

Physical Science with Norman Davies-Transcript

[00:00:00] **George Eadie:** [00:00:00] Since 1975, the answer series often called Tez has been empowering high school learners. We've become the best selling study guide series in South Africa. Test study gods are comprehensive and easy to use. They are written and frequently updated by teachers examiners and subject specialists. The answer series is, and always has been a family run business.

[00:00:27] Our purpose at Taz is to impact the gift of confidence. Welcome to subject scoop with me, your host and Taz CEO, George EDU, in each episode of subject scoop. We dig into a specific subject area and what the holds for that subject. We'll unpack what learners are really struggling with and how you as a teacher can help them on a practical level.

[00:00:50] It will also cover what subject experts experienced in grade 12. Exam marking

[00:01:04] [00:01:00] This episode, we tackle physical sciences and joining me to do so is Norman Davies. Norman has been a matric marker for nine years, and he has run a teacher development program at UCT for 10 years, all dotted around his illustrious career. He's authored six different physical sciences textbooks, and he is still a dedicated teacher as the Head of Science at Pinelands high school.

[00:01:29] I've had numerous interesting conversations with Norman over the years. And so I am extremely excited to get into the detail and unpack with him what Physical Sciences has installed for 2021. Welcome Norman. It is awesome to have you here today, and I can't wait to get into the detail of what physical sciences has in store for 2021 and to just hear your views. You've recently spent January marking the matric papers. Um, what were some of the things that really jumped out for you as a consequence of that experience? I know you've been doing it for a number of years [00:02:00] now. Um, yeah. What stands out?

[00:02:02] **Norman Davies :** [00:02:02] Thanks, George. And thanks for having me here, as you say, I've done this for a couple of years now and when it gets used to a particular kind of pattern to the way in which students perform in that final exam.

[00:02:14] When I think back to my expectations, I think a lot of us were expecting something to change as a result of COVID 19. And it was interesting to see that effectively the pattern was pretty much the same. It's not as though one suddenly saw a collapse in the capacity of students to answer questions that had been said before.

[00:02:33] I think they're still making the same kind of mistakes that they always made it more or less the same kind of frequency. The only thing I might say is. I got an impression that there was a bit more of a tail. So maybe some of the weaker students were impacted a little bit by, by the pandemic, but not at the top end, as you know, um, scientists got to be very exact, it's got to have an ambiguous meaning.

[00:02:58] So when the students are writing [00:03:00] exams, they writing to us and the sun gets, I'm talking very much from a sort of teacher point of view. I want my students to be able to communicate with their examiner. And to communicate clearly. And that means I've got to stick to the rules. It doesn't matter what it is.

[00:03:15] Naming compounds, writing, mathematical formulas, those kinds of things we then did use or infer from what they've written, that they know what they're talking about. And I think that requires them to practice and it requires them to look at good examples of that kind of practice.

[00:03:33] **George Eadie:** [00:03:33] Okay. So it's actually less about blinding changes and insights of this round of marking, but more of those persistent challenges that, that have recurred and therefore that we can talk potentially about, you know, what might be relevant for teachers as they consider going into 2021 to, to put into place to really make sure that learners are much less likely to fall into those common traps. Would you like to unpack a little [00:04:00] bit about that?

[00:04:01] **Norman Davies :** [00:04:01] I think it's, um, a case of your teachers, themselves being familiar and comfortable with a subject, and then being able to convey that confidence across to their students. You know, if I think of my matric class of last year and, and how we worked steadily and, and, and in a constructive way through the various topics, and then the exercises that followed and then the practice papers, you know, I think it's building up that sequence that's important for them.

[00:04:32] **George Eadie:** [00:04:32] So what is your outlook for 2021? And what are some of your concerns for 2021?

[00:04:38] **Norman Davies :** [00:04:38] Well, I must admit I'm feeling pretty upbeat about 2021. Um, certainly, uh, I think something that we showed last year in 2020 was that strong human characteristic of being able to solve problems. I mean here, we were faced with this pandemic problem and, and we had find a way around it, over it, through [00:05:00] it. Um, and I think it's that adaptability that that's, that has struck me strongly, um, over the past year. The other thing of course is that young people are better at that than older people. So. They inspire us, I think, to take on board the changes, the things that have to be dealt with, um, obviously there's there's individual problems. People who may be, um, suffering from a great sense of loss. Um, if you've had loved ones who have died in your family, that's nothing to be trivialized over at all. But I think generally the, the ability of us to be resilient in the face of change has for me being quite remarkable.

[00:05:45] **George Eadie:** [00:05:45] I remember you answering a question that I asked you recently, and I thought a very insightful way when I said, you know, What, what did you implement this past year in 2020 that, you know, you'll definitely retain and [00:06:00] potentially even, you know, what are some of those changes in teaching strategies that have now evolved and kind of, won't go back to the old way.

[00:06:07] **Norman Davies :** [00:06:07] I think we were all thrown, um, into this, uh, distance learning sort of style, um, by the lockdown and by an attempt to sort of circum vent that, to get rounded, to, to find, uh, an alternative. Uh, I had to take on a lot of skills and techniques, which I previously hadn't used. So my classrooms previously had been very classroom centered teacher talking to the students, um, sharing the knowledge, you know, the very sort of old fashioned sort of model that we have of teaching.

[00:06:38] Now, it was much more up to the students to find their way through the work. I had to be much more of a guide, um, in, because they were engaging with. Um, say the

textbook, uh, notes that I might've sent them a handwritten, um, comments that I was giving to them in terms of feedback about their work as they, as they submitted it.

[00:07:00] [00:07:00] So I'm going to spend a lot more time. Well, I'm going to, um, leave quite a lot more of the learning in the hand of the youngsters via that online presence. And I'm going to spend my class time explaining things, demonstrating things, showing them things. Um, I can think of a number of lessons that I've already had this year, where I've been able to put that into practice.

[00:07:26] So it's not about the students spending a lot of class on writing down stuff. They can do that in their own time, but if they can engage with me, if they can see me showing them different kinds of physical and chemical behaviors, then I think we're on the right track.

[00:07:41] **George Eadie:** [00:07:41] I suppose. We not all are now. You know, comfortable using big words like asynchronous work and all this sort of stuff a year later, but really sounds a bit like that you know. You're, you've been able to through the remote requirement of last year, learn some of the benefits of being able to apply that [00:08:00] individualized response to certain people. And. And in the old days, you know, since you've got everyone in the class, you may as well be talking to everyone. Whereas when people are remote, you're often finding yourself, speaking to one at a time, um, fascinating to then now blend the discipline of one-on-one even when learners are all together in the classroom.

[00:08:19] Um, that's going to be interesting. So looking ahead to 2021, what are some of the key areas you'll be focused sitting on in teaching physical sciences?

[00:08:29] **Norman Davies :** [00:08:29] Well, George, I'm going to click my wife on this one. Um, She's also a teacher. And, um, as she was sort of watching what is going on in the teaching world, she said, if there's not enough time to teach content, teach the skills, teach the skills. And I think sometimes in science, we don't think enough about what the skills are. You know, we have all these concepts, which we want to get across, which you want the students to understand. But what about the language skills? What about the math skills? What [00:09:00] about the communication skills that underline all of that, that make you a successful scientist?

[00:09:05] The thinking skills, the cognition, all of that sort of stuff. And of course these skills are not separate from each other. They, they kind of interwoven just today. I was teaching my grade 10's and trying to get them to understand that. If you want to explain something that you can observe or see or measure, you need to have an idea with which to explain it.

[00:09:30] Now that's a language skill. Being able to construct that sentence, to write it down, the communication we were talking with your examiner. So it's that sort of stuff. I'm going to focus more there.

[00:09:40] **George Eadie:** [00:09:40] Norman, why do you love physical sciences so much?

[00:09:45] **Norman Davies :** [00:09:45] Sure. I guess it starts with being a teacher. The empathy or the, um, or the ability one has to connect with children, teenagers in my case, because I'm high school teacher. After that, it's, it's a question of subject, [00:10:00] you know, should have taught geography or science or maths. Well, here I am teaching science.

Um, and maybe I was most confident in that area. Maybe that's how it started. Um, and I think there's. I'm sure this is true for every teacher. I'm not going to claim this.

[00:10:19] Only true for science teachers, but you start to see the value of what you're teaching. You start to see the merit of it, and you start to understand what benefit it has to your students. And every subject I'm convinced has merit and has benefit. And I guess that's where it comes.

[00:10:38] **George Eadie:** [00:10:38] Gotcha. And, and following on from that, w w what do you see are some of the most lasting benefits of a deep dive into physical sciences in high school?

[00:10:49] **Norman Davies :** [00:10:49] Um, I think there's two parts to that answer. The first one is, is the, the pragmatic one. If I do well in physical [00:11:00] science, I could become an engineer. I can become a science teacher. I can become a medical doctor. I can become a scientist. I can join the professional classes.

[00:11:10] I think the second component is about being, um, that adult who's able to understand the role of science in society. You're able to tell the difference between a decent scientific claim and one that has no grounds. Um, and there've been lots of examples recently with fake news around COVID-19 and I think perhaps what COVID-19 has also done is it's made people more aware of

[00:11:39] both the power of scientific knowledge and also the limitations of it that you can't just simply take a medicine that somebody claimed for work and give it to a whole lot of people. And suddenly that be okay. It's much more complicated than that. So I think the, the, um, [00:12:00] citizen, the scientist, the person who is able to, to, um, discern what is true, um, and is able to deal with.

[00:12:09] Some of the uncertainty in science. Again, if I go back to a recent lesson, talking to my students and making them realize that if somebody says it is so they're probably a politician, if somebody says it may be so, or it's likely to be, so they're probably a scientist.

[00:12:31] **George Eadie:** [00:12:31] Excellent. I think that's such a relevant point because. I I, if I take myself back to when I was 16, 17, and rolling into my classroom in materia, um, you know, at this point you're just trying to survive and get done what needs to get done. And for teachers out there I'd imagine be a huge contribution to, to your learners, to just remind them of these broader benefits that they're, that there implicitly signed up for, by, by taking [00:13:00] physical sciences, you know, number one, they're going to be set up for a really awesome career. And number two, they are going to learn the kinds of, um, ways of understanding the world that are more accurate and with so much ambiguity and unknown out there, that's an incredibly valuable lifelong skill.

[00:13:20] Um, so thank you for, for sharing that, but I think teachers don't overlook the importance of that in individual learners, motivations. For, for getting on top of the subject early on and, and just not continuing on with the teachers, what resources have you found to be really helpful in the teaching of physical science?

[00:13:39] **Norman Davies :** [00:13:39] Google classroom has been around for a while and I used it a little bit, but in the sense we were thrown into that context completely. It was the

only way we had of communicating with our students. If you weren't going to well, if you were going to avoid. Having to communicate with them with your cell phone.

[00:13:59] And [00:14:00] I really did not want to go down that road of being in a WhatsApp group of my students. So Google classroom was great. Um, you know, the praise singer in me says use Google classroom. If you haven't used it before, it's just got so many functions that are so useful and that help you to get that asynchronous learning going, um, that help you to give individualized feedback that allows the students to work at their pace.

[00:14:25] So I'd wake up in the morning and student X will have sent me five assignments at three o'clock in the morning. And I didn't mind because it hadn't woken me up. And like my cell phone, which might've pinged, what it tells me is that that student had been working on that particular topic or had been working in science for preps that whole day and was now ready to send me these five assignments, even if they'd only started at midday, you know, cause we find very few students

[00:14:53] said anything before 12 noon and then it kept on going till about three o'clock in the morning. And [00:15:00] so my perception of that is that students were taking on board, their own timing for when they were going to do things. They were, they were able to work in that sort of way. And I thought that was great.

[00:15:11] Um, The Answer Series was very useful. Last year. The Answer Series was with, was available online at no cost, great move. You know, a number of different publications were put on online like that. And that was great. Another, um, resource that we use quite a lot of Siyavula. Not only as an online textbook, but also they've got this thing called intelligent practice with lots and lots of opportunities to practice your work and get feedback electronically, which saves me as a teacher from having to mark, mark all the work that they do.

[00:15:46] I think those were the kinds of resources that worked well last year, which I want to continue using this year. You know? So it's not a case of going back to the old style. I don't think I'll ever go back to that old. Old sort of teacher talk style again.

[00:15:59] **George Eadie:** [00:15:59] Yeah. [00:16:00] Now that you mentioned resources for teachers, you've actually got a small ad that we'd like to share about the answer series resources, and then we'll return to some of the questions.

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[00:16:48] **George Eadie:** [00:16:48] And we're back last year was everyone's first year as a teacher, but being in the mind and heart now of a, of a first time teacher [00:17:00] in physical sciences in 2021.

[00:17:02] What are some of the things that you would offer them as, as guidance to just build momentum and really grow their confidence quickly in addressing and supporting their learners in the year ahead.

[00:17:14] **Norman Davies** : [00:17:14] Learning age is actually quite a slow process. It's not a, it's not an instant thing. You learn on the job and different people learn at different paces. They take on board different things so I think teachers, firstly, need to be kind to themselves. And then I think they need to. They need to practice the tools that they are going to use until they feel confident about them. So they can exude confidence to their students. I think students pick up very quickly if you're unsure about what you're doing.

[00:17:46] So the more you can, uh, feel like you're on top of the material that you're teaching and the tools that you're using. I think the better, the better you go forward. Um, [00:18:00] So I just think of my own lesson preparation at the moment and, and the way in which I will show students slides or short videos, and then post that same material on Google classroom so that if they didn't get it all in class, because maybe I was going too fast, or maybe they, you know, our kids, they get distracted for a moment.

[00:18:23] Um, and then they lose the thread of the lesson. Now, if you can replicate that lesson online, At least the material of the lesson, it gives them a chance to play catch up. And some of them actually prefer that they prefer to kind of like think in a sort of vague way about the concepts while they're engaging with you and the students around them and the activities that you've organized for the lesson, and then go home and actually engage with the content in a more deep fashion, make the notes, et cetera.

[00:18:50] Of course other students want to scribble down everything that happens in the lesson. Um, we have to allow them a space for that as well. So I think as a teacher, especially if [00:19:00] you're, if you're, if you're hitting out, you know, if you're still at that sort of learning stage, being able to, um, take on board those skills one by one.

[00:19:10] Now we haven't talked about practical work yet. Are we getting there? Go for it because science is a practical subject, at least at the level of you as the teacher demonstrating. The phenomenon that you're, that you're trying to put across and I'm always having new ideas. My new idea today was going into grade 10 class with three bottles of water, one frozen, one liquid, and one in gas form.

[00:19:40] And then just being able to talk to the students about the difference between those three phases. Like the fact that the guests, the bottle filled with water vapor was much lighter than the other two. That the frozen bottle was hard. Whereas the plastic bottle filled with water, you could squeeze it, you could change [00:20:00] its shape and you just, I've never done that before.

[00:20:03] It was just an idea that came to me this morning and I went and scratched in the bin to go and find three empty 500 milliliter water bottles so that I could go ahead and, and have something tangible that showed the students what we were talking about. And I think building up your repertoire of those kinds of things, sometimes simple, sometimes a bit more complex and it's much more complex.

[00:20:25] For example, to show grade twelves, how to make an Ester. That requires preparation beforehand and the right kind of apparatus. You can't just find it in the bin. Um, but there's this great variety of ways in which we can demonstrate to our students.

[00:20:41] **George Eadie:** [00:20:41] That's really great for, for teachers listening out there. Don't be limited by, you know, um, the, the prescriptions around practicals. I love that story about the bottles, you know, that was something you dug, dug around in the bin for. And, you know, not all, not all practicals need to cost an arm and a leg, you know, and I think that's [00:21:00] that staying innovative for me is a great inspiration for, for teachers out there, even just to keep your own interest, um, you know, for those teachers, perhaps like yourself, who've done so many years, um, you don't want to roll out the same ones that you did last year.

[00:21:13] Try something different, keep it fresh. They're going to see that sparkle in your eye as you kind of feeling the edge about doing something new. Um, so yeah, I think that's, that's such a great story that you share.

[00:21:24] **Norman Davies :** [00:21:24] It is edgy what you're just saying, you know, that you'd try something new and you're not quite sure if it's going to work cause the other great resource is YouTube. Almost any practical activity is on YouTube. It's there. And you've just got to go look for it. There are teachers around the world who have been quite happily putting stuff on YouTube for a number of years. I'm a late, late adopter as it were to, to this. But, um, you can show your students so many things just straight off YouTube.

[00:21:54] And of course you're mediating what they're seeing on YouTube. You're explaining it. You're, you're [00:22:00] pausing the video and, and helping them to think about what they've just seen on the video. So it's not a case of you're now working yourself out of a job. In fact, you can enrich the experience that your students have by giving them more than just what you can actually save verbally or write down on a page.

[00:22:19] **George Eadie:** [00:22:19] Zooming right out. Some subjects are in a state of flux there, you know, the curriculum reviews are under underway, you know, are there certain sections that need to be expanded or minimized or eliminated? What are some of the happenings in physical sciences in that respect? Are we seeing more stability or is it quite a lot of change.

[00:22:41] **Norman Davies :** [00:22:41] In some ways science changes very slowly. If we're talking about the curriculum now, um, you know, there is a, there is a revised, um, ATP for this year for physical sciences. Grade 12 is pretty much as it was minus [00:23:00] one small section, grade 11, they've nibbled at different topics and sort of removed one or two sort of phrases from the curriculum document.

[00:23:10] Grade. 10 has been quite a significant shuffle and I'm still thinking my way through the rationality of that change. It's not so much that. Again, there's been some, some contents that removed, but it's more the sequencing of the, of the topics that's come up for quite significant change. And, uh, I think we need to apply mine's a little bit more to, yeah. To what are we going to do about those changes?

[00:23:40] **George Eadie:** [00:23:40] Yeah. I suppose we've learned we have to be prepared for anything and yeah. Being a head of department. I thought there might be some relevance

in talking a little bit about departmental strategy for, for teachers out there and perhaps other heads of department that are listening.

[00:23:54] What, if anything has been your biggest insight for the way of how you would structure a department? [00:24:00] You know, is it best for physical sciences teachers to really focus on one grade? Or should they be teaching across the grades or have you got any useful insights for, for teachers out there on how to structure things?

[00:24:12] **Norman Davies :** [00:24:12] Can we have a particular way in which our department is organized? I mean, firstly, it's, it's very stable in terms of staffing. So we haven't had a change in, in science teachers at my school for three years now. Um, and some of us have been there for quite a bit longer, so we all know each other very well.

[00:24:31] And. We teach across. We teach across all the grades. So there are three of us who, um, teach grades 10, 11, and 12, and then there's another, um, a natural science teacher was a teacher's grade 10. And the reason why I choose that approach is because you then get a much higher level of collaboration between your staff members.

[00:24:53] And just interesting to see how with COVID, um, different people's skills came to the fore. [00:25:00] I mean here, I've got a Natural Science teacher. Who's only teaching grade 10, and yet he's the guy in the team. Who's making the videos and developing the web page and basically showing the rest of us the way to go in terms of online work.

[00:25:16] If we hadn't had him in the team, you know, if we'd been just teaching one teacher, one grade, we would have lost a lot of that. So I've become quite good at, um, making slides, my own slides and then talking to their slides and capturing that as a video on my iPad. And so I've been able to share that with my colleagues, which means that we're able to send the students a video before the lesson with the basic stuff of the lesson.

[00:25:45] They come to the lesson, having already read the textbook and watch the video that's of course, if they're on the ball, can't guarantee that, and now they're ready to see the phenomenon or the, have the explanation or [00:26:00] practice the calculations. And then they're able to go home afterwards and do step three, which is, you know, practice and, and, and get good at it.

[00:26:08] So our teaching strategy has changed quite significantly. Um, and, and taken on that form. So when you hear a teacher talking about something in the classroom, it's not for the first time, not if you're well-prepared Google classroom has given you the, the sort of advanced work, and then you're engaging with the real understanding and then you're going away and you're consolidating it.

[00:26:33] **George Eadie:** [00:26:33] Physical science has so much to, to contribute. What is the status in South Africa right now? Are we seeing more learners taking up physical sciences or less learners? Are you aware of, of enrollment?

[00:26:45] **Norman Davies :** [00:26:45] I know that in certainly in some areas, enrollment is dropping and that's problematic. You know, I've been involved with schools in the Western Cape for a number of years, and I know that we've had [00:27:00] cases of schools. Um, where they've stopped teaching physical sciences. So the school has decided, um, at some kind of level that we can't fit this in, or we don't have the resources or we don't have the

teacher, or the students are not choosing the subject. And so they stopped offering physical sciences as an option. So I think it's probably a bit patchy, the capacity that we have to produce these physical science students.

[00:27:30] Um, even in my own school, I've seen numbers fluctuate, and I can't really put my finger on why they're going up or down. Is it because I'm subject choice change is because certain subjects suddenly became, um, that they suddenly were counted for matric exemption or, or the bachelors pass. You know, so things have fluctuated a little bit.

[00:27:53] I do think that the top end of what we produce in science, [00:28:00] In South Africa is really good. I think we continue to have students who are exceptional scientists in the making. One of the things I always tell my, my grade twelves, I say to them at some point, you know, are you going to choose a career in science?

[00:28:18] Uh, okay. But if a student says to me, well, I'm thinking about it. Have you got any suggestions? And I did not point out to them that we have a square kilometer array telescope, just going to function for the next 30 to 40 years, which is their working life. And we are going to need 3000 astrophysicists in this country.

[00:28:49] Just to process the data out of that telescope. Why don't you go and become an astrophysicist and usually, okay. I get about one student at least a year who says that's not a bad idea. I think I'll [00:29:00] go and do that. And did I hear that the following year they've gone off and there registered up at UCT to do astrophysics. So it's that kind of little nudge that, it's required.

[00:29:10] **George Eadie:** [00:29:10] Well, Norman, it has been amazing to connect with you today about all things, physical sciences, but a few things really stood out for me. And on behalf of the learners, I thought I'd just highlight three things. I think that one of the most surprising was that it seems that COVID 19 has had a relatively limited impact on, on the outcomes with last year's metrics, you did mention there was a bit of a, a longer tail and those struggling learners, perhaps they struggled a little bit more.

[00:29:40] Um, but the, the insight almost emerges that. It's it's actually the perennial problems and the patterns that have existed for a number of years where, where the learners struggle.

[00:29:51] So thank you for highlighting what those were and that, you know, one of them that really jumped out was that, that idea of really communicating to the [00:30:00] examiner and being able to apply the skills of science and not just the knowledge. The other thing that stood out was from a teacher's point of view, the being able to really provide the combination of the, what I think is colloquially termed sort of flipping the classroom strategy of having learners watch videos for homework and, and then coming into the classroom for the deeper dive explanation, that genuine live experience, um, that you know, that you've been able to afford them before going on to step three, which is that at home practice. And then lastly that there's some things that, that you have used in 2020 that have really added value that will now likely mean you won't go back and Google classroom for you was really the standard art tool and resource that you used with all its functionality and its ability to have learners follow their own track and operate at their own speeds that worked for them. You said some learners [00:31:00] submitting assignments at three in the morning.

[00:31:02] That does sound a bit crazy, but you know, each their own course. So just thank you so much for sharing your time today. And for, um, getting us all warmed up for another year of getting more learners, get up to be those astrophysicists, getting more learners, to be geared up, to be critical and, um, and helpful members of society, no matter where they are, even if they don't follow purely scientific careers.

[00:31:28] We're so glad that you took some time to listen to this episode of subject scoop. Please feel free to share the link with anyone you feel would benefit from it. Do you also keep an eye out on our podcast channel for a new series launching soon called around the table with George D, where I'll be talking all things, education, innovation, and inspiration with some brilliant guests from around the country and further afield.

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