VIEW to the U transcribed
Season 1, Episode #8
Professor Jodie Jenkinson

[VTTU Theme Music]

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So, for example, if you're trying to depict a crowded molecular environment, I mean, that's very labor-intensive and time-consuming to do, whereas now Hollywood is using software applications to simulate crowds of fighting hobbits, and they're able to harness this so that they can simulate digitally this really crowded environments.

And, if we can take *that* and transfer it over to the molecular realm from a software perspective, that would revolutionize our ability to simulate molecular dynamics and things like that.

From a research perspective, we need to be a little bit more careful. VR – virtual reality is a great example. A lot of people are using it but I find whenever I'm in a position to see a demo of a VR project I'm always asking myself, "Could this have been done without the headset? Could this have been done by looking at a screen? Could this have been done with an illustration?"

[theme music]

Carla DeMarco (CD): Animations, visualizations, illustrations, art, and technology tempered with the measure of molecular mechanism and some science. The brief but comprehensive blend of disciplines in the intro on this edition of *VIEW to the U* podcast does a decent job of summing up a program like biomedical communications.

On the Biomedical Communications website, the program is described as “an interdisciplinary graduate program in the design and assessment of visual media in science and medicine” and that it “bridges disciplines, art, science, medicine, and communication to develop visual material for health promotion, medical education, and as part of the process of scientific discovery.”

On this edition of the podcast, Professor Jodie Jenkinson takes us on a virtual tour of her work in the Biomedical Communications Department examining her current research program, how she ended up in this area after starting out her career as an animator, what kinds of developments she's seen over her time at UTM, and what she sees on the horizon for her field.

Hello and welcome to VIEW to the U: An eye on UTM research. I'm Carla DeMarco at U of T Mississauga. View to the U is a monthly podcast that will feature UTM faculty members from a range of disciplines who will illuminate some of the inner workings of the science labs and enlighten the social sciences and humanities hubs at UTM.

Jodie Jenkinson is an Associate Professor in the Department of Biomedical Communications and she's cross-appointed in the Institute for Management and Innovation at UTM. She teaches courses in research methods for visual communication, interactive media design, and information and data visualization. Her academic credentials include a BA in Art History and French from McMaster

University, a Master of Science in Biomedical Communications, and a PhD in Education from the University of Toronto. Her research is concerned with the role that visual complexity plays in learning. Jodie is an elected member of the Board of Governors of the Association of Medical Illustrators and a board member of the Vesalius Trust, a non-profit foundation supporting research and education in visual communications for the medical and life sciences.

You are professor in the Master of Science in Biomedical Communications, which I'll refer to as BMC, and that's a part of the Department of Biology at UTM. And I understand that in your research, you are primarily focused on the role that visual perception and visual complexity how that factors into learning, and so I just wondered if you could tease that out a bit and provide an overview of your particular program of research, and maybe define for us what does research look like in a BMC lab?

JJ: Research in a BMC lab is *really* focused on visual communication and how that impacts learners. And so much research in learning is devoted to text and imagery or animation in text or interactivity in text but it doesn't focus on the individual components that go into making a visualization and how those can be manipulated to either hinder or foster learning. In my research lab, we really do look at how the design of animations and the design of interactive tools may be used effectively for learning.

Again, it really focuses as much on the perceptual aspects of learning: how color and tension-queuing devices, like using arrows or other devices to direct the viewer's attention, how those things affect learning in different learning contexts.

CD: So, if you're maybe studying how people look at these things then you've got your test subjects, and you're just seeing what it is that they're drawn to or what's most effective in terms of their learning for the majority?

JJ: Yeah. I think because visual assets are so complex and detailed it's often difficult to tease out exactly what it is that might be drawing one's attention, or what it is that's contributing to the learning, so we use a number of different research methods to get at that. We use eye tracking to look at where the viewer's visual attention is focused, and also things like pupil dilation to determine cognitive load in viewing the material. We also use verbal protocol, so we get viewers to think aloud while they're watching animations or using interactive tools. Then we use traditional experimental test instruments like pre and post-tests, as well, we conduct focus groups with students.

You know, often you'll conduct an experiment and the results might not be quite as compelling as you think but that doesn't mean that there aren't other questions, deeper questions, you can be asking. So we'll conduct focus groups often as a follow up to studies to try and really characterize students' understanding of things, the impact of the visuals, their misconceptions. That's a big factor, and what we do is really looking at student misconceptions around life sciences education.

CD: I don't know if this is a fair question but you're just making me think there's a psychologist on campus that does this EEG. Are you getting involved with that at all, or no?

JJ: I would *love* to. I would love to work with imaging technologies actually. I need to find someone who can give me access to functional MRI so that you can have students even undertaking tasks, visual tasks, and look at, depending on their level of expertise and where they are in their learning trajectory and what their prior knowledge is, what parts of the brain are lighting up in response to the material that they're interacting with.

CD: I see from your website, which is The Science Visualization Lab – which is beautiful by the way, with all of the visuals and imagery on it, and I highly recommend people check it out and we can link to it from our site (https://bmcresearch.utm.utoronto.ca/sciencevislab/index.html) – but that you have several ongoing projects with grad students.

By way of example, one current project is a "molecular journey through space and time." I saw that, it's got a neat animation on the site (https://bmcresearch.utm.utoronto.ca/sciencevislab/index.php/portfolio/a-molecular-journey-through-space-and-time/index.html). But I just wondered if you could describe in a bit more detail this project in particular just to give a better sense of the applications of the research and what is involved with this kind of project that you are supervising.

JJ: That molecular journey is an interesting project insofar as we had all of these lofty goals when we set out to develop it. We wanted to look at creating two different visual treatments. One that used a framing. There's a grid in that animation that helps take you through each scale of the molecular realm, so from the level of a molecule down to the level of an atom. And using grids to show people how incredible that spatial scale is because students have a lot of difficulty understanding that, of course they do, they can't see it. And it doesn't correspond to anything in their experienced world.

The other thing we wanted to look at was the use of sonification. So at each level, so from the level of a protein to the level of looking at protein conformation to looking at down to the level of amino acids, we used different sound frequencies for each of those. We were trying to use that to emphasize the big change in both the spatial and the temporal scale because you might have, at one level, a protein bending and folding and then it's moving at a completely different temporal level than amino acid chains. So, it's very difficult for students to comprehend both the spatial and the temporal scale associated with cellular environments.

So our goal was to create one treatment that included this visual aid of a grid that would help them go through the levels and also the sonification. And our goal was then to take one without these queues and see how if it made any difference and to use crowdsourcing as a means of evaluating that. So something like Mechanical Turk, where we could enlist thousands of people and really get a sense of how these two different treatments were working, but of course, that hasn't happened yet. You get caught up in other things and still on the back burner.

CD: But so then the ultimate goal, though, is once you've got those versions ready to go you would test them out and see what makes the most sense or what people understand better?

JJ: Yeah, so we might even then create three treatments: one with sonification, one with the visual grid, and one with all three. And then, if you've got a captive audience of 10,000 people, you can get a pretty good sense of which of these is more effective in conveying both the spatial and temporal scale of these environments. So, it's something we still do want to do, we just haven't gotten around to it yet.

CD: And so, are these videos for the average person or are they meant for people who are working in the medical field?

JJ: Ah. Okay, so a video like that would have been I would say both for an undergraduate audience and also for the general public but more the Novo or Discovery Channel general public that might have a

basic interest in these things. Many of the tools that we do develop are geared specifically towards undergraduate biology students because, of course, we have a large biology population here at UTM.

CD: I understand from listening to the *Raw Talk* podcast, which comes out of U of T's Institute of Medical Science that you were on, and we can also link to that from our site (https://www.stitcher.com/podcast/raw-talk-podcast/e/8-dr-jodie-jenkinson-48948494), but that you have an arts background. I find this so interesting because, to hear you talk, you sound like a scientist, and that you started out your career as more of an animator in the arts area, and so that you were motivated to pursue this particular area when you were frustrated with the medical field. I was wondering if you could talk a little bit more about that.

JJ: Yeah, I like to think, to be kind to myself, that I'm a late bloomer and not someone completely without direction. My undergraduate degree was actually in French Literature and Art History but I was always very interested in fine art. And I was lucky enough to pair up with Hall Train, who at that time was an animator, but now he works on paleontology reconstructions for museums, and he's just a fantastic guy. So I worked in his animation studio for a few years, and I also found myself becoming more sort of interested in science for the general public. This came out of family illness. My mother was diagnosed with breast cancer, and so I was scrambling, trying to find lots of material both for her to understand her diagnosis, as well as recovery through that process, and there was *nothing*. Now granted this was long time ago but I was *so* frustrated, and went to see my doctor, who then started pulling out all of the Netter Symposia, Frank Netter illustrations and said, "You know, medical illustration is a field you should consider. *You* should do something about this."

And so I decided to go back to school, and completed a Masters of Science in Biomedical Communications, and for the first few years I really did focus on patient education. I worked with prostate cancer patients developing educational material for them, animation, interactive tools, videos, and I still have a very close collaboration with the prostate center at the University Health Network.

CD: I think that you're touching on this a lot because I think this is very much about helping people learn, but what do you think is the biggest impact of your work?

JJ: Well, I think that is particularly now we're living in, I think, an increasingly visual society, there's *so much* visual stimuli out there. I mean, everywhere you look it's wonderfully programmed television, science shows, YouTube videos, there's so much educational material on YouTube, which is really astounding. And I think we still don't know what the impact of all those visuals are so I think my contribution is hopefully threefold.

It's trying to figure out what the best practices are for developing those materials for people so that ultimately they are effective. It's also reaching out to the scientific community and helping them to understand that visualizations can be impactful in their own work. *Every* researcher should have a visualization scientist in his lab.

The third part is really bridging all these gaps between the educational psychologist, who are studying visual stimuli but not…some of the resources they use, they don't reflect what people are exposed to today. People expect Hollywood movies today, and so some of the materials they are using don't really reflect the sorts of videos animations and interactive tools that students are finding online. So bridging that gap is the third part.

CD: Do you find most of the students that are in the program, are they mainly coming with a background in science or a background in the arts?

JJ: I would say 95% of the students coming through our program have a background in science, either undergraduate or graduate degree in science but it's almost always the same story. They always kept a sketch pad or they secretly wanted to be artists but they didn't want to give up science. Sometimes it's the little negotiation with their parents, you know, that maybe I'll try this out first before med school. And so, it's always the same. They come in. They've had an epiphany, and they realize that they could actually do both, and that's very, very exciting to them and they are such an interesting group of people, too, the students who come in to our program.

CD: You're making me think though, too, I saw a TED Talk from Sunni Brown that she talks a lot about taking notes but she's always drawing in pictures. She talks a lot about visual learning that you're kind of making little doodles that people used to sort of, especially professors, be against because it looks as though you're not actually paying attention but she said that's how she would get some of the concepts that she was [learning] -

JJ: I remember when I was in grade school, I used to doodle a lot in my notebook and it was partly something to do with one side of my brain while the other was listening to the teacher but at the same time it was also a way of making sense of what I was hearing. And I remember one of my instructors saying maybe one day they'll give out a degree for doodling. He was just very upset that I was doing this all the time. If that's what you want to call Biomedical Communications, then I have an advanced degree in doodling.

CD: [laughing] I love that.

[Interlude theme music]

CD: Coming up, UTM at 50: Having moved over from the St. George Campus in 2005, and with the BMC program based at UTM, Jodie reflects on the changes she has noticed on campus since she's been here and the evolving nature of her field in Biomedical Communications.

CD: This podcast's first season is about UTM at 50, so now I'm going on a little bit of a different tack. I'm asking people about how UTM has changed since they've been here, and I know that you started out in BMC as a student before joining the faculty. So, you've been on the UTM campus for a few years and what kinds of changes you've perceived on this campus since you've been here?

JJ: I've been around *forever*. I actually got my start on the downtown campus and taught there for a number of years. We moved out here I think around 2005 and the campus has changed tremendously. It's grown and it's such a beautiful campus but for me, the most liberating thing about coming to this campus, and I brag to people about this all the time, 'I'm right down the hall from the research office. If I have a question, I can go knock on a door, and I get a response right away.' For me, being out here it's a productive space. I get things done. I love it.

You know, at first, of course, when we moved out to the UTM campus, like everyone else, we all live in Toronto, we were all a little bit leery of the commute, but even that has become a lovely educational opportunity for me. I listen to podcast on the way out and no, it's just a wonderful space, it's expanded the number of students. It's incredible to watch the programs swelling. Even our own program, our

graduate program. When we were on the downtown campus we had eight students per year, and now we're up to 18.

CD: And you know, I have to say, being down the hall that whenever I walk around there's always people here, and even sometimes I've had to come and pick things up at odd hours, there's always a student sort of working away in the lab. I know, you know it's a two-year program so it's kind of concentrated, but people are just so dedicated in this program.

JJ: And we really encourage students to spend time in the lab, too, because it's not just about sitting in front of the computer but it's all of the, sort of, feedback and collaboration with your peers that students come to value and they miss as soon as they graduate. So, we encourage them to really foster that kind of collaboration and hopefully take it into their professional lives as well. The same as with the faculty. They are wonderful people and we love collaborating and exchanging ideas with one another, so coming into work is always a pleasure.

CD: On that note, though you were talking on the *Raw Talk* podcast about a collaboration you had with Jumi Shin. She's a faculty member here in the Department of Chemical and Physical Sciences and I just thought as you're mentioning before, it would be so great for all of the researchers here to be somehow tied to the BMC program.

JJ: We're working on that. We're collaborating more and more with biology. I had a wonderful collaboration with Jumi and one of our graduate students, Matan. He has just finished his project, which was devoted to chemistry and helping students understand three-dimensional structures of chemicals based upon these two-dimensional diagrams, and that's oversimplifying it, of course, but we conducted a little study whereby some students used the physical models in the lab, some students used a three-dimensional program, and then the third group used an AR program.

CD: AR is augmented reality.

JJ: Sorry, yes, augmented reality, in which the three-dimensional structure was overlaid on top of the two-dimensional diagram. And so it was a really interesting study. It's wonderful working both with people who have that kind of domain expertise but also who are in the trenches, in the classes teaching students, so that what we're doing can have direct applicability to advancing education out here at UTM.

CD: I imagine that in your line of work because there's so much technology and animations and design at the forefront that we could see some wild changes coming for the Biomedical Communications field, and so I just wonder, what kinds of changes do you foresee for your area of research? Because with visual, what do you think the research will look like maybe ten years from now?

JJ: I think that the advances in technology have directly impacted our program, and will continue to do so, both from the research perspective but also from the practice-based perspective. So, you know, for example, if you're trying to depict a crowded molecular environment, I mean, that's very labor-intensive and time-consuming to do whereas now Hollywood is using software applications to simulate crowds of fighting hobbits, and they're able to harness this so that they can simulate digitally these really crowded environments. And if we can take that, and transfer it over to the molecular realm from a software perspective, that would revolutionize our ability to simulate molecular dynamics and things like that.

From a research perspective though I think we need to be a little bit more careful because you see a lot of people jumping on the bandwagon with the latest and greatest technology. VR, virtual reality is a great example. A lot of people are using it but I find whenever I'm in a position to see a demo of a VR project I'm always asking myself, "Could this have been done without the headset? Could this have been done by looking at a screen? Could this have been done with an illustration?" I think it's really tempting to dive into a new technology when it might not necessarily be the appropriate technology for what you're trying to communicate.

I think time will tell if VR is going to be something that will be really, really useful. I don't know if it is right now. I think AR is starting to, I notice for example Apple in updating their software development kit. They've forgotten about VR altogether and they just jumped into AR. It's important to pay attention to those sort of flags as well.

CD: I can't help but wonder though too about in BMC you talk a lot about like say the user experience.

JJ: Yes.

CD: As this next generation is coming up, and they've been on computers since they were born, and I see it with my own kids. It just comes naturally to them or even when you think about animations, people have access to making little films and things like that automatically through iMovie but I just think that will also be maybe an impact on your field.

JJ: Yeah, that's actually a really important point that as more of these technologies become available to consumers, you get people creating their own experiences. And I think that's something actually that is *incredibly* valuable in teaching and learning that if we can create tools even that help people to through inquiry design their own learning experiences, what could be more valuable than that? I mean, do you learn more watching a cooking show or going into the kitchen and trying to do something, trying to bake something? So, I think that's really, really valuable.

Just anecdotally this…I spent the past few days with a friend and his young children, one of whom is five and to watch her use an iPad was just extraordinary to me. It was like her digits were moving so quickly it was a blur. You're right, that is second nature to people now, particularly to young people. And I'd love to see more schools integrate coding, get kids coding and making things, I mean, I love the whole sort of maker culture in that idea that you can really explore technology and create new things.

CD: Absolutely. Those are all the questions I had for you today. I want to thank you so much for coming in and telling me about your research and what's going on in BMC.

JJ: Thank you for the opportunity.

[closing theme music]

CD: I would like to thank everyone for listening to today's show. I would like to thank my guest, Jodie Jenkinson for coming in to speak about her work in the BMC program.

Thank you to the Office of the Vice Principal of Research for their support, for everyone who has been helping to promote the VIEW to the U Podcast, and for all the great feedback I've received. Thank you to Tim Lane for his tunes and support. Thank you.

CD: Okay, we're okay?

JJ: I hope so.