Justin 0:00
Let’s get started. Hello everyone. My name is Justin Weinberg. I’m one of the founders and the CEO of Chem 101 and I really want to welcome you and thank you again for joining us. Today we have a really exciting and great panel event that’s going to be all focused about how we can better think about recitations or discussion sections. And I'm extremely glad to be able to share the advice and the words of wisdom of two very innovative and thoughtful chemistry professors today. And those are Scott Reed of Marquette University and Tara Todd of Vanderbilt University. Both Scott and Tara are going to be sharing some best practices about, and the ways that they have been optimizing the recitation sections of their respective courses, and whether we call these recitation sections or discussion sections or whether our courses don't even have those officially scheduled, but we still want to give students those additional problem solving experiences and extra practice. I think we can really all benefit from what they're going to share with us today and their insights. So I'm going to tell you a little bit about our speakers and some background and then we can go ahead and get started. I'll go ahead and start with Scott and then we'll shift over to Tara. So Scott Reed joins us from Marquette University, as I mentioned before, where Scott is both a professor and the chair of the Department of Chemistry. His laboratory research focuses on the use of laser and mass spectroscopy to probe the spectroscopy and dynamics of complex chemical systems. And his chemical education research focuses on studying the impacts of flipped classrooms in chemistry courses. In addition to his expansive work in research and education, he has leadership roles on both the ACS petroleum Research Fund advisory board, and the ACS Committee on Professional trading. And at Marquette, he teaches both Gen Chem and organic chemistry courses. Tara is the principal senior lecturer and Director of Undergraduate Studies at Vanderbilt University. She plays a central role there in the undergraduate curriculum of teaching both introductory chemistry and general chemistry for science and engineering majors. In addition to teaching she's involved in curricular curriculum development and is currently focused on foundational courses in STEM. Tara serves as an undergraduate advisor to chemistry majors and she also serves facilitate undergraduate research experience within the department. As a bit of further background, both of these instructors came to my attention as they've been using Chem101, our platform, in really impactful ways. They use it to engage their students during lecture, sometimes in place of lecture, some use it for homework assignments, extra practice, but both Tara and Scott and their colleagues have implemented Chem 101 to support their recitation or recitation discussion sections and it's that last part that we're going to focus on today. So to just cover a brief agenda of what's gonna go down in terms of what we'll cover.. Both Scott and Tara are going to talk about what they've been doing with recitation, some of the challenges, how they think about recitation, but also how they've been using our platform to support the specific sections. So for those of you who may not be familiar with Chem 101 I thought we could just start off a little bit of introduction just to sort of round a little bit of what they're going to be talking about and then we'll turn things over to Scott and Tara to kind of hear what they want to share about their discussions, how they think about them, the challenges, best practices, but we also really want to hear what what your questions are, what your challenges are, and questions you have for both Scott and Tara. So I really want to encourage everyone to have a discussion in the chat today. We are going to be monitoring that and keeping that active. So if anyone wants to say

hello, post questions, thoughts, comments, anything that's on your mind, just feel free to set your to field to everyone. So everyone including both Scott and Tara, as well as everyone else here can see what you have to say and what you want to share with us. So that being said, I'm going to go ahead and just do a brief introduction to Chem101 and then we'll turn things over to Scott and Tara. So when we talk about Chem101 the entire platform is centered on active learning. That's going to be a key part of our discussion today as we talk about recitation or discussion sections. We support a variety of different courses. Both Scott and Tara are gonna be mainly talking about first year courses like general chemistry and intro, but we support courses like GOB, organic chemistry, I'm sure everyone can see these courses in the list that I have up. At the end of the day, to support these variety of first year and organic courses, Chem 101 has a library of over 15,000 different problems and learning activities that instructors have access to, as well as a range of different types of activities, which I'll talk about in the next minute or so. Because Chem101 specifically focuses on chemistry, what we get to do is build really awesome technology that tackles some of the biggest pain points that come up with these courses, and really give students an opportunity to interact or engage in some nice Chemistry specific activities which I will loop to in just a second.

Justin 5:19
Instructors have the option of taking advantage of Chem101 in different ways. We're going to be focusing on one particular use case today, which is sort of a live in class or synchronous use case, which can be used to you know, take attendance, deliver polls, set up live quizzes, use in recitations or discussion sections with those worksheets or do things like think pair share activities. Faculty and instructors also implement Chem101 for online homework for quizzes and exams. But as I mentioned, we are really going to be focusing on that live engagement piece of the platform today. And in particular, how Scott and Tara have been using this to engage students in small sections and have coordinated that amongst their TAs. As I mentioned, while we have a variety and large number of problems and activities, it's really about what students can do in this platform most of the time. Our team has spent an enormous amounts of time and effort to create really nice space for students to engage in some of the most difficult topics and pain points that come up in the course. I'm just going to name a few here, which I'm sure Scott and Tara will mention as they talk about Chem101. Things like bonding and structure to help students draw Lewis structures and visualize molecular shape, enabling them to not only work on traditional devices like laptops and desktops, and tablets, but also phones, which is a really important part of breaking Chem101 into a live classroom or during synchronous sessions. More recently, our team has created really advanced tools for organic chemistry courses for any of you here who teach GOB, or organic one and two or survey organic, enabling students to draw skeletal structures and complete mechanisms and resonance and synthesis questions. We help students with nomenclature and chemical equations. We use really intuitive techniques that we call smart suggestions to enable students to easily come up with IUpac names or write out a formula or balance a reaction or predict products of given reactions. We help students in quantitative areas, big ones in first year courses like dimensional analysis, where we scaffold students around unit conversions, moles, stoichiometry, density problems and things like that. And in second semester Gen Chem would do something similar for equilibrium and constructing

ice tables, building equilibrium constant expressions. So this is just a little bit of background on some of the things I'm sure Scott and Tara will talk about today. But I thought that might be helpful for you to turn things over to them. So with that being said, I'm going to go ahead and jump into our discussion with Scott and Tara. So the first thing that I want to kind of talk about is the purpose of discussion sections. So I'm going to ask Scott to go first in this case. And then what we'll go over to Tara. And I know Scott has some slides prepared to talk about sort of what his program and his colleagues have been doing. So um Scott and Tara, the thing we want to talk about here is, you know, what you see as the purpose of discussion sections, and if you could share, kind of how they're particularly structured in your programs. Scott, I'll turn things over to you.

Scott 8:30
So we're talking about discussion sections, but since there's so many different ways that, that people do general chemistry, I thought it would be helpful just to give sort of a brief overview of what we're doing at Marquette and also where discussion sections sort of came from. So traditionally, we have sort of two flavors of General Chemistry at Marquette, which are the first what I would call large, I mean, this isn't large to some people I'm sure, but roughly 200 persons sort of lecture based sections and then we all have a small we also have a small flip section, which is meant for majors, chemistry and biochemistry. And I've actually used Chem101 in both of those formats with a lot of success. So it hasn't been dependent on that. But the background of this as far as recitation sections go is that about 15 years ago, I think we really saw a need to add some additional problem solving into our courses and give students some additional ability to practice problems in a structured environment. And so we added discussion sections to our courses around the same time we also started using clickers. And we were using Clickers in both lecture and discussion. And so actually, Chem 101 was initially explored by us as sort of a replacement for clickers. And you can see from what Justin showed it's a pretty advanced replacement to that. So just to give you an example from my course, this term, I have around 200 students in a large lecture hall. And what I tried to do is to build a course on sort of a two week pattern where in the first week I cover material and lecture and I'm using Chem 101 there. And then the next week we cover that material in discussion, so we have problem solving around that, the lab and then there's a culminating quiz at the end of that week. And so I think that that has been working well because what it does is gives students a chance to see material from a number of different aspects before they're then tested on that. So this is just the pattern that was shown here. So week one topics covered in lecture, week two, discussion lab, there's homework and then the quiz and for our course right now we're actually using Aleks as the main homework platform, we're not using Chem 101 for homework. It easily could be used for that. That's another discussion. And so just wanted to give a brief overview of you know, how we use it in lecture and how we use it in discussion. So in lecture, I typically present for about 10 minutes, and then I push out a set of questions to students, and then there's usually a TA and myself in there with 200 people then I walked around this large lecture hall and really work individually with students. It's really great because you can track in real time how students are doing on the problems, and so you can identify questions that, which are challenging to the class, you can then enumerate and pull those out and work them if you want to. But you see in

this picture, this is actually a screenshot I was live streaming my class this morning, where I pushed out one of these problem sets and you can see that I'm not there, right, because I'm actually walking around the room. And that's the way that I do it. And so really, how I'm using the Chem 101 is really in class and in the discussions and I also use it as practice for my quizzes. I don't use it to give quizzes and I don't use it to give homework right now, the quizzes are actually given through our LMS. And then finally, how are we using it in a discussion. So what I do is to create discussion sections, content really in the same way. So what's nice is that the students enroll in the course and then they're enrolled into specific discussion sections, which the TA has access to. And so again, what we're doing is grouping sets of questions and pushing those out to the students. Ideally they work in groups, although in the COVID era, that's been a challenge, and then the TA's instructed to bring the groups back together to discuss that just in the same way I was using it in lecture. So we're training TA's before the semester on how to use this and best practices for leading discussion and those TA's can be graduate students. Oftentimes we don't have enough graduate students to teach all of the discussions and so we hire undergraduates, and usually they're pretty fantastic at doing that. So this is just a quick overview to see how we're using it. And I'd be happy to you know, discuss any of those points. And let me stop my sharing. There we go.

Justin 12:45
Awesome. Thanks, Scott. Tara, do you want to kind of give an overview of how, how you view the purpose of discussion sections, recitations and courses at Vanderbilt and kind of how you've been structuring them as well?

Tara 13:00
Absolutely. Um, so the structure is a little similar and a little different. We have large and by large, about 160 to 200 students per section in general chemistry, and in general chemistry itself in the lecture, we do we use a completely different system for in class response. But we use the Chem 101 for both homework for homework sets, as well as for our discussion sections. And the discussion sections we actually they meet as a group of 24 students that are then broken up into approximately three to four students per small group, and they're led by currently a graduate student TA. Now in my individual section of lecture, I actually do use learning assistants. So there's a lot of active learning that's going on in my classroom. I don't incorporate Chem 101 into the classroom itself, but that's just a completely separate issue. From the perspective of the discussion and like the purpose of the discussion, I'm sure you guys can all can relate to this. Basically, what we find is that the one thing that students really struggle with is the concept of putting the pen to paper and practice. And we want to encourage them to do so in a in really in a low stakes way and getting them to engage where they are not going to be penalized largely for doing harder problems. And we like to give them harder problems when we have TAs around or when we have extra upper level undergraduates present that can help guide them and encourage them to start working problems and start trying it before they get to the exam where it's a much more high stakes challenge for them. So the purpose, the general purpose of the discussion is really to encourage them to start problem solving and problem solving early. In terms of the structure it's very much like Scott said we introduce the topics and

the information in one week and in the next week, we're following up in discussion with problems. We now, we do quizzes, and we actually do use the quiz function in discussion. But it's only every fourth week so we quiz them right before they take an exam so that they have a sense of “where am I?" but they're taking it during the discussion section. So it's a little bit of a different take on it but it's only a once a once per exam quiz.

Justin 16:00
Thanks Tara and you know already you know you can see some similarities and differences between the two approaches. I did want to follow up on one thing you mentioned about, you know, giving students more difficult problems to kind of work through with the assistance of having the TAs there and sort of that live environment. Could you maybe help us in the in for the audience to just can maybe contextualize that with some examples. Like, what do you mean by like more difficult problems, you mean like problems that may be applied to the real world. multi concept problem?. Anything that you can share? And of course, I think would be helpful.

Tara 16:40
From my perspective, it's multi conceptual problems. Um, you know, usually when you're in a lecture setting, you start out with more of a foundational problem and you can move only so far so fast in a 50 minute or 75 minute lecture period, particularly when you're wanting to also do some active learning with them. And so the opportunity to engage with multi conceptual problems is to do so in a small group learning setting, which is what we typically do in discussion. And so one of the reasons why we actually moved to Chem 101 was not just that you guys have these fabulous tools that are built, I mean, there.. there.. I really do like some of the features of some of the Chem 101 tools, but also the ability for us to write some of our own problems. And house them so that we can actually write some more multi conceptual problems that they might come across as, you know, not necessarily like exam like problems, but similar because we want them to be able to solve higher order problems eventually.

Justin 17:53
Absolutely. Thanks for sharing that. Awesome. Um, so, you know, one other thing that we wanted to talk about today was sort of some of the challenges that you face in terms of achieving what you want from those recitations or discussion sections. So if you could maybe sort of think back to even before you both started using Chem 101, and I think Scott shared a little bit of this already. You know, what, what were some of the challenges, you know, what, what are maybe some challenges that you face now that that you'd like to talk about? That you would still like to you know, improve on and maybe Tara lets start with you this time.

Tara 18:33
So, I think some of the challenges that we face, you know, I mean, Chem 101 is a, you know, it's online, and so we have had to be a little bit creative about problems, and monitoring students to ensure that they're actively present in class because we don't want it to be an activity. We want them to be present. We want them to engage with one another. Part of what we're trying to do as well is like build communities with each other so that they can learn to study with one another

and, and talk to each other and help each other out. And part of their grade is actually a participation component. It's not just “did you do the problem set and did you get the answer right?” Um, so some of it is, are they present, and then also preventing them from sharing the problem sets in advance. Um, so those have been so we've had to be a little creative, and it's okay, we, we've figured out how to do that. Because you can, you know, you can make variations. If you're writing your own, it's a little more complicated. You guys actually do like logarithmic problems, which is nice. So there's, there's ways to do it. You just have to think ahead and you know, all those considerations. Other.. other challenges, really, in our original COVID and when we are.. in the original part of this process was that we introduced this during COVID. So we were meeting with them online. So their discussion sections were virtual and by zoom, and so that was really intriguing to do that, but that was that had nothing to do with Chem 101. Chem 101 actually made it easier, because they could actually open a problem set and we didn't have to worry about, you know, pushing problems that’s to them through a chat function or file sharing. They could actually open access that website, so that was actually really beneficial.

Unknown 21:05
Yeah, thanks, Tara. And, Scott, I believe you also, were were faced with sort of that online challenge report. So be great to hear your thoughts on on what what you did to sort of counter that. If I can also invite anyone to chat to also share, you know, their challenges if they're running recitations or discussion sections, so we can talk about them as well or get Scott's and terrorists thoughts on them. But Scott, I'll turn it over. to you about some of those challenges.

Justin 20:42
Yeah, thanks Tara. Scott, I believe you also were faced with sort of that online challenge so it would be great to hear your thoughts on that. Like what you did to sort of counter that. Um, uh. If I could also invite anyone in the chat to also share their challenges if they’re running recitations or discussion sections so we could talk about them as well or get Scott’s and Tara’s thoughts on them. But Scott, I’ll turn it over to you to talk about some of those challenges.

Scott 21:15
I think that, you know, Tara talked about some really good aspects, which is how do you keep students engaged in the process? And I think we probably made a lot of mistakes in that but when we started this 15 years ago, I think what we would do is come in there would be a written sheet of problems that would be given to students. They would work on those usually in isolation, and then the TA would answer questions. And that's just really not a great approach because usually what would happen is students would come in and try to finish the problems as soon as possible, and then depart. And so you know what we wanted to do. I think Chem 101 provides that ability is to really engage the students much more thoughtfully but also by pushing out groups of problems. And then sort of reassessing after that it provides both the students and the TAs a chance to really see what students conceptually are not getting, and to really address those right there, you know, in sort of a just in time way, and I think it's really powerful for that. So, having that ability, in addition to all of the other nice features of it is really good. There were a few questions in the chat about this idea of using both Aleks and Chem 101 which I can just

briefly address, which is we historically over the past few years have been using Aleks because we use our ebook embedded in that but actually one thing I like about the chem 101 is that it has the Open Stax chemistry both regular and atoms first embedded within the program that students could use. So one of the things we're debating moving forward is just going to let's say like Chem 101 with Open Stax would be a very low cost option, you know, for our students, so we could talk more about that but that's not the focus. So

Justin 23:02
Yeah. Thanks. Thanks, Scott, for mentioning all that, um, anything else you want to talk about in terms of, you know, challenges that you face other than, you know, the online component or the things that you're trying to work on in future when it comes to recitations?

Scott 23:18
Yeah, I think the biggest challenge for that is is trying to get students engaged in the content and recognizing for them that problem solving is just the key. And, you know, I try to emphasize to my students that you know, there really no shortcuts in chemistry and you have to put the work in and you need to do that in a way that's going to be beneficial. And so having this discussion sections structured in a way where you can make sure that students are accessing the problems and actually accessing as Tara said, like multi conceptual problems. I really like in Chem 101 that they have these more advanced problems or cross cutting problems at the at the end of every section that you can pull in. And so you can really combine concepts and get students thinking more broadly about that. And that's really great.

Justin 24:02
Awesome, thanks, Scott. While you were speaking, Scott, Tara actually asked me if I could share a little bit about the real time feedback that Chem 101 also provides, you know, maybe she can also speak to that in terms of how that's been helpful to both her and her colleagues and TAs. I actually was planning to do that a little bit earlier, but I think for some reason we skipped over the slides. But um, well..

Tara 24:28
Scott has mentioned it as well. So I thought it would be good for people to see how to do that.

Justin 24:35
Yeah, so, you know, it's a great thing to bring up and something really powerful about that sort of live engagement that it can occur, that it could, can occur in class or during those recitation sections. So you know, it's a pretty simple idea. And, you know, Scott has alluded to this before when he was talking essentially, whether you're online or in person. An instructor or TA, can essentially use Chem 101 to send out live activities during these meetings. So whether that's going to be a single problem to replace something like a clicker type question, or something that is multi-layered to replace something that would traditionally be more like a worksheet. That's all flexible to you guys. And you guys, as instructors or TAs figure out exactly what that combination is going to be. And actually one of my last questions was sort of that strategy on

putting together these problems, problem sets, but we'll come back to that. But essentially, the students can pick these up on you know, any device they want phones, tablets, laptops, Chromebooks, I mentioned before. And you know, the example I always like to talk about here we can talk about, you know, any, any sort of topic that we want but let's talk about things like Lewis structures, something that is universally taught and, you know, in any first year course. So let's say, you know, you as an instructor, your TAs are going over things like Lewis structures, VSEPR, polarity, hybridization state, things like that, students can actually take advantage of the module, the technology I was talking about earlier, where they can go in and draw and visualize and build structures together, and then send the answers back to the TAs or back to the instructors. And this is what Tara was alluding to before. There is real time feedback that occurs on both ends. So as a student we give immediate feedback that identifies if the students right or wrong and also specifically why. So when we talk about things like Lewis structures, and VSEPR, we're talking about things like valence electron count, formal charges, skeletal structure, things like that. But the instructor can also or the TA in this case can actually see what's going on in real time in the case of drawing structures that can actually see the common mistakes of the students specifically what they're drawing in real time. So, Tara, feel free to comment on this in terms of how you guys are taking advantage of this data. But you know, these common mistakes, three common mistakes, buckets, enabling you to go look at other answers as well, it'd be really useful insight to sort of understand where the students are and to have a better discussion with them. So Tara, would love to invite you to talk about how you've been using this data

Tara 27:11
Yes. Um, so with the.. when we look at actually the student responses one of the best things that you can do with this is that you can redirect any myth or or re address any misconceptions I mean, one of the things that we all know is that students will come in very frequently, particularly with general chemistry courses with some preconceived notions or ideas. They've been taught chemistry before in the past. And so there is some level of knowledge, but they may not fully understand. So when you see something like this, you can actually redirect. And one of the questions that I saw in the chat was how do you promote collaboration as opposed to individual problem solving. Even though this is pushed out as a problem sent to all of his students, there's a feature called think pair share. Which instead of the students receiving feedback on the problem in and of itself, like they're not, they don't get it's correct or it's wrong. The TA or the faculty member can actually see those bar charts and you can see how the students are individually doing and then you can actually redirect the group in that think pair share mode, as they're actually working and collaborating together in groups. So that's one of the that's one of the ways that you can actually encourage collaboration.

Justin 28:48
Thanks. Thanks Tara, and thanks for bringing up the think pair share mode as well. That's a really key aspect of how we can promote those sort of in class collaborations. One thing I'd like to add as well, that I've heard from from others who use our platform during class, is that they also like to take advantage of like things like algorithmic problems and question pools during

class as well but keep the feedback on so essentially, students can work in groups, and they can sit next to each other they'll be working on the same learning objective, but they can't directly copy off copy off of each other because they're getting different numbers. They get to get into different structures and things like that. So yeah, and, Scott, maybe you have some thoughts on that topic of collaboration among students in these sections as well.

Scott 29:39
Yeah, I just put some in the chat on that. But I think in the lecture when I use it, I mean, I encourage students to work in groups with their neighbors, but in discussion sections, we actually formally put students into groups. Because otherwise, I think it's harder for the TA to force. You know, and there's some students who always want to sit by themselves if you don't formally put them in the group. And then what generally we do is we rotate those groups one or two times during the semester. So I mean, if you're stuck in a bad group, you can escape as it were. So that's generally how we promote collaborative work. But yes, the think pair share mode and in general, what we encourage students to do is to work on those problems, and then discuss those problems. And as an instructor, the ability to see which problems are the most engaging in are the most difficult for students and they're not getting is a point of entry into that space, which I think is very important. And in the lecture, I mean, that's what really what the clicker was designed to do. You know, I'm prattling on, is anybody understanding what I'm saying? I'll push out a question. But now I actually get to push out several questions and the nice part about that is I can push out a conceptual question. I can push out a math question where they have to solve a problem around that topic. And so I can get, I can see how they're struggling or interfacing with the material in different ways.

Justin 31:06
Absolutely. There was a request actually to see kind of what the think pair share mode looks like. I do have an example histogram that I can bring up to maybe visualize a little bit for everyone. So there was another question here from Sarah, I don't know Scott if you maybe want to answer that one out loud about using the same problem or on different days and things like that are or..

Scott 31:30
I was just going to type something in the chat. But just a quick answer to that is my experience that this year, and Trevor has been really great about doing that, so what we do is the students enroll in they have to pay to get into my lecture section, but then we create discussion sections with separate codes that is free for them to enroll in. So while I copy the same content across all of the discussions, it's not open to the students until the TA opens it. And so every student is only in their discussion section. So if you have some discussion sections on Tuesday and other ones on Thursday, that's not going to cause a problem.

Justin 32:06
Yeah, so we go ahead and

Tara 32:07
I was going to say something else to you is that we do use the I would use the word the same problem, but we will generate it if we're writing our own. We will generate it with different numbers very similar to like the algorithmic. So maybe if we have different discussion sections in the same day, you know, the earlier one will get one set of numbers and then the next one will get the next set of numbers. So even if they were to share the problem set, they can't just come in and plug numbers in and quickly get answers. So they're going to have to come in and they're going to have to rework problems. So there are different ways around those, you know, issues.

Justin 32:49
Yeah, and this is such a good segue into the next thing we wanted to talk about, which was you know, how to actually set up these problem sets for the different sections and strategies that you guys have have taken so you know, would love you know, I know from our previous discussions, do you guys have different thoughts and different ways you go about doing this. So would love Scott or Tara to jump in on, you know, their strategies for working with their TAs to sort of set up these different problems sets for every week or every period that you're doing those?

Scott 33:25
Tara, you want to hit that?

Tara 33:30
Sure. Um, so the original view, we originally were using almost all problems that were generated by Chem 101, and we've moved mostly to writing our own problems, which is interesting. But that has more to do with the fact that we're also using Chem 101 for homework. So it's just to you know, keep things a little bit different. But, um, one of the things that we do in terms of our TAs we have a set of TAs that only teach discussion. We meet with them once a week. We make sure that they are on board and understand the problem sets. We actually do have one TA that helps to work, or I should say rework, rewrite the problem sets with different numbers. Or maybe a slightly different variation of the problem, so that it's different for different days of the week. And then when Justin gets into the the idea of how to set these up, just like Scott was mentioning, every section of discussion has their own unique code that only those students who are registered for that section would have the code to so every 24 Students of ours only have have their own unique code. And so they have their own unique section, even on Chem 101. But our setup is pretty simple in terms of it's a problem set a week, and then a quiz every, like fourth week or so.

Scott 35:06
Yeah, now, I would say in our case, because the Chem 101 sets that we use in discussion are only used for discussion and they only count for participation points. I'm completely not bothered if that students are going to try to copy off of those. So if you have like a discussion set later in the day, why would you actually try to cheat off your friends who had the discussion set in the morning, but part of that is because I've actually gone sort of a different way is that I give our quizzes through our course management system and because I've done that I've put like

several 1000 questions into a bank there which required a lot of time so I really haven't spent a lot of time building out questions in Chem 101. I did that in our LMS you certainly have the capability to do that. But I tend to just use the questions in Chem 101. And as I said before, when I push questions out to students, I generally try to push different types of questions out to them that illustrate both the concept that we're talking about and maybe a math problem or two or some combination of the two. But I haven't done a lot of writing of my own questions.

Justin 36:18
Awesome. Thanks, Scott and Tara. So, you know, last thing I think we want to just get to and then we can get to any questions that the audience has and I know there was a request to see that I think their share so I can show that too. But um, you know, I think we can just maybe kind of wrap things up with your words of advice. You know, I know when we talked to folks all around the country, they have recitation sections, but they're not really getting what they want out. of them. Some folks are thinking about implementing recitations because they want some designated time for students to have problem solving experience. Some programs are thinking about sort of how to mesh this with a peer tutoring sessions that they offer. So would love to just hear your advice for everyone here in terms of what you'd recommend to them as they think about their recitations in the future.

Scott 37:24
Tara why don't you go first, and then I can.

Tara 37:29
So, um, my advice in terms of discussion sections, um, well, first of all, I will say this, if you're thinking about implementing them, just make sure that your department and University has the bandwidth to support it in terms of TA support or undergraduate support. Because essentially, what I mean by that is is you actually do need extra personnel for it. And it can look very different when you're trying to support it for the number of students that you have versus doing something that is more of the equivalent of peer tutoring where it is more of a drop in service, right. So I'm not discouraging you from doing that. I'm just saying be very thoughtful and making sure that you have the bandwidth to deal with before before doing it. The other thing is that we've run into in terms of issues, and this has nothing to do with the platform we're using, is scheduling issues. Right. Where do you put a discussion section that meets once a week in the middle of a schedule for a STEM student who's also taking potentially like calculus or biology or physics or some other courses that they're also juggling labs and maybe a writing course and some other stuff that they've got on their schedule? So it's things like that and there are different universities that have different plans. I've seen some that do their discussion sections on the weekends, which I find interesting. Some that do them only at night. We don't we do ours in the afternoon. And we're, we're still even though we are probably more than 20 years into using discussion sections, we are still juggling with the best way to use them and the best place to put them within the day. It's always you know, there's always thought behind it. If you have not implemented them, they you know, they're a good way to build community, which is one of the ways that we're finding is incredibly important in STEM retention right now. That community

building helping students to share ideas and learn with one another is really critical. So if it's something you're considering you know, just just keep that in mind.

Justin 39:53
Scott..

Scott 39:54
Those are awesome points. So, I would say with regards to scheduling and actually what we found is that it's very helpful to schedule the discussions either on the off day. So for example, we have a three hour lab, if that's Tuesday morning from eight to 11, we scheduled the discussion either immediately after that, which gives a four hour block but students don't seem to mind that so much or we scheduled that on Thursday in the same time slot, so that way we try to minimize disruption to students schedules, but that may depend a lot on when you're offering your labs and how many labs you can offer simultaneously and all that kind of thing. I think with respect to discussions, I actually went in and looked at some of the student evaluations of the discussions, which I chose not to share with you because it's very much colored by the TA that they have as you would expect, but I think generally they very much appreciate the discussions. They like using Chem 101 in the discussions. And I think the big challenge there is just since you have a range of instructors, you're trying to have as much uniformity as you can. That's also an issue with the labs as well. There's just not not much you can do about that. But I think we could be more intentional about training and supporting our TAs I think and one of the things we do is a training session at the beginning, but I think it'd be really helpful to do some visits to the discussion sections and provide them feedback on that just like we do for faculty. That's not been something we've implemented, but I think we could do a better job of supporting the TAs for sure.

Justin 41:25
Awesome. Thanks so much, Scott. And Tara, I mean, these insights I'm sure are going to be really helpful to everyone here, and everyone who watches the recording. So I do want to hear questions, if there are any from our audience, and I do at this moment want to invite anyone here to use the raise hand function in zoom. So if you look towards the bottom center of your window, you can actually raise your hand and if you click that button, you can actually talk to us and we can hear your question. If you feel more comfortable going in the chat and asking those questions, we're happy to answer those as well and we will be on the lookout. So I'll give everyone to think about if they have questions for Scott and Tara that haven't been answered already and feel free to go ahead and raise your hand. Um, I do want to bring up one thing that Rashmi brought up in the chat and Rashmi, thank you, it's good to see you here and thank you for all your comments. So she brought up something about metrics and SI IUPAC units, in Chem 101. I do want to make sure that everyone knows that we have a full range of support questions in Chem 101 things that follow SI IUPAC naming things like that, but we also do have some English or non standard units there as well. We do see those and in those wanting to be used in some of our United States schools, in Canada I know things are are more strictly followed and the SI IUPAC range, but we do try to make sure to have that range. Cool. Well. We'll go ahead

and look at questions here. I know there was also a question about looking at the think pair share mode and Scott or Tara, I don't know if you saw any questions that we didn't answer in the chat that anyone would like to see. But um, while we're still waiting for hands to go up, I'll go ahead and also just talk about how the platform handles think pair share activities. So before I was mentioning a little bit about that histogram that enables instructors or TAs to sort of see common mistakes, and we use that sort of color coding before to show correct answers and mistakes. But we do also have a think pair share mode, which alters the behavior of the histogram to look more something like this. So when we're in the think pair share mode, we actually group this by common response. Whether or not the most common response is incorrect or correct. In this case, the most common response happens to be correct and they are ordered as such, what the think pair share mode allows faculty instructors to do it's just a switch between that color coding and the obfuscated view so you can actually bring this up to a discussion with your students and and say okay, well 30% of you thought this 15% of you thought this. This happens to be a good example with formal charges versus not but that's a side comment. But you can sort of probe into why students think that they can go back and change the answer so hopefully that helps visualize sort of what's going on when we turn on that mode as well. So um, I did see a hand pop up while I was doing that from Farouk. So I'm going to go ahead and get Farouk the mic. Farouk, feel free to unmute yourself and ask your question.

Farouk 44:46
Good to see you, Scott. Hello, Tara. I have a couple of questions for you. I have been teaching general chemistry for over a quarter of a century. And I find that my current group of students have something in common with students historically, although increasingly I'm finding this to be more so two aspects readiness in simple algebra, second, prior exposure to chemistry. So please, share with me your experiences using Chem 101 how you address these two aspects in a large classroom. Thank you.

Scott 45:30
Hey Farouk, it's nice to see you. So I would say one of the things I really liked about that about Chem 101 is a couple things. I mean, the Lewis structure drawer, yes, absolutely in love with that. The new one that they have, even better! But what I really like about in which we didn't show mainly as much as questions where there's setup with dimensional analysis, because I find that students throughout gen chem really struggle consistently with dimensional analysis, even though I tell them literally like the last problem I will do in chem 1002 will be dimensional analysis right? I'm never going to use this throughout the entire year. But the way that I like Chem 101 is because they basically have like a drag and drop feature with the dimensional analysis problems that give you the opportunity to really focus what I like to do, which is to focus on units and really have the students work through a problem and to make sure they're getting the right unit before they try to do any math. Because I find that that's a huge sort of disconnect that people immediately start plugging numbers in and they have really no idea what they're actually doing with those numbers. And so I use the Chem 101 tool to make sure that students are getting the right unit before they even think about doing any kind of math problem. Not that

that solves all the problems but I think it's, it is a really nice feature. So maybe that could help get at some of the math deficiencies that you're seeing. And the basic chemistry knowledge, I'm not sure.. you know, what, what do you see as terms of deficient in terms of their basic, you know, chemistry knowledge? Are you thinking about things like bonding, or are you seeing that in different areas?

Farouk 47:10
In many instances because of changes in Georgia, students take Chemistry for the first time when they come to college. And they might not have had a prior course in physics so that they struggle with dimensional analysis, as you mentioned, and the course moves along so very rapidly, that essentially every week we have a brand new concept. And so it.. they don't really have the time for the concept to soak in. If this is their first course in chemistry, which increasingly it is.

Tara 47:44
So I am going to say something that's a little bit different. One of the things and I didn't do it this past summer, but I did do it at the beginning of the semester. I actually created essentially what was like an assignment because we do actually use Chem 101 for homework, but I created an assignment that was equivalent to like things that you should know how to do prior to the start of the semester, even though the semester technically had already started. And so it did actually include some of the basic math skills in previous semesters with different systems, we actually had required homework over the summer for them to do that they had to complete a certain percentage before the start of the semester that would help to address some of that skills gap. Not that there was any penalty to it. It was you know, they were just told that the statistics show that if you complete 80%, those that complete 80% do XYZ on the first exam and those that don't are typically below that line on the first exam which you know, we were using they're real, they're real statistics. I don't know, I mean, we do see similar things in terms of algebraic readiness for some, and some of that isn't necessarily that they don't know algebra, some of it is that they're starting to take algebra for some students in middle school. And so they're rusty, like very, very rusty. And so you know, having them practice some of their skills over the summer has been a little more useful. In terms of the previous exposure to chemistry, if it's their first time into a chemistry course, and they've never seen chemistry before, I really genuinely think that that's a completely separate topic. I mean, if that's a state of Georgia issue, then that's, that's totally different than what most of us are seeing. And we do see some students but it's not the bulk.

Scott 50:00
I would agree with that. I think that very much so because I think that most of the time what I see with students struggling is that they haven't had chemistry since sophomore year of high school, but they've had it and I think if you have a student coming in to college level chemistry, who had never had chemistry in high school, that's going to be a tall order. In the way that we currently teach the class. It’s not geared for that. I mean, I think you have to rethink your chemistry. And I'm not sure how to do that.

Farouk 50:28
Thank you, Scott and Tara.

Justin 50:33
Yeah, thanks. Thanks as well from my end. That topic of math remediation is an important one and something that we do here, especially for populations where the chemistry background is weak or there we do talk with a lot of faculty who are dealing with students who have never taken chemistry before. We as a company will have a little bit more to say on math help sometime soon. But um, it's definitely a really important problem that needs attention. And there was one question in the chat and Scott you had answered a little bit about this. Like how many TAs are necessary for a class of say 200 or n number of students? So, you know, Scott, if you want to give any additional input on how to sort of reach everyone in large audiences or Tara if you want to do that as well? Or maybe if either of you want to comment on like, how the feedback, student feedback in the platform helps sort of get that remediation when you can't reach everyone. Feel free to comment.

Scott 51:48
Well, I think that that's really where the discussion section is very powerful, because the TA is going to be able to reach everyone. I can't reach everyone in the lecture class, there's no doubt about that. But I will tell you something really interesting. When I started doing this. It was the first time ever that I started walking up the stairs and around this lecture hall and the first few times I did it, you would be shocked at students closing their notebooks as I walked up the stairs. So I didn't know what they were actually doing in the back. But the nice part now is that when I push out those problems and I walk around, all of those students are doing those problems. And I can see in the back they're not on you know Ebay, or whatever. I mean, they're actually working those problems and I can see on their computers how they're doing on those problems. And so it was really, opened up my eyes a bit. I can't get to everyone, but if somebody has a question, they'll raise their hand and we'll address it you know, it's not perfect by any stretch. And with regarding maths skills, the only thing I was going to add to that is that we had this initiative this year to look at student success and so they they really looked at what they called like high DFW courses. I mean, our university is probably 10 years behind this question. And so like I think people thought that Oh, like chemistry is really a high DFW course. No, not at all. I mean, gen chem was like 30th in the university. I mean, we would like to do better, but you know, we weren't doing that, that bad. But the all of the top 10 were in math, just like intro math, you know, so we really need to do something about that. And I'm not sure how to do it. I don't want to blame the math department, but it's a real issue.

Tara 53:22
So, um, I was gonna say something about the reaching the students. This is the first year literally that I'm doing this. I have what are called learning assistants in my classroom. And learning assistants are actually undergraduates. So it's very different than having a graduate student. It's actually financially very different as well. I have 10 undergraduates in my classroom

and I have 13 students right now per undergrad. It was supposed to be 12 it ended up being 13. And so I group them in those groups with their LA's and I limited the enrollment. The classroom fits 240 students, but there's only 130 that are in there. And so I have a seating chart. It's color coded with blocks and it's like you sit in this block. And yes, it's a lecture hall the students cannot move as well in it, but in a group of like 12 to 13 they can then subgroup into groups of about three to four and then the LA can move a little bit better around those empty rows. And then I just intentionally leave the empty rows. And then what Scott was saying is that I actually go and move into the classroom. And I've had other faculty walk by and they're like, where did Tara go? And I'm like, just look in the chaos up above. I'm somewhere in there, probably talking to a student, because I will jump in and help them and one of the things that's really interesting about that is in the past, it means students come to office hours, you know, like you would expect them to right, but I have a lot of students that will now like reach out and ask a question just in class because I happen to be walking by where they never would have before.

Justin 55:10
Awesome. Well, I think we are reaching just at the end of the hour here so I'm not seeing any other questions in the chat or hand so I think we can begin to wrap up here unless there's any last questions in the chat or hands that want to go up. But I really want to thank Scott and Tara for spending their time. These insights were extremely valuable. The questions were great. And I just really appreciate everyone joining us today and spending their afternoon or late morning with us. So we'll see everyone soon. Thanks again, Scott and Tara, and have a great start of the semester.