resource is being rapidly shared out between users, and allocated as they require it amongst the users. And so we look at this in broadband mobile communications, cable communication, all that kind of thing. And that takes you into areas of how broadband actually works, how mobile communication works, 4G, that sort of thing.

And we're getting into 5G now. I may have told you we're updating the module. If you like, I can tell you a little bit more about 5G. It's popped up--

KAREN FOLEY: Well, everyone's talking about their old mobile phones in the chat right now. And I think when you're sort of talking about things being shared, I know you were trying to explain to me the other day-- and it sort of completely blew my mind-- but this whole idea about sharing different things, and I guess the way in which some of these things are marketed. You're actually teaching students what some of the implications are of some of those sharing operations.

ALLAN JONES: Very much so, and with a mobile phone in particular, it's not the case that you have a continuous connection guaranteeing your data rate. What it is is it's like a fixed package of communication capacity which is split into slices. And slices are allocated, millisecond by millisecond, to people, and taken away, and reallocated, that sort of thing. And it's all done very quickly.

And looking at 5G, this gets faster and more sophisticated, sophisticated in the sense that traffic will be differentiated according to whether it needs to be low latency or whether it doesn't matter. I was talking earlier about Internet of Things and industrial applications, which is a big 5G thing. But latency doesn't have-- high latency doesn't actually matter so much there. That's a long delay between sending and receiving.

But then, the fanciful things people are talking about like telesurgery-- which sounds a bit far-fetched to me, but people do talk about it-- where latency is highly critical. So somebody performing a procedure in one part of the world, it needs to happen almost instantaneously in another part of the world on the patient, if you like. And so the idea-- one of the ideas with 5G is that you differentiate these kinds of traffic, and you give them the kind of communication parameters, properties of delay, speed, whatever, appropriate to that type of traffic.

And what's in the pipeline-- and nobody ever seems to mention this publicly-- is differential pricing. Because if you get kind of the fast lane, I'm sure you're going to have to pay for it.

KAREN FOLEY: Mm. So lots and lots of implications there, and one of the interesting things, like with so many of the sciences, is that you're not just looking at one aspect. You're looking at all the sort of levels of things, from, for example, the copper wires and the physical medium, the optical fibres and the radio space, and of course, then the issues of the communication, the ethics in terms of who is right to charge what, and many other areas as well. So it's not quite as clear cut it it? There's so many factors that must impact on each other.

ALLAN JONES: I think, well, you're absolutely right there. And I think also, coupled with all that is a lot of the propaganda around these things. And I think it's reasonable to call it propaganda, because when people are talking up 5G for instance, they've got an agenda. There's a lot of money riding on it. So a lot of people need it to be a success. So it's useful to appreciate this and not get taken in by all the hype and all the fanciful talk that goes with it.

KAREN FOLEY: Absolutely, and this was one of your main problems. We need to end the session very soon now. In terms of curriculum area, I think when you were looking at 5G, it was very challenging for you to write about, Allan, in the new module.

ALLAN JONES: It was. Well, the module-- the module has been out for a while. But we're updating it bit by bit. And so the students who start in October this year, they will get 5G material in the module. And then in subsequent years, other parts of the module will be updated in the light of what's been happening. So 5G will be the big new thing in this bit of curriculum for the next round of presentation.

KAREN FOLEY: And it's so important to keep refreshing curriculum in terms of new things that are happening right now. John, what are some of the things that you've found challenging in terms of some of the updates that you've had?

JOHN WOODTHORPE: It's really knowing what to put in and what to leave out. We could cover so many areas, but there are only so many of us. And writing all of that teaching material does take time.

But we've started launching a new module shortly on artificial intelligence-- a stage III one, Artificial Intelligence Machine Learning, that's in a qualification that we support that maths and stats have. That's a new module that we've produced recently. We're looking at expanding into that area in more depth.

But there are so many other areas that we could move into. And in fact, we're starting now to develop the curriculum further to work out where we need to go over the next five years. And really, it is-- I feel like a kid in a sweet shop at times. There are so many wonderful things we could do. And our subject area just never stays still. Actually, keeping up with the development is a real, real difficulty.

But it's a fascinating challenge, and it's a really enjoyable one trying to work out how to put stuff together, and how to do coherent modules that help our students. One are the resources we're using, that is we have an industrial advisory board which has senior people from several companies working in-- or employing computer scientists, IT folk, et cetera. And we ask them, what should we be teaching? What content would you like? What Skills would you like in your employees? And they give us a steer there.

And particularly, they talk about the employability skills-- the ability to communicate, to understand to work in teams, to work remotely-- that they want us to teach people. So yeah, a fascinating time to be working in this kind of area.

KAREN FOLEY: Brilliant, Well, John and Allan, I'm afraid that's all we've got time for today. But thank you so much for coming and giving us a flavour of some of the complexities, and also sharing to us how you're making some of these choices in terms of updating curriculum to make it relevant for students, both in terms of the academic content and the practical applications. Thank you.

All right, we're now going to show you another video. This time we're going down to the Berrill Building and then to the Cellar Bar. So we'll be back after that to look at the Open STEM Laboratory. So stay tuned, and I'll see you in just a few moments.

[MUSIC PLAYING]