Defining Creativity S1E18: Esther Kataate Namakula transcript

Debbi: Hi, everyone. Thank you for joining me for this episode of *Defining Creativity*, a podcast that explores where and how creativity is found. I'm your host, Debbi Ponella, a creativity researcher, cultivator, and devotee. On today's episode, we're joined by...

Esther: Hi, my name is Esther Kataate Namakula, and I am an international student at IU. I am doing science education. I am from Uganda, a country in East Africa.

Debbi: Esther, thank you so much for joining me today. I'd love to start by learning a bit about your background. Let's begin with why science education, and then we can get into the creativity perspective of it all.

Esther: Science has been kind of my life. So, I grew up in a family. My mom was an elementary science teacher, math and science. And so, she taught us so many things, especially around science. My father was into the church, so we never got a lot of time with him. But because we lived a lot with my mother, almost all the time, I got to know science. At first, I hated it because she almost choked it down our throats. But with time, as I grew up, I loved to do science.

So, I went to single schools and when I was in an environment where I could thrive, I thrived. So, in my single sex school, were all girls and I could feel that I knew science. My favorite subject was actually chemistry by then, but I also loved physics, and I also loved math and the whole science. And my O-Level, which is middle school here, I went to high school where you had to choose a path. You either had to do the natural sciences or you had to go into humanities, they were all vocationals. There were only three paths to take.

So, I decided to do the sciences, especially because there was a sister, my big sister. I am the second of the six children, and my sister was in science. So, I loved following, too, with what she was doing. And then with that, I did physics, chemistry, biology, and mathematics. Loads of challenges because in my class, were very few girls. This was a mixed school now, moving from a single sex school to a purely mixed school where the boys were the majority in the science field. I remember we had about 120 boys and we were about eight girls. And so, coming from a single school, I was very shy.

So, there are lots of factors that contributed to my learning. But the biggest issue I think was how I was taught science and how the teachers taught the content itself and the methodologies that the teachers used was more of lecture because we never had lots of labs and apparatus like the way I see things here in the U.S. So, when I did that, I had wanted to be an engineer, but I didn't make it on merit to the engineering course, but I made it on merit to become a science teacher. And so, my major was physics and my minor was chemistry, and then I also took with education. So, I started to be a secondary school physics teacher and chemistry teacher.

So, when I was in school, to be honest, in my career, I was teaching the way I was taught. I would define pressure, define all the concepts the way the teachers had taught me, like what I had learned in school. And that's how I was teaching. But I realized that I struggled a lot with understanding concepts because physics is a very abstract science. You talk about things that you cannot see, things that you have… terms you have not heard about. And then there's so much of mathematics.

Debbi: It seems like there is an opportunity for creativity to be incorporated. I firmly believe that creativity should be part of all teacher education programs, but can you talk about how you see it's role more specifically with science education?

Esther: [5:13] I think the way we teach students matters a lot. For me, a master's in physics gave me the context, that conceptual understanding of physics with all the branches of physics and what you love to do, like the hard material of the content. But because as a teacher, I never saw this help me…

Actually, at that time when I did my master's, I was already working at a higher institution of learning. I got another job. It was a teacher education institution. So, I was teaching students that were going to be physics teachers. And again, I was teaching them the way I was taught, the way I see things, the didactic methods.

So, when I was choosing to do a Ph.D., I was weighing between doing a Ph.D. in physics itself as a core and a science education or physics education. And then I decided that because I am a teacher, I should do science education. And then my area of emphasis would be physics.

And my heart is looking at two things. I am looking at bringing more girls in physics by, of course, coming up with creative stuff, like thinking outside of the box and helping them get onboard, right? But also, the boys would benefit if we change the way we teach. And when you look at physics as a nature of science, we say that there are lots of different tenets of the nature of science. We know that science is tentative. It keeps changing all the time.

Debbi: You mentioned 'creative stuff' and thinking outside of the box. Can you dig a little bit more into that?

Esther: [7:18] For you to be a scientist, you must be creative because you're coming up, you're teaching things that people do not know or that students do not know. You talk about coming up with models and using drama to teach. I have seen these things, and I feel like, why didn't my teachers teach me like this? Probably I would have been better if I was taught like that. So, I would really want to look at the PCK, which is the pedagogical content knowledge of teachers, the teachers that I'm going to teach.

Debbi: Yeah, actually pedagogical content knowledge, or PCK, is something we talk a lot about in teacher education, but would you mind explaining a little bit more specifically how you're applying that to your thinking and science education, and where does creativity live within that?

Esther: My notion is that we teach the way we were taught.

Debbi: Right.

Esther: If your teacher told you something and you understood it, that is how you're going to teach it to the other people. But as scientists and as the students that I want to teach, I want them to think outside the box. Almost all the content in physics is taught differently. You cannot teach it the same way. We have content that is micro, it's like microscopic. And then we have the macroscopic and then we have the microscopic.

For example, when I teach some content and I'm using experiments, that is macro. The students are able to understand. I have to be creative and say, okay, which topics will go with experimentation? And do I have all this instrumentation that is going to help me bring out a concept for these students to learn? And usually that will be in an inquiry way of teaching, helping them inquire from the knowledge that they know and the knowledge that is out there to come up to produce new knowledge.

But then I can also say that I have these other micro elements of physics. For example, when I talk about forces, I talk about matter. I'm not talking about the secondary school physics, like the simple concepts that can be understood. Can I use drama? I have seen students use drama to explain the changes in matter from solids to liquids to gases. And I'm sure a child, a student that would act in that kind of drama or in whatever play they would be having, they can never forget that.

But you also know physics deals with facts. We say facts. Force is a force. That is, it's a fact. We are always, we are all to the ground or to the center of the earth by gravity. When you fly, you cannot go. So, these are things that we work with. But how do I make them understandable? One of the things that I've been thinking about, like thinking outside the box and being creative, especially in the context that I teach in, is teaching with things that are low-cost materials. Like, when I am teaching a concept, can I get materials to use?

Because we are always doing experiments. You're always having models and doing all these other things to make sure that students learn. But can I use instrumentation that students can use when they go back home? Can they replicate these experiments at home? And this I've been teaching my students. I like teaching with low-cost materials. A student doesn't have to buy stuff to perform an experiment, especially if they are able. Leave alone things like rulers that are already instruments that have been put out there. But can they use a plastic bottle to learn a concept?

Can they just use a chair that they have at home? What can they learn by just putting on a nylon or a silk dress and it makes noise? What can they learn from that? So, if we could think of getting what the students can access to teach science, I think that would be very creative. Because as scientists, we have to be... Creativity is part of the nature of science. We learn from evidence, observations, coming up with qualitative data, quantitative data, analyze this data. You know, you go through all this scientific inquiry, all the scientific method, but you are using things or instrumentations that students understand.

Debbi: I love the idea of creativity being part of the nature of science. Creative thinking interwoven with critical thinking.

Esther: [12:52] I also feel like teachers can, we can, or I would want to handle areas of PCK in terms of the components of PCK. What brings about student understanding of physics? First of all, we have what we call orientations. Like a teacher goes into the class with what they already know. They have different beliefs. They have their own way of doing things.

For example, a teacher that is an extrovert is going to teach differently from how an introvert will teach. But can we draw a line between the two of them for the sake of learning and say, okay, at least, yes, you are like this, and you are like this. But for the sake of bringing conceptual change towards the students we teach, this is what we need to consider. Can you go outside of your comfort zone for the, not even just an introvert, but for someone who doesn't want to suffer or do experimentation and all they want to do is PowerPoint and lecturing.

But can you go out of your comfort zone to ask questions, use things like, the students like using those mentimeters, use instructional technology, you know. This is an age of technology, and I think teachers have actually a big challenge with that, that we like teaching how we know that even when new technology comes up, we don't embrace it. In science, we have simulations. You can teach with simulations. There are so many out there. But I don't want to go out of my comfort zone to look at this simulation and bring it into my class.

So, I think it's also, creativity also takes me from going out of my comfort zone. Am I willing to shift who I am for the sake of the students learning? As a teacher, knowing your student as a science learner is important. And I think this cuts across not just for physics, but if I know my students, what is their social, cultural background? How do they live? What are they familiar with?

Students are very bright people. They see these things happen, irrespective of their age, including the elementary kids. They see these things happen, but how can I teach science in their context, in their social, cultural context?

Debbi: [16:02] Do you see specific examples of difference between the contexts of Uganda and the U.S.?

Esther: In Uganda, when I am teaching physics, I am not going to use some of the things that I have seen here. First of all, they are not there, but also my students will not understand them. But when I am teaching and I'm using things like hose and digging and going to the well and swinging, like, I don't know how they call them here, like swinging for oscillations, I will do them in the context that they understand.

Debbi: What would be an example, then, of how you might approach a similar class here in the U.S.?

Esther: Here, it would be very different because they do not understand what I am familiar with or where I have grown up with. I'll give an example. One time I was teaching my class. I teach a physics, environmental physics class, which is an inquiry class. And I was bringing an example that I see works a lot in the context that I have been in. And I felt like the students would understand it. My example was that gravity always pulls things to the ground. And things usually, especially like rivers, they would flow from the north to the south, right? Or, depending, they will flow downhill. But then I was telling the students that we have a river, the River Nile, and it flows up north. So, my question for them was, why does that happen? What do you think? What is going on? What's the science behind that?

But they didn't even know the Nile. Some of them have not heard about it. So, the example that I used was out of their sociocultural understanding or interactions. Probably if I had used the White River or something that they are familiar with, it would be easy for them to understand. So, that is why I said that it is very important to know your science learners that you have. How much do they know? What is their sociocultural context? That is when you're going to think outside and say, okay, these are the kinds of students I have, and this is how I'm supposed to teach.

Almost every country has their curriculum, right? All states here. This gives the teacher an opportunity to think ahead. I know I am supposed to teach this topic here. After this topic, I bring this topic. After this topic, I bring this topic. Can I use different methodologies to teach this? Because not all topics go with experimentation. I'm not going to use models on all the topics. I'm not going to use simulations on all the topics. But because I have this curriculum, am I able to think outside of the box and also not use the same thing all the time, even if it's the same class that you'll be teaching the next year? So, I think there are so many opportunities for us in science teaching, especially physics, to be creative. There are so many.

It will take the willingness of the teacher. Do they want to learn? Because I've also seen it, like I mentioned, we have continuous development, professional development courses that come up for teachers. And people don't want to attend them. We always want to be in that comfort zone. And the more we do that, the more the students will not learn. And physics will continue being abstract. And it is not abstract. Yes, the truth is, you need to be mathematically capable to do physics. You need to understand this stuff.

But I believe everyone is born with that understanding. It's just that you are teaching them wrongly. And they will fear these subjects because it's the boys that are always on top of the game. But even in the U.S., literature says there are not many girls in physics. So, it's not just in other countries. Even here, there are not so many girls.

Debbi: So, diving into some of what you said specifically about science or physics, you were talking about how there's so much that you cannot see, right? And the things are always changing. So, you've got to at least have some amount of imagination to be capable of imagining something that you can't see, that you can't prove, I guess. How do you develop that? How do you approach that idea of using your imagination in something that's… you know, if you say scientific, it's going to seem like it should be very strict and provable in a certain way. How do you develop that ability to understand the concept of the unseen?

Esther: [21:37] We have what we call scientific inquiry. So, it begins with a student observing. Let's say in physics, they are observing water flowing. Water is flowing. Let's say water pours on the table. It just goes and then all of a sudden it stops, right? Because that table is flat.

So, a student begins with curiosity. They look and then they are curious, why did the water stop? And then give them an opportunity to ask those questions that they have in their mind. Let them ask, why did this water stop? Is there anything that happened? Is there something that is happening and what is really going on? And then this student will write a series of those questions. Some of them are going to be investigable, like you can subject them to experimentation and others are just going to be non-investigable.

For example, when I ask, okay, this water is flowing, but where does it stop? They can tell that it stopped somewhere, right? They can tell the color of the water, like qualitative data. You just look and then get out the quality of what you are seeing. But then they will also have that questions that are going to lead them into an investigation. So, if a student asks, what is stopping this water from moving? Definitely the answer would be, of course, there is inertia, there is force, there is all these other things.

But I want the child or the student to come up with those answers, right? I don't want to give them to him or her. I want her to come up and say, okay, I think this water stopped flowing because there was a force that was, let's say, friction or air resistance, right? Air resistance, it's another force that could refuse the water from going ahead. So, they would think and say, okay, maybe there's something that is pushing the water back and not to go forth. So, the path will only be on the surface, right?

So, I will ask, what do you think that something is? So, the point I'm trying to make is the teacher helps the child to imagine all these things. My job is to elicit or to kind of provoke this student to think, okay? I don't give them the answers, but they will think outside of the box. They'll think, and even if the answer is wrong, just encourage them. And you ask questions that are leading to the right answer.

Debbi: It sounds like you're not only helping them develop creative problem-solving skills, but also problem-finding skills, like figure it out, even what you're looking for.

Debbi: [24:59] You've mentioned multiple times about observation. And I'm thinking when you observe things, obviously, if you're working with children or students or people any age, there's going to be different ways that people look at things. And they can look at the same thing and see different things. So just those skills of observation, I'd be interested to hear, because obviously you've developed them quite a bit. How does that outside of science, outside of teaching, how do those skills of observation affect how you interact with your environment or within your community outside in the world?

Esther: I will give an example of one of the… I did a data collection with the students because I wanted them to inquire into the environment. And so, I told them, the first activity, I told them we go out, get a pen and a paper. We are going to go and observe a tree. And I want you to tell me ten observations that are quantitative. Quantitative in the way that they're measurable, you can put a number to them. For example, the tree had ten branches. The tree had one trunk, right? And then I told them, you go and also make qualitative observations.

Those that you cannot put a number to. For example, the tree had yellow leaves, or it had green color. The trunk was rough and things like that. And then they also made some dynamic observations and some static observations. That was in the environment. So, we did that together. And then I told them, okay, so you guys are going out for a week. I need you to go and dig up soil and observe that soil. Yes, in your neighborhood, close to your dorm of residence or wherever you live. Get soil, look at it and observe it.

And then write down the observations that you're seeing. Are you seeing some bugs in the soil? Do you think the soil texture is different? You know, all these things. And these were done in the community. And then the other question that built onto that was look at the state of Indiana. What are the things that you're seeing that are affecting the environment, right? So, students had to think outside of the box from just observing to think of things like pollution, think of things like deforestation, littering of plastics.

And these are not answers that you're giving them, but you are trying to build because it begins with what are you observing? What can you see? And then it goes on building and building and building. And actually, where we are going to end up is them designing a study to see how they can look at the topic they will have chosen in the environment and how they can either do an observational study or an experimental study to come up with the results and tell us what we can do to solve this problem that is there. So, this is even outside the classroom. It's not confined in the walls of the classroom, but the students can still be creative and think of the environment that they're living in at home.

Even the country at large, a student came up with climate change. That just doesn't affect America, it affects the whole world, right?

Debbi: Sure.

Esther: Yeah, so I think science can go far if we know how to teach the students.

Debbi: Right.

Debbi: [29:14] I want to just change pace for a second and ask you more about you. Do you have a particular creative process?

Esther: Yes. If process, you mean coming up with my ideas or developing ideas that I want to use to help students. Personally, as a physics teacher, I cannot go to class without anything. Even if I don't have a gadget or any manipulative instrumentation, I will have a simulation, at least. Because simulations are everywhere. I will at least have a simulation.

If I don't get that, I can use metaphors and analogies, you know? How you bring the exact situation in another place and then bring it to a classroom environment or setting, especially in that subject. So, I will have to think about all these things before I go to teach my class. But I cannot go to class and just lecture. They will not understand anything. They can't. You have to use something. So, my process has always been, what am I going to teach? How does this apply to me as a person? Because if it applies to me as a teacher, it's going to apply to them. And it's going to be easier to transfer what I already know and applies to me to the students.

Debbi: I love that you can be flexible and use things like you mentioned, metaphors and analogies and help find… You had mentioned earlier about knowing your students and being able to reach them in a that is meaningful for them and that starts with something that's meaningful for you. And that's amazing. Is there anything particular that inspires you, that inspires your creativity or that just inspires you in general?

Esther: [31:27] I wasn't taught well, and I want to be a good teacher. I want students to find it easier than I did. Even now, when you tell people, oh, I am a physics lecturer, everyone will say, ah, you must be so sharp, and, you know, which I think is not the case. I can still be a lawyer. I can be a geographer. I can be a historian and I'm still sharp. But there's this connotation that goes with, you must be so sharp for you to do physics.

And I should say that I am not an A-plus student. I struggled. Seriously, I struggled because I went through alone. It was always a lecture method for my teachers. And I don't blame them because that is what was there then. But now, being in the system, I know better. I know better. I have studied some of these things and mastering these things. And if I can teach my students and they come out of a class and they say, “I learned this concept. I think this is easy. I think I can tell this to someone else.” For me, that is my great, it would be my

greatest joy. So, my inspiration has always been, I don't want to teach the way I was told. I want to be better than how my teachers taught me.

Debbi: And I find it amazing that when you're talking about it wasn't easy for you, yet this is the road you chose, and you're so passionate about it, and you want to share it. That's inspiring to me, definitely.

Esther: Thank you.

Debbi: Absolutely.

Esther: Thanks.

Debbi: You've talked about difficulty of some of the education situations that you've experienced, but you seem like such a positive person in that you take those challenges, and you make good on them, and you are inspired by them. On the flip is there anything that you find that really sort of does the opposite and stifles that ability to be creative and share your passion?

Esther: [33:44] Yeah, the road is very lonely. Many times, you find that you are alone who wants to do this. Teaching is not an area that has a lot of money, that even the ones that are already there, I don't know the situation in America. I've only been here for one, almost and a half years, but back home, teachers are not paid very well. But science teachers are paid, unfortunately, or fortunately, science teachers are paid well. Like we would earn three times the history teacher would earn. And I feel like that should be a motivation.

Yes, scientists are paid quite well indeed. This should be a motivation for you to do better and to change. But still, people do not want to change. So, when you bring up ideas like these, someone will feel like you're taking them out of their comfort zone. Why are you bringing this to us? I say this because I have been a head of department, the physics department at the college where I was teaching. And so, you think about lots of things that you can bring about to help the students learn, but of course, you'll not bring it and just throw it there.

You bring it into a meeting, and you tell people, let's do this and this and this and that. And most of the time, it will be cold water. You don't get people that support you in the cause. They are not where you are. They cannot see what you are seeing, especially because it looks like it's extra work. And probably they're not motivated enough to take on the work, which I think they should be motivated because they earn three times more than the humanities teachers would earn. But for me, I think it's been the journey is very lonely if I put it in that context of where I come from.

Debbi: So, how do you see changing that? With all these creative ideas and this inspiration and your passion, what can you do? You want more girls to be in physics, even particularly. So, what would you tell them? What kind of changes can you either see happening or that you want to be a part of? What's going to be that spark that you would tell them to help them understand what you see as that possibility?

Esther: Um, first of all, in what can I do about this lonely journey? Like if people are not getting on board, continue doing what is right. Because they always said teaching is a calling, right? And I'm accountable to those students and how I teach them. And if it's good for me to help, not even to help, this is my job. This is what I do. I know the subject that I teach. And because I know the subject that I teach, I don't think I should stop being creative. Even if no one gets on board, continue doing it.

Someone brought up that bird that said, just keep doing it and doing it. The little steps that you're taking, you will get there. Probably others will see you and they get on board. Plus, you will see the fruits. I have so many mentees that look up to me and they inspire me actually. When someone just says, thank you, I am here. That they're engineers and they tell... you taught me physics. You taught me well. And I remember I wanted to be an engineer, and I never made it to engineering. But just seeing that I have a student that has made it to engineering, it's inspirational itself and I wouldn't want to stop that.

And for the girls, I think the best way to help girls come into physics as a masculine or the anglophonic area that it is, is to have mentors. If we could have many women in physics, many girls would come. Even when I was doing my high school, most of my friends went into biology, like they went into medicine and, you know, all those other courses. And I still stuck with physics and math. And you study alone. When you come to the staff, I am still alone on the staff. So, students are not very inspired, like they feel scared. They're like, “No, I don't want to have this kind of life.” So, I think that if we had more mentors, female mentors in physics, I think there would be a difference.

Debbi: And I think that just listening to you talk, I can now envision how, in contrast to maybe the idea of, like you said, physics, it's all this math, it's all this really hard stuff, and it could be intimidating. What you've described to me is something that any child who's using their imagination and making up stories and seeing things and imagining what they could be and have all of this, that that is an avenue for them as a possibility. And to have someone like you that they can see being successful and passionate, I think that is invaluable. I think it's beautiful.

Debbi: [39:48] Is there anything that I haven't covered regarding physics, science, Uganda, anything with creativity that you want to make sure that you've shared?

Esther: I think I have shared a lot, but maybe I should say physics is a practical subject. Yes, there's so much theory behind the physics, but it's very practical. Everywhere you look, everything we do, speaking, talking, writing, walking, all of that is physics. And I wish we would bring these things into the classroom. It would be easier for the students to understand these things, because physics is all around us.

We are just not getting those things into the classroom, but we have so many examples to give, so many analogies to make, a lot of those things. But can we go out of our comfort zone to think outside of the box for the sake of these learners that we have? I think it would be probably easier and less abstract than it appears. Yeah. Someone said, I think it was Nichelle Nichols, I've forgotten the name, but she said, physics is not only for the boys, physics is not for the girls, physics is for everyone.

So, the question we ask is, why are the girls few, and yet it is for everyone? Is it the teacher? Is it the curriculum? Is it the student themselves? Where is the problem? And for me, I think the problem is in the pedagogy. The way we teach is a big problem. Because if you teach a class of seventy people, and you only have five girls in there, there's a problem from where they are coming from. It's not that everyone has issues with understanding. It's not that boys are born brighter than the girls. No. It's something that we need to work on.

Debbi: Right.

Esther: Yeah.

Debbi: I think just that perspective and understanding more. And I think you are a trailblazer with that. And it'll be exciting to see what changes you can help in the field. So, I cannot thank you enough for the time that you've given me. This is the *Defining Creativity Podcast*, so as the last question, I will ask you, what is your definition of creativity?

Esther: [42:41] My definition of creativity would be, think outside of the box to cause learning.

Debbi: And I think we're always doing that. Or we need to always be doing that. Right?

Esther: Yes.

Debbi: Again, thank you, Esther. This has been just such an interesting discussion. And I've learned a lot. So, I appreciate it. And I wish you all the best.

Esther: Thank you very much. Thank you for inviting me. I appreciate it.

Debbi: That's a wrap for Episode 18, my discussion with international Ph.D. science education student from Uganda, currently studying at Indiana University, Esther Kataate Namakula. I'm so grateful for Esther and for you, the audience, for tuning in. Additional thanks to August Fackler for composing and recording the music. Join me next time as I talk creativity with teacher, trombonist, composer, and life-long music, arts, and creativity aficionado, Harold Popp. Meanwhile, be open to possibilities, make connections and embrace your creativity however it manifests itself in you.