**ID\_MI09\_F\_Maths\_Y**

**Voice\_048\_N**

I Would you like to introduce yourself?

MI09 I’m Sue Armstrong, I ‘m a Senior lecturer in Electric and Electronic Engineering. I’ve only been here since November, before that I had 10 years’ experience teaching engineering in an [FA?] college, mainly [HEA?] students.

I so, all in all how many years of teaching experience?

MI09 9 and a half years

I So, what module do you teach?

MI09 I’m the module leader for the Introduction to Engineering Maths and I teach on the Electrical Technology and I share that with Walter.

I So, how do you find the students respond to the basis of Critical Thinking Skills when you teach Maths, because Maths is generally known as a rigid subject?

MI09 There is a massive debate in the class because some students have done A level Maths before so, the A level students tend to fly through all their work because they already got the skills, but some students, mature students and some come from overseas through sort of the FE route tend to just have block with maths, they just think they can’t do maths. But, I’ve started to get them in January, the attendance is integrate because a lot of the students get part time jobs that interfere and things, but we sort of do a revision of some of the things they haven’t covered in the first semester, so building their confidence on that. But since I’ve given them some engineering problems which were worded, a lot of them couldn’t understand how it applied [quadric equations?] to that situations so, we tend to have a lot of tutorials about engineering problems rather than just repeatedly doing maths examples. And still even the [small and before?] they were asking how does that question relate to what we’ve learnt so, there has been a bigger improvement but not in all students.

I Right, you mentioned about two things, one is the debate between the one who already done it so they feel their repeating themselves which is sometimes they may feel that way, compared to mature students who left school long time ago so their trying to catch up and also some overseas students who technically learn differently. So, how do you make them happy?

MI09 (Laughs) So, is that overseas students have ways to solve maths problems, is different to what we teach. So what we do is we share out with the group and then my friend says ‘Oh yes Alan, we do it that way at school’ and I explain, it’s okay to use that method because it works so we learned a few different methods. Some people who, especially with algebra have had a mental block since they were at school can suddenly see a better way to do it and you know about which step you do it first. So we try to share it um, the more the A level students tend to vote on the [feet?] with attendance the ones who feel like they’ve done really well in A level Maths. Um, only a few of them actually come in and what they do is say [Reshoul Material?] and get them to help whoever’s sitting on the table who might be struggling to get a bit of debate.

I So, the attendance, the no attendance is basically already done it before?

MI09 Yes

I So can I say they are UK students?

MI09 Yes

I just now you mentioned about sharing the methods from different, different parts of the world then when it comes to marking during the exam, so it might be if you allow that to happen in the classroom, then how would you mark them in the exam they used different-

MI09 If they using different methods but they still don’t seem answer still, then it would still, as long as that. As long as that method act can follow it suddenly jumps to the right answer, then they would still get that full marks. They don’t have to follow the described method, as long as they can solve that engineering problem.

I Right mmm, so you don’t – don’t prescribe them to follow that specific method, but it’s up to them how they apply it.

MI09 Yeah

I as long as they get the answer.

MI09 (laughs)

I Ok, thank you. Right. So, for the- for the teaching, how do teach them? Is it like, lecture ways or is it like you teach something, like a formula – you introduce to them a formula and they have it in class practice and the practice in leisure time or in the class – incorporated?

MI09 Yeah, in the class we try to stick to normal than sort of half an hour of lecturing. Which is always including work or going through example – so examples. And then some worksheets for them, so they might have a worksheet say, they have 20 questions on in the class we expect them to get 10 done. The A level students will get all 20 done, some of the other students might only get 6 or 7 done so then if you take them away in the first 20 minutes next week we go through it and then we’ll do a next topic and another worksheets. They’ve got work to take away, to catch up but they come and see me any time of they’re stuck.

I umm, right okay when it comes to critical skills so um, what do you think of? Is there any obvious difference or is there something familiar or there’s none?

MI09 (laughs) say that critical skills where its lacking is mainly in students, no matter which background, who’ve got the least confidence.

I for example?

MI09 one or two students who are really not confident on anything mathematical when they came. And every time in the first few lessons, before they started to do a solution, they wanted me to ‘That’s right’, ‘That’s right’, ‘That’s right’ rather than trying to make a mistake they wanted to make sure every step of the way. Um, so it’s letting them know that it’s okay to make mistake because we will find out why and that and that helps them to solve the problem next time so that they understand where they went wrong. So, that’s the main thing with the maths, um and with the electrical technology it’s more ‘hands on’ and building things and calculations seem to be happier to trying things because it's simply where that building circuit or that measuring. Whereas, that maths is probably right-

I Or, wrong?

MI09 Or wrong (laughs)

I So they always want that confirmation.

MI09 Yeah, right

I So compared to all the students that you have, which group of students do you see lack their confidence?

MI09 I would say, its mainly the ones in the UK who go through a BTEC route. Students that come from and FE qualification so-

I Yeah, just now you mention ‘FE’- what’s that FE stands for?

MI09 Further education.

I Oh, ‘Further Education’.

MI09 So, they’ve done a vocational level of three qualifications.

I Yeah.

MI09 Instead of A levels.

I Oh ok, and this system does it still exist?.

MI09 Yeah, it’s nearly every college students have the option to go on and do A levels or they can do it’s mainly a BTEC qualification that [excels?] qualification, where it's the equivalent of 3 A levels, but a purely vocational.

I BTEC is purely vocational?

MI09 Yeah, so well, they will still do a Maths module or do electrical principles which is more of science, but they will do more practical. So, every module they do will be related to engineering and, but there’s no exam in Maths, everything assessed on course work.

I So, these students who have done BTEC lack the confidence?

MI09 I think so, I think, to think back, coz they’re coming from an environment there’s no exam, they’re coming into a large environment where big class sizes, where they would have only had about 12-15 students in a ‘Further Education’ college and it would have been quite small group sizes. They know that in a BTEC, course work could be taken, you know, take marks and given back to improve with some tips. That used to be the rules, and BTEC just changed it now. So, next year it would be different, um, but yeah they just seem to lack the confidence. And the other one is we have a lot of students with part time jobs whose attendance […] because they’re not catching up on the work until the day before the exam.

I So, these students are they matured students or is it the pressure from their A levels?

MI09 I think- I’m not sure which background they’ve come from, I’ll have to check with Walter. But, it tends to be more about, um, they’re definitely UK students but they come from like Asian backgrounds so they’ve got like a family businesses and then they work late at night, and work some days, helping to look after the family.

I Okay, um, another thing is , um, now coming back to language there must be a language issue, um, so do you think lack of [vocabulary?] – I wouldn’t use that word vocabulary, like some words like terminology are very important to understand the concept of formula, so if you don’t understand then you struggle with other applications. So, then how do you handle that? Do you face that kind of problem?

MI09 Absolutely, I’m an ex- Year zero student.

I Okay.

MI09 I was on a foundation year many years ago and I can remember how my teachers explained Maths to me and how the mathematicians write maths so, I see it as my job to put things in an everyday ordinary language so instead a’ startin’ off [sayin’] transposing equation. I say we gotta rearrange it coz’ everybody understands that and I’ll explain it later on another name for this is transpose and it’s in the [notes?] means rearrangin’. So, it’s explainin’ the terminology coz, even down the things is solving the equation and rearrange but the got to solve it so, I have to explain look for the words and things. So, I think its coz’ of my background but, it comes natural to me to try and explain it whether it’s to a UK student or to a overseas. The overseas students that attend regularly know that there’s always 20 minutes at the end of my lesson where I’ll sit on a one to one basis if there’s anything they didn’t understand because they don’t like to ask in the middle of the lesson. So I always step on site- side for them.

I So, so during you lecture, students they can always rely on you for the last 20 minutes, they have any personal questions they will ask.

MI09 Yeah, if they don’t wanna ask in front of the class.

I So, is there any group of students whom they really struggle with language and therefore they struggle with other things as well?

MI09 Not in this group there isn’t. I would say this group is really good with the language compared to our first year degree students who have a lot of Chinese in there but, this group tends to be that they’re English is more good. Um, no we have one Spanish student but again his English is very good.

I So, can I, can I say because the students who are in some places they, they just will, the students will be able to be offered a place even though they do not fulfil their language acquirement and then they have another program invalid in the-

MI09 Yeah

I Existing, um, curriculum so that they have language also the carry on with the engineering modules, so for the case of here - so do you think they are fine because the one who comes in their already like, they already have a certain level required, so you don’t take in any students below [that?].

MI09 I’m not, I’m not sure that, um, the application to procedure [works like that?]-

I Oh, okay.

MI09 Like I say, we’ve worked here since November, but I would say our year zero students have definitely, as a group, got a better level at language, English language. Then, people coming straight on a degree who’ve never been, I think most of them have been in here since, country before you know. But I do know there are, if anybody did come on the year zero we would’ve had concerns about their level of language, there are courses that we can send them extra modules, so we can send them to help available.

I Okay, right so do you think language is very important, for, for the content, subject language, like for Matt and for critical skills?

MI09 Yeah, because if I went in and started talking to my extended students in the same way as I do with a third year degree student, they wouldn’t understand what I was trying to get them to do in the same language. So, I have to break it down more to their level to more like a level 3 engineer whose learning how to solve problems than somebody whose expected to be able to take the first steps to solve the problems so-

I Mmm, okay, so how about, just now you mentioned students who struggled with critical skills generally because they lack their confidence.

MI09 And that’s our job to build that confidence up and the first thing, coz’ we don’t teach them engineering until the second semester is getting them to look back and see what they’ve achieved in such a sort time they’ve already achieved so many modules. And then every few weeks, say we didn’t know anything about this two weeks ago but now you know about that topic and praising em’ as well if they’ve been working well and you can see their struggling in the lesson and say to them you’ve worked really hard there. You’ve worked, your struggling now you can do it, so how do you feel about that because a lot of them just think I’m going to get the work done then I’m away. They never stopped to think, to give themselves a little bit of praise. They just get it done and away. (Laughter)

I Right, so usually in a lecture how many students, what's the enrolment like?

MI09 Um, I think in engineering it’s supposed to be 40 – 47 on the [register brand?] also with [Beameth Draw]. So in the exam day it was 37, so there should be at least 37. Plus we’ve got a few more who have got medicating circumstances who, who are not comin’ in the lecture that we support through email and [Vialing] and things like that so generally there tends to be sort of mid-twenties to thirty who turn up to a lecture.

I That’s the average?

MI09 That’s because some have child care issues, some have health issues like I say the main one with the Maths. A lot of them feel like they’ve already done the Maths before with the A levels.

I So do you have any kind of a enrichment activities for the A level students who are maybe, they feel frustrated? Do you have any kind of separate task for them or it’s just the same for everybody?

MI09 No, no their – All the activities get harder and harder and there’s always the engineering activities which are the worded ones. I don’t think it’s that the, well, their maybe bored. They feel like, the may have a ‘Grade B’ in A level Maths but they failed physics. So they feel like ‘Why should I have to do this again? I already have A level Maths’ and it’s where it’s keeping your brain going. You should be getting 100% in this exam.

I : So, um, let’s say in a class so there’s average, let’s say, 30 that’s it, 30 all the time. So, how do you identify these students are the ones who have problem with critical skills? Do you have some kind of assessment or it’s just through observation or-

MI09 It’s through observation when their doing their worksheets or when we’re doing a problem as a class. Um, and it’s also from all the lecturers who have taken the group in the first semester, passing on information about students as well. So, it’s quite easy to spot in the class and we have got a couple of small groups where one of the A level students is helping people from a non A level background, have made friends. You know one of the extension tasks I give is where you’ve explained how you’ve done in Maths, to them too so I can get around everybody. It generally works okay.

I Because sometimes there’s a claim, um, whether critical skills is a language skill or a language problem or a thinking problem. So some students might have the thinking skill but, because they lack their language they're unable to express it. So have you ever come across that kind of student, you know they have something it’s just that their struggling to convey or communicate?

MI09 [19:50] was because their level of English is very good, I would say not that group but definitely with the first year degree students find that a lot because they really, can be really good at Maths and Science and things. But they just don’t understand what that question means, so I have to sit down and draw diagrams and pictures to show them what it’s asking for and then they can take it away but, you can see that the language there is a barrier. Especially in some exam type questions, but again I think it’s of this [core hort?] Their English is really good and if it’s a word they've never come across or not shying to ask ‘What does that mean?’. So we had a problem about a crane and there’s a lot of technical terms about the crane. So, I drew a big crane on the board and labelled it all up so they knew what the [chip?] was and things like that. So [21:02] had a problem that diagram was still on the board so they could understand what, I suppose, if they’ve never come across a crane before but from the UK or the overseas it’s hard to remember which bits which.

I Mmm, right coming back to FE students in engineering, um, so there are some conscious decision, usually the tutors make based on, because every year students are different there are some skills for this [core hort?] what are the skills. Critical skills which is included maybe could be implicitly or explicitly or some skills that deliberately excluded or unconsciously excluded. Is there any skill you think you have explicitly introduced or-

MI09 Um, like I say the first time I taught ‘Year Zero’ this year [so I took back?]. All I can say that is they really enjoy that [contract?] module that they do with Walter where they really tend to, it’s up to them to choose which skills they want to develop because if they can pick that project idea as a small group. Then what I have seen is some small groups working in a workshop where they’ve said ‘You’re good at [saw-daring?] you do that, I’m good at this – I’m good at programing’ so they’re all working together. So, there’s even management skills, working as a team. But the actual engineering skills, I think at this level their doin’ mechanics, their doin’ principles, their doin’, um, the Maths. But there are a lot of students doin’ auto-motive engineering so the only thing I would say is that they only need to look at more, put in more, put in more examples, where it’s relevant or auto-engineering and not just electrical and mechanical. To get there their more engaged with the Maths and the Science behind it but, we can always afterwards say and think to them this is what circuit can be used in a car to do but it’s to reinforce that the notes. I think the notes tend to be more mechanical and technical and not explaining that it relates to that part of the car. I think there’s a lot of locomotive students in our years.

I Locomotive?

MI09 Yeah

I So is there any skills not included or you think is not necessary for them or just not necessary for them?

MI09 I think because I get to see them in the second semester already gone through writing a report.

I That’s in semester one, is it?

MI09 Yeah, they’ve already had to write a small report you know and the data – collecting the data , analysing the data and all that so.

I Analysing?

MI09 Yeah, so they have to the statistics module, so they learn how to analyse all the information about a given scenario. So I think I’ve already seen them when they’ve already learnt some skills so it would be hard saying it from the beginning of the year but, I think the only thing that maybe lacking is the research skills .

I So students lack the research skills or-

MI09 They just ‘Google’. (Laughs) Everything is google, when I explain that the best information for a A level is in a textbook, so they never got a textbook out of a library before so I get them to get a Maths textbook out. ‘Go and get a Maths book’. Or perhaps at the start of the second semester people get a librarian to talk maybe a good idea but that’s. A lot of them are okay, no where to go none of them. […] Start a reference material in a proper year.

I So there’s only a minimum – how many percent would you say they still let the skill [walk to?]

MI09 It’s probably 5, 5% but I find that generally though the year as well. (Laughs)

I So, do you think research skill is very, very important?

MI09 Um, because the Maths is engineering Maths I think it is because if one say the become engineers they’ve not got all the skills to solve the problem in the real world. The first thing you need to do is be given the problem as an engineer but if they don’t understand it they have to research it otherwise it could waster months trying to find out something that somebody’s already invented.

I Ok right, so for engineering students there’s a lot of skills which is important for them. So in your opinion which skill, or skills do you think is important or you think must have it for them to progress, for them to move on?

MI09 Definitely, Mathematical. So they’ve got to be able to solve mathematical problems so they [quit?] thinking about how to solve a Mathematical problem. Because that applies to the science side of the electrical, mechanical.

I So problem solving is very important?

MI09 [At times?] Time management-

I Time management, yes! So why do you think time management is very important?

MI09 Because there’s still, because there’s the first year haven’t worked deadlines for the exams. They just look at what’s the next thing that needs to be completed and then spend all their time doin’ that are not worry that. And in the next 2 days something after that needs to be completed so there’s like constantly, not all of them, constantly trying to catch up. The mature students tend to be really good coz’ the have time management skills and they’ve got families and jobs but the younger ones, constantly leaving things to the last minute.

I So can I, correct me if I’m wrong, say the essential skills they must have according to you and your opinion is solving time management.

MI09 Yeah

I Yeah, okay right, so how would you define what is critical skills?

MI09 Um, I think it’s ever-changing. (Laughter) Sort of, for engineers, again comes back to the confidence, the confidence to try and solve the problem and to have an idea of what the answer should be. I mean if a student’s doing a problem with the[lunge of the tables?] gonna be 3 kilometres long the put that as answer not thinking a table 3 kilometres long doesn’t sound right and to think back and check and have an idea of what it means in the real world and that will be difficult to teach. Coz’ that will need experience as well.

I Right, so can I say it’s common sense?

MI09 (Laughs) You can say that-

I I’m being rational about it. It’s like being rational about it?

MI09 Yeah, gone off with a project idea that’s gonna take 4 years to build when you've got 4 months. (Laughter)

I Right, so basically you would define it as problem solving skill and having that rational thinking when solving a problem in a real life situation

MI09 Yeah.

I Can I say that?

MI09 Yeah, you can

I It’s not my word

MI09 No, no you can (laughs)

I That’s the last question.

MI09 That’s the last question.

I Thank you very much! I really appreciate it!

S That’s fine thank you! Your welcome!