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WP2-A3 Report.

Webinar: 'Assessment in the Artificial Intelligence Era'

REMOTE
Erasmus+

REMOTE: Assessing and evaluating remote learning practices in STEM

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Webinar: ‘Assessment in the Artificial Intelligence Era’

2nd of November 2023

Webinar Report

Since the WP2 involved understanding the state of the art and discussing remote assessment and learning with key stakeholders, several ideas and challenges came out. These ideas were further discussed in the last activity of the WP2: the webinar entitled ‘Assessment in the Artificial Intelligence Era’. This webinar not only discussed the remote assessment in higher education: the changes, the impacts, the challenges, the benefits and the shortcomings, but also aimed at understand how artificial intelligence can influence the way we teach, learn and assess in higher education.

On the 2nd of November, we have then organised a two-hours webinar with an introduction, two keynote speakers, a round table and closing remarks. The first key note speaker, Professor Marc Alier (Associate Professor at Universitat Politècnica de Catalunya) explained how artificial intelligence and CHATGPT can change the way we assess higher education. The second keynote speaker, Professor Arlindo Oliveira (Professor at Instituto Superior Técnico, University of Lisbon) explored the impact of large language models on learning and assessment in higher education. Then, the round table was moderated by Professor Marilena Maniaci (Full Professor at the University of Cassino and Southern Lazio) and involved Professor Fabrizio Micari (Former Rector of the University of Palermo), Professor Francesco Rattalino (Executive Vice-President of ESCP Business School), Professor Mari Elken (Associate Professor at the University of Oslo) and Ana Gvritishvili (member of the European Students’ Union). After the two presentations of the keynote speakers, mainly bringing into the discussion the potentialities and challenges of artificial intelligence, the round table raised different perspectives and perceptions about remote learning and remote assessment in higher education. The webinar resulted in a very fruitful and lively discussion also with the audience, which has made comments, suggestions and has questions during the entire webinar.

During the webinar, we had around 120 participants and until the end of 2023, it had around 590 visualisations.

Paper and conference

Within the context of WP2 and the activity specially dedicated to exploring the state of the art of remote assessment in higher education, the team of the University of Minho and of A3ES have submitted a paper to the 15th International Conference in Education and New Learning Technologies, EDULEARN, which took place in Palma, Spain, from the 3rd to the 5th of July of 2023. This paper was then published in the Conference Proceedings, which are included in the Conference Proceedings Citation Index (Web of Science). The paper can be cited as:

'M. Manatos, A.R. Dias, P. Sampaio, A.S. Barbosa Pereira, J.P. Teixeira Domingues (2023) STATE-OF-THE-ART OF ASSESSMENT PRACTICES IN STEM REMOTE LEARNING, EDULEARN23 Proceedings, pp. 6684-6692.'

This work has been developed by the partnership of the Erasmus+ co-funded project 'REMOTE: Assessing and evaluating remote learning practices in STEM'

ANNEXES

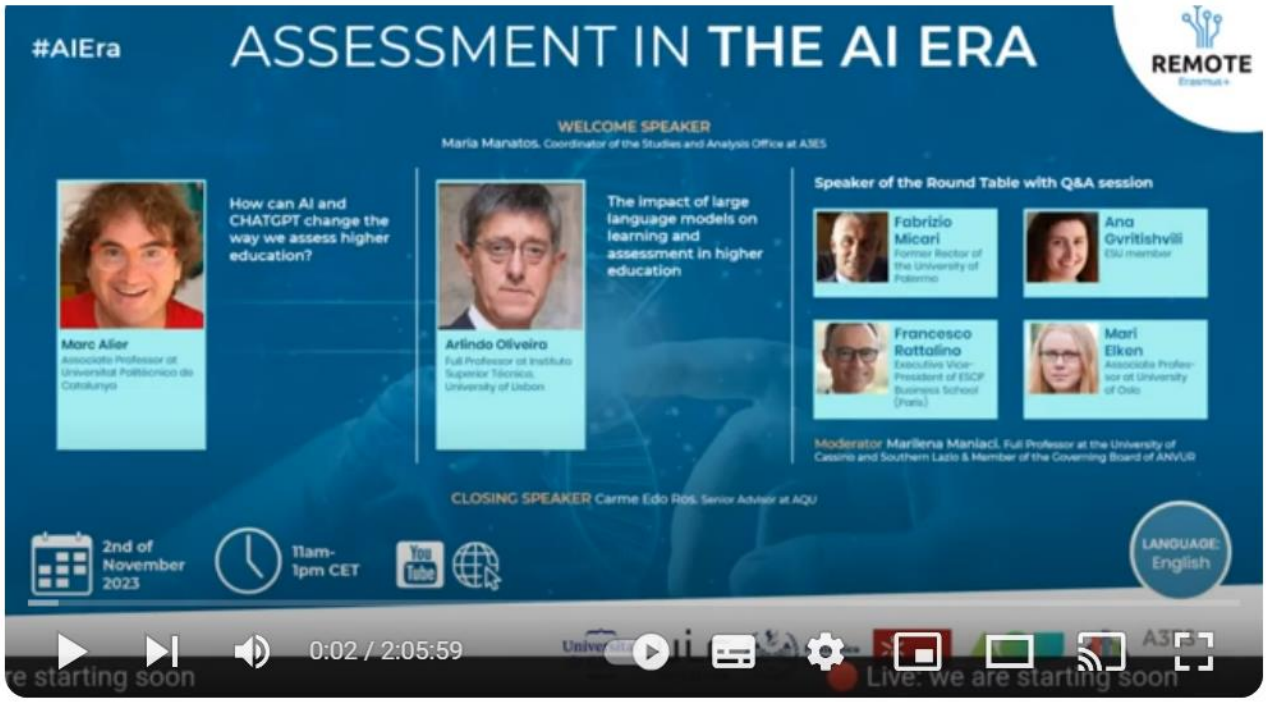
Annex 1: Webinar recording

Annex 2: Webinar automatic transcription

Annex 1: Webinar video recording

The video of the webinar is available to the public through the Youtube platform at this link:

https://www.youtube.com/watch?v=9mI9m3yex_Q



LIVE - 2 November 2023 11 am - 1 pm CET - Assessment in the AI Era

A3ES

215 subscriptors

Subscrit

33

Comparteix

531 visualitzacions Emès fa 2 setmanes #AIEra

LIVE - 2 November 2023 11 am - 1 pm CET - Assessment in the AI Era

Annex 2: Webinar automatic transcription

In order to facilitate a further use of the contents of the webinar, an automatic transcription has been made as it is presented below. This transcription that complements the 2 hours video, can be useful for researchers and academia to extract expert opinions and knowledge.

9
0:00:00
Good morning and welcome to the webinar Assessment in the Artificial Intelligence Era.
3
0:01:23
My name is Maria Manatos and I'm the coordinator of the Studies and Analysis Office of the Portuguese Agency for the Assessment and Accreditation of Higher Education in Portugal. And I have the pleasure of presenting this webinar. Thank you very much to the audience for taking the time to watch this webinar and hopefully to participate with comments and questions. A very special and warm thank you to our keynote speakers and to our colleagues who are participating in the design, organization, and dissemination of the webinar. As you can see in the program, the webinar will take place in the next two hours, and we will do our best not to overrun the time. And for that, I ask the collaboration of all our speakers to keep to the schedule so that we have time to answer the questions and comments from the audience, which I encourage. This webinar is integrated in the remote project, assessing and evaluating remote learning practices in STEM areas, which has seven partners, higher education institutions and quality assurance agencies from three countries. From Italy, we have the Politecnico of Torino and the Italian National Agency for the Evaluation of Universities and Research Institutes, ANVUR. From Portugal, we have the University of Minho and the Agency for the Assessment and Accreditation of Higher Education, HPEES. And from Spain, we have the International University of Catalonia, University of Girona and the Catalan University Quality Assurance Agency, ACU Catalonia. As you can see on the next slide, this project officially started in November of 2022, although the actual start was delayed to the beginning of 2023 and is now expected 2025. This is an Erasmus Plus project specially boosting cooperation partnerships in higher education. So the project has three main goals as you can see on the next slide. The first goal is to provide an understanding of current assessment and remote learning and assessment practices provided by higher education institutions in southern Europe in STEM areas. The second goal is to provide user-friendly guidelines and benchmarks supported by external quality assurance agencies to be used by institutions and the rest of stakeholders for implementing and evaluating successful methodologies in remote assessments, provide a roadmap and and a sustainability plan that directly addresses how to implement the normative actions. The next slide shows the five working packages of this project. The first is project management. The second working package is mapping and posterization of teaching and assessment in STEM education, which comprises literature review, so basically understanding the state of the art, crowdsourcing, screening, and this webinar. So we are now ending this second working package. The third working package mainly comprises survey to professors and students and in-depth interviews and focus groups. The fourth working package comprises benchmark and guidelines for monitoring and evaluating remote learning activities. And the last working package basically integrates the diffusion, exploitation, and sustainability plans for ongoing implementation. So, as I said, we are now ending the second working package, which basically involved understanding the state of the art and discussing it with key stakeholders. And as you can see on the next slide, I will not go deeper into the conclusions, but I will try to emphasize some of the challenges which came up in the literature and some ideas which can be food for thought for this webinar. So some challenges that arose are obviously physical distance, but also the lack of digital literacy leading to difficulties in communicating, the replication of face-to-face conditions instead of adapting to remote teaching, limitations of automated assessment systems only considering assessment results. And as you can see on the next slide, very broadly what the literature but also from the interviews with stakeholders, we see that independently of the assessment method that is chosen, formative assessment and immediate high-quality feedback allow students to know their strengths and weaknesses. So, we are aware that remote education can be a powerful tool and enhance students' learning, especially when allied to face-to-face education, allowing professors and students to combine and use the best of both modalities. from the state of the art that we tried to explore. And I end up trying to summarize those ideas into keywords. This is obviously an exercise with limited utility, but can perhaps help to kick off the discussion. So we have active learning, the engagement of professors and students, collaboration, autonomy in the learning path from the part of students, flexibility, adaptation, re-skilling and pedagogical training for professors. much go into the direction of problem solving and into solving global challenges, the importance of citizenship and of course digital transformation. Finally, let's then go to the next slide

and of remote assessment in higher education and discuss the changes, the impacts on higher education, higher education institutions and all stakeholders in higher education panorama, the challenges, the benefits, the shortcomings, etc. And with no further delay, I will present our first keynote speaker, which is, well, now you can see. Good morning, Mark. Good morning, Maria. Thank you for having me. Professor Marc Hallier is an Associate Professor at the Polytechnic University of Catalonia and Deputy Director of the Institute of Education Sciences. He has been doing research about the e-learning industry over the past 20 years, so I would say that he is the best person to reflect about how artificial intelligence and and chat GPT can change the way we assess higher education. Once again, I encourage the audience to write their questions and comments, which will be addressed in the end of Mark's talk. So Mark, the floor is yours. Thank you very much for being here. Thanks for your introduction, Maria. I don't know that I'm the best person, but I will try to do my best.

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0:10:12

First of all, I'm not alone no longer the deputy director in the Institute, but I am the coordinator of the PhD program of engineering education at UBC so much talk is assessment and genetic AI, the elephant in the room for several years, we know that we have GPT three available to students and all the tools that we have been having around GPT-3 available to students and all the tools that we have been having around for the last three years. And maybe the smartest students knew it and some cheaters use these kinds of tools, for instance, creating derivative content and so on. But right now what we have is that elephant in the room that was there and nobody was talking about suddenly on 30th or the 30th of November, 2022, almost a year from now, open AI releases this new interface to access their model, ChatGPT. And we all know, and then everything went boom. And now we have this huge disruption and everybody's talking about AI. It's interesting because we are reaching this moment of disruption, this moment when everything changes. For instance, in 2007, 2008, before 2007, 2008, we know we had smartphones, but were something few people had, and some experiments they were clumsy to use or even dorky like the Blackberries and suddenly we got the iPhone and quickly the Android devices and now we have this new class of devices that transforms everything and now we have this new class of applications we can think about Instagram, we can think about Snapchat, we can think about all of the applications and the environments that we use in the mobile scenario that now change and transform how we interact. Yesterday my father-in-law and my mother-in-law went to have a certification in the administration and they had a problem because the administration expected them to have one telephone number for each. So now we go from having the phone as something that is there or a smartphone or something that is there and we can have it and now it is something that is expected for you to have to be able to relate to the administration and relate to the administration. So we can see how fast the change that a new technology induces in society. So now let's talk assessment and generative AI, which is the topic of the course. So let me change the slide. The second slide I generated yesterday, or to this on last week's this, this image. It's a hound it's a dog sniffing about on the essays about who is cheating, we know this image or at least this, this mental image because we all have in our virtual campuses platforms, something like turn it in or could work, which, what they do is to far try to find or Urkund, what they do is to try to find evidences of copying into the essays of our students. We have to start realizing that this is not a good way to go, why? Because we are treating the students like cheaters. Instead of creating a culture of honor and about honesty and about saying this is my work and you deal with it, we are treating them as suspects and we screen them for cheating as we go into the airport, they treat us like criminals in this theater of security that they do. You are expected to carry a gun or a bomb or I don't know maybe some salami that you cannot enter into the country, you're treated like a criminal now we treat with these tools our students as criminals, and suddenly, with chat GPT and other generative generative AI we know, and let me be clear, This year I have been teaching professors of in Spain and outside of Spain, about how to deal with generative AI in the classroom. It doesn't work. Let me show you this paper which prove it mathematically is this. whether a content generated by AI can be detected. And the conclusion say, when then provided with a theoretical impossibility, it's impossible to indicate that something has been generated by an AI. Why? Because the AI is trying to simulate the person. If the AI is trying to simulate the person, then it's all gone. If the person is lazy and just uses the first thing that the chat GPT on another chat bot generates for him or for her, well, maybe you can detect it. But for a sufficiently advanced language model seeking to imitate human text, even the best possible detector may only perform marginally better than a random classifier. OpenAI removed their AI classifier from Qwik like slowly and without speaking about it. And there are companies that try to sell our universities these tools for detecting AI genetic content. So they don't work. And that's the question I would like to pose to you and think about. If one of these tools can provide false positives, which is an AI says, oh, this has been generated by an AI, and it's a false positive, then we have a huge ethical burden, a huge ethical burden to act on this information. So we have to, as teachers, as professors, we have to think about differently of how to, what kind of activities we propose to our students and how do we assess these activities. If something is as easy to cheat, if we make it as easy to cheat as

just tell the chat GDP or another AI to generate our essay for us, then maybe we are not thinking hard enough and our education is not the best that we can have. And we also have to have a thing that we are teaching our students to work in an environment when AI is going to be present. So a clever and good use of AI shouldn't be considered as cheating, but just good work. If the work is really good, and not something like mediocre generated by the first short prompt that we give to ChatGPT, for instance, copying and pasting the text of the professor into ChatGPT. So we have to think about this. Now, we go to a scenario. I also generated last Monday or Tuesday, this comic book with Dal-E and ChatGPT. In this scenario where the student has some homework and given the elephant in the room, asks a robot to create the essay for her. And then the student delivers the essay to the teacher. And now the teacher is going to use, the teacher is going to use the robot to evaluate the essay. So we have this like Kafka situation that we may go through. Sometimes I have been in this situation, for instance, in email, I get some PhD students send me a letter that I say, okay, this has, I smell that this has been generated with a chatbot and because it's too long and the way it's redacted. And then I'm going to use a chatbot to summarize it for me, and then to generate a response for him. So chatbots in the middle all the way, turtles all the way. But this is not everything. My idea is that these tools are useful for students, these tools are useful for teachers, and we can learn a lot, and we can gain a lot of insight, and some tasks we can automate. So, I'm going to show you an experiment that I conducted this very last week using content, using an exercise of math of my 13 year old. So this is, let's consider this slide. Please put it big, really big because we have to read it. Then maybe put my face in another place because it's, can we put my face the other way? So this is the exercise, it's an exercise of math. The exercise text says, the exercise is about ordering some fractions. We have to order the following numbers from minor to major, seven four, seven fourths, nine fifths, three halves, and eight thirds. And then, and now let me go through the prompt because it's not a casual prompt. It's a prompt that I have developed over several tries to make a good assessment and to make ChatGPT provide me with the best impression. First of all, this is ChatGPT 4 V, the version that is able to read and access to access images. So I say, I tell the chatbot that the student is answering in Catalan, so he has the language context. Now I said that the student is presenting fractions and it should not calculate it, because in previous answers I saw that ChatGPT when presented with a division, it said it calculated the result of the division. I didn't want that. So I said the student presents a fraction and doesn't convert it into decimal number and should be considered as a fraction in this answer. Now I tell directions I tell the model how I want the model to behave I tell him first solve the problem then find out the problem how does did the students solve the problem and determine if the strategy is good or not, and derive from the strategy the knowledge of the domain that we are evaluating of the student. It's instructions, sequential instructions for the model. Last, determine if the answer of the student was correct. Then grade the student on both criteria and only if needed, propose of the student can orient his learning to improve. If the writing, now there's a final note, if the writing of the student is difficult to interpret, be kind. For example, if a number can be interpreted as a zero or as a nine, assume he wrote the correct one. So let's see how, let me talk a little bit more about this prompt because it's really important. This prompt considers the idea and the understanding that the model has a context. This context of the model is the model knows things and is going to interpret and analyze and act on this context. As the model is generating an answer, this answer is getting back into the model. This is really technical, but it's key to understand if we want to use these models properly. When I tell the when I tell ChatGPT to make the solution to the problem, this part of the solution, this first part that we have here before the student's answer, this, the model is going to know when he's going to see the answer of the student. So everything that he outputs is going to be considered in later instructions. So we can provide with detailed instructions and chatGPT is going to follow instructions. We can go, so we see that the model is able to make a solution of the model. It's able to read and interpret correctly the letter of my son, the writing of my son. And he's going to provide an analysis of his strategy. And he's going to provide an understanding. And he sees that he's made a mistake and is going to provide a grade and a grade of seven for the strategy and a five because it only got two fractions out of order. And now it's going to provide me a good recommendation. While it's good to be able to compare fractions directly, convert it to decimals can make conversions easier and more accurate, especially with fractions that have different denominations. And what the student can practice. So now we are in a situation, we have tools that are able to read even written responses. We can automate this into programs and crafting accurate prompts and iterating from that, we can not only make an auto-correction. We have been for 20 years with online quizzes, making auto corrections and taking work out of the hands of the professor. We can have a detailed analysis of the understanding of the student, what the student is getting and what is not getting, and we can provide with this assessment for the professor, so the professor can know for each of his and her students what is the level of understanding and we can provide personalised exercises and we can provide personalised lessons. Maybe this student needs to go in this track. Maybe this student has to go through, this student needs to go through a lesson that he has not understand because it shows here. Maybe this student needs more time because it's in a hurry and now it's doing mistakes that he shouldn't do. All of this information we can

put into the model and use it not as a tool, not as this hound, as this beautiful hound that is sniffing and saying if everything is correct or not correct, but something to help the student improve his doing. And to do that, we need to understand how to craft the prompts and understand the technology. And of course, the chat is not the best interface. We need this understanding to put it into applications, into applications within our learning management systems. And this is smart learning applications, which is my field of research currently. So, teachers, students, let's everybody enjoy the ride and do not forget the elephant in the room. Any questions?
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0:26:08
Thank you very much, Mark, for this very interesting presentation. So you emphasize a lot the benefits of, or at least how students and teachers can benefit from these tools and from chat shippity. But what about the challenges of the implementation of these tools in daily assessment in the context of higher education? How...
18
0:26:47
Yes.
3
0:26:48
Yes, I could think of the ones that you think are, or how you see the implementation, the real implementation of this in the present and in the future, of course.
2
0:27:01
First of all, what we have to understand, and now we are just in a moment of explosion, of explosion of new technologies that are being developed at a very fast pace. Maybe this is going to plateau in the near future, but right now, during 2023, the acceleration of capabilities, a number of models and the capabilities of these models is just accelerating and it's crazy. When I have taught to professors in the university about chatGTP, usually one of the questions that they said, for instance, in my example, chatGPT knew how to solve the problem that I proposed because it was a secondary school problem of math, a really simple problem of math. And so professors are going to say, Chad GPT doesn't know how to solve my problem of mechanics of fluids or something like that. OK, you can provide Chad GTP with the correct solution. And then with the solution that you provide, Chad GPT can provide the assessment and the analysis. You can even provide with all your course details in the context, you say, in this course we're studying this, this, this, this explain everything in the context. And then, ChatGPT knows the answers of the questions, even can understand, you can provide nuances. This is a good response, this is a not so good response, and all the analysis that you want. And when you have provided this to ChargePT, ChargePT can read the images of the exams of your students and then can provide you with a nuanced assessment and feedback for the student. Let's remember, this allows us to create, to provide personalized feedback to the students. And feedback is something that we usually don't provide. We just provide with a number and you go on your own. And now we can do a lot and we can even suggest the students, you should read this, you should read that, maybe you should repeat this exercise, maybe be aware of this, you made the mistake here. And this is something that when you're grading 100 exams, you're not going to do for each student. Maybe you can provide this and you can say, you can do it with chat, the bot says this, if you have any questions, please contact me. Okay, but it's something that we have. Then in the university, we have privacy problems. So, chat GPT is a tool, it's now the best model out there, but we know that we have a lot of open source models, and these open source models can be fine tuned and can be embedded with contents developed by the university. So the universities have to know, in the same way that 20 years ago we had to learn how to deploy these virtual learning environments and connect it to the learning, the learning, the academic management systems and so on. Now we have to know how to embed our knowledge, the culture of our university and prepare these models to work locally, integrated with our learning platforms, because we cannot upload the data of our students to chat GPT, because we have privacy problems, you cannot upload the names of the students to chat GPT, because chat GPT is not being executed in the EU, and we are violating GDPR, so we cannot automate this, you can put the exercise but don't put the name of the students, because you are you're in infringement of the law. you're in infringement of the law. So we need to make this open source. We need to fine tune it and then deploy it inside. We need experiments. We need to learn what we can do. And ChargPT is a good prototyping tool. But this needs to be embedded into open source technologies, exploited and operated by the universities,
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0:30:47
and maybe by alliances of universities. Thank you very much. So we have already a few questions. We have questions of Marty. Thanks, Marty, for your question, which is a different kind of dimension of the issue. in

education, if you see that it's possible and can make that contribution? Well, there's two questions here. One is about biases and one is about inequality. First of all, let me answer the first one, inequality.
2
0:31:11
One of the interesting things is, for instance, I can buy today the same smartphone as Elon Musk. Because there is not a better smartphone, there is not a better smartphone that I can't afford. And I'm not a billionaire or a zillionaire like Elon Musk. So, the new technologies, IT, is generating a democratisation of access to technology. And Elon Musk maybe can access GPT 4.5, well I doubt it because now he's not in good terms with open AI, but I can access the best model out there for a really small price or for free. So the inequality is being handled by the very technology itself in the long run. Everybody has a smartphone. Maybe you have a nicer smartphone with a better camera, but everybody has a smartphone. There is no inequality in access to smartphones right now. Maybe there's a bias, maybe there's a divide in knowledge, and education is what fixes this problem. Now we talk about biases. For instance, this week I saw a tweet by Carissa Belyff, which is a researcher in privacy and AI and ethics in AI. And she was surprised because there was this researcher who trained one image model, one image generation model with one Pixar movie, with Toy Story. And then it asked the movie, then as the model to generate images of cars and then Lightning McQueen appeared from another movie from Pixar. The model without the retraining with Toy Story wasn't able to generate Lightning McQueen. Why? Because there was a fine tuning that prohibited. There's this content that the trainers used the content from Pixar, all the content from Pixar to train the model. And then they said, do not output this information as a filter later. Then another one trains the model with the, the train the model with Toy Story and then ask for cars and Lightning McQueen was out. Why? Because it was really in the model. We can try to use fine tuning to block some biases, but the biases are in the model. So this is a problem. The problem is not technological, it's societal, it's in the society. And our biases are going to be back from these models one way or another. So we need to deal with them in another way. It's not a technological problem, it's a societal problem, and we need to deal with it in societal ways. That's my answer. I have five questions, maybe I have time for two, if I behave and I don't delay myself a lot.
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0:34:41
Well, maybe we can go to... I think there's two questions that are similar. There is more, which other technologies might universities integrate?
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0:34:56
Juan has a really interesting question. Hello, Juan. So, the answer is, first of all, as you, Juan, know, there are open source models. That's nice. Somebody has made the effort to expend the money, the effort to gather the data and the energy and the computing to create these models. Okay. And it's really interesting. But the interesting thing is not the model itself because somebody else has done it and we can have similar model but it's in datasets and strategies and developments over the same architectures. We can have, so we can have different models that right now in the scene, we have Lama one, Lama two, any, the model isn't, we need interoperability. What we need is to have fine tunings, embeddings, architectures to use and to exploit these applications that we can connect to many architectures of models and then we should spend our money. If we spend our money just to work in one architecture of open source, then we are like investing ourselves a lot in these architectures. Like in learning management systems, we need interoperability. So our developments and our work and our fine tunings and our possible embeddings can be plugged into many different models, so we have future proof.
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0:36:30
Okay, maybe we go to the next question of Robert Valente. Going behind the tools and technologies, what will be the role of academics in these next decades?
2
0:36:45
Can you reply? Because I was reading one question.
3
0:36:49
Oh, no, no. But do you prefer to answer to another question?
2
0:36:52
The question that was before, for me what's more interesting in the future is multimodal models. When we have models that are able to interpret image, sound, text and video and can get a lot, get different sources of information,

connect it to find out different things and communicate it to us in a different ways. Multimodality I think is the most exciting thing that is happening. And for instance, if we get multimodality in disciplines, for instance, like medicine, where we have a lot of sources of information, we have analytics and we have CT scans and we have central data from these things. Now, maybe these models can detect things in a more clever way because it's not just one dimension that you're making an analysis of health, but different dimensions. And we can make really great improvements. In other fields, because we, as humans, we can, we focus on one day, for instance, like assessment, you are assessing this test, but it's not only this test, it's this test and it's a lot of information about the student and it's a lot of things that happen that you can use, not to put a grade, but to help better the student to learn better. That's the goal. And the problem is that this is written with privacy issues all over the place.
3
0:38:25
We also have a question of Domenico, thank you Domenico, about the repeatability. Can you tell more about this repeatability of artificial intelligence? So can the answer I get vary even if the question is always the same? Yeah, that's the issue.
2
0:38:45
You cannot have repeatability with if you want interesting answers. For instance, if you have a database, if you have a database and you want to know the contents of a table in the database, you absolutely want repeatability. The same query will also provide the same results because it's what the database is about. You want data integrity. But if you want to ask to an intelligent agent one question, you want different questions. The same question that you're asking me today, next week maybe I will provide a different one because I hope an intelligent agent. So when you are dealing with these AI's, you don't want repeatability, you want a clever answer. If you need a repeatable answer, you need a traditional information system, like a database or a system built on top of a database.
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0:39:48
And we have here a comment of Lucia about the competences of academics. So we can make it a question. So many academics at the moment don't have the competencies to be able to use the artificial intelligence in this way to enhance those formative and summative assessment. How do you see this, I would say, a challenge of the competencies or the lack of competencies
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0:40:18
of academics? Yeah, here we have three aspects. First of all, when we, 10 years ago, 20 years ago, we had to learn to use a learning management system. The problem was the interface. We had a lot of options. It was complex. For instance, if you want to create an online quiz, there's a lot of things that you have to, a lot of boxes to tick, and they have to be correctly, they have to be correct in order to get what you want. But with ChatGDP and other models, it's really easy. You just have this text. It's a chat interface. So it's deceptively easy. It's deceptively easy. You don't need to learn the interface. What I, my, the way that I prepare the courses that I give to professors is to focus on two things. One is to understand the impact of these tools in the society, and that's why I speak about history and speak a little bit about philosophy and about the impact of these tools. And then I need them to understand at least to have a grasp for what the models are about and what are the underlying concepts. Before I was talking about, for instance, about the context you need to understand the context. By the way, in my webpage, if you want to put it again it was in the first, there's a lot in the place where they say courses, there's a lot of open courseware that I have been putting on this year about teaching all these things, about the social impact, the context, technical aspects of how to use it. But it's understanding what's going on, how the world is changing, it's changing because we don't know what is going to happen, but we understand that a change is going on and understand at least the underlying principles. We don't need to be able to build a large language model, but we need to understand how they behave so we can exploit it and understand what the answers they give us mean.
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So maybe we...
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I'm losing a little bit of time with the next speaker. I'm sorry, but. No, no, no, no, you are right on time. So no need to be sorry. I just want to thank you a lot for this interesting discussion. We could stay here all the webinar discussing and make questions about it. But thank you so much. So there is a lot of ideas to think about it. And thank you so much, Mark, for this.

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Please just put the first slide again so people can get my first, the web, I will put in the chat the address of my web page where I have the coordinates. So if people need it, the videos and essays and things that they can maybe.
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0:43:06
In the first slide we can see that. Okay, yeah, and if you can put it in on the comments then they stay there and people can have access to that. And of course this YouTube channel will be available so everyone can see after that. Okay, so thank you again, Mark, very much.
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Thank you.
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And now we will go to our next speaker. I'm now very pleased to introduce our second keynote speaker, Professor Erlindo Oliveira, Distinguished Professor of Instituto Superior Técnico with the Department of Computer Science and Engineering and President of INESC, the Institute of System and Computer Engineering. His areas of interest are algorithms, machine learning, artificial intelligence, bioinformatics, and computer aid design. And here he will discuss the impact of large language models on learning and assessment in higher education. Once again, professor, thank you very much for being here. And now the floor is yours.
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Hello.
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Good morning, everyone. I don't know if you can see my slides. I'm sure, yes, there they are. So what I will try to share with you, well, it's a bit of a survey, an overview of what large language models actually are from a little bit more technical point of view, and then discuss what we have, what we, the conclusions we have reached in a commission that was designated to study the impact of these models on learning and assessment in a higher institution, institutional higher education, in this case, Institute Superior Technique, okay? So AI is actually, I mean, everybody's paying attention these guys and last year in particular, but the AI has a long history. And in particular, it started, although there were although there were a number of earlier efforts, it started with the computers that were designed and created for the Second World War and the important work that was done in the 40s and in the 50s. particularly during the wrote an influential paper in 1950, where he argued that there is no reason for computers not to behave in intelligent ways. Then there were a number of developments that started 55, 56, and that led us to the present day state. Large language models are just one aspect of AI, is certainly artificial intelligence, is not just large language models, but they have attracted a lot of attention. In part, this is due to what is known as Moravec's paradox because the earlier efforts in AI, the earlier efforts in AI focused on things like through improving or playing board games, which turned out to be actually relatively easy to program, but recognizing faces or understanding speech or language were actually very hard to program. And only in the 10 in only in the 10 years since about 10 years ago, did we start making significant progress in these things, tasks that are very easy for us, but actually very hard for machines. Behind all this is the key concept of machine learning, which is actually what is what is creating the revolution that we are assisting, because all previous approaches to AI or where people try to hard code intelligent behavior came to very little. But when the idea that actually was also proposed by Alan Turing in 1950, the idea that you should be able to teach a computer from examples, it makes it much more robust. So Peter Domingos called this the master algorithm. The idea that we can have basically one single algorithm that can be used to to create many, many different algorithms. You can see the boxes in blue. While in general, you need a specific program for each task when you use a computer in the traditional way. When you use machine learning, you can just create a new program from many pairs of input output pairs, as you can see in the blue box below. And this is really behind all the significant advances in artificial intelligence in the last decade, from language models to computer vision, to generation of images and videos and other types. There are many paradigms for machine learning, symbolic methods, methods that work by analogy, methods that are statistical in nature, regression is a good example. But the connection is methods that use neural networks, very simple units connected, interconnected by weights, actually are the, have shown to be the most powerful ones for problems of dimension in vision and language. How do they work? Basically, you have these simple units. They are connected by by weights. They they are inspired by the synaptic weights that interconnect neurons in the brain. And then you can adjust these

weights to obtain the desired input to output mapping. These weights are actually obtained by a mathematical method called gradient descent, where you basically minimize the error. Imagine you have only two parameters and you want to minimize the error. You can see that the error surface. So you do this gradient descent. What is happening today is that we are minimizing the error in systems which have hundreds of billions of parameters, so almost close to a trillion parameters. And this is what is behind the revolution, the deep learning revolution that we are assessing today. Well, here I have the video, which I will not be able to show because I can only use PDFs here. And so let me move forward. The first language models are actually fairly old. So the first one was proposed by Claude Shannon in 1950. His objective was to estimate the entropy of the English language. And since then, in these 75 years, we have had hundreds of different language models. Some of them are statistical, some of them are logical, some of them are grammar based. All of them can, in principle, be used to generate text that is based on matrix operations and a number of concepts that I will detail. are embedded in a specific space, in a vectorial space, in high dimensional space. And then the model is used, is trained to predict the next word. So you can say it's self-trained because it looks at text and is trained to predict the probabilities of the next word. And then you can generate text according to these predicted probabilities. This is just an example of the embedding, in this case, a two dimensional embedding. And in reality, the embeddings are in higher dimensional spaces like 1024 is the most used dimension. And they preserve semantic meanings. That's why these models can extrapolate between languages and between contexts and make analogies and so on. Because these embeddings are actually a very important part of the models. They preserve semantics and they enable the model to extrapolate and to make inferences about relations between tokens. The models also use a model, what is called the self-attention model, which basically enables the neural network to relate different words, different tokens in a sentence, possibly very distant, possibly hundreds or even thousands of positions apart. And this self-attention model is the self-attention method is the key part of this model. All of this is packed together in a number of very efficient metrics, multiplications that are then mapped in a very efficient way to GPUs. And this is one of the reasons why these models are so so powerful and can be used in such large scale systems. So you read a small animation, but we'll just go with the static thing. So imagine on a very simplified language models that you start the sentence with an eye. Right. And then you can say love or hate, for instance, let's imagine 50 percent. And if you hate. So as you move along in this tree, you can see that the context limits the possibilities. For instance, if you say I hate spicy, then afterwards it's probably food, right? But if you say I hate snakes, then maybe. So the key point to understand, and this is a bit related with the previous speaker, is that as you give more and more context to the model, you restrict the possibilities, and you make the model more accurate. So choosing the right prompt, which can be a very complex prompt, it can be many lines or even thousands of words long. Choosing the right prompt is very important because that, in a sufficiently powerful model, that limits what the model can generate and makes it better at generation. So the current model is the GPT-3 is a model that has been launched in three and a half years ago. It was already very powerful. It was a model trained with texts that if someone were to read it, it will take 5,000 years of full-time reading this text. So it gives you an idea of the huge amount of text that was used to train GPT-3. It was already very good in many conversations, although it could be led astray. For instance, this is a conversation in July 2020 about the effects of COVID, which it predicted correctly. And then also on the future impacts of when all this money came out of the bank accounts. And so this was a prediction in July 2020 that we were going to have inflation, which turned out to be true against the expectations of the economists. And by just changing slightly the prompts, you can see in this example, for instance, you can make it give much more interesting and much more detailed answers. So this was a bit covered by the previous speakers. It can also be used in many applications, for instance, writing computer codes. In this case, it writes a program in Python or even slightly more complex programs in Python, even if it's not fully correct. Fully correct. It can be of help for people that are not familiar with these languages. But then in some cases, when it goes out of the comfort zone, it still makes obvious mistakes. So for instance, how long will the plane take to fly to the moon? And you have to give it a lot of information until it gets the right answer. So you can see these examples. The first answer is wrong. The second answer is still wrong. But then if you give it more information, it can deduce from that information the right answer. When GPT-3 came out, well, actually after that, but about one and a half years ago, Douglas Hofstadter, a known philosopher and scientist, argued that GPT-3 had no idea of what it was talking about and he was right, so he cooked up this few questions that take it out of the comfort zone and that make it answer in the wrong way. But then more recent developments that led to CHAT-CPT corrected many of these problems. Not all of them, of course. It used what was called human feedback reinforcement learning by trying the model to understand the best answers, the best path on that tree that I have shown. And then with this trained model, it gets much better results. And I have a few comparisons, I guess not. So GPT-4, which is the successor to ChatsGPT, was actually trained on multimodal inputs. You can query with not only text, but also images and drawings and pictures and so on. And in fact, in the future, these multimodal models are likely to be much more powerful. So one interesting thing is that if you look, even though these systems are

statistical probabilistic word generators, they already do a very good job on many standard exams, like the GRE, like the bar exam. the percentage of of students of humans that took that got worse results than GPT-4 in green and GPT-3.5 in blue. So you can see for many of these exams, actually, these systems take to better than most humans. And in several of them, they still do in the remaining ones. They still do better than a significant fraction of the units. And so this raises the question, how should we change the way we teach and how should we change the way we assess students in when these systems are available to them at all time? There are, as you already heard there, there's a large family of these models. Some new models come out every day. So prohibiting the use of these models is not a possibility. These models are increasingly available and will be more and more available in the future and also more powerful. Why? Because when you start and this is already happening, you start interconnecting, for instance, a large language model we want from Alpha, it will be able to understand questions in English and answer and do advanced math. If you interconnect with a relational database, it will be able to understand questions in English and query the database, say it's a human resources database or the financial database. So when these large language models start being vertically integrated with symbolic systems, they will be much more powerful and they will be able to answer any questions about chemistry, law, math or anything that you can think of. So we should interact with students, the way we should teach students and the way we should assess students. So Institute Superior Technique, the University, the Engineering School of the University of Lisbon designated a commission to address this challenge with a very specific mandate. How should we assess AI assisted content production? And under what conditions should test and exam questions be formulated to allow for AI-assisted responses? When should the use of AI in assessments be prohibited? And what are the conditions, the principles, that should be put for the use of AI language models in dissertations, reports, and other documents used for assessment purposes. And finally, what resources should be made available to students? And so I will finish my presentation with the main conclusions of this commission. The first one was that no measures of prohibition should be adopted regarding the use of AI tools in the teaching or evaluation process. On the contrary, they should be the use of such resources should be stimulated and encouraged. The resources that including AI tools that students can use in specific coursework should be specified beforehand so that everybody knows the rules before the courses start and what are the ethically appropriate uses of these resources should be clearly specified. On the other hand, the participants in the process, both the professor and the students, should be made aware of the limited reliability of information provided by large language models. Having said this, it must be noted that in the near future, this accuracy will certainly improve as these language models can significantly improve the results if you have the right prompting and if you give it the right context. The second set of recommendations was that professors should actively use AI-based tools to enrich and simplify the teaching and content creation process. And in particular, that students should be encouraged to use these tools as teaching assistants and work aides. And in particular, they may use these tools to enhance the quality of their report and dissertations. So they should use these tools not only as private tutors, which they are already doing, but also to improve the quality of report and dissertations as long as the process is documented and it's explicitly reported which which components were corrected, summarized, or drafted by the language models. And the probably less obvious conclusion was that as remote assessments become harder because of the ability that students have to consult these systems, probably all or almost all the courses should include assessment components where the use of these tools is not possible. That means in-person exams, the physical exams in physical presence, so that we are able to assess also whether there was effective acquisition of knowledge and skills. This is something that goes a bit against the current because technical was heavily involved in using project-based learning. But if you use only project-based learning, only methods of assessment that enable the students or allow the students to use these tools, then you'll never be sure whether the student actually acquired any relevant knowledge or skills other than, of course, communicating with language models. Finally, there was also recommendation that even courses outside the computer science and the EE area should enhance the training in the field of AI and machine learning in the different courses. Those were the main conclusions of the commission. I presented them here very briefly. There is a full report on this, which I can make available. And basically, this is it. So this is just a number a number of interesting books on the topic. The master algorithm by Peter Domingos makes it's a good book on machine learning and a few books on the impact of these models on the economy, but also on society in general. And so with this I finish my presentation and I am available for any questions. I don't exactly know how I remove the slides now, but...

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Thank you very much.

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Thank you very much. Maybe we can pick some questions that were not answered and I think can be connected to

maybe to your presentation. For example the the question of Eduard Stivs saying that the set GPT referred to was the 3.5 or the 4.1 pay version, once these contribute to widen the tech gap among the academics, higher education institutions, etc.
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So the question is whether people have access to the free 3.5 or the paid 4.0 makes a difference and can create a gap. Is that the question? Yes. Yes, but I think this will be very, very temporary things, right? I mean, we'll have we'll have plenty of models in the in the near future and GPT-4 will not be the will not be the dominant technology in just a few months. So I think in six months or so we'll have things that are probably better than GPT-4. So I think it's a moving target. So whatever is true today will not be true in six months.
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about the reluctance to the use of these tools, which is the first step to encourage the use of these tools for those who are reluctant to, I believe, more direct use of the word. Yeah, that's a good question. I mean, I can only answer part of that, right? I mean, for society at large,
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I may just suggest that people try it, but particularly in the academic environment, my suggestion is that professors in all areas are strongly encouraged to use these tools themselves, to make experiments themselves, and to think how they can be used to improve the teaching. And for this, I think we have to do something more than just tell them, go and use the tool. should create scripts and examples. In ISS philosophy, as history, as law, as engineering, we should create scripts and let the professors try with the script and see by using the right prompts and using the right context, you can get very interesting answers out of these models. You can talk with the peasants on the Middle Ages, for instance, if you are studying history, or you can talk with a Japanese person right after the bombing of Hiroshima. So all these models have sufficient information to, in many cases, provide interesting reenactments, for instance, of history, or the points of view that you cannot normally access, so they can be used in many things, but you need the right prompt. So if I were in a position of responsibility in universities, I will probably create specific scripts and invite professors to use these scripts to see so that in a guided way they could understand how these models can help in teaching, but also in tutoring the students. The students are already using this, but I think if the professors help them in that way, we will move towards a more personal experience of the students where they not only have access to the professor two hours a week, but they have access to a personal tutor anytime they want to.
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OK, thank you.
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And we have a question now more related to the quality assurance. So it's from Vasco Lanza, a colleague from the agency. Do you know any examples of the usage of artificial intelligence in quality assurance systems to summarize feedback information, deal with big data, finding consistencies, how can this also help the quality assurance system?
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Yes, I'm not overly familiar in particular in the education area. What we have been doing, but I don't think it falls in this category, we have been doing this with legal texts. So, we developed a system that includes all relevant legal information in Portugal and then you can talk with the system and ask for what is the relevant information so on. So this is the closest that that I got in person to this so I cannot I cannot really help you there but I think that with the right with the right configuration I think these systems can probably be useful in in the assessment part in giving in giving specific feedback to each student and so on. Of course, it forces us to have the answers of the students and then the work of the students in digital format, right? But this is very common these days.
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Thank you.
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Thank you very much. And we have another question from Pedro Domingos. Do you feel that there are any specific scientific domains where artificial intelligence will be more useful to students than others?

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fields that are more language-oriented, like law, literature, history, philosophy, because of the maturity of the systems. And while we don't have this integrated version where the LLM is integrated in the symbolic system, I think in the next few years, I think this will be more immediately useful for students that are in fields more directly connected with language and less useful or somewhat less useful to students that are in math or engineering or very quantitative fields. But I think this is something that will be only temporary because in two or three years we have these systems that will be very competent in almost any area of knowledge. So I think it will be widespread. But right now, for instance, if you ask for a civil engineer who needs help from the students, they probably will not get as much work done as if you are a student in philosophy trying to resume the works of Socrates or something. So I think, paradoxically, technical areas will benefit less in the beginning, but this is just a temporary thing, I think.
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And from your experience, you already talked a little bit about the reluctancy of professors. And how about students? How open are students?
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They are extremely open. So they are extremely open. I'm every day I'm surprised by how much they use this. They even use this to replace things like Google. Right. You're right. I had a meeting today with the student and he forgot about some comment in the computer and I was expecting that he would go to Google to find the comment but he went to chat GPT and chat GPT answered the question. And a couple of days ago a student was having a meeting with me and after the meeting she said, oh thank you professor I think I understand the basics of it now I'm going to talk with chat GPT and find out the details. So I think I think almost all the students are using this very heavily. And in fact, when when we do homework and assignments, we have to be careful not to make them totally trivial for students who use this tool. So they have to be somewhat I'm teaching a programming course. and the assignment was designed in such a way that the chair CPT could not solve the overall assignment. It could help in specific parts, but I think that's okay, but it could not solve the overall assignment. So the students are using, at
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least the students in my school, are using only for helping them to solve it or if they are kind of replacing them?
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I think it's very hard to control, despite what you may have read. I think the automatic methods to detect whether something was generated by a large language model will be always very fallible and you can go around them. So I don't think we could trust any detection methods. So what you have to do is you have to have to create the assignments in such a way that, well, first of all, that there is not enough similar assignments on the web so that the system can do it, right? I mean, if you just do a general assignment that was already probably asked a thousand times, the system will have found it on the web. So you have to find something that was at least not very commonly done before. Of course, you can use something that is common, but then change it in a way that, you know, maybe change it some detail of the rules of a game or change something that makes the assignment different. But then in general, you have to think of it in a way that is almost for sure different from anything that was asked before. And this is actually a challenge. I think we can do this in programming, for instance, because programming is almost infinitely flexible. But I think in other areas like math or physics, it's a bit harder. So I think it will be it will be harder for mathematics professors and physics professors to find assignments that were never asked before on that specific form, because otherwise the language model is likely to have found it and will be able to solve it. So this puts a lot of emphasis on creativity of the professors, on originality of the assignments. And I think this is a heavy burden. I think this is a heavy burden. But on the other hand, it may also make the assignments better, right, more original. So, harder, I mean, forces the students to think instead of just going to Google and finding a solution.
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I think we have time for another question from Domenico from the Polytechnic of Torino. Is there any possibility of instructing artificial intelligence application, even paid ones, to perform repetitive tasks, avoiding losing all the information query after query, for example lectures, assess the goodness of technical reports, or...
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Yes, this is possible. It's not available on current systems in part due to privacy. So when you are using a chat GPT,

for instance, the questions and the interaction is being stored, but it's being stored only for future use. It does not. So every time you leave a session, you start from scratch. But there is no basic objection to a system that will keep the history and the log and will also learn and evolve as we address it. So there are some issues with regulation and with privacy but there is no fundamental objection. There is one technical difficulty which is these systems are very hard to train so they cannot be trained in real time with your input. So when you correct the system that cannot be used to train it and avoid the future error. These things will take time. But with time, I think that they will improve also as they integrate many of the inputs that are being used now. But in principle, there is no difficulty in keeping the history of the interactions and making the system evolve and Keep previous state and become more useful as time goes by Just one more well, it's more a comment I think

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About what I asked before about how we kind of control what students Use or not and we financed call the synthesize that emphasize that we should control the process. We don't need to control which tools the students use to find the solution. We need to control the process, if the students solve the problem or not. That's the important point.

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I don't think if I fully agree because I mean if you ask the wrong questions, right, questions that were asked before that are relatively trivial, the student doesn't need to do to know anything. It just needs to put the question to check it. Check it. The answers may provide a very detailed and correct answer. But the student did not understand the topics that were, for instance, let's say you are computing some mathematical function of something so the student can get the right answer by just touching it. But if the objective of the course is to teach in math, then it did not learn any math. That's why we argue that this ability to use this tool should be complemented with assessments where you cannot use the tools. And of course, they will not assess the same thing, right? I mean, you can ask much more complex questions and you can use the tool than in the other case. The physical, the assessments that require physical presence, I think are important to make sure that the students at least understand the basic knowledge that we want him or her to get from the course.

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So we are right on time. So thank you very much. Thank you, bye bye. And it's now time for our roundtable which will be moderated by Professor Marilena Maniaci, Professor at University of Cassino in Southern Glasgow and member of the Government Board of Amdor. So she will moderate this roundtable, will introduce us the participants, who will give certainly different perspectives about the remote assessment in higher education, and who will be answering a few selected questions from the audience. So again, I encourage people watching to make comments and questions to our participants. So, Marilena, the floor is yours.

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Yes, thank you very much, Maria, and good morning to everybody. We have listened to very, very inspiring presentations, keynote presentations, and also to very inspiring discussions. So now we will try to delve deeper into some aspects or also shift the attention to the implications of the use of EA in teaching and learning and in assessment. So I'd like to address the first question to Professor Fabrizio Migari, who's full professor of manufacturing technology and system and is also former rector of the University of Palermo. And of course, I'll ask him to answer, but then also if the other participants to the round table want to add something, they are of course welcome. And the question is the university as universitas, universitas magistrarum and scolarium, that is a community of professors and students has been for centuries a place of physical and intellectual growth. So in your opinion and basing on your experience, is it possible to reconcile the increased use of technology in higher education with the need to preserve the role of teacher-student relationship, the value of social network in present social networks and personal development? And if so, how?

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Please.

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First of all, thank you very much for asking me to take part to this very important webinar and really I followed the previous presentations and they were very interesting for me and I believe for all the community. Well, we are speaking about the future. And of course, they must be well aware of all the new technologies. This is the first point

we can discuss about everything. But anyway, people that is going to be the professionals of the future, of course, must be well aware of the new technologies, of the new possibilities that are offered by science and technology. And it is almost clear that the way to learn has been changing in the last 10-15 years. It is absolutely clear that nowadays the availability of knowledge that students have is much larger, is incredibly larger than it was before. So, of course, they they they they must know what is AI. They must know what is a chat GPT, what is augmented reality, everything, virtual reality reality and so on. They of course they must have all this knowledge but they they have to maintain some basic issues that are just the basic of their learning today and their life tomorrow. I mean what we are trying to give to the students is, let's say, critical knowledge. It's a very critical, we call it in Italian. That means that they must be able also to understand, to maintain some
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capability, critical capability to have some to distinguish
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among
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among or in the field of all the knowledge that nowadays is available. All these instruments are okay. They are important. Students must have a good knowledge about them, but they also should understand which are the advantages, but also the limitations. The critical knowledge is the basis for everything. Otherwise, they could not be able to understand in all the available knowledge. It is really a lot, maybe too much. People, students nowadays through internet or the other issues can reach every kind of knowledge, but they must be able to understand what is true, what is not true, what is good, what is not good and so on. And nowadays, this is probably much more difficult than it was before. Once this point is established, of course, the advantages that are offered by AI, by and availability of knowledge that nowadays we have are incredible. Of course, people in the field of medicine, but also in the field of mechanics, of physics and so on, can have the possibility to learn in a much more diffused and deep way than before. Augmented reality, for instance, for surgery is fundamental as it is also for other other other fields of science. Of course the AI gives and machine learning give a lot of possibilities but probably they can put people in error, they can make them wrong if they do not maintain this capability to have some critical capability with respect to new knowledge and so on. Of course, on the other hand, as I was saying, both the capabilities, both the possibilities that are offered, but also the University of Palermo, we started with these with these a couple of years ago, are providing some classes that are given or some courses that are given in a distance. The computer not in presence. And of course, it is important to reach parts of the population that have not the possibility to attend the lectures, to go to another town for lectures, or also probably they work and so they need time, they have not enough time. So it's useful also for discussion, for diffusion. But anyway, we have to maintain this critical capability. So just for this moment, I stop here.
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Yeah, thank you very much. There will be time to say something else if you want later. And you really made a very important point, which is critical thinking, which is indeed an important aspect to preserve. So before going to another question, I wanted to introduce the other participants to this roundtable in case they also want to add something. We have together with Professor Mikari, we also have Professor Francesco Rattalino, Francesco, who is Executive Vice President of ESPC Business School in Paris, and also professor at that school, where he teaches strategy and management. And then we have Professor Marie Elken, who is a professor at the University of Oslo, an expert in higher education studies. And last but not least, Dana Grittich-Mini, who represents the American Student Union, where she's a member of the executive committee. And, OK, so do you want to add anything to what Professor Mikhail said for the first aspect of our roundtable. If not, then I'll propose another question and I'd ask Francesco, Professor Rattalino to start answering to it. And the question is, from your perspective, how do you think that the use of technology and AI will affect traditional teaching and assessment methods? And do you believe it is possible to integrate old and new approaches?
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Thank you so much. First of all, I ask if you can hear me well. I see some comments of strange echo.
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It's okay, we do hear you well.

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And then of course I thank everybody for inviting. Okay, as you said at the beginning of this roundtable, we tried to deep dive into the matter, but it's not so easy as the keynote speeches were very comprehensive and they touched upon the most relevant topic. So I'll try to be brief and maybe leave it for the Q&A session so that we can go deeper in the area where all the attendants might be a little bit more interested in. to your question is how can we blend traditional teaching and assessments of artificial intelligence. And yes, it's not only we can do it, but we must do it because we cannot resist innovation, although some of our colleagues are trying to do it, especially at the beginning, and there are some universities that took a quite resistant approach, probably initially, but this is a real revolution and we cannot really withstand the magnitude of the event. we must blend traditional teaching and the new way of leveraging the technology. And besides teaching, there's also assessment. How can we do it? I think that we can go for two approaches. What I'm about to say is probably already a little bit touched upon before, but I do believe that we can summarise it in two points. So the first thing is how artificial intelligence can supplement traditional methods. So I can add another layer to our traditional way of teaching and learning from the students. So, of course, artificial intelligence can make the learning more personalized. So the students, of course, with the help of the professor preparing your classes, can tailor-made the instruction for their learning. And on the background, the professor can track the progress of the students and then adjust the learning progress to each student with, let me say, a limited effort because most of the analysis and most of the answer will be provided by the artificial intelligence. artificial intelligence can provide real-time feedback. I think that, at least in business school, but I'm sure also in university, the continuous assessment is always a tedious assignment for a professor, because it's not very easy to be done. But definitely, artificial intelligence can help on that and not only evaluate students while the classes are progressing, but they also, as I touched before, provide suggestions and immediate feedback so that the learning happens not only at the end of the module, but during the module in the right and proper way. Last thing that can be really leveraged by professor, and I know each and every one of you would be happy about it, is automatic grading. So we can use artificial intelligence to automatically grade assignments, and I'm sure it will be done in a more accurate, consistent, and less biased way, or at least with the quite known bias of artificial intelligence. And this can free up time for the teacher to provide a more personalized support and assistance to students. Then the other group of things we can do with artificial intelligence is really to create a more innovative learning experience. So for sure, we can easily create a virtual simulation. So we can engage students more with something that is closer to their way of interacting with the technology and the rest of the world. We can, and this is one thing, we can have more interactive learning content, so the content is not going to be just one dimensional, but we can make it at least a bit dimensional. And then, of course, artificial intelligence can help detecting plagiarism. And I want to underline help, because as we all say, there's always a way to find a way around any checks. But at least it's there. So these are the two main areas. And how can we do it? I mean what is the approach that we as educators must take? Well we need to have an adaptive point of view. So while we have to embrace this new technology, we need to make sure that the students will be learning what is going to be needed for them to be, of course, a good worker, good citizens in the future. And technology will play a major, major, major role. As it was said, the first thing is we need to promote critical thinking. It's nothing new. I mean, I remember that critical thinking has been there since education existed. We can recall the Allegory of the Cave by Plato. It's there, you know, and it's painful. So we need to make sure that as educator students find that that is not answering to a set of questions that make them a good learner, but is going through the pain of reaching for the truth, which is the real objective. In business school, we are luckier, I want to say, because we use the case methodology since many years. years and although cases can be solved by charge EPT normally they are discussed in class and the class dynamics is what makes the difference and we still have some ground there to develop and to promote critical thinking possible in all the subjects, but still we need to think about that.
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Francesco, if I may interrupt you, it's because you really anticipated a supplement of questions.
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Oh, sorry, sorry, sorry.
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Which was exactly concerning the risk, whether a risk exists that students become lazier and also that teachers become lazier through artificial intelligence, to the potential of artificial intelligence in teaching and learning. But I think you answered already, but I would also be interested in listening to the thoughts of Marie Elken about

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that. And yeah, okay, so I stop here because you can manage. Then I have also a few other points, but we can...
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Yeah, they can come into the debate later on.
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In the Q&A, exactly.
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Also through the questions. So I would now ask Mari, whether she thinks that AI, if correctly implemented, could enhance the quality of teaching and learning? How? And especially if this could happen through allowing personalized teaching or addressing educational disparities of which we have already heard about in the previous discussion. So please, Mari. Yes, thank you. I hope you're hearing me well. I think in terms of a question, I would first think of what is the correct implementation of AI. As also some of the previous speakers have mentioned that AI is not one thing. And there are very different kinds of tools available which build on various AI techniques. And chat GPD, which has been mentioned now many times, is only one of quite many interfaces and tools. And the other part of that would be the correct response. And I think this is something that institutions really grapple with. So I'm currently part of this project here in Norway, where we look into how institutions and educators have sort of pedagogically tried to use digital tools in more general. And we started actually our project more or less the same time when Chatshipity was launched. So we've actually managed to follow up with how higher education institutions here in Norway have tried to sort of respond to this. And it was a landslide. And also what I'm sure many of you also might recognize is that there was a lot of uncertainty what to do. And I think also in one of the keynote presentations, it was quite sort of strongly emphasized how some of the initial responses still now are very strongly focused on regulative aspects, sort of trying to catch the cheaters. And that also is something that we saw very quickly being the first response. But there is an underlying sense that something is at stake here. So that these AI based tools which are able to generate text, which is supposedly then indistinguishable from what humans can contribute, it does raise some questions about education and good quality education. So what is good quality education actually about? And I think the other part of that, those of you in parallel to this, is also something that we've been in this discussion talking a lot about sort of how to teach and how can I come into teaching? But I think it's also we should keep in mind that AI based tools will also change the content matter. So it will change the disciplines. It will change the professions. And that will also then have implications of how we teach. What do we consider good quality teaching in the particular disciplines? So I would say if we sort of start thinking about one is about correct implementation, there are many correct implementations. The other part is that it will also change our content matter quite substantially in the coming years. But in terms of using it in teaching as a pedagogical tool, I would say we should turn the discussion around. So we shouldn't start with the technology. This has been a sort of a hallmark of all the previous discussions about using digital tools in education has been that what we now have this tool that we do this. And I'm sure I might be sort of the big revolution and probably is in some aspects. But if we want to sort of think about how we can get good quality teaching, we should ask, OK. What kind of skills and competencies do we want our students to have? How is this altered by new technology? Then what do we want? What do you know about how students learn? So we know quite a lot about how students learn. And then we can ask the question, OK, how does AI fit into this? So in terms of how we how students learn. And then we should design learning environments that can facilitate this. And that sort of AI comes in as one of different kinds of tools that we can use for this. So in terms of your questions, I think, of course it can enhance quality. Of course it can also sort of provide more personalized teaching. I mean, it's all embedded into this, but it's really dependent on thoughtful pedagogical design. So, and that's where I think often some of the discussions maybe don't sufficiently cover this because there is a strong focus on the technology itself, but not on what is the purpose that we use it for. And of course, yes, it can do this, but then it doesn't mean it's easy. There are all sorts of hurdles. What we saw in our project is staff competence, student competence, lack of appropriate tools. So the fact that there is a jet ship out there doesn't help. We need something that takes account into privacy laws, everything else. And there are regulative constraints, all sorts of constraints involved. So it is a question about, I want to say, how to actually get there.
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I think more so than whether we can do this. Thank you very much, Mario. It was very important to remind us that

things are not as easy as we look at them. I mean, they're much more complex and we have to take into account this complexity. And I would also say, I don't know if I'm right, but I have the impression that the debate should be widened so as to include also high school teachers, high school students, because artificial intelligence in teaching and learning will impact more and more also them. And I think that it is important to start early to cope with this issue of finding new ways of teaching and learning, new content, new ways to regulate
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this content as well. I don't know if you agree with that, but I think...
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Really? Because it is a question of how to say, how do we introduce students to take into use digital tools in a good way? And you can't just throw digital tools at them when they enter higher ed. They should be able to use them. That's also, I think, a good point. And it is not by chance that I mentioned it because we would never have to forget that students are at the center of all this revolution. So that's why now I wanted to hear the voice of the students through Anna Gricvili because, yes, we are accustomed to hearing that technology and EA are changing the way students approach their studies. studies, what do students think about the pros and cons of this transformation with particular reference to teaching and also to assessment. Are they happy with these new
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ways of doing things? What would they contribute in terms of what has to be developed or taught
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or retaught? So please, Anna. Thank you very much, first of all, for inviting me on this very interesting and important webinar. Also, thank you very much, the keynote speakers for a very interesting presentation. They have already mentioned the students in relation with the use of artificial intelligence, but I will try to bring the more broader students' perspective to this discussion. European Students' Union has already published the resolution on the artificial intelligence advances and its impact on higher education and now we're working on a statement. While the artificial intelligence would believe that artificial intelligence cannot replace the human interaction in learning and teaching, we think and truly believe that AI can serve helpful add-on both in classes and in the task assigned to students in order to support student-centered learning, which is one of the main priority of ESG as well and the quality of learning. And also we believe that AI can support the innovative methods of teaching and learning. Decisions about using artificial intelligence technologies in assessments are typically made based on various factors, including about cheating, maintaining the integrity of the examination process, ensuring fairness for all students. Institutions may also have concerns about potential for students to access unauthorized information during exams, which could raise ethical issues. While assessment based on knowledge remains crucial in many subjects, it is also essential to reconsider assessment methods that are vulnerable due to artificial intelligence. If a subject can be evaluated using a methodology replicable by AI and still maintains relevance, the question of exploring new evaluation methods has to be asked. So we believe that the institutions should think to reconsider the methods of assessment. Similar to the transformative impact of the Internet and research engineers, ISE opportunities should be put to good use, but focus should not be on banning the Internet or artificial intelligence. intelligence if assessments can be conducted online but rather on evaluating the relevance of a test when answers are readily available through these tools. Considering iTools as a tool, it's crucial to address issues of accessibility and equal opportunity. We also believe that no iTools should be prohibited in assessments where other technological aid such as computer and internet are allowed. However, this condition should apply only if the eye tools remain openly accessible to the entire population and the eye is used as a tool, not a replacement for the assessment. The arrival of artificial intelligence in education is also an opportunity to improve assessment and learning and teaching methods. And as I already mentioned, this is some kind of tool to find a new and innovative methods of teaching and learning. Also we think that with the help of artificial intelligence, good feedback and instant feedback could be given to the students, which is also very important for the quality of education. And also, we also believe that artificial intelligence can find the new ways for the students with disabilities. So, it's also very important that countries need to integrate the integration of I-Policies in their digitalization policy. And of course, we think that I can support student-centeredness and innovative teaching and learning methods, while we should also take into consideration the data protection issues and academic issues as well. The previous speaker has already mentioned that students can legitimately use the artificial intelligence in coursework. Of course, we agree that artificial intelligence could not be prohibited, but the institutions and the government should help the good integration and

well integration of artificial intelligence and teaching and learning, and we should support students and academics to find the best way of use of artificial intelligence in teaching and learning.
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Yes, thank you. Thank you very much, Anna. You raised many, many interesting points. I think that also the other speakers, the other participants agree on what you have been saying. I just wanted to highlight one point, which is, in my opinion, very important. It is a point concerning accessibility and equal opportunities that has to be taken into account when we talk about these new tools and also more generally about these new possibilities and the turn in teaching and learning that they imply. So before giving the floor to the external public, if there are questions, I wanted to ask the participants to the roundtable whether they have something to add on any of the topics we've been discussing until now. So I don't know who wants to add something. Fabrizio maybe or please.
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Add microphone, please. Now it's okay? Yeah, oh really, you already mentioned
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the point of accessibility.
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I mean, this is the most important point. We must ensure the largest diffusion of knowledge and to guarantee the possibility to all the students everywhere in Europe to get this kind of knowledge, in particular for some fields just like STEM and so on. And really, I believe that I am very, very, very interested in that also because I work in, I've been director of the University of Palermo in Sicily. That is not the most advanced part of Europe. It's different than other parts of Italy or Europe. And of course, we have the lowest percentage of graduated people in the range of 25, 34 in Europe, except for a region of Bulgaria and another one in Romania. So, of course, we need to increase the number of people that have the possibility to access to the higher education. And in this sense, new technologies, AI, and so on, can be very, very, very helpful.
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So it's important from this point of view.
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Yeah, thank you. Francesco surely had something else to add, since he said it already before.
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So please.
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Well, yeah, I would make it maybe a little bit more interactive with the Q&A, but yes, I agree with what was said, that blended assessment methods are the way forward. Probably we need to go back to the way we were assessed while at the university, so coupled with of course more written exams so that it is clear vis-a-vis the learning process. I think that one thing that we need to ask ourselves is, and probably someone touched it before among the public, from evaluating the output, from evaluating the process. Because the output will be probably better produced by an artificial intelligent tool, whatever it's gonna be, but it's in the process that we can make a difference. So asking the right question, and making sure that the machine is working in the right way
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is gonna, are gonna be the right skill for the future.
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Thank you. This is also true, in fact, also for traditional assessment methods, but it is also true for artificial intelligence. I don't know if Marie wanted just to add a short message, because I see that we have at least a question here, or maybe I ask the question, and then if you want to answer, Mari, or add something at the same time. And the question is, from Dalila, did we need to change the soft skills at the end of graduation and evaluate the process? So it is on the processes. So please, Mari, if you want to add something. Yeah, I'm not sure I'm actually answering that question, but in light of what the previous speaker was just mentioning. And it is a question of what is it that

we are evaluating. So one thing is sort of from the output to the process, but if we also assume that in a number of fields where text is central, the very content of what we are learning is now changing. So the aim is not to produce any more students who are able to write in a good way, but it's students who are able to work with technology in a way which is relevant. So I think it's also in that sense, the content of our assessment naturally has to change. So it is, I think, the focus on soft skills and or general skills or whatever you want to label them, that will get a very different kind of emphasis in our educational processes. But I also wanted to mention a bit about what it has to do with inequality. And I think it's AI has both potentials. It can reduce inequality in a sense that it can make, how to say, it can give access to a sparring partner for many students who maybe did not have that before because they come from lower socioeconomic backgrounds. But it can also reinforce this. If we don't seriously take into account how do we introduce students to being able to use digital tools in a good way, because we always assume that students are digital natives, but using tools that we use in education, we cannot assume the students just can't do that without any kind of introduction. And I think their institutions have to be quite careful in how do we introduce students into this in a way which reduces inequality
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rather than enforcing it.
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Thank you very much. Sometimes they have the impression they know how to use them, but they don't know actually, as you have also to make them aware that these are better ways to teach.
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I have an easy example. A few days ago I had a job with a student who was very clear about using ChatGP as a search engine, and it's not a search engine. Do you agree, Anna, with what we have been saying now, that learning how to use the tools and be sure that the tools are used in a proper way by students is also important? And then with just a short answer, because we have to close then.
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Yes, I just wanted to add that students, academics and all the stakeholders need to be equally involved in the implementation process of artificial intelligence to ensure good and efficient use of artificial intelligence because it's a quite new tool and we need to properly introduce this to the all parties of this academic community and students need to be equally involved in these processes. Thank you very much once again. So we are at the end of this interesting discussion. So let me just say goodbye and thank you to all the participants and to Fabrizio, Mikari and goodbye and thank you and to Francesco Rattalino and Marie Elkin and Anna Grechvili as representative of the students. Thank you very much.
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Thank you.
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Thank you very much.
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Thank you.
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We don't hear you.
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So I will just thank you very much, all the participants again, and to you, Marilena, for moderating it so well. So thank you very much. I think it was really interesting. And so to close this webinar, I will give the floor to Carmen Edojos, who is a Senior Advisor at ACOT Catalonia. Good morning, Carmen. Good morning.
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Go ahead. Thank you, Maria. Well, good morning from Barcelona. It's like an almost rainy day, so let's see how ends the day. As we approach the conclusion of this session, it's time for some make some final remarks. But first, on

behalf of the Remote Project and the webinar organizers, I extend my sincere appreciation to all the participants. I would like to begin by acknowledging our keynote speakers, Professor Bart Calier from the Universitat Politècnica de Catalunya and Professor Arlindo Oliveira from the Universitat de Lisboa for the engaging and thought-provoking presentations. I also want to express our gratitude to the participants in the roundtable, Professors Fabrizio Micari, Francesco Rattalino, Mari Elken and Anna Gritis-Gilli, giving voice to diverse stakeholder groups. All the speakers have provided valuable insights into the changing landscape of higher education in terms of learning and assessment, driven by the arrival of new players such as EI. They also highlighted the opportunities and challenges that come with this evolving landscape. And last but not least, I would like to express our gratitude to the audience. With over 120 attendees, your questions and engagement have enriched the output of this session. Altogether, we have contributed to the creation of knowledge, which will be of great value for the development of the next steps of the remote project. Having said that, I would like to point out some of the key topics that have been discussed during this session. I took some notes, so I'll try to give to you some feedback. Professor Allier discussed how AI and Child GDP can reshape the higher education assessment. He said, we are facing a moment of disruption, a moment when everything is changing to the new AI tools. Right now, we are not trying to defend, to find out how to detect cheating, and we must to go further away and make clever use of AI. These tools are useful for students and teachers. For example, he showed us that if you use well and with the right inputs and instructions, AI can provide teachers a detailed analysis of the student knowledge and can allow to give students personalized advice and feedback. On the other hand, Professor Oliveira has focused on the impact of large language models on learning and assessment in higher education. He talked about the evolution of large language models since the 1950s and the way of teaching these models. He pointed out a set of recommendations made for a commission created to address the challenges facing the use of these tools. The first one that just impressed me was like, okay, is that prohibiting these tools and especially ethical issues. In the roundtable we had, we talked about a range wide of topics and I will try, I'm not going to talk about all of them, three or four points which just took my attention. First of all, is what Professor McCarran said about critical knowledge. Of course, critical knowledge is a basic, critical capability to distinguish among all the knowledge available, what is good and what is not good. That's very important. It's always been important historically, as it's been important, but nowadays, it's also one of the critical things. I want to talk about also about the correct way of implementation of these tools. So the right way to address the implementation is to think about what kind of skills and competences we want students to get and how these tools can help in getting those learning outcomes. That also is And I also want to remark the issues about accessibility and equal opportunities. This is also that we need to study further. And one thing that also just paid my attention was, I don't remember who said that, move from evaluating the output to evaluating the process is what we are going to have to do now. I think that we are just at the end of my recap, so I'll give the floor to Maria for the final closure.

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Thank you. Thank you very much, Carmen. Thank you very much. And well, to close this webinar, I just want to once again thank you very, very much for your participation, for all the attendance, for all the people that were commenting and questioning and watching this webinar. I hope it was a fruitful discussion of the ideas for all of us. We know that teaching and learning is rapidly changing, and so the way professors and students interact and the way students are assessed, and this brings great challenges for higher education institutions and all its stakeholders. And we will continue this discussion and our project in the remote project until 2025. And there will be and for sure there will be further research about it given the importance of the topic. And so once again, thank you very, very much. continue discussing these topics and that we will disseminate also the results of the topics and we'll share and disseminate it through the normal channels and we'll also have a website that is under development right now. And once again, thank you very, very much for all the contributions and the availability of the participants and the speakers. And to everybody who watched this webinar, I hope you enjoyed it and it was a pleasure also to present it. Thank you very much.

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