**ID\_MI05\_M\_MS\_N**

**REC034\_M\_N\_MS**

I so, could you give a brief background about yourself as a lecturer or module instructor in the programme

MI05 It’s a very brief history, I’m just in my second year of teaching. I came straight in from doing my PhD. Literally, I handed in my PhD on the 31st of August and started working on the 1st of September or something like that. Literally it was very quick, so on the first year I essentially used the previous lecturer’s materials. I didn’t really have the time, all I really had time to do was my lecture slides, but all the course notes etcetera were his

I umm

MI05 the second year I started to modify things a bit more to think a little bit more about the programme. Last year was just getting through it, but to be honest I think there’s huge number of success in exam results this year than were last year, so, (laughs). So, maybe I haven’t got any good, but it’s going to be a gradual stage though. It’ll take probably four to five years the way I want it, I think

I yeah

MI05 I teach essentially in Mechanical Science and a third of the Route to Success

I the third stage of Routes to Success?

MI05 the second three stages

I how does that work, semester one, semester two

MI05 ah! No, it’s just taught in three six week blocks, Routes to Success

I okay

MI05 and I teach the second of those six weeks. Supposedly, to add problem solving and I also run the labs and run the problem classes, because I run them, I’m in charge of the PhD students to run them. So, attend them to from time to time to check up on these things are going

I oh okay, so it’s the PGTAs?

MI05 PGTAs, yeah

I sort of facilitate that group?

MI05 yeah, I give brief introduction to the training package as well

I okay, so they’re given training?

MI05 umm, not very formal, that’s something I want do this year

I okay

MI05 because in the past they haven’t had anything. I was actually a PGTA on the foundation year for four years and until John tried my very last year to introduce something. I had nothing, it’s just thrown in the deep ends, I tried to stop that bit, but then I would like to introduce more formal training

I so, just now you mentioned you’ve been a PGTA when you were a PhD student and you’ve been there for four years

MI04 umm, I actually only, well I was a PhD student for four years, in the first year of my PhD the only foundation year I taught was covering for people in my office, but there was a fair bit of that, and the next three years I taught as PGTA on the Maths course

I so, the first year you just covering for foundation year module instructors

MI05 there were two in my PhD office, so, I had a fair bit chance to cover it

I and the following year onwards you were a PGTA?

MI05 yes, I was

I for the Maths, yeah?

MI05 yeah

I second question you already mentioned you teach Mechanical Science

MI05 yeah

I so, would like, sort of give a brief background, an overview of the module

MI05 and yeah, it’s, bulk of the module concerns, is essentially match to what materials you have in applied Science in A Level, sorry on the applied Maths on A level. So, it deals with essentially, ‘forces’, ‘forces in motions’, ‘forces in static situations’. I think everything in some way related to, ‘forces’, will apply to, ‘linear motion’, apply to, ‘circular motion’, apply to, ‘forces and balance’, so to, ‘networks and forces’, where when nothing moves. But, in the last four weeks in the course I have to cover basic, ‘Electromagnetism’. Umm, very basic, ‘Electromagnetism’, in four weeks

I umm

MI05 but, that part used to be John’s. John teaches in EE, but (5:50?), this happened before I started. I should say, I started my foundation year in 2005, I was a students, so I noticed some changes in the course since I did it

I oh, okay. So, this initially belongs to EE module and then it was incorporated…

MI05 yeah, yes

I alright, okay. So, semester one and semester two, how do you break down the module?

MI05 I don’t

I oh! It’s been prescribed

MI05 No, what I’m saying is I don’t specifically have semester one materials, semester two materials. We only have one exam right at the end of two, so, I just have it in what I think is sensible progression, but there isn’t really any terminal point, because everything leads on from everything else

I right

MI05 it’s very much like Maths in that, so, when you learn more complicated stuff you also revising the stuff you’ve done earlier

I umm

MI05 at the same time because you’re been asked to recall it all

I okay, so, it’s an on-going…

MI05 it’s an ongoing progression, you rely on what you’ve learnt before to go ahead, apart from as I say electromagnet which is entirely separate. Actually even that, has some parts from (7:25.7 ???), where we consider acceleration on particles and electric fields, etcetera, so,

I right, based on your observations on students which group of students lack critical skills and what would be the contributing factors you think?

MI05 I’m not hundred percent sure about what you mean by critical skills, are you referring here critical thinking?

I yes, critical thinking skills

MI05 umm, that’s almost inherent in the course. I would that inherent in any mathematics space course that to some degree you got to apply critical thinking. But, may be you don’t over mentioned it, but it’ inevitable because the whole thing is based on logic. You’re given a set of premises and you supposed to derive solutions from those using the rule of logics

I so, when delivering this kind of skill which students you think struggle more than the other?

MI05 umm, I don’t think it’s fair to generalise. When you say which students, I mean if you’re speaking, I mean if we’re talking in term of ethnicity the Chinese students did very well, but, that’s probably part of their background

I No, it’s nothing with , because there’re a lot of issues or contributing factors to this, one could be lack of confidence. Some students who lack the confidence they lack the skills, some students have the skills but because they have language deficiency so they couldn’t express the way they want to

LANGUAGE

MI04 I think language difficulty in some ways is a less an issue because the language of mathematics is, (10:00) I mean that’s not good English is it because it’s on Blackboard, so, I think the skills of critical thinking, language doesn’t really influence. Alright, they got to understand what I say, they got to be, but language is less of an issue I would say in a Science subject, particularly heavily mathematical one. Maybe, more in chemistry and biology would be an issue

I so, so far it’s not an issue in your experience, your observation …

ATTITUDE

MI05 the one I would say looking at from just purely logical thinking point of view have the biggest issue I would say mature student for some reasons. Well, I expect to see better but (laughs), they maybe they got too set in, I can't say why but students, you know I was one (laughs), a lot of them seem to struggle with, ‘a+b = c’, you know

I umm

MI05 the connecting the logical path where else the younger minds generally are quite good at it, but the trouble is lot of them don’t work hard enough (laughs). But, it’s unfortunately true, I don’t know why it is for foundation year, but we have about hundred and thirty students and there’s might be about eight in my lectures I’m feeling lucky

I so, can I say younger students could do it, it’s just sometimes it’s their attitude

MI04 the attitude

I they don’t work hard enough?

MI04 the attitude among some of them was no good, yes

I umm, and mature students have problem as well, what you think might be the contributing factors

MI04 I think, I was told I don’t know whether it’s true. But, I was told when started my Masters degree that doing a Masters degree changes the structure of your brain more than the rest of all your teenage years put together. And when, you get to a certain age if you haven’t been involved in that sort of subject I think people find it very hard to walk to the way they think about the world, and it does require, to think logically requires a different mind set. And, the young brains are more flexible they can adapt, and I think, I mean this is just supposition of my part of course

I yeah

MI04 I think older people are be set in their ways, a bit harder to adjust

I so more of adaptability?

MI04 yeah, I would say so. That's, you know I know nothing about neuroscience so (laughs)

I another question, you’ve already mentioned maturity, so do you think maturity is important in critical thinking?

MI05 do I think?

MATURITY

MI05 I would say no, but I suppose it depend on what you mean by maturity? I think I got three kinds of my own and they got no problem with critical thinking, umm and probably at quite a young age. In fact I think children don’t, if they’re introduce to it properly

I alright

MI05 it’s funny I was talking to John just about fifteen minutes before you turned up and I don’t think critical thinking is sufficiently taught in schools, well, it was certainly wasn’t when I went to school. It’s assumed you picked it up from doing maths, from doing physics. Umm, I don’t know they’re teaching now, I think it something that needs to be, the ideas behind it needs to kind much younger I would say. Although, eighteen I suppose they’re still flexible enough

I right. so, maturity …

MI05 I wouldn’t say it’s really an issue, in some ways maturity well can be handicap ( \_ )

I like for example mature students, some of them might already had been in work

MI05 oh! Yes

PREVIOUS EXPERIENCE

I so, that might be an added bonus, sort of in problem solving

MI05 (sighs)

I and being able to …

MI05 in a very narrow field

I narrow field

MI05 I worked in retail management

I umm

MI05 and they set me on various management courses, which were either about personal management, or whether about problem solving and I never had chance to apply one of the, single one of the problem solving exercises I had to my work or I couldn’t see how I could apply them. I was quite at them (laughs), but I just think there’s something about the older mind it become slightly more set in it’s way and if it is, unless it’s use to the flexibility ( \_ ) it’s just a silly example, but you think of, I thought it’s actually a very good example (laughs)

I (laughs)

MI05 you think of the people vote for UKIP. UKIP represent conservative, they represent the alternative the old ways. Whatever, you might think of them and the majority who voted for them would be over forty because they are more set in their ways

I right

MI05 I don’t t think I don’t think many young people voted for UKIP. That’s not a statement of good or bad. It what it represent as a, they represent extreme conservative with a small ‘c’

I right

MI05 just a personal point of view, but ( \_ )

I yes, those with fixed mind it’s difficult to …

MI05 yes, yeah

I change them

MI05 yes, and I think that stops people thinking critically and unless of course they used them, a bit used to it. I wouldn’t say any of the professors of Maths sort of short of critical thinking skills, no (laughs), because they have to apply them everyday

I right, okay, so, can I say maturity is not an issue?

MI05 I would say it’s a handicap

I it’s handicap?

MI05 or a possible handicap

I umm, yep. Okay

MI05 is that not what you want to hear (laughs)

I no (laughs). Right, the next question is about the way you run your lectures, so how do you run them? Do you have teaching session and then you have Q & A, teaching session with in-class practice, or is it a full forty five minutes lectures and then they go back and look at the Blackboard for extra work…

MI05 it’s a full forty five minutes lecture, I tend to have lecture notes which I work around, I can’t just stand and read the lecture notes to them (laughs), but I have lecture slides that I put up and work around those

I umm

MI05 and then I have a series of work problems that I work through slowly on the white board for them so they can see and that works

I uhm

MI05 and then for each two hours of lecturing they have a two hours problem class where they have problem sheets, so they can go work through problems under the PGTAs. Umm, so it is essentially all we do is talking. I do encourage questions, I don’t get many, but I encourage them. I mention at the start which lecture if you got a problem please don’t worry about sticking your hand up and interrupt me at the end of a sentence, but they’re a bit slow coming forward

I umm, so why do you think students tend not to get actively engage in the Q & A sessions

MI05 I don’t, they weren’t last year

I umm

MI05 I think it’s a different group this year, umm…

I so last year…

MI05 last year were lot of questions, umm this year, I always leave five minutes at the end to come and ask me questions as well. So, I got lot of questions at the end of the lectures not during the lectures

I okay

MI05 and I also, I’ve open door policy anybody can knock on my door anytime for that reason I hate working on my back when I open door. One of my main job for this summer is to move my office space so, my desk place is at the door then I can sit with it open all the time

I right. So, having a Q & A session during your lectures is it a conscious decision?

MI05 I said I don’t really have question and answer session, but will leave a few minutes at the end for anybody to come out and ask questions about things I talked about. I’ll welcome questions in the lecture bits and it’s not really a session. It’s a question on individual point and then I carry on and somebody else ask question

I umm

MI05 umm, that’s the idea it doesn’t (20:31.2?) that way

I okay. You mentioned about you also work with series of work problems that you show on the white board?

MI05 yeah

I so, it that the questions they find on the Blackboard for weekly worksheet on the…

MI05 no. These are extras, these are examples so that they can go away and do those. Umm, they can be anything from really gentle introduction problems up to exam level questions

I okay. I think we’ve already touched on the questions I’m gonna ask you now, just a little bit, but I’m gonna ask you again. So, how important do you think language in applying critical thinking skills in general, over all

MI05 I think it’s less important, not important at all. Maybe in expressing the ideas, umm the outcome or your thinking it might be an issue, but that’s only in expression it’s not in the thinking process itself. Umm, I would say in Maths (writes a maths symbol on a white board), ‘any written English? No!’

I no (laughs)

MI05 (laughs) so, as far it applies to my course not an issue at all, I think

I okay, how about over all engineering foundation year programme

MI05 umm, I would say (sighs), for critical thinking as oppose to just learning knowledge I would say the Maths is the one probably requires the most of logical thinking probably followed by my course and then Electronics and, umm but, I don’t think in any of those language is a severe issue. I mean we make a point of, I’ve been putting up a little bit. Occasionally, using accessibly flowery language, umm but we make a point make things clear and understandable to all, to our students we speak slowly etcetera. Umm, where it’s become an issue in laboratory reports for John they have to produce posters and they have to do a bit of self-reflection. But, I would say critical thinking as I understand it is probably less involved in those, they’re often just referring to books and just copying, you know. Not copying, sorry, taking references from books. Umm, so, I would say there’s less critical thinking involved in those exercises

I umm

MI05 some of the lab reports maybe they have to draw conclusions at the end, umm and some of the use of language are not brilliant, you can see what they’re trying to say, so they’ve applied critical thinking to it

I umm

MI05 but, as I say they probably accessing the outcome of their thinking, so I would say that as more of an issue

I umm, right. Just now you mentioned about poster for EE…

MI05 no, that’s part of the Routes to Success poster

I they still have that poster presentation?

MI05 I don’t think they’ve presentation, no

I it’s just…

MI05 no, they just, it’s part of Routes to Success, probably they have to produce a poster at some stage

I okay. So, for engineering studies on the whole, language is, how important it is?

MI05 umm ( \_ ) as long they understand basic English, and I mean, I don’t see it as that critical. Umm, we take them with, which obviously one point lower language qualifications than they need for full degree

I umm

MI05 they get supplementary English on the course, they get I think Language Pathways at certain level, where they have extra English lessons and miss some of the, depending what their degree option is they miss either Electronics or Engineering Principles

I umm, right, because for engineering studies for example, let’s say they’ve designed something and they have to convince the sponsors or whoever they need language to convey their idea…

MI05 this is when they got on to the full degree I can’t speak about that because I don’t know enough about the course content

I umm

MI05 all I can speak about really with any degrees with certainties is my course and Maths course content because I’ve only two I’ve taught on

I umm, for this stage, foundation engineering year, can I say it’s not, they should able to sail through?

MI05 they should be able to sail through if they have the specified language qualification that we insist on. I say they may struggle on bits totally on related to critical thinking, bit related to more regurgitation I would say

I umm, okay. There’s also two issues here, there’s claim that when a student lack critical thinking, they wonder if it’s a thinking problem or a language problem

MI05 umm ( \_ ) I see what you mean because there can be, I don’t think I have issues with it in my course, but I could see in some of the courses unless the actual problem is specified very clearly. Umm, they might have trouble actually forming the problem in the first place. In fact as I recall there’re couple of Maths homework sheets which I think they’ve been altered where some of the overseas students couldn’t understand what they’ve been asked for

I okay

MI05 umm, I see some of the UK students couldn’t understand what they’ve been asked for either (laughs), but ( \_ )

I right. So, the next question, this is the second last question. Students every year come with a different profile, the students are different every year, so therefore, we usually, consciously include or exclude certain skills in the teaching. So, on that basis is there any skills with relevance to critical skills you feel they need therefore you deliberately include for this year students

MI05 umm, ( \_ ), I don’t think I’ve deliberately include, I assume, you see, I don’t, though I’m sort of almost equating critical thinking with mathematical skills I quite entirely do that

I umm

MI05 but that is a chief element of critical thinking they need, it’s mathematical skills ability to think logically, and I tend to see not anybody (28.55.4) who starts the course has a reasonable ability to think critically. I’m clearly incorrect in this, but (laughs), we haven’t really got time to teach critical thinking as such

I umm

MI05 but, anybody who’s done, take the UK they all have to have at least GCSE in Maths, so they learn basic mathematical skills

I umm

MI05 the overseas students, well normally they’re academically better qualified than the UK students I would say, I, it’s a sweeping generalisation

I right. Is there any skills that you excluded for this year’s group?

MI05 I’m not quite certain what you mean by that? Is there any skills that I’ve excluded?

I like for example…

MI05 if I’ve excluded then it’s either regard as trivial or they never occurred to me so (laughs), so what skills they likely, English language is dealt with spelling, no (laughs). I don’t include things like that

I no, those are language skills because, what I’m trying to ask is something to do with critical skills like looking for details, challenging the authority those kind of things which have direct relevance to engineering for…

MI05 it’s ( \_ ), I don’t encourage them to challenge anything, no

I umm

MI05 I’ve never ever thought about it because, I don’t know how to put it. It’s very difficult to challenge logic. Logic is absolute and mathematics is logic therefore, the only thing they might challenge occasionally is the initial of assumptions of course because logic is based on initial assumptions

I umm

MI05 but I tend to point out these are only the first order of approximation to a problem but they’re not. They’re not serious mathematical, well they not mention anything more than semi-series (31:29.6) mathematical model of a system

I like for example do you introduce them to any theories because the lab work is to actually find if the theory works

MI05 yes, umm and no

I no

MI05 no, umm it’s a, a problem I get with students’ reports actually that they (32:09.6) ask to calculate acceleration due to gravity and rather than put the end result in the possible errors they put their results and then put their norm value came back as error

I umm

MI05 so, they’re actually, labs are supposed to be open-ended they suppose encouraged them to think because they’ll be doing experiments that they don't know the answer

I umm

MI05 they would be may be in their final year of engineering degree they would be the first people who will be doing these experiments and certainly in their first year of their PhD. So, the labs are not necessarily encouraged to, somehow they back up the theories, yes, they test and confirm the existing theories. But, they should be taught as far more open ended things than that, so, it’s not just critical thinking it’s the original thought that we’re after as well and the ability to question their own ideas

I umm

MI05 umm, I’m actually in charge in teaching in the labs, but John does the bits on how to write a formal report and what goes into it so, umm ( \_ )

I okay, interestingly you mentioned about encouraging students to sort of question their own ideas which is sort of challenging…

MI05 yes

I so this, they have more opportunities to practise this kind of skill, critical skill in lab work

LANGUAGE

MI05 well, they have to produce two formal reports, to be honest the first one is all about to get the structure of the report is right, so you know, how they got the abstract, how they got the table of content, how they got an introduction. The second one is far more about the content and we give a lot of marks to discussion and conclusion at the end. They get somehow thirty percent of marks for that, so then, that form the most important part of it, yeah

I right. so, the first one is more on the layout, the convention

MI05 yes

I they have to get it right

MI05 yeah

I the second one is how they critically analyse the content

MI05 yeah

I okay, this is the last question. So, as a module instructor of Mechanical Science how would define critical thinking skills?

MI05 I would say, it’s difficult to sum up in a very short space of time, but essentially it’s the ability to arrive at logical another important part of critical thinking. Umm, I was brought up as a Catholic and even though I thought critically or thought logically about things, I start from the premise of what Catholic priest has told me (laughs) whether that it’s true or not is by the bib. But, so part of the critical thinking is to question authority to some extent that’s probably the part that we don’t encourage. We tend to concentrate more on the ability to draw conclusions

I alright

MI05 umm, because if they question everything I say I never get anything taught

I right

MI05 but, I would say critical thinking does involve that. Umm, but to some extend the facts is so well established there’s almost you can say they established by experiment you know. I mean the way science progress is through questioning other people’s work and

I yep

MI05 not necessarily wrong, I mean Einstein didn’t show Newton was wrong Einstein showed that Newton was incomplete, I say it’s a big difference. But, ( \_ )

I we recognise their contribution

MI05 yes

I and then we follow up to make it better?

MI05 yeah, we don’t encourage them to question authority and I think that apply for my degree as well that I wasn’t encourage to question the authority until I got to my PhD when I was encouraged to look at things from a different point of view totally different. But I think you need some basic level of knowledge before you actually start to questioning the authority. So, may well provided in that knowledge so, but we certainly do encourage, well I’d say any Maths based courses kind of encourage logical thought, it must be

I umm

MI05 umm, you know, maybe not as directly as the, sort of what I would say, ‘oh! Cats have four legs my dog has four legs therefore my dog is a cat because they have four legs’

I yes

MI05 we don’t go that far, although in my part of Routes to Success I do a course on problem solving and it’s, there’s one lecture in particular which I base around solving problem where you don’t seem to have enough information or you don’t initially have enough information, but you do in fact

I umm

MI05 so, you looking at how you arrange the information you have. Umm, I build up that quite slowly I sort of give them the skills of problem solving so they, I do lecture on numbers, a lecture on accuracy and measurements, I can’t remember what the lecture on now, but there’s a particular one that I introduce last year. I didn’t do it the first year which is specifically on problem solving (shows on whiteboard)

I I’m not good at Maths (laughs)

MI05 it’s alright (laughs)

MI05 it makes you to think a problem in a different way

I yeah

MI05 actually, the person who taught me that was unemployed and I get it at a job club (laughs)

I oh! Okay (laughs)

MI05 so, to think outside a box, so I had to find a job

I right. So, to conclude, you mentioned about the importance of having the basic knowledge before you can explore any other areas of thinking. So, the important thing here is the ability for a student to draw a conclusion from a set of criteria, is it? Based on…

MI05 from we gave them a set of premises or, premises was what I used is it?

I premises, yeah

MI05 and from those they should be able to draw a conclusion. A conclusion that they’re asked for, they’re not encouraged at the moment to think of anything original, so I mean, a swift thing like they’re given a force, they’re given a weight, what’s the acceleration of the object? That’s a brief sort of example, but’s it’s the source of problem they set

I umm. So, for your problem solving is the, can I say that?

MI05 that’s a typical problem from the engineering or that’s one of that ran in every single base to be honest (41:21.2?) but, the problem solving classes they, I tried to let them think of how to arrange the information so they can tackle a problem. Particularly let say in questions where they don’t seem to have enough information. Umm, I just want to show you sort of the thing I meant, sorry I’m not keeping you am I? (retrieving the slides from his laptop)

I no, I’m fascinated by all the information that you’ve given me (laughs)

MI05 (laughs) problem solving, yeah (laughs). That’s a typical problem (showing on his lap top screen). It doesn’t seem to have enough information to answer it

I umm, I wonder how to solve this?

MI05 (laughs) well, you either move three eggs, there’s a bridge

I yeah

MI05 a train is coming that way sixty miles an hour and it needs three eggs way across, you either get to that end which is three eggs a distance, or you can get to that end which is a five eggs of a distance. So, you cover the cost of the distance in the time the train approaches which is going to cost the speed of the train. It takes a quarter of the bridge for the train to come over the bridge (laughs)

I yeah

MI05 but it’s not that obvious (laughs)

I yeah, I was looking earlier at one of the slides

MI05 (scrolls the slides)

I yes, this one (pointing at the slide) you explicitly, this really helps them isn’t it? To think through a question, so all these are like step by step how to apply critical skills and this is really good…

MI05 yeah, that’s the first one and so then I mention the idea which is very similar

I umm

MI05 identify the problem, define the problem

I yeah

MI05 examine the options, actual plan and the consequences

I umm. Yeah, wow! This very explicit and if the student don’t get…

MI05 so many details

I yeah

MI05 it’s just the same as the other one

I it’s very interesting, I think, that’s about it I think

MI05 okay

I thank you very much