Welcome and thank you for standing by. At this time, all participants are in a listen-only mode. During the question-and-answer session, please press "*1" and record your name as prompted. Today's conference is being recorded. If you have any objections, you may disconnect at this time. I would now like to turn today's meeting over to Elliot Douglas. Thank you. You may begin.

Thank you. Welcome, everybody, to the IUSE PFE "Revolutionizing Engineering Computer Science Departments" webinar. I am Elliot Douglas. I am Program Director within the Division of Engineering, Education and Centers. I'm joined by two program officers who are also working on this program, and I'll let them introduce themselves. First, Kamau.

Good afternoon everyone. My name is Kamau Bobb. I'm a project officer and the director for computer information science and engineering.

And I'm Olga Pierrakos. I'm a program director in the Division of Undergraduate Education and a director of education [inaudible] resources.

Great. So our goal for this afternoon is to give you an overview from our perspective of the RED program. I would say that some of this is logistics that you'll find kind of summarizing things in the solicitation. Some of the things I have to say are not official NSF policy; they are, you know, based on our experience over the last two cycles of the RED program based on things we've seen coming from the review process, but they're not set in stone in any way. They're intended as guidance for you.

So we're going to talk about the program overview and goals for the program, important elements of the RED proposals that you need to consider as you're crafting your proposals, and some common weaknesses, again, that we've seen through the review process. We will be taking questions. There will be a couple of stopping points throughout the webinar where we will be stopping and giving you an opportunity to ask questions. I should also tell you that this webinar is being recorded. We're going to be posting it on the program website with the slides and the audio recording, and a transcript so that you'll be able to go back and refer to it again if you have further questions that you want to go back and double check some things.

So, first of all, here's the basic information about the RED program. The goal is to address key challenges associated with the middle two years of the curriculum. We want to bridge innovations that are occurring and have occurred in the introductory and capstone-level courses within both engineering and computer science education, and bridge them across the entire sequence. So the focus of this program really is the sophomore and the junior years, although, of course, you're going to want to make sure that they're connected appropriately to the freshmen and the senior years. And you want to make sure that you're not just looking at curricular issues. And I'll talk more about this in just a minute, but there are important aspects related to the faculty.

So that is expected there will be faculty development that you will need to do as you create your innovations. You might need to address issues within a faculty reward system in order to incentivize faculty to participate. And really, really importantly is this issue of the academic culture, and, again, I'll talk more about this a little bit as we go along. But the goal is to involve everybody within the undergraduate program. Of course, funding is one million to two million, somewhere within that range, for up to five years. Proposals that fall outside of those funding limits or that go beyond five years are subject to be returned without review. So make sure you stay within those limits.

Deadlines that you probably know at this point. There is a mandatory letter of intent due on December 9th. That is due at 5:00 P.M. your time, whatever time zone you're in. And if you don't submit it by that deadline, you will not be able to submit a full proposal, so please make sure you do. Those letters of intent are not reviewed. You won't get feedback on your letter of intent. They're used by us to start to put together the review panels in anticipation of the proposals being sent in. Proposals, as you know, are due January 18th, 5:00 P.M. your time. As with all proposals, we strongly encourage that you get your proposal in, you know, submitted the day before or certainly at least the morning of the 18th. Don't wait until close to the deadline. There have been certainly cases where PIs have tried to submit proposals

right up against the deadline, and, in fact, they did not go through because Fastlane got backed up. And so you don't want to run into that position.

So the overall -- what we're, overall, looking for within RED are several things. We want to fund a programs that can serve as exemplars of change across a variety of institutional types so that other institutions can look at what you are doing and see that as a model for them to follow. As part of that, we are actually treating these proposals as a cohort. So, for any of the awards that are made, it's not like a typical proposal where we're going to make the funding and then you're going to go off and you're going to do some annual course once a year, but, other than that, there's not going to be much interaction unless something special happens. In fact, we have a continuous process of interacting with these programs, both from our perspective and also for sharing across the different awards. So we're really trying to create a cohort.

We'll talk a little bit more about what revolutionary means as we go along, but it is revolutionary change for the middle two years of the curriculum. So -- and let me specify that that means revolutionary within the context of engineering or computer science education, not revolutionary just to your program. So if it's something that is known -- and say a very common one is design throughout the curriculum. So proposals that come in, unless there's something special about it, but if it's a proposal about design throughout the curriculum, that will probably not review well with regard to the revolutionary aspect. Now, and so I'll come back to that, I think, a little more later when we talk about revolutionary.

There needs to be a connection between engineering or computer science education, research, and practice. So what you are doing must be informed by the literature in engineering and computer science education. Again, that goes to the idea that we are looking for new ideas, not things that have been done. And it is very important to provide a contribution to the literature on change. This is the role of the social scientist on your team. It's really someone who is an organizational change expert relative -- you know, that's of relevance to your particular project. And so that social scientist is going to contribute to the literature on change.

So let me talk about these prefixes because there's a few interesting things that I need to explain what this is all about. IUSE is -- it's not a program. There is a program called IUSE EHR, which his often just called IUSE, but, in fact, IUSE, Improving Undergraduate STEM Education, is an NSF-wide umbrella for all undergraduate STEM education investments. And so it -- IUSE itself is not a program of funding, but there are programs that exist underneath IUSE, basically all of our investments in undergraduate education. So IUSE EHR is a program within IUSE. There's IUSE GEOPATHS and, in this particular case, IUSE RED, because this is focused on the undergraduate curriculum.

PFE is an initiative within the directorate for engineering, where I sit, that we use as an umbrella. What it means is we're interested in understanding engineering formation holistically. In other words, how do people become engineers, with that phrase, "People becoming engineers," construed to be as broad as possible? So, as far as the people go, it's K -- pre-K even through grades, all ages, all education levels, formal and informal, it could be the public understanding of engineering, interaction with engineers, how engineers practice in the profession, and, of course, undergraduate education in this particular case. It could apply to understanding of technical skills, technical engineering content, professional skills, but also many other things such as identify of engineers, what are engineering ways of knowing and doing, credentialing, cultures of inclusion with engineering, all of those are part of PFE and all can be part of your RED projects. You want to think broadly about what it means for engineers to be formed, not just the technical content of engineering.

RED has many partners, you know, as exemplified by the program officers you have on this call. It's joint funding across multiple directorates, across engineering, EHR, education human resources, and computer information science and engineering. Again, to emphasize, computer science departments are a part of this program because many of the issues faced by computer science are similar to those faced by engineering. And I should also point out, within engineering, all of the engineering divisions participate in the funding because it supports all of the engineering disciplines.

So, again, professional formulation of engineering. The formal and informal processes and value systems by which people become engineers, this quote from Michel Fabre, translated by Gary Downey, I think really points out what we mean by "formation of engineers," that it's really about who you are, what you are, your identity as a person becoming, you know, part of that identify being engineering. And so these are many of the elements that professional formation of engineers. Introductions to the profession at any age, technical and professional skills, formal and informal, ways of thinking, knowing, and doing, identify as an engineer, acculturation to the profession. Again, all of these things are things that you may want to consider in crafting your RED proposal.

Where did the RED proposal -- so, understanding where the RED solicitation came from is going to help you understand the kinds of things that we're looking for within your proposal. You know, the engineering coalitions -- you may be familiar with those -- were funded by NSF from roughly the mid-'90s to the early 2000s. These were large groupings of academic institutions, multiple institutions for each coalition that were looking at issues within advancing the state of engineering education.

Two of the major outcomes from the coalition's program were freshmen engineering courses, which many schools have, and senior capstone, really reviving senior capstone, and particularly making them more realistic and involving industry. But there's now a need to focus on the middle years and the technical core courses because those have pretty much stayed the same as they've been. You think about someone going into the core courses, such as static, circuits, thermodynamics, they have a very traditional, often -- not always, but very often an important point. And so as a result of this change from a very creative, professional engineering experience in the freshmen year to technical courses in the sophomore year, there is a very high attrition rate. That's not the only reason for the high attrition rate, but that's one reason for it. And so we want to address that attrition by, again, making it seamless across all years.

It's also clearly a critical entry point for transfer students, particularly from two-year schools, who may have done their first two years and then transferred in, and, again, to a very different kind of environment. And there is a need to integrate professional skills holistically across the undergraduate experience, not just having them in the freshmen year and then not again until senior capstone, and somehow expecting the students to remember and be able to now work at a higher level in the capstone year -- capstone course [inaudible] professional skills. So how do we bridge those gaps?

So research points -- so that's the goal of the changing -- that's, in terms of the curricular aspects, what RED is really pointing to. But how do we make that happen? It's clear that simply changing curricula is not enough because those can easily change as people change. So if you think about creating a course or a sequence of courses using the flipped classroom, for example, that's often very dependent on a particular person.

So how do you make these changes happen? Well, three important things that the research points to are faculty development, that is helping faculty to learn about these different ways and approaches for teaching, for learning, for the curriculum; reward systems, which provide incentives to the faculty to do this. Faculty already have incentives typically in the form of tenure and promotion requirements. Those may or may not support the kinds of changes you want to do, and so there may need to be some things to be done there. And really, really important, and really a very strong emphasis of the RED program are the cultures that support faculty engagement. So I want to talk a little bit about the cultures in just a moment.

And you'll note in the solicitation that the PI must be the department head or department chair. The reason is it's not just because that's the head of the department. So I get questions, "Can someone else be the PI?" In general, the answer is no. You may have a specific situation, but, in general, the answer is no. And the reason is we see the department head as the person who is the lever for change. That person, to a greater or lesser extent, in different departments, first of all, provides the leadership for the direction of the department, provides support for resources, for faculty assignments and things of that nature. So it's really important that that leadership be present.

So I mentioned the coalition's program. There was also the department-level reform. From 2003 to 2005, NSF made 20 grants, and they ranged from 500K to 1.5 million over three years. And the point was curricular reform. And these projects did result in significant curricular reform with things like, as you see on that list, multidisciplinary systems thinking being incorporated into the program, emerging technologies, project-based teams in different areas, different kinds of contexts. But those were reform efforts. Again, those didn't really address issues of culture within departments. Those were really curricular changes. So they have been successful, but they haven't been widespread in their adoption. And so, again, we want to look at what it takes to make widespread changes happen more completely.

So now what we're looking at is something that's revolutionary and not just reformist, revolutionary -- and this was actually pulled from the dictionary in order to go into the solicitation -- "radically, suddenly, or completely new, producing fundamental structural change." And that's a really key phrase, so let me just repeat it, "producing fundamental structural change; and going outside of or beyond existing norms and principles." So we're not looking here for curricular reform. Again, saying "I'm going to take my entire curriculum and make it project-based learning or active learning." It is about -- it goes beyond that; right? It goes to creating that structural and cultural change within the department. And so it's got to be significant and systemic.

Why do we need to do it this way? Well, because status quo, people, because we are people, we are resistant to change. And so without thinking about the culture involved, change, as this occurs, may be fleeting, may be dependent on one particular leader. If you change the culture, you change the way of thinking. And so what I like to say is where you need to start with your proposal is not with -- and start with either conceptualizing it, thinking about it, and writing it, is not with the activities you want to do but with the vision you want to have. And by vision I mean everybody associated with the department, students, faculty, staff, alumni, industry, other stakeholders as appropriate, everybody should be thinking differently about what it means to have an engineering program in your particular discipline.

So, again, I want to give you an example of -- and this is just a completely made-up example, but it's sort of supposed to illustrate what happens as we think about change. So here is maybe a large research university, typical. This might be statics or circuits or thermos, one of those classes that are core classes that everybody takes. And two faculty are talking, and one says, "Students always complain about lectures." And the other one says, "Oh, let's try problem-based classes. I've heard that's a good way to teach." So they try it. There's some problem-based classes -- students in the class. And he says, "Wow, students are still complaining. I guess we should go back to lectures. It's certainly easier for the faculty. This is a lot of work for us to do." Go back to lectures. And then the comment is, "Well it was worth a try, but lectures have worked in the past, so we might as well keep them."

Well what happened there? What happened there was there was a focus on the activity of changing to problem-based classes. What's different about when we think about culture? There's a lecture class again. And the [inaudible] says, "What do we want our program to be?" Okay, now, usually when I say this, people groan, "Oh, no, faculty retreat," but, I mean, it's a way to get your faculty together. If it's organized well, you can get some good work done. So let's have a faculty retreat to figure out how to change.

And so there's a discussion that, oh, students should be engaged with real-world content. That's the vision. And so they try problem-based classes, but then they come back and say, "Wow, students are complaining. They still aren't seeing what engineering really is." Now, instead of going back, because they thought about what they want the program to be instead of what they're going to do, they can go back and say, "Oh, okay, if we want students to be engaged with real-world content, problem-based classes aren't working, what else can we do instead?" Well, let's have another retreat to talk about it. They say, "Let's create field experiences. Maybe that's going to be more realistic for our students." And so they create field experiences. And so that's why I'm saying you want to pay attention to your vision and your culture first and not the activities you want to do. With that -- that's the ending point, right, Olga?

So I think Kamau goes.

So Kamau goes next. So, before that, we're going to take a stop here, and Caroline, we're going to open it up to questions on what we've discussed so far. And if you have specific solicitation questions, I'm going to ask that you hold off on those just because we may get to that later. But anything about the things we've talked about.

We will now begin a question-and-answer session. If you'd like to ask a question from the phone, please press "*1." Make sure your phone is unmuted. And you must record your name to introduce your question. To withdraw that request, you may press "*2." Once again, for questions or comments at this time, please press "*1" and record your name. One moment while we stand by for questions or comments. And again, if you have a question or comment from the phone, please press "*1" and record your name. And you may withdraw that request by pressing "*2." One moment, please. We do have a question or comment from Heidi Ellis [ph]. Your line is open. Please go ahead with your question or comment.

Hi. First, thank you for this webinar. I'm finding it quite helpful. We are in a situation where we are trying to establish a new Center for Computational Science, which may eventually become a College for Computational Science. I'm a faculty member that's been working in the area, but I'm not a department chair. However, we were curious as to whether the provost could serve as the PI on an RED proposal.

So, potentially, yes. So we have a couple of -- we don't have anyone with a provost as a PI. We do have one or -- one, I think, with a dean as a PI at a smaller institution. The idea is we want the PI to be the person who's closest to the -- you know, the academic leader closest to the students at the appropriate level. So if you don't have a department at this point and you don't have a college at this point, then I would say probably yes, if the provost is going to be the one actively involved in sort of the academic aspects of the program as you set it up.

Yes. Okay. The provost and I were going back and forth whether it makes sense to put her as PI or to provide me with a title such as director. Would that be a better strategy, would you say?

I think that would probably be a better strategy.

Okay.

Yeah.

Great. Thank you very much.

Sure.

We did have one or two instances like that before, particularly in the computing spaces where they were transforming departments and building new ones. In a letter of intent, if you just explained that so that it's clear why the PI is the person who it is, that's helpful.

Yeah.

Okay.

And not just the letter of intent, but in the proposal itself, because the reviewers won't see the letter of intent. They'll see the proposal.

Correct. Thank you very much.

Sure.

Thank you. Our next question or comment comes from Natori [ph]. Your line is open.

Yes. Thank you very much for the webinar. My question to you all is how do these radical transformations affect the accreditation of these programs?

So I'm a ABET evaluator for materials programs, so I can speak to this pretty well, although I don't know if Olga, are you an evaluator?

I am.

Okay, so we can both speak to this. From my perspective, the point of ABET accreditation is to demonstrate performance on student outcomes, I mean, ultimately, if you look at criterion for assessments. And so ABET does not prescribe how you do that. We have some very radical projects in which there's, like, major restructuring of, like, what classes -- like, what it means to even have a class. And so as long as -- as long as -- I mean, so ABET is agnostic to the structure of your curriculum, even though many people don't think that way. And so as long as you're showing, you know, student outcome performance, that you have a process for assessing student outcomes, I don't think it matters. Olga, anything to add?

No. I totally agree. I think there's misconceptions for a lot of people for ABET [inaudible] for what ABET is looking for, but the outcomes, once -- if you can show that you're achieving those, it's how you get to that, that's where you have to justify the program. Any program has to do that. So I agree with what Elliot is saying.

Okay. I have another question. Do you have any data how these programs are received by the industry people?

No, I don't.

But in a recent session that we did at IUSE, one of the current awardees talked about that. They're actually leveraging their industry board because the members of the industry board get it. So they get the importance of revolution. They get the importance of really transforming the curriculum to get the output that they want. And so they're being used as a leverage to support the changes that are going to take place. So I think they can be a partner that can really support the goals of this program.

And we do require in the solicitation that you have an industrial advisory -- most departments have or colleges already have an industrial advisory board. So in working with them to help chase that program.

All right. Thank you very much.

Thank you. Our next question or comment comes from Lara Thompson [ph]. Your line is open.

Hi, this is Lara Thompson from the University of the District of Columbia. I just had a quick question regarding the proposal itself. Are we expected to have some preliminary educational data and would that help bolster our proposals?

No, you're not required to. I don't know. I think more importantly than having some preliminary data is to show how your -- what you're planning to do is connected to what's been in the literature. That's where the engineering, education, or computer science expert comes in, which you'll hear more about in just a minute, but providing that connection to show that it is informed by the appropriate learning theories and things of that nature.

Thank you.

Thank you. And I'm currently showing no further questions or comments at this time.

All right. So, Kamau, you're taking over from here.

Sure. Hello again. If you could -- Elliot, could you move to the next slide?

Yep.

Go ahead and put the whole thing up.

Okay.

What we wanted to show is essentially to reiterate some of the points that Elliot has raised. And, in fact, it brings up some of the questions that were just asked. So, here, the intent is, as was stated, to figure out how to seamlessly infuse some sort of innovative process between the first and senior years for student's education. The core -- the point that we're really focused on through this RED initiative is that sophomore and junior year. As has already been stated and as you all know, there has been a lot of focus and innovation in both the first and senior years over the last several years. But one of the challenges of attrition takes place in the sophomore and junior year where students are kind of going through the mundane technical skill-building.

So when we're trying to figure out what to do, to the extent that you just asked -- [inaudible] that just asked about the role of industry, for example, one of the things that we're trying to do with this project -- with this program is to better understand how to infuse what 20th century and [inaudible] skills are throughout the curriculum and in ways that students find are engaging. And there, too, I think [inaudible] one of the things to be considered is that there's also the changing landscape of students themselves and their expectations of what an undergraduate education is and the increasing treatment of them as consumers and customers to an extent. So, trying to meet them where their expectations and needs are in ways that are creative, innovative, engaging, and ultimately meet the standards of expectations in what industry and higher ed and the postsecondary landscape would be like.

So, with that, if you take a look at the next one, there are -- this is a way that we're thinking about the program element. So, again, the focus of this is those two years in the middle. And it's important to note that repeatedly because we've had a lot of questions about bridge programs and first-year experiences and so on, but the real core focus of this is those junior and sophomore years. And to the extent that community colleges are entering into that place, it's also increasingly important to make sure that the experiences that you're proposing or the reformation you're proposing is considerate of the fact that that's one of the primary transfer points -- entry points into the formal undergraduate educational experience, both in engineering and in computer science.

But it's not enough to say that you can just kind of change the way that that experience works without being considerate of the lives or ecosystems in which all of this takes place. Some things to consider that are relevant to other focus areas within an assessment but also [inaudible] experiences are these range of things that you see in red. And again, the question [inaudible] nicely is ABET is one of the things to be considered of [inaudible] and the kinds of changes that are -- that you're proposing, of course, have to match the expectations of what ABET accreditation requires.

But then within -- if you're looking at it [inaudible] --and again, I want to defer and thank Elliot for some of the [inaudible] of all this. But if we think about this on the upper left-hand side, the department head, the department culture, the faculty development, thinking about what that means [inaudible] there have been instances where those focused on the incentive structure, as Elliot pointed out, but also what faculty learned and the extent to which they are engaged in experiences [inaudible] reciprocations between them [inaudible] we're looking to the community for that can help facilitate the transformation of that educational experience in those two middle years. And the departmental culture, the departmental heads are clearly important in that and part of the reason that we require that a leader in the department be the PI is because it's also clear that some of these changes cannot happen without the direct support of the department chair or a dean, someone in that role.

And then if you come down around going kind of counterclockwise, to the internships and the co-op and things of that sort, there, too, are opportunities to tie that directly to what students experience in ways that

[inaudible] the changing [inaudible] landscape itself offers a lot of the opportunities for trying to use informal ways to the external and extracurricular activities students engage in with their external opportunities. So there is another kind of [inaudible] to consider. And [inaudible] on the bottom are also things that, from our point of view, we have programs in other areas that are focused on how you use -- for example, how you use [inaudible] as a conduit into the higher education in terms of being more engaging, meeting students where they are, trying to elicit the deeper experiences [inaudible] senior-level high school students in various [inaudible].

Similarly with those internships, co-ops, and innovation, in thinking about who those students are, of course, there's the importance of [inaudible] participation in equity. Who are the students that are being successful? In the computer sciences, for example, we have essentially an instruction patterned with women [inaudible] earning computer science degrees from the 1980's to today [inaudible] the proportion of women earning undergraduate degrees has dropped precipitously. And so then here's to our innovative and courageous ways to try to figure out how to get women to be successful in STEM and engineering, of course.

And then students of color. I have to be constrained in what I'm saying, but [inaudible] the political landscape has influence on students' attitudes about the extent to which they feel accepted, what an engineering identify or a higher education identity means relative to race in a changing climate is something that's important and to be considered. In the innovation space, as you see on the bottom right-hand side over there around [inaudible] those are things that are part of that innovative attitude, social, albeit, and that's where the roles of the social scientist starts to have -- starts to engage, trying to look at the totality of the experience that you're proposing. And you may have seen a number of different kinds of things in that space.

And the other [inaudible] perspective is you go up and down to three, two, and one o'clock up there. Those are the things, again, that are kind of the factors that are considered. The other form of [inaudible] creative about where students actually go. And here, speaking, again, from computing, what we often find is that students are getting computer science degrees, for example, they don't necessarily want to be computer scientists. So they're using their skill sets to meet their personal interests and various occupational paths. So we're trying to think about what that means in the context of their education, even in a disciplinary way, is something to be considered. We've seen that in some of the instances where the course sequencing is not necessarily geared toward students just becoming [inaudible] but rather getting particular kinds of computational skills in the support of some other disciplinary interest that they may have, computational biology, computational physics, et cetera.

So there are things that we're just looking at [inaudible] becoming [inaudible] ABET. And the influence of these 21st century skills is one that we are very conscious of. I think there's some element of delicacy there to make sure that even if they are not dictating what educational outcomes are and educational interests and objectives [inaudible] of the different institutions are, but certainly we have to work together so that the extent to which that advisory boards and industrial input on what 21st century relevant skills are, because those are clearly changing day by day, generation by generation. Those kind of things can be inputted in ways that are potentially effective. [Inaudible] the next slide, Elliot.

So, here, this is just kind of some practical issues now. And these are things that you've already seen, we're just kind of throwing it at you again with some [inaudible]. The people that we need on [inaudible] are thought through carefully. Does the PI have to be a department chair or dean, which has already been said for multiple times, but just to reiterate, there's a reason for that, that we really believe that culture change can't happen without the leadership team fully behind it. That has very practical and policy implications about faculty [inaudible] structures and student experiences and expectations, et cetera. And even to some extent advisory and the kind of data that's collected about students and their progress, predictive data, analytics, and student success, et cetera, those things really have to be enabled by someone who's in a leadership position.

The other thing to the question, Heidi, that you raised before is that we're aware that in many instances cognitive computing are, in some cases, separated from cognitive engineering or there are information

technology departments that are emerging in new ways and without them. So, to the extent that you have some new department steps, as Elliot pointed out, we need not to only to have some statement of what that is and who the leader will be through a letter of intent, but also in the proposal itself, just to make sure that you explain what the -- what the particular context is for that department. We've had a number of experiences with that, and it's nothing to shy away from. Just be clear on who the leader is and why they're in the role that they are in.

The letter to the education researcher and the social science experts are, to some extent, self-explanatory. The culture pieces that we're talking about, those foundational things that will transform what students actually experience, we expect that that is a rich and dynamic opportunity for educational research. That is a changing landscape and we want expertise to demonstrate that you have some clear research methodology for what it is that you're -- what questions you're asking, what is the hypothesis that's born of the theory of change that you propose, and how do you expect to articulate that [inaudible] larger community in understanding what it is that you've done. And to the extent that it's transferrable and scalable, there will be some methodology that other institutions can follow.

So the education researcher makes clear in the proposal the specific role that they will play and outlines clearly what that research methodology will be, again, around the vision that you articulate for the project itself. Similarly with the social science experts, it's the same kind of things. It's slightly different, of course, from the specific educational questions you should be asking in terms of content and learning progressions and so on. But rather, with the social science experts, again, as Elliot pointed out at the beginning, we're looking for cultural changes [inaudible] social science experts and [inaudible]. So the role that they play and the questions that they will ask are certainly specific to the experiment that you're trying to run in the context that you see fit.

But the reason that we're emphasizing their positions here, to some extent, is about -- they're designed to help validate the revolutionary criteria itself. So when you're making changes with [inaudible] vision of something that will be demonstrably different than what has been the status quo. We need some mechanism by which we can assess that. And that's different than evaluation, but we just need some mechanism by which you can say that these are the culture variables or these are the education variables that we're beginning with, and we're expecting these outcomes to take place. And we need the experts that can articulate those differences clearly for not just us but also for the broader community. [Inaudible].

So, just some nuts and bolts. This is where often a lot of the questions come. So this letter of intent, I'll spare you reading all of this for you, as you can see it there. But essentially, let me just reiterate, the date is not on here, but the date is December 9th, and as Elliot pointed out, it's at 5:00 PM. That's 5:00 PM, and the millisecond after, it's late. I have to deal with people very upset about things like that, but we're essentially -- that's out of our control. That’s an NSF foundation-wide policy. If any proposal submitted is a second late, it's late and we just don't accept it. So, as Elliot pointed out, please make sure to try to get it in at least the morning of, at a minimum the morning of, it not the day before.

So the letter of intent, as was noted, is really to help us organize and get an expectation of the number of proposals that we will see. We're not necessarily using them as a yes/no filter, but it has to cover the basics. As you see there, we just need to know who the institution is. This says engineering, but it's also engineering and/or computer science department. Who the person is that will be the PI, and the members, the members and their roles. [Inaudible] thinking about the previous slide, make sure that to some extent you can be clear about who those members are and their experiences match with the expectations of what you would have them do in the proposed work. And the partners and collaborators are also significant.

And then you're, again, think about that previous slide when [inaudible] external agents that you may be bringing into the work that you're proposing to do. Identify who they are and then ultimately, in the proposal, be clear about the roles that they play. As you well know, I don't need to say it, but just having gratuitous partners just because they have significant [inaudible] doesn't necessarily translate into a substantive partnership that has meaningful outcomes for students. So, being clear about what those partners and collaborators actually do and the extent to which they match some particular project model

through theory of change or play a particular role in that, that can be measured at the outset -- sorry -- at the end of it all is important.

Of course, we need the titles. And the important part here is to begin the title with IUSE PFE RED as the [inaudible] categorizing all of those. And then the importance here -- the important part here with the [inaudible] is the 200-word limit. So we're looking for precision of language to make sure that you can be clear about what you're planning to do. And then this last bit about the senior project personnel, I know that in many instances these projects get [inaudible] people, but there's a -- you can have just a PI or the co-PI operating on their own, but at a maximum there can only be four other senior project personnel. Those are the kinds of nuts and bolts of what we expect in the letter of intent.

So, some of the pieces of it now. In that project description, I mean, this is self-explanatory, but the important part here is I think with the vision. And as Elliot pointed out, we're not looking just for some specific change in a mechanism. Rather, we're looking for a re-envisioning experience. That vision becomes important. So the extent to which and the clearer that you can explain what your changing vision is, it really does help the panelists [inaudible] that I've seen understand the thinking behind what your revolution [inaudible].

And there, because of the dictionary definition of "revolution," what's important here is not going on [inaudible] about, you know, what the realities are and how you're going to change the various different pieces, but what would be the lasting change that any number of different attempts to get to would actually realize. And that's where the discussion of revolutionary criteria become important. And then underneath that, as is typically the case with all proposals, the project plan and evaluation framework become quite important. I'll talk a little bit more about the bits and pieces of these elements, but this is what that project description [inaudible]. Can you go to the next one?

So, in that [inaudible] -- I kind of jumped ahead of myself here, but the vision here is what are the lasting artifacts of those projects that you're proposing? Here, again, I'll just reiterate that we really are looking for things that can be transformative. I know we throw these words around all the time, for sure. But we've been able to see in some of the previous cohorts that there are places where they've been very clear about what fundamental changes they would like to see happen for their undergraduate students experience in that core target zone that we laid out. And it may be that the individual things that you're trying to do might not get you there, but the vision [inaudible] resolute [inaudible] despite what happens.

And then of course how is success defined? That helps implicate what the evaluative methods will be. And, of course, that has to be in [inaudible] with what the research methodology is as well. But being clear about how you know that you want -- how has the resolution been realized. You can answer those kinds of questions just in a cursory discussion about the work that you're proposing to do. That is very helpful. And I think the extent to which you can answer that, how is success defined, clearly and concisely, the stronger the proposals will be. And then that leads, of course, to this question about what will be different. And in many instances, I think it's the real strength of the proposal that it's not a requirement or a prescription in any way, but if you can just say that, that this will be different afterwards, it strengthens the proposal and it helps [inaudible] understand what it is exactly that you're trying to do. The panel discussions around those issues have been rich [inaudible].

So, here, there are a number of different elements of this project plan and evaluation framework. So, again, I hesitate to read through these things, but the thing that we're looking for that needs to be very clearly stated is what your theory of change will be. So there -- it's similar to what I was saying before that we just need to be clear about what the before and after effects are. Ultimately, because of the nature of what we're trying to do with this project, with this program, is affect lasting change becomes important. So the extent to which whatever it is that you're proposing to do can be lasting and sustainable, particularly without direct year-to-year funding, what will that be -- and ultimately, of course, how will you measure the impact to which you're proposal will be.

And we realize that in many instances, particularly when you're talking about culture changes, the impact is difficult to measure. It's certainly difficult to measure in the evaluative space, but that's where it offers

some opportunity for innovation and creativity, and those themselves can be outcomes of the project's work that can be meaningful [inaudible] back measures of culture change the way that we're proposing the revolutionary [inaudible]. Of course, sustaining long term is something that we abide by and hope for. Some of the critiques that we often get is that our funding cycles don't lend themselves to long-term sustainability, but that's [inaudible].

Then the research plan -- and these are standard expectations that we have for all proposals -- is adding to the knowledge base. I think Elliot laid a good framework there for the body of work around the first and last years of the engineering student's education. The CS student's education pathways have not been as richly researched as it has been in engineering. I think the length and richness and the robustness of ASEE doesn't necessarily have -- it doesn't have an analog that is as rich or that lasts as long-term as engineering does.

So here there's an opportunity and I think one of the kind of the thinking between the engineering and the computer science departments is that the knowledge base is slightly different. The baseline knowledge base is what's involved in education research [inaudible] is slightly different. But that said, the research questions have to be very clear. The hypothesis need to outline in ways that are clearly understandable. And then these educational and sociological theories, the extent to which the research questions are built on strong theoretical [inaudible] is always true and it's always clear. It's always important for you to make clear that it comes out of the literature existence in and relevant to whatever your proposed work might be, just make sure that it's built on the best knowledge that's available out there.

Ultimately, with the research plan, of course, the methodological infrastructure is paramount so that it's clear how these questions and achievements will be measured, and ultimately they help the clarity of the methodological descriptions, as you well know, enables people to understand how it is that you'll know whether or not you're right. How is success measured? How will you know that what you've done has worked or not worked? The clarity of that research design is always paramount [inaudible]. They can be -- as you also know, they can be qualitative or quantitative, as appropriate, but clarity in the explanation of why one versus the other always supersedes the mechanism itself. So the theoretical clarity is what drives the methodological mechanism.

And then the barriers is also important, barriers, what are the anticipated barriers. This is not something to belabor in your proposal, but it's also -- it helps the panelists certainly, and us, understand the extent to which you've thought through the potential problems. And here I think I would just add that, in addition to the standard barriers of faculty incentives and so on and so forth, and students [inaudible] complacency in those difficult courses where we see a lot of attrition, it's a changing landscape of higher ed. And here I would add that, again, I think that this issue of equity and broader participation, the barriers to student achievement here are changing because of the larger social climate in which students are going to higher ed institutions. And be aware of other places where you can be innovative despite [inaudible] barriers to be in and ultimately which proposals you're offering in your work to mitigate those barriers.

And here, these are, again, kind of standard things. The clarity of these are they're always helpful. And I realize the kinds of projects, particularly under this "revolutionary" banner, they can get to be a little obtuse when people are trying to describe what they're trying to do. But the extent to which you can be clear about what your goals and incentives are really are strengths. And here, looking at what the outcomes are [inaudible] earlier of what other specific changes you would like to see, how will you recognize success at the different levels.

So what these RED highlights point out are the institutional levels at which you would like to see the outcomes [inaudible]. So, at the department-level there's one; if the faculty changes, depending on the focus of your work; and change with the professional formation of students, again, keeping in mind the goals of the professional formation of engineers in their identities as totality of their experience in education, and the analog that you would expect for computer science students as well. What is it that you'd like to see in each of the [inaudible] once they've rebranded as having a graduate at your institution, who are they? The extent to which your work has helped understand and impact that experience [inaudible] the objectives, again [inaudible] more specific about how these goals will be [inaudible]. And

then ultimately the incentives, providing some sense of what it is that you will do to make these goals be realized.

So I think --.

Is that it?

That's it. So we're going to go to the question and answers now, another question session.

Thank you. At this time, if you have a question or a comment, please press "*1." Make sure your phone us unmuted and record your name to introduce your question. To withdraw that request, you may press "*2." Once again, for a question or a comment from the phones, please press "*1" and record your name. One moment, please. And we do have a question or comment coming from Kevin Hadley [ph]. Your line is open.

Hi. This is kind of on the first part, but it relates to the incentive aspect. You know, there's obviously a PET [ph] thing, but what other kind of incentives or rewards have you seen in the other RED proposals that are I guess novel or different than just PET?

Well, it depends on what the objectives are. So with regards to faculty, those are often the ones that proposals are focused on, but also the roles that they play. There have been some that have kind of creative communities of learning. I've seen some that deal with -- I forget the title of it exactly, but it has to do with friends -- it's like a culture of --.

Critical Friends Group.

Critical Friends Group, yes, where the development of those communities -- the participation in those communities is well recognized and well-regarded. So the ability to really be a contributor in those circles has [inaudible] faculty created its own culture where that is not necessarily directly connected to [inaudible] but it has its own hierarchy among the faculty that's connected to those that are most effective in being receptive to what student experiences are, such as STEM, which, again, if it's not faculty, it has to do with students, and there are a whole other array of things to think about. Olga or Elliot, if you have any other thoughts on that, you're welcome.

Yeah, when I look at the words [inaudible] broadly, I think to many people we might think [inaudible] incentives is external of the work. And I look at it a little more broadly, and I would encourage the community to look at it that way. And here's kind of how to think about it. [Inaudible] change of culture where we want to change certain behaviors to make the vision that we have in place, whether it's for the faculty, whether it's for the students, staff, the leadership. And so the incentive does not only [inaudible] externally [inaudible] those behaviors that you're envisioning, but what are the other ways that are not external, where making the value is the [inaudible] in higher change in the culture, but to truly create an environment that incentivizes certain behaviors to take place. And I'd like to share [inaudible] forced or external [inaudible]. So I just encourage everybody to kind of think about it a little more broadly and not [inaudible] traditional external reward structures.

And I'll add a little bit to that, sort of following up on what Olga just said. The extent to which you provide opportunities for faculty to, in a sense, do what they want to do, that in itself can be an incentive. So how do you create a shared vision from what you're doing? How do you create -- I think this is what Olga was saying -- how do you create opportunities for faculty to do things that are of interest to them rather than prescribing what they should do?

Elliot, just a quick follow-up. So having, I guess, a values aspect to it [inaudible] a value-added reward that, framing it in that way, fits that criteria.

Yeah, and I wouldn't -- I'd hesitate to say that it's a criterion in the proposal, because that sounds like it's something that's going to be checked off. But it's an aspect of making these changes that faculty need to be onboard. And so how are you going to engage the entire faculty?

Thank you.

Does that conclude the question or comment?

Yes.

All right. Thank you. Our next question or comment comes from Venker [ph].

Hi, this is Venker Atluri [ph] from the Alumni [indiscernible] University. My question is regarding the composition of the [inaudible] you know, it was not clear what exactly [inaudible] personnel.

So what that means is -- so if you look at -- I mean, this has to do with sort of how the budget lines are laid out on the NSF forms. You have a maximum of I think it's four PI and I think up to a maximum of four co-PIs. I don't remember. I think that's the number. Beyond those people, you can have an additional four senior personnel. And there's just lines -- this particularly -- it has to do with the budget line and where they would appear on the budget. Of course, other people can be involved, but they just would not be listed as project personnel in that way, on the proposal and on the budget.

But they can be on the payroll, though; right? No, they can't?

I don't know -- I'm not sure what the mechanism -- again, that's [inaudible] research offices. I'm just trying to think through the budget form, and I'm not sure that there's a place to put them on the --.

Elliot, I can say, if you're going beyond the nine, right, nine paid positions, somebody may have let's say faculty participants as some kind of reward for participation. And it might be listed on the participant costs.

Okay. So the way I understood -- and I just want to make sure I got it right -- so there is one PI, four maximum of co-PIs, and a maximum of four other senior project personnel.

Correct.

Okay. Now --.

You may want to double check the PI number. I'm doing that off the top of my head and I'm not 100% sure that four is the correct number for co-PIs.

Is there a max number for co-PIs?

There is a maximum number.

[Inaudible] faculty can be on the --.

No, there's a maximum number for co-PIs.

Okay.

I think you're right, Elliot.

I think it's four, yeah.

Okay. Now, where do -- you know, what category obviously means that we have the social scientists and educational researchers. These two who go under the four other senior project personnel; is that right?

It's up to you to decide where to put them. We've seen them both as co-PIs, we've seen them as senior personnel, I mean.

It depends on the nature of [inaudible].

Yeah. Yeah.

Now, I think last time I think [inaudible] when I [inaudible] three webinars, I think there was a question, and the answer was that, yes, the evaluator can be on the payroll.

Yes.

So the external evaluator. So I'm looking at that like the maximum of four co-PIs, and then three members here, evaluator [inaudible] personnel and [inaudible].

So this sounds like these are questions specific to your proposal. What I'm going to ask is we go to the next person and we can interact offline about specific questions about how you think you're going to structure your proposal.

Okay. Thanks very much.

Thank you. Our next question or comment comes from Vondira Jordan [ph]. Your line is open.

Hi. Yes, I'm interested in your definition of an expert [inaudible] social sciences [inaudible] engineers. We have people that have been trained, but they don't have a higher degree in those fields. So do we need people with a demonstrated higher degree in those fields or can we have someone that is qualified, otherwise?

The extent to which that you can articulate what their qualifications are relevant to the work that you're proposing they do is sufficient. If it comes up in those discussions where in some cases you have someone who's quite clearly qualified to do the work, but the way that they've articulated the role that they play doesn't quite match. So, to make sure that in your specification of why that particular person -- just be clear about the role that they've played, the expertise that they have, or the training that they have that's relevant to the work that you're asking them to do.

Okay. Excellent. Thank you.

Thank you. Our next question or comment comes from John Rand [ph]. Your line is open.

Hi there. Aloha. I'm from the University of Hawaii and currently serve as the director of STEM education for our ten campuses. And I [inaudible] specifically with your systemic change. We have seven community colleges as well as four-year colleges. [Inaudible] trying to make a [inaudible] IT programs and [inaudible] programs go together [inaudible] islands that oftentimes don't have a four-year program. I guess my question is [inaudible] available to two-year colleges specifically in the community college system. It doesn't seem as though [inaudible] working on [inaudible] considering two-year colleges as part of this. [Inaudible] IT area [inaudible] other STEM area. Two-year degrees can be very powerful. And I'm just wondering if this kind of transformation is intended to help community colleges as well, or is it just part of a transfer [inaudible]?

[Inaudible] but I think, in the spirit of what we're trying to do, it's applicable. And I think particularly when we're thinking of that schema that I showed -- schematic that I showed that has where the points of entry are, if you're thinking about community colleges, for example, as the conduit into the middle two years,

then the extent to which you can articulate how preparation for students in the community college space is directly applicable to what you would like to see happen in the core target areas that we're proposing.

Yeah, well, that is true, but if you look in the solicitation under "eligibility information," that's number -- let me go to the PDF version so I can tell you what page it's on. On the PDF version of the solicitation, on page -- sorry, I got to scroll down -- page seven, "Eligibility Information: Additional Eligibility Info," it says "Only colleges and universities with baccalaureate engineering and/or computer science programs are eligible. Partnerships are encouraged with local two-year colleges to ensure that the impacts are properly considered." So a proposal needs to come from a four-year institution, but if there's a partnership with a two-year institution, that's part of the process to ensure, for example, that the students at the two-year college are able to seamlessly and appropriately enter into the four-year program with the appropriate professional skills, et cetera, then that would be appropriate.

Thank you very much.

Thank you. Our next question or comment comes from Heidi Ellis [ph]. Your line is open.

Hi. I just have a simple question that perhaps is a logistics question. Is it possible for the educational researcher and the social scientist to be the same person?

I suppose, but when I think about the amount of work to be done, I think there would be a question as to whether one person could do everything. And it's really targeting different types of -- one person could have the appropriate expertise, but it's really targeting different kinds of expertise. In the social sciences, it's about organizational change. The education expert, it's about learning theories, for example.

Thank you. [Inaudible].

Thank you. Our next question or comment is from Natori. Your line is open.

[Inaudible] just tell me how emeritus professors could be part of this RED program. Can professors, like, if they have expertise, background.

Yeah, I mean, to the extent that you include them in the project as you would anybody else. NSF doesn't have a policy on the participation of emeritus professors. I mean, and I think, from the perspective of history and of things like that, they can be very valuable in engaging with, you know, what the program has been and therefore where it's going to go. On the other hand, they could be, I could imagine, sometimes they could be, you know, sort of more resistant to change because of their history and background. I mean, that's just true for anybody, I suppose. That's not unique to emeritus faculty, so. But no, NSF does not have any kind of policy around that.

Okay.

Thank you. Our next question or comment comes from Huihui Wang. Your line is open.

Hello, this is Huihui Wang from Jacksonville University, Florida. We are [inaudible] conducting [inaudible] established from scratch. We [inaudible] engineering [inaudible] program for over 35 years. So my question is I guess we are qualified to apply for this, but I talked with a couple of new [inaudible] members and they just thought we are kind of new [inaudible] not proper [inaudible]. So I want [inaudible] if we are qualified for [inaudible].

Yeah, absolutely.

It sounds like you are. It sounds like you have a two -- a four-year institution, a four-year degree.

Yes.

So there is elements of this, of [inaudible] previous sister to the development of the program, but there's certainly a vision for where you're trying to go. And if you can align with all the pieces that we've talked about, I don't see -- we don't see a reason why you couldn't [inaudible] qualify for [inaudible] and work towards it.

Yeah, in fact, I mean, I think in some ways, a new program could have an advantage in the sense that they're not dealing with inert -- you know, institutional and historical inertia on what the program has been.

Yeah. That's how I [inaudible], too. Thank you so much.

Also, just for the CF folks involved with that similar question, in the instances where they're looking to develop new either IT departments or computing departments, it doesn't preclude you from participating.

Thank you. And again, as a reminder, for questions or comments, it is "*1." Make sure your phone is unmuted and record your name. And to withdraw that request, you may press "*2." Once again, for further questions or comments, please press "*1" at this time. Our next question or comment comes from Heidi Ellis. Your line is open.

Hi. This is a follow-on question from my previous one. Can the educational researcher be a PI, and is that a strength?

The answer to the first is yes, of course. I think it can be. I mean, again, it's up to you to decide how you want to structure the project. I think having a person like that as the PI can certainly send the message to the reviewers of the level of importance you place on that person's participation and the importance you place on the education, and, in the case of social sciences, the organizational change aspects.

But keep in mind that the PI needs to be a chair of a department or dean.

Yes. Yes. Thank you.

Thank you. And again, as a reminder, for further questions or comments from the phone, please press "*1" and record your name. And to withdraw that request, you may press "*2." Once again, for questions or comments at this time, please press "*1." One moment while we stand by for further questions or comments. One moment, please. And we do have a question or comment coming from the University of District of Columbia. Your line is open. Please go ahead with your name and your question, please.

Esther Shifaya [ph], University of the District of Columbia. As well as engaging community college, can we engage high schools?

Yeah, that's a little trickier, only because, again, remember that the focus of these projects is on the sophomore and junior years. And so to the extent that you engage K12 students in a way that makes sense within what you're going to do with those middle two years, you can.

For seamless pathway, creating seamless pathway from high school in a [inaudible] college or to flagship four-year degree.

Yeah. So, I mean, again, I think it's possible. I think you're going to have to be careful in doing that to make sure that the focus of the project stays on the middle two years of the undergraduate degree and that, you know, it's clear that that is your focus, and that the K12 is, you know, a piece that you're using to create these pathways but it's not the focus of your proposal.

Okay. Thank you.

We've seen something like that where, to Elliot's point, where the pathway part was reviewed weekly because it was too far away from the core experience that we were focused on. But we've seen some others that were reviewed as well where it was clear that the unit analysis was the students that were at

the higher ed institution and what their engagement was with other students in terms of student mentoring and things of that sort. But the focus was the experience of the undergrad students.

Thank you.

Thank you. And again, as a reminder, it is "*1" and record your name for a question or a comment. And to withdraw that request, you may press "*2." Once again, for further questions or comments at this time, please press "*1" and record your name. And we'll stand by for further questions or comments at this time. And again, that's "*1" and record your name for a question or comment. And we'll stand by for questions or comments. One moment, please. And we do have a question or comment coming from Natori. Your line is open.

Thank you. This is our professional formation of students [inaudible] to professional societies like ASME [ph] and ASWE [inaudible] or are there other things that you could help us understand?

So, professional formation refers broadly to how people become engineers. It doesn't mean specifically professional societies. So any aspect of how you're helping these students to move through the undergraduate program to develop as engineers, that's what formation of engineers refers to. Of course, a professional society could be a partner in your project if it makes sense to do that within the context of the change that you're trying to make.

It could also [inaudible] perhaps globalization aspects of the engineering profession?

Absolutely. I mean, that's, again, another important aspect that's becoming of greater and greater importance these days. So, yes, anything that's going to support students in their development as engineers. And if you decide that that's an area that you want to target, then that's perfectly appropriate. I would caution everybody not to do too many things; right? So when you do that, proposals that we get that come in that way appear to be too diffuse. They lack a clear vision and a clear focus. And Kamau talked very well about what that meant to have that vision. So just keep that in mind, that you're not trying to do everything.

Right. Thank you.

Good. Caroline, I'm going to suggest that we move on, and then other questions we can take at the end.

Thank you very much.

Okay. So, Olga.

Great. Can you --.

Yep, just one second. There we go.

All right. So we have a few more slides to go over, and be thinking about questions that you have. So, in this particular section, in this slide, we want to talk a little bit about what is the difference between research versus evaluation. And this is a kind of [inaudible] thinking about making sure the research questions that you may have would be things like what happens to the flavor when I use different ingredients. So if I add curry versus ginger, what's happening to that? Of course, I have to [inaudible]. When you're thinking about what is the rate of cooling change when I use different bowls, right, you're also bringing into play nuances in the researcher's question. You're also bringing into play theory. Kamau talked about research questions, theory of change. Research design has been really critical to this component. So, in this particular question about rate of cooling, we would use Newton's law of cooling [inaudible] to understand that. How does the rate of cooling change if we use different materials for that bowl?

And then when we think about evaluation, if we're really going back and thinking about the vision, the vision that Kamau talked about and Elliot talked about, and thinking about, okay, do I use appropriate procedures to make [inaudible] or do I use appropriate procedures to lead this vision? Did I adequately consider the possible ingredients that I might use? Again, the possible ingredients, you're going to need that vision for those goals. So when you think about evaluation and an evaluation plan, we think about what are the overall goals [inaudible]? We sometimes may use the formal sort of logic models to showcase that and to demonstrate that. There might be indicators that are identified. But in both cases, research and evaluation, evidence becomes the critical piece and methodology becomes a critical piece. And at the [inaudible] level, you want to continuously improve all of those pieces. And so that kind of leads to the next slide.

Sorry. That's messed up. There you go.

So when we think about gathering evidence, I think many of you are aware, in terms of assessment, [inaudible] started. So, formally, this idea that how monitoring things and collecting evidence along the way [inaudible] exactly similar to when the chef tastes the soup. So she will taste the soup and realize, okay, this needs more salt, and so you can adjust it. Versus the summative approach is that's the kind of final product. When you're looking at, okay, what is -- this final product, what does that begin to look like and have we met the vision for what we want this final product to look like? Thinking about, okay, this is from [inaudible] tasting the soup, that's the final product.

And so both of these pieces become really critical as evidence to ultimately continuously improve what you're doing in the project. So what you're doing in terms of methodology, what you're doing in terms of strategies and interventions. How the team has been involved. So you want definitely to think about what is the body of evidence that will be gathered in both the research plan, but also kind of the bigger picture of the evaluation plan, and who plays a role in that.

In terms of supplementary documentation, there's a couple of things that are still valid in the solicitation. One is institutional information, and I'll talk about that in the next slide. The second piece is letters for institutional leadership. We've pointed out before, already, the importance of having key leadership and the reason why we have the department head or the department chair or dean be the PI. One thing we have learned about institutional transformations is that institutional commitments and leadership beyond [inaudible] of the department becomes really critical. So letters of institutional leadership and commitment also become important as supplemental documents [inaudible].

If you're also having a project where there's a postdoc that would be involved or would be hired to support the project, a mentoring plan is required. So that would be something that would go under supplementary documentation. The other thing that every proposal [inaudible] requires is a data management plan. So this is how is the data managed, thinking about if human subjects data is corrected, have we thought about privacy, have we thought about sharing of this information. So I would encourage you to go to the grant proposal guide, the GPG, and look for all the details on a data management plan. But that's a required piece of documentation.

When thinking about -- you know, you're given two pages in supplemental documentation for describing the current state of that department, or maybe that college. So thinking about information such as what are the demographics, the demographics of the students, at all levels, undergrad and graduate, and as well as the faculty. So describe that. What is the current state? You would also present information such as retention data, and break that down by race, gender, and ability. You also would want to describe what are the current and structural instructional activities? What is the current sort of landscape of how instruction happens across the curriculum? Who's teaching what and what classes are these [inaudible], labs versus lectures versus recitations? What pedagogies are currently being used [inaudible]?

You would also want to describe what the current state is of the department in terms of policies, roles, governance, what is being done for faculty development, the current state of professional formation of these students, and then I already mentioned governance. How do all these pieces now come into play? Is there any prior effort at the department level about -- that can be evidence of strength or evidence of

opportunities to grow or opportunities to improve things? That's another way of also describing what the current state, the current environment, the current landscape of the department is. So I know it's a lot of information, but try to split it all into the papers, because that's all we have.

In terms of thinking about successful RED proposals, we've talked about the importance of vision. Start there. I can't emphasize that enough. Elliot made that point, and Kamau did as well. Far too often we have PIs and co-PIs who come to us and say, "I want to integrate service learning across the curriculum." And that's -- and there's not much more than that. So what is that vision? How is this revolutionary? How is this is going to force the [inaudible] knowledge in how we form and professionally develop these engineers and computer scientists? So think about what the vision is. Start there. And maybe bring somebody to support you in setting the vision and in developing that.

Other successful RED proposals, you want to have a good team. You want to convince the reviewers and you want to convince NSF that the team that you put together has the skills, has the expertise, and has the credibility to get this job done and to get the project work done. Institutional commitment, I already talked about that. Support beyond this at the department level, at the college, at the provost level, president level, anything that you can show evidence that there is commitment at the institutional level adds other layers that make a stronger case.

Connection to professional practice, many of the questions that we've received kind of bring up professional societies, bring up ABET, bring up industry boards. These are all opportunities to make the professional practice, to do the best you can in mentoring and then describe what those connections and partnerships would look like. And then definitely think about -- we focus a lot on thinking about the curriculum and students, certainly [inaudible] years, but our faculty in the positions to carry their work through. So faculty development and a plan for that becomes really critical to really support and create an environment for those innovations to happen. So those are all critical elements for a successful RED proposal.

The other thing we haven't talked too much about but is something that the solicitation requires that teams think about is scalability. Thinking about [inaudible] to make an evolution and you make impacts at your own department. But how achievable and significant will those changes be in those middle two years? Is your theory of change kind of strong enough and well-justified? What we need to [inaudible] formation of those institutions [inaudible]. Thinking about what is the existing knowledge that exists on how to do that and how will we push the boundaries to achieve that and sustain that change. So the scalability becomes really critical because the funding will also end at some point after five years. So how do you sustain those innovations? How do you build culture that will allow for those innovations to be sustained? And then how do you propagate and transfer that body of knowledge? So the scalability becomes really important.

Connections to research on engineering education, so Kamau talked about differences that might exist between engineering education versus computer science education. You want to [inaudible] for what is -- what do we know. For example, we know active learning works; right? Unless the team is proposing a new way to educate engineers, modifying an existing pedagogy that's pushing the boundaries. There's certain knowledge that we already have. Making the case and building on that body of knowledge that we have becomes really important in order for us to set the vision and to kind of follow through with the right activities.

And then it becomes really important to think about scaling and adoption. One thing that we have learned from institutional transformation experts is that just because a certain innovation, or in terms of intervention, has led success in certain departments for a course or context, that doesn't always translate to success in a different environment, a different context. And so what -- how is that knowledge that you're going -- going to be shared, what is the potential for scaling that, for maybe trying variations or sharing with the community [inaudible] of that intervention or innovation, and thinking about how to measure that and how to contribute to that knowledge base.

So issues -- physical issues that would deal with the RED proposal is [inaudible] and curriculum and pedagogy, but there's not enough [inaudible] culture. The proposals that commonly [inaudible] they fail to address culture. In other cases, they're missing information, and missing information [inaudible] things like structural changes, faculty development, institutional commitments, plans for sustainability. So do address these critical pieces that are described in the solicitation.

Other things [inaudible] concepts, and it definitely will make an impact to an institution or to that department, but the overall concept is not revolutionary for engineering education and computer science education. So definitely know the current state of not only your department but the current state of where the community is at, and build the case from there. And oftentimes you'll get this great kind of visual [inaudible] of here's a vision and [inaudible], but the "how" -- the "how" in which it's done is not clear. And so it's not convincing, even though we may like the review and we may like that position. How [inaudible] if that's not compelling, then that's [inaudible].

Another mistake that oftentimes is made is the lack of appropriate research or evaluation. We talked a little bit about those differences. And some teams may have people that are involved in both the research plan and the evaluation plan, but there's differences across those two things. So very clearly showing that those differences are understood, the approaches will align with the goals of the research and the goals of the evaluation become really important.

Lastly, one of the other things we see that there may be -- the teams may lack an engineering education researcher or a computer science education researcher, or they may lack an organizational change expert. So you definitely want to have those key pieces, have the right team in place to support the project. I think that's it; right?

Yep.

So a few weeks ago -- a couple of you mentioned this already -- there were a series of three webinars, "Developing a Competitive RED Proposal," that was presented by current RED awardees. The link is there. It's under a website, academicchange.org. I participated in, I think, two of those, I participated in the form of listening, and they did an amazing job. To hear the perspective of RED awardees and to hear the perspective of what they've learned along the way was truly powerful. So I would encourage all of you to go and check out the existing three webinars that were done on this website, and they're recorded. And then [inaudible] this reading list is also available in the solicitation. I'm not going to go over this.

No, it's not in the solicitation.

Oh, they're not?

No.

I thought this was.

No.

Okay. Well, it's here. So there was a special issue in the Journal of Engineering Education in April 2014. So, definitely take a look at what is the current state and think about -- this was -- be up to speed with where the current state of engineering and computer science education is [inaudible]. There's other sources here that you can see that describe -- that will give you a sense of what it is that we know, the current state of our knowledge. This is about the knowledge that we have at [inaudible]. So I encourage you to look through this and see where the gaps are. So that's the end of our presentation. So we'll take -- we'll have another round of Q&A now.

Mm-hm.

Thank you. And again, if you'd like to ask a question or make a comment, please press "*1," make sure your phone is unmuted, and record your name. Your name is needed to introduce your question. And to withdraw that request, you may press "*2." Once again, for a question or a comment from the phones at this time, please press "*1" and record your name. One moment while we stand by for questions or comments. And again, for a question or a comment from the phones, it is "*1." Make sure your phone is unmuted and record your name. And to withdraw that request, you may press "*2." Once again, for further questions or comments at this time, please press "*1." We'll stand by for questions or comments. And I'm currently showing no questions or comments at this time.

Okay. Well, with that, then I want to thank everybody for participating in this webinar. We did this with the hopes of giving you information that's going to help you write a quality and competitive proposal, and so we hope that it did that. Of course, you are welcome to contact us with any specific questions you have about your proposal, additional questions that may arise as you go back through this, as you continue to work on your ideas. So, again, feel free to contact us and we'd be happy to speak with you. And with that, I'll say good-bye.

That concludes today's conference call. Thank you for your participation. You may disconnect at this time.