**Project Completed by:**

Educause

EDUCAUSE Live! -  Disrupting Students' Career Journey with Blockchain

Wednesday, May 8, 2019

1:00PM – 2:00PM Eastern

**Educause**

**EDUCAUSE Live! -  Disrupting Students' Career Journey with Blockchain**

**Wednesday, May 8, 2019**

>> Welcome to EDUCAUSE Live! Everyone. This is Jody Tracy, Online Event Production Manager. At EDUCAUSE, and I’ll be your moderator for today’s E-Live webinar. We’d like to thank Quest for their sponsorship of the 2019 EDUCAUSE Live! Webinars. Quest is the go-to solution that helps universities and schools better move, manage, and secure their Microsoft infrastructure. You are probably familiar with the interface for our webinar, but here are a few reminders. We Hope you’ll join us in making this session interactive. Use the chat box on the left to submit Questions, share resources and comments. If you’re tweeting, please use the tag #EDULIVE. That’s E-D-U-L-I-V-E. If you have any audio issues, click on the link in the lower left- Hand corner. And, at any time you can direct a private message to “Technical Help” by clicking In the top-right corner of the Chat Pod. A drop-down menu will appear where you can select “Start Chat With” and “Hosts.” The session recording and slides will be archived later today on The EDUCAUSE Live! Website. Our webinar today is Disrupting Students' Career Journey with Blockchain. In the near future, students' records of achievement will travel with them from K-20 and into their working careers, available for learners to share their verifiable achievements online with others at their discretion. Scaling support for digital credentials toward this bright future requires a robust, Reliable infrastructure built on open standards. We are delighted to be joined by Feng Hou, CIO Chief Digital Learning Officer at Central New Mexico Community College -- Feng Hou is an award-winning CIO and a leading voice in higher Education for blockchain technology. He currently works as the CIO at Central New Mexico Community College, but starting on June 1st, he will step into a new role as the Chief Digital Transformation Evangelist at Maryville University in St. Louis. Mr. Hou is urging higher education to accelerate the adoption of blockchain technology. We Need to? Understand the transformational power of blockchain. He said, higher education institutions need to collaborate to build a? Blockchain ecosystem to address major challenges such as student learning gaps. We are also joined by Alex Kaplan, Global Strategist at IBM Global Education -- Alex Kaplan is One of IBMs thought leaders on how advanced technologies can transform lifelong learning. His career has been spent working with education institutions around the globe on projects that Use artificial intelligence, blockchain and cloud to change the teaching and learning experience. Alex has worked with leading organizations in the field including Apple, Pearson and Sesame Workshop. He has shared his views and knowledge on forums at Columbia Univ, Harvard Univ, The Getty Foundation and many others. Alex currently serves as a board member of the IMS Global Learning Consortium, Global Sales Leader for Large Deals at IBM Research, and a Member of the IBM Industry Academy. Thanks to both Feng and Alex for joining us here today. And with that, I’ll turn it over to Alex to begin.

>> Terrific. Well thank you so much and I appreciate everybody joining us today for this call. Feng and I hope that you find it interesting and informational and we look forward to answering questions at the end of the presentation. What we're going to answer today is blockchain and how it can assist with the disruption of education and provide greater support for students as they evolve through their careers and I think it's important to start out with a bit of background here about why this is occurring. We really are entering a new age of education and there is disruption occurring in the education landscape and this has been going on for years, big data and analytics, mobility, movement to cloud and now blockchain is upon us as a disrupting technology coming forward. One of the things interesting about belong chain enabling technology is it can address challenges we have around learning credentials and we're thinking about evidence of mastery of skill, that could be a digital badge a diploma and it could be earned through activities in the Girl Scouts. There's a lot of different ways that people accumulate skills and master skills over the course of their lifelong journey and we want to make it possible for people to use those skills to advance careers but in order to do that we have to make sure that that data is firmly in the hands of the owner and the learner. We talk a lot about the concept of self-sovereign see is really at the heart of this discussion. The fact is this credential type of information that users are receiving is important to them and individuals should control that and we don't want to hand over data to big companies but we want to control our own digital lives and identity and we want to introduce self-sovereignty and to give individuals control over this data. We also need to disrupt trust. We need to anchor it on technologies that allow us to see the Providence of the information that's available out there so when we see a piece of information that flows over the internet to us we can understand who provided that information, what that information is about and determine whether it's still accurate so that we can verify that information. We like to talk about the concept of trust anchors and we want to, we all want to know that and clearly over the last few years I think everybody is safe and trust in the information is coming to us electronically has been shaken and we want to address that issue straight on. We also want to disrupt data because we want data to be put to use in a very personal type of way and in order for that to occur we need to make that data available to people individually and give them power and control over it and apply it in ways that are meaningful in individual lives and being used to make personal decisions. In finally, we really do believe there's disruption going on in the learning universe where there will be the rise of meta universities and learning pathways that will allow individuals to take control of learning experience and you can already see that today. You can see students that are taking courses at multiple colleges or in high school and taking a course at a community college or somebody is in a four year institution and they are taking a course through IBM and people are engaged in creating their personalized learning pathways and we anticipate that's going to continue to grow into the future. The reason all of this is important is we want to unlock the lifelong learning experiences that credentials make available to us because they are evidence of mastery of skill. The other interesting thing about credentials are they are currently being issued by thousands of organizations around the globe and IBM has over 2,200 digital badges and we've issued over one point two million of them since we started our digital badging program four years ago and these digital badges are a great value to IBM employees. We use them to help our team members make available the skills that they have when they apply to different projects, but they use them as a badge of honor and respect that they master certain things and they want to make that available and known to the world. They've become a valuable commodity for our team members, and we see the rise of this is cross the private sector. We work with companies that are implementing digital badging programs as a really important pillar as a part of their talent transformation strategies and we think that this is going to continue to explode. Not only are our education institutions like yourselves actively involved in credentials but so too are main companies and we expect that will continue to be the case for many years to come. Given that we want to make it possible that mastery can be demonstrated in different ways. It can be represented through a badge, through a transcript, through an internship and a work experience and we want to be able to collect and bring together all of those badges so we can paint a profile of that individuals skill and help guide them on the important decisions that they are going to need to make. Finally, we're very man enamored with the concept of subcomponents so when I look at somebody who has taken a computer science classic look and see what skills they've masters, artificial intelligence or blockchain but I want to be able to understand when I graduate and I graduate my class and get the diploma for that class I want to be able to make those available to the world and that's my concept of the core credentials. Now that we're in a world, let's say where we have these digital credentials available to people that are representing our diplomas and transcripts and learning and experiences and badges we've had I want to be able to hand those off to an individual so they can store it in their wallet but my concept here is we want to make these into transactable digital assets and what we're saying is that today credentials are managed in centralized databases so institutions like yours have these credentials there and if I want to get access as a student I have to come back to you, you govern that data and these databases can be both centralized or distributed but they are really there, you know, the technical infrastructure is there to solve the data problem around the management of them but we want to transition to a world where credential owners transact with their credentials so they have the ability themselves to decide who do I share that credential with, how much do I share, why of those credentials do I share and you can envision a situation where I'm a student or employee and I'm looking at a new opportunity here and there are five credentials in my wallet that I think are relevant and I want to their those five credentials but there are three others that I don't think are relevant and I don't want to share those. We want to empower the individual who has those credentials to share them with whomever they want with whatever level of security they want and to make it possible to quote transact with those so that when that person goes applies for a job rather than them having to mail over proof of information they can send over a digital credentials that's automatically validated through the blockchain as trusted and applicable. We can think there's power to that for the education institution, for the learner, for the employer if we can turn these into transactable digital assets. There is something that stands in our way of unlocking credentials today and have to address that today. There are six primary things that stand in the way of that. One, today it's expensive to verify credentials, it's in quite costly and I've spoken with registrars across the country and when they receive a transcript from a student who is seeking entry into their institution and they receive a transcript from another institution it's quite laborious to figure outdoes that equate and how much credit can they give when they accept that student into their institution. There's a trust /SKPR fraud problem in the marketplace. In fact, the survey shows that 33% of employees have reported to their employer degrees that are called an aspiration al in one degree or other and on the issuance of our credentials where we can see the proliferation of pictures of our credentials by un authorized people, we need to tackle the trust and fraud issue. It's out there and needs to be addressed. There are regulatory requirements around credentials. Think about a veterinarian or an accountant or attorney. Their credentials can we revoked. They need to be renewed and updated and as an institution we need to give those issuing institutions the power to continue to control those credentials through an individual's lifetime so that they are accurately reflected. We want to be able to improve the fidelity of pathways to employment or new educational opportunities and today the data that's available is inadequate given the fact that much of it is not as trustworthy as we need it to. It's hard to give an individual the fidelity and clear guidance, where to go next with their career and what courses to take next to build strength and I can tell you from the IBM perspective we struggle with this with our 400,000 employees and making sure they know how they can contribute to the growth of our company and we know how we can provide in the right skills development and work opportunities. For learners, credentials get lost and destroyed which makes them unmanageable and I think there are a couple of important instances here. There have been higher educations in the U.S. that have gone out of business. The credential record is lost and if the individual didn't have proof of that it could be lost for all-time. There's a lot of movement around the globe and people come from areas where they may not be able to reach back and get proof that they were a physician or attorney in their home country and we think that blockchain can help really address the issue, making sure that once a credential is written to the blockchain it's there forever. It's immutable and globally available eliminating the problem that a person couldn't show they had an asset they could use in the future and we want to bring transparency into this. It stands in the way of our ability to make credentials more valuable today and I think we're on a good pathway in terms of credentials but there's more work to be done and we're excited about the potential of blockchain to help facilitate work and take us to the next level with credentials. The thing that Feng and I have been working on for a while along with many other smart people is the idea of creating a learning credential blockchain to unlock the work potential and the reason we think that is important is if we can move to a world where credentials have a trust anchor where they have complete transparency in sight and always available globally where we're in a permission based world where people can only write credentials to the record with the right permission or only seek credentials we think we can make a lot of difference and see change happen. The work that we have underway that we've been collaborating on through central New Mexico cois around building a learning credential blockchain built on industry standards and technical standards so working with the standards organizations like IMS global learning and the Linux foundation and others around the appropriate standards is a critical component of building what could be and should be a globally available blockchain and needs to be founded by institutions and leaders of the education insurance industry and we're working collaboratively to ensure that this blockchain is supported by, founded by, operated by those who will have to work with it every day, lending our expertise and deep technical expertise around the blockchain in combining it with the deep expertise with the impact it has to have in working with academics institutions around the world as well as other employers that supports the learning case that we've discussed and that's available to everyone working with credentials. We think there's a lot of potential here and lot of interesting collaboration that can and should occur. One of the things that I was really fortunate to do is participate in a design thinking workshop with our colleagues at central New Mexico co-college late last year for the three primary players involved in blockchain. Those players would be the learner, the person who is actually taking a course or getting a job experience or working on an online class, the institution itself and that institution is somebody who is issuing a credential credit and that can be an academic institution, it could be a company like IBM or Microsoft and the employers who are interested in talent management and through this design thinking workshop where we spent a couple of focused days brainstorming about how this could make a difference we came up with these three statements. What you can see here is that the top one, you know, what's in yellow is what they consider to be the wow statement. And you can see that what the learner wants to do is have a single evolving verified record of skills and qualifications that can be selectively shared instantly and cost effectively to help them differentiate when applying for a job or to an institution. So really making a difference in that person’s life in how they can do things. As an institution they want to be able to process transfers efficiently so they can encourage people to apply and go into administrative cost. Imagine a world where we could proactively offer admission to students because we had their trusted academic records. We knew that they had these trusted skills and that would be an exciting world where we could reduce any friction involved in helping students move from high school to college to graduate school into employment. There's a lot of I think great excitement there that would we could do for the institution and finally as an employer to be able to invite qualified applicants to apply. Employers today receive many thousands of applicants for open jobs. They have to spend a lot of time and effort in working their way through those applications and wouldn't it be great if they had a much more refined and targeted list of employees that could fill positions and proactively go out and look for people that have the skills they need and embrace the concept of this job and flip the paradigm here such that it would be possible to see what individual skills people have and proactively look for employees that met the skills that they have for the important jobs that needed to be filled. We envision all of this ending up in a wallet for an individual and at IBM we're not manufacturing a wallet but working with important partners of ours so that if I'm an individual and earn all these different skills from institutions and companies that I work for and internships that I've done, all of those can come to me in a wallet and a trusted verified way and I would be able to share those credentials broadly so we make it really easy for people. We have a terrific user experience such that if I'm a learner earner or employer that this is simple and easily available to me and I don't have to worry about blockchain. We want this to be a very simple and pleasing experience for people where they can take those credentials and put them to work for their futures and we think that's in our grasp. We think that can be done and there's excellent work being done around this and we want to do what we can to accelerate that work and be able to provide four core capabilities in this credential blockchain. One is issuant to the blockchain. That's the most basic. When a credential is issued by an educational institution through their student information system so when you all say Alex has received his diploma that can get written automatically to the blockchain. Second is to allow people to search for credentials. As I talked about before an employer could look for credentials. If I made my credentials available out of my wallet and I'm an employer I can go out and look and see what credentials have been made publicly available and see what skills people have. Third is managing credentials. I can update those credentials and revoke them and aggregate them, but I have continuing control over those credentials as long as they exist to make sure that they are accurate and verifiable and trustworthy. And then I want to be able to verify those credentials so that when I receive a credential from an applicant at my job or somebody who is trying to get into my university I know it's trusted and I can instantly verify that that credential is real and there would be no question about it from any before in the globe. Finally, to exchange that credential and share my digital credentials when applying for college. I'm not sending in paper. We think there are a lot of exciting possibilities and that these five core capabilities really support the transformative potential of blockchain in the education space. As I mentioned previously a digital badging is part of our transformation strategies here from an IBM perspective and we've used it extensively and the surprising thing is the fact that it's been so well adopted by our employee population. We see more and more people taking courses and more badges being issued. They just really like it. It's a badge of honor. It's a demonstration of skill mastered and helps them guide careers and it's been gratifying to see how people have embraced digital badging for talent. With that I'm going to turn this over to Feng Hou. We've been collaborating very closely on this journey and he'll talk to you about the work we've all been doing together. Thank you all. Feng, all yours.

>> Sure. Thanks Alex. I definitely do appreciate everyone for joining and again my name is Feng Hou and I serve at central New Mexico community college and Jody mentioned in the beginning that I'm currently transitioning and taking a new role as the chief digital transformation Evangelist. I want to talk about the central New Mexico community college as at largest higher education institution in the state of New Mexico. We are ranked nationally number one in graduating Native American students and Hispanic students and CNN has always been very innovative and just want to tell everybody that you know, when you started looking into any kind of a blockchain solution and here I'd like to share with you our journey in a little bit. So, starting in 2017 CNN first started with our own strategic initiative to convert what we call college owned technology to student owned technology and one of the things that's in the credential, one student successfully completed his or her journey and then we really truly believe that we need to create a student owned learning credential solution. At that time and the college student enrollment services was already looking for digital diploma solutions and then we partnered with the learning machine and joined this kind of initial pilot in this block search that was originally incubated in MIT and then we became the first community college in the country to implement that block search solution. In November 2017 we started from the noncredit site and issued digital certificates for the deep dive coding camp class. We wanted to start making sure that everything works and also want to build the acceptance among our students and more importantly, also the community which I will talk a little bit about later. In May 2018 and we started issuing one specific program, general ed for full credit side of the house and all CNN graduates will receive an optional blockchain degree diploma and the reason we're still doing it as an option is because we want to still give our students that paper based diploma for whatever the needs they may have. However, with a digital diploma as Alex said earlier, the five different core functions that our students use. CNN received the distinguished award and I want to talk a little bit about what since CNN has implemented this blockchain solution. What has happened? We are seeing already some strong success with this blockchain initiative. The data shows that for the first time CNN issued about a 580 six digital diplomas on blockchain and we already have 61% of our students participated meaning you heard Alex talk about the digital wallet and our students use digital wallet and are downloading their digital diploma and their wallet to share for other purposes. I was surprised that we are also seeing the community participating. We have over 40%, three hundred forty-nine community members actually are using the digital diplomas to verify our student learning credentials and of course the businesses still in the beginning of digital result. However, what really the data shows to us is not only are students participating with some very significant number. In this case, over 61% but our community and the employers and the other organizations are also using this kind of learning credentials on blockchain to verify and we conducted some quick survey among the community and students and asked why they wanted to use blockchain and overwhelmingly she shared with us for two reasons. The first reason of course is the time. Instead of a traditional verification process that everyone is familiar with, that it may take days if not weeks for the people to wait until the official transcript gets mailed or even if you would get a PDF format, it takes time. The second reason that our local community embraced this technology is of course the cost. Everybody of course knows that when you try to get your official transcript or learning credentials you have to pay a fee. And CNN has offered this completely free of charge to not only our students but all the employers to verify our student learning credentials free of charge. For these two reasons and again, the time that it saves and if you would ever have a chance to look at how quickly it literally takes second instead of days and weeks as I mentioned, and of course it's cost savings for employers to verify students learning credentials. This has been quite successful here at CNN and of course we are having this wonderful opportunity to partner with IBM, and we want to really expand other organizations opportunities and resources and expertise and to support this transformation of higher education through blockchain. Just imagine that if we use the blockchain and among all institutions and of course Alex mentioned earlier about the design thinking workshop here in Albuquerque New Mexico and for that workshop we invited two other organizations to join. Since CNN is a two-year community college, we invited the university of New Mexico to join as an upper division institution because many of our students transferred to UN N and we invited the press /PWAU Taryn employer for students. We invited them to participate because we anticipated that whatever we're building we need to build an ecosystem and collaborate among the stakeholders. That's what's happening and leveraging the strength of this blockchain technology and we can create a global learning credential blockchain that make the learning credentials, sharing, searching and verifying much easier and also IBM has an experience advisory in the domain of blockchain tools and technology to collaborate and all work together to really make this blockchain solution really work to address several big challenges that higher education together is facing today. I'm going to bring it back to my colleague, Alex, and he'll finish up the conversation.

>> Alright. Great. Thank you, Feng. I want to emphasize what a strong collaboration it's been and how helpful it's been. There's a lot of different facets to a blockchain, a couple of them that stand out, I think, are one, blockchain is a team sport. In order for blockchain to be successful you have to have a community of organizations that are committed to sharing credentials amongst themselves and we call this the minimum viable ecosystem. That's our term for that but in essence it's that work of users of the blockchain. In having worked with with CNN and having worked with their collaborators in New Mexico we had a very strong set of dialogue around how they would work together and they would make these credentials transactable and this viable ecosystem is getting permission from other participants to use the blockchain and then technical proof of concept. For those of you on the phone that are technical and know hyper ledger fabric and the other initiatives within higher ledger you'll know that the technical dimensions to issues around writing the blockchain, privacy security, exchange of them and open standards are complex technical challenges to solve and they have to be based on strong use cases so that we're really clear about how these credentials can move about, what we do with them, the role of each player and being able to collaborate with CNN has been terrific in those areas and the proof of concept and viable ecosystem. I'm going to wrap up here with sort of a view of what the blockchain world would be. You know, this is just a simple view that we put together to sort of capture the fundamentals of the use case where we have our student Rebecca studying at the university, completing her Bachelors of Science and Engineering degree and this credential goes directly on to the blockchain network and sent to our student Rebecca so she can download it into her personal wallet and once this is issued it cannot be altered. It can change through adding another block to the record but remember all blocks in a blockchain record continue on indefinitely and you just add a chain. If there's a change in the credential or grade or whatever you write a new entry into the blockchain record which shows those changes as you go forward but nothing gets erased from the past. You have this immutable regard /THO captures every transaction that's occurred, and people can see the entire thing. She decides she wants to work at IBM and she comes and takes a certification class and gets blockchain foundation for developers and we issue a digital badge through our colleagues and that gets reported to the blockchain so now she has her Bachelors of Science and Engineering on the blockchain but this new credential as well, the digital badge and her manager wants to verify those credentials and that's traced back to the organizations that issued them. Her manager pushes a button and it goes back and does the verification and there it is. It's accurate and verified and useable and Rebecca’s information is now on the blockchain on the ledger for Rebecca and everybody who is involved in the activity. That's sort of our vision of it. Lots of detail under it from a technical perspective and user experience perspective but it goes back to the five capabilities that I talked about previously and then finally for those of you who might be interested in learning a little bit more about the technology that we're building we have a lot of good information. You can go to Linux foundation and check on hyper ledger, hyper ledger fabric and the hyper ledger initiatives and see a lot there. If you are interested in IBM solutions, it's called the IBM blockchain platform and there's a lot of information as well as courses you can take to build your skills. Thank you all. I really appreciate everybody joining on the call today and you know at this point I think we'd like to answer questions.

>> Thank you so much for sharing that success story and you know, how you all made that happen. We do have a few questions from folks attending the webinar today. Steve tailor made a comment that they've offered a few credentials within their mode al system, but they can only be exported to backpack which doesn't provide an easy pathway to other sites such as LinkedIn. Do you have suggestions there?

>> Feng, can you take that one?

>> Yes. I think that essentially one of the issues is really right now there are so many chains out there and which blockchain that an institution or in this case service decides to use, it's very critical and that is the reason why CNN was deciding to use one kind of a chain and we selected to use the major ones and of course everybody knows block initially is using the Bitcoin chain as the largest property and reliable blockchain and then we're currently partnering with IBM to use higher ledger fabrics for that particular reason. You want to pick a platform that's anchored or that can be compatible with any other chains to make sure that those credentials or whatever certificates that are being issued and can be viewed or searched and verified on a different kind of a chain. I personally do not have any specific knowledge about the mode ales implementation blockchain but certainly I'm willing to do research and help get responses back.

>> Great. Thank you. We have some questions here from Nathan at American college of healthcare sciences. It looks like the question is about maybe setting standards of meaning of what these credentials mean. He cited an example that we all pretty much know what a BA in English from Stanford means but is there a way to understand a credential beyond it's mere description.

>> It’s a great question and we have to get to the heart of one of the important issues of this transformational transitional kind with this. We need to know that level of granularity under the credential. This really gets us into the area and I saw the other question about standards here, it does get us into the area of open standards and schemas because one of the challenges in this space is understanding what is a credential really mean and that's really about the metadata that can be embedded in the credential itself. If you understand how that credential was earned and sort of the implied value of it, you know, you want to know what would the primary learnings that came out of your experience. If I'm taking an English language course what were the major topics that I learned when I took that, and we'd like to see that information embedded within the credential itself. This gets to what's the taxonomy that one would use to describe an English course, what the schema that that ought to be represented in, are there a set of standards? We are starting to see that journey begin here. Particularly I'm most familiar with this in the technology arena where we're trying to embed that kind of information. I think what will happen in the future is that building within the badge itself metadata that describes not only the credential which is sort of the title but also what you learned in that course is going to be an essential component of it. And then also from an employer perspective when employers become standardized in terms of describing the skills that they are looking for making sure those skills described by the employer match up with the skills that are described as part of the metadata of the badges.

>> If I can add to it and then I think I also agree this is a very good question. Just look at recent data and the survey shows several major challenges with regard to higher ed. One is that close to 40% of college graduates are under employed and then the major challenges that have been identified is this student learning gaps between what the school is teaching and what the employers are expecting and for example, recently here at CNN we conducted a quick survey about what the employers in this case it's a plumbing industry, what are the industry leaders expecting from our colleges students and this is where we are discussing what should we put into the credentials and what the curriculum of our students need to learn Surprisingly overwhelming employers came back with empathy. Empathy is a skill that they think that CNN students need to learn. So very quickly we are developing now a softer skill, a badging program specifically for empathy and we want to address what the employers needs are and of course now we are also seeing major trends like micro credential as well as the skills based education and many schools are redesigning there, for example, computer science curriculum to really match that kind of industries needs and this is something that -- I just want to make two points. One is that the higher education institutions needs to address what should be reflected in a credential and second, that blockchain with all of its major characteristics as Alex mentioned that can really significantly help address that gap issue. With the metadata associated with a degree, employers will be able to see what specific skills and even the portfolios, projects that a student has done and either that will meet their needs or not and that I think blockchain can really make difference.

>> That’s such a great point about the learning gaps. There's another question from Sarah. A little bit more about the technical side of blockchain, I think. She mentioned that I think Alex had mentioned earlier that a credential could be removed by an institution and then said that once it was added it could never be lost. She is looking for clarification there.

>> Sure. I'm happy to provide that. The way blockchain works is that you have a right to a blockchain and continues to exist forever. So, when I was talking about removing or revoking a blockchain what I mean is you would then write to the blockchain itself that that credential is no longer valid. It doesn't disappear but the blockchain itself reflects the fact that the credential no longer has validity. So, if you think about a bank account. Your bank account when you close out your bank account the bank account itself never disappears. But there's a record at the end of it that says this account has been closed and that's exactly the same concept in terms of the blockchain technologies. Now, I might add for those of you who are familiar with the GDPR regulations in Europe this presents an interesting nuance around the right to be forgotten because blockchains don't go away. You can't be forgotten. But you can certainly eliminate its availability for people to see it. If I'm an institution and I revoke a credential it will disappear from that person's wallet, but it will continue to exist in perpetuity.

>> There have been certainly some confusions out there that blockchain has been a mandible technology meaning you can only amend. You cannot be erased forever but that's with regard to the blocks or the data. And the confusion is about that a lot of times the data itself, let's just say credentials itself, are not necessarily being posted in the block but instead it's a hash link or index. That index through the hash link or secured link to link to the actual data, that is another way and of course we can prevent any kind of a right to access or address the security concerns and Alex is correct that even though the block or that particular data may not be removed or erased, however, there's another kind of issue about either when you select blockchain solution you should use a pop up chain or private chain, a permission less or permission chain but then you want to make sure you build that kind of access control if you do have some sensitive data that you need to protect.

>> Thank you. There's a question that may have been touched on earlier but asked if IMS is developing a digital credential standard?

>> There are a number of credential standards that are evolving. One has to do with the schema around portability of the credentials themselves so that the definition of a credential is identical. That is, you move credentials across what will be thousands or tens of thousands of learning credential type blockchains. That there's no problem with those credentials and another area about an IMS global consumptions this is the metadata within the badges themselves. There are a number of work groups within the global learning con sore Shea looking at the different facets of credentials to have a comprehensive set of standards that allow for completing upper ability across all potential blockchains.

>> Thanks, and there's another question about reasons to use permissions blockchains. I know some talked a little bit about that just a minute ago. Did you have anything to add to that, Alex?

>> Well I'm personally, you my personal opinion is that permission based blockchains are the correct technology for this particular use case and the reason that I say that is because in this case, this particular use case with credentials it's absolutely core to the viability of the blockchain that those who are writing credentials to the blockchain are screened in some way. There has to be standards for those who can write credentials because the validity of the credentials themselves is going to be highly dependent upon the viability of the credential issuers. The issuers have a strong interest in controlling who can write credentials to the chain. So permission blockchain is constructed exactly to allow that to happen. The other side of it has to do with the digital privacy and security and so you've got the other side of it which is who can read that blockchain and again you want to have very tight control over who can access and see that blockchain because you want to be in a position with these blockchains for this credential where you have to receive explicit permission from the owner of the credential whether that be the credential issuer or the student themselves to actually look at the data on the blockchain so permissioned ledgers are designed precisely to address this issue. You know, there is always the bad actor problem that one has to address and we think the best way to address this concern in the aspect of credentials is to a strong governance structure who drives who has permissions to both read and write to the chain. As opposed to token based blockchains which handle the bad actor problem through a token model creates economic solution to this problem. I'm interested in other people's points of view. Please feel free to share your perspectives on the token based blockchain versus other types. We'd love to hear it.

>> This has been a really great discussion today. I really appreciate both of your time today and sharing your expertise. I'm going to go ahead and wrap it up today since we're hitting the top of the hour. On behalf of EDUCAUSE, my colleague Sean Kennedy, and today’s presenters, this is Jody Tracy, and I thank all of you for joining us today for an engaging session and conversation. Before you sign off today, please click on the session evaluation link, which you will find in the Chat pod. Your comments are very important to us. The session’s recording and presentation slides will be posted to the EDUCAUSE Live! Website. Please feel free to share it with your colleagues. And finally, please join us for the next E-Live! Webinar on Tuesday, May 14 at 1:00pm ET to hear About Technology Budget Forecasting for Small to Midsize Schools. On behalf of EDUCAUSE, this is Jody Tracy, thanks for joining us today for EDUCAUSE Live! Thank you, Jody. Thank you, everyone.

**[End of Webinar]**