OritHazzan 分段小标题

1.三个概念:改变生态体系多元

2.以色列的机器人教育（上）

3.以色列的机器人教育（下）

4.以色列的计算机科学课程和 STEM 教师培养

Good morning!
早上好
Thank you for inviting us.
非常感谢你们的邀请
For me, it was the most difficult part of the talk.
对我来说 用中文打招呼是这次演讲最难的一部分
I would like to talk today about how Israel cultivate its pupils' innovativeness
今天我想讲讲以色列如何培养创新人才
I'll talk about and only on STEM education
我将给大家介绍 STEM 教育
when STEM stands for science, technology, engineering and mathematics
STEM 代表的是科学 技术 工程 数学
We know in Israel today if we want to be a modern country
在以色列 我们知道如果我们想成为一个现代化国家
we should cultivate and promote the study of STEM subjects
我们应该培养和推广 STEM 科目的研究
So you have already heard many times: STEM, STEM, STEM
你们应该经常听到 STEM
just keep in mind that it stands for science, technology, engineering and mathematics
记住它代表科学 技术 工程 数学
OK, I'll start with the definition of creativity which distinguishes it from innovation
首先 我想讲讲创造力的定义以及创造力与创新的区别
While creativity means thinking about new ideas, new skills, to have new directions,
创造力指的是思索新想法 新技能 有新方向
think about how to promote the world,
思考如何促进推动世界的发展
Innovation means that you actually perform this creativity.
创新则意味着我们将创造力付诸实践

And it means that you actually do things.

也就是大家真正采取行动

And I think one of the strengths of Israeli population

我认为以色列人的一个优势

is that they actually implement things to keep on this idea

就在于我们真正采取措施

that we are not afraid to implement new things

让人们勇于进行新尝试

As I mentioned before,

我刚刚提到

I'll talk about STEM education,

我会给大家介绍 STEM 教育

and I'll give you several examples for the 12th grade education system in Israel.

我也会给大家讲几个例子来展示以色列的 K-12 教育体系

These grades start in kindergarten, 12 is the highest grade of high school.

K-12 从幼儿园开始 12 年级是高中的最高年级

And just to give you a perspective of what I'm going to talk today

为了让大家对今天的演讲有一个概念

just draw in your mind a table 3*3

我想请大家在脑中画个 3X3 的表格

And I will present 3 examples

我将给大家讲 3 个例子

One would be about the pupils

第一个是关于学生的

we will talk about robotics education

我会给大家介绍机器人教育

I will show several examples how we promote robotics education

同时也会通过例子来展示我们是如何推动机器人教育的

The second one would be about high school computer science curriculum

第二个例子是关于高中计算机科学课程的设置

and I will present you how Israel computer science curriculum in the high schools

我会给大家介绍以色列高中的计算机科学课程设置

Is considered to be one of the best in the world,

这一课程设置全球领先

and that would influence the entire ecosystem of Israel

而且会影响以色列的整个生态体系

And the third initiative that I will show is about STEM teacher preparation

第三个例子是 STEM 教师培养

We launched three very innovating, very proactive, very creative programs

我们启动了三个非常新颖 颇具前瞻性的项目

That now we hope the entire world learn from us

希望全球能向我们学习

because it gets a lot of attention

因为我们的项目得到了很多关注

So this is one on the columns of table
这三个例子我们放在表格的纵列
On the rows of the table think about three concepts
横排是三个概念
one is change
第一个是改变
change is the central concept when you want to promote innovation
改变是推动创新的核心概念
the second one is eco-system
第二个是生态体系
and I will explain it in a minute
待会我会进一步解释这个概念
but in general it means that no one can create something new
但简单来说就是要实现创新
by his or her own, or an institution cannot create something new by his or her own
仅靠一个人的力量或一个机构的力量是不够的
but rather other several components or sectors
创新的实现需要各组分 各部门进行合作
should cooperate in order to create something new
创新的实现需要各组分 各部门进行合作
and it's not so surprising that Israel and China cooperate
因此 现在以色列和中国在促进创新和教育体系上展开合作是不足为奇的
in order to promote innovation and their education system
因此 现在以色列和中国在促进创新和教育体系上展开合作是不足为奇的
So the first one is change,
所以第一个概念是改变
ecosystem
然后是生态体系
and the third one would be diversity
第三个是多元
and diversity means that you allow many people, many people of different kinds,
多元指的是我们允许不同背景
different professional backgrounds to participate in your innovative initiative
不同专业的人参与到同一个项目中
So just keep in mind this table
所以请大家记住这个表格
and we will fill it together during the talk
接下来我们会一起来填充这个表格
Professor Fagan mentioned the department that I am heading
费根教授刚刚提到了我领导的系
It is the STEM teacher preparation program of Technion in Israel
也就是以色列理工学院的 STEM 教师培养项目
It is the largest science education department in Israel
这是以色列最大的科学教育系

with about 400 undergraduate students

我们有 400 名本科生

who learn to teach STEM subjects in 8 tracks

他们主攻 STEM 科目和其他 8 个科目的教学

mathematics education, biology, chemistry, physics, computer science,

数学 生物 化学 物理 计算机科学

environmental sciences, mechanical engineering and electrical engineering

环境科学 机械工程和电力工程

We have about 75 graduate students

我们有 75 名硕博生

and we have about 500 teachers in service

在职教师人数为 500 人

teachers who come to our department,

这些老师来到我们系

and work in workshops,

组织工作坊

and keep on learning the STEM education

同时研究 STEM 教育

Now maybe in Chinese term it is not considered so big

可能在中国看来 我们系并不大

but it is the largest education department in Israel

但我们确实是以色列教育系中最大的

Ok, this is the ecosystem that I will keep emphasizing

这是我将反复强调的生态体系

I will keep telling and showing you, this picture

这个图表也将贯穿我整个演讲

In this picture, STEM education stands in the middle

在这个图表中 STEM 教育位于中心

It is something we want to cultivate

这是我们想培养的东西

and one of the ideas that I just mentioned is that we cannot do it by our own

我刚刚提到 创新的实现紧靠一个人的力量是不够的

For example, in the case of Israel

比如说 在以色列

we integrates several sectors

我们融合了不同部门

of course, the schools,

首先当然是学校

because we want them to implement many of the innovation

因为我们希望学校执行我们的创新

We involve academia

其次是学术界

Academia should participate in this effort to cultivate innovation

学术界也应该参与到创新的培养中

The third circle is about hi-tech industry
第三个是<mark>高科技产业</mark>
that has very huge and successful start-up ecosystem
这个产业拥有巨大而成功的创业环境
Each should participate in STEM education
各个组分都应参与到 STEM 教育中
each should not be isolated from the education system
都无法跟教育体系分离
And finally the third sector
最后是<mark>第三产业</mark>
it has also many main role in this successful story on the Israeli innovation
第三产业在以色列的成功中扮演着重要角色
Ok, I will read this. I was asked to answer several questions
这是主办方给我的几个问题
and I will read it to you
分别是
How does Israel cultivate innovation in STEM education?
<mark>以色列如何在 STEM 教育中培养创新</mark>
How is technology used to foster innovation?
<mark>如何利用技术促进创新</mark>
How does Israel cultivate its pupils' innovativeness?
<mark>以色列如何培养学生的创新</mark>
How to build a curriculum that fosters innovation?
<mark>如何设立促进创新的课程</mark>
How are teachers prepared to foster their pupils' innovativeness?
<mark>如何培训可以促进学生创新的教师</mark>
How to build a learning and work environments that cultivate innovation?
<mark>如何建立培养创新的学习和工作环境</mark>
And I am not going to answer all these questions
我不会直接给出这些问题的答案
what I would love you to do during the talk
我希望大家能在我的演讲过程中思考这些问题
is to think about the answers to these questions
我希望大家能在我的演讲过程中思考这些问题
And in fact, we will implement now one of the pedagogical principles
其实我们现在就在运用一个教育原则
that I will lay out in a minute
我待会要给大家介绍的原则
I will not tell you everything
我不会直接给大家答案
You will have to find out some of the answers to these questions
而是要各位自己寻找答案

三个概念:改变 生态体系 多元

So the three concepts that I am going to present are
我要介绍的三个概念是
change,ecosystem and diversity that I have already mentioned
改变 生态体系 多元
Change means that if you want to be innovative,
改变意味着如果你想创新
if you want to be creative,
如果你想富有创造力
you should embrace change
你应该接受改变
You cannot promote innovation, you cannot promote creativity,
否则你无法推动创新和创造力的发展
you cannot promote your children's innovativeness, if you do not allow them to change
也无法培养学生的创新意识
And it requires the entire system to change
改变也需要整个体系做出改变
the teachers, the university, academia, hi-tech sector
包括教师 大学 学术界和高科技产业
everyone should be open to changes
每个人都要接受改变
because we cannot ask the students to change if we do not allow them
因为我们无法让学生做出改变 如果我们自己不允许改变
if we do not provide them with the environment that is open to change
也不给学生提供一个开放的环境的话
The second one is ecosystem
第二个概念是==生态体系==
And basically ecosystem is a concept that is borrowed from biology
这个概念是从生物学借来的
all of us live in some ecosystem
我们每个人都生活在某个生态体系里
Think about the world. It is composed of people, of animals, of air, water
想想我们的世界是由==人类 动物 空气和水==等元素构成的
so many components are interacting, there are interaction between them
这些组分相互作用
And we cannot be able to create something new which is bigger than each of
如果==没有它们之间的相互作用及合作==
these components without the interaction, without the cooperation,
我们便无法超越各组分
without the mutual relationships between the different components
实现更大的创新
And in technology in general
在技术领域
education specifically
尤其是==技术教育领域==

we refer to institutions like academia, hi-tech companies
各组分指的是各个机构如学术界 高科技企业
and the people who work in the universities, in the research centers, all these centers
以及那些在大学 研究所等工作的人
So interaction between these institutions and the people in all these institutions
这些机构与工作人员之间的互动
is one of the facts that matter to creativity and innovation
便构成了创造力和创新的一个重要因素
And the third one is diversity
第三个概念是多元
And diversity means the exposure of different kinds of people,
多元指的是不同背景的人走到一起 相互协作
with different backgrounds that come and collaborate with each other
多元指的是不同背景的人走到一起 相互协作
because just think of any, any problem that you face
大家只要想一下我们现在面对的问题
if you don't know to embrace different ideas,
如果你不知道如何接受不同的观点 不同的角度 不同的经历
different perspectives, different points of view, different experiences
如果你不知道如何接受不同的观点 不同的角度 不同的经历
you would not be able to solve hard problems
你就无法解决当今的经济和教育问题
that we are facing today in our economy, and our education
你就无法解决当今的经济和教育问题
So during the talk,
在我的演讲中
the second task is to think how there concepts are related to your case
我希望大家能将这三个概念与自身实际联系起来
It could be your class, your school, you city, your state as well
无论是你的班级 学校 城市或州
Just think about how these concepts are related, are expressed to your case
思考下这些概念是如何体现在你的实际情况中
This is a book that you have a translation in English in your bags
大家的袋子里都有这本书
It tells a story of Israel from the start-up phenomenon
这本书讲述的是以色列的创业情况
So Israel is so successful in its development
以色列在发展过程中取得了很多成就
You see how small Israel is
大家可以看到以色列是个很小的国家
You read the figures before
从我们的人口就可以看出来
just to give you the sense that it has a population of half of Shenzhen
只有深圳的一半

Half of Shenzhen is about 8 million people
也就是大概 8 百万
This book tells a very nice story about how Israel
这本书讲述了以色列如何
has succeeded in developing its innovativeness
在推动创新方面取得成功
and all these start-ups
以及各产业的开拓
but in a another research we did in Israel
我们在以色列做了另外一项调研
we decided to explore it from different perspectives
从一个不同的角度来分析我们国家取得的成功
One of the conclusions that we came up with
我们发现
is that it can be very nice to describe from an ecosystem perspective
从生态体系角度切入是一个非常好的角度
This is the perspective that we will highlight today
这也是我今天想强调的角度
So you can see, demography, there is a market, the geography, so many factors
大家可以看到 这里有各种因素：人口 市场 地理等
one of which is education
其中一个便是教育
Education plays a central role in this innovativeness of Israel
教育在以色列的创新中发挥主要作用
And we talk about formal education and informal education
无论是正式教育还是非正式教育
Ok, this is the ecosystem that we apply
这是我们采用的是生态体系角度

项目一：机器人教育

改变在机器人教育中的体现

and I might talk about 3 examples
我将给大家介绍三个例子
Remember it is robotics education, computer science curriculum
分别是机器人教育 计算机科学课程
and teacher preparation program
以及教师培养项目
Ok, I need a mouse?
我需要鼠标
[video]
视频
This robot was developed by three middle school students

这个机器人是三名中学生开发的

The role of this robot is to serve as a waiter

它的角色是服务员

It had to take this plate

它要端起这个盘子

and to take it to another table

然后把盘子端到另外一个桌子上

Maybe it looks simple for you

你可能觉得看起来很简单

but think of pupils who have to program it

但想想这些编程的学生

To keep its balance is very difficult

要保持机器人的平衡是非常难的

the programming is very, very difficult

编程难度也非常大

And now to hold the plate is very difficult

现在它要把盘子端起来 这也很难

Wait a minute,

等一下

you will see something that you would not expect that I would present it.

您将看到你不会希望我呈现出来的东西

But it is one of the messages that I want to deliver

通过这个视频我主要想跟大家传递一个信息

These three pupils won a worldwide competition

这三名学生赢得了这个世界大赛

in which all teams of pupils had to program such a robot

在这个比赛中 参赛队伍都要编出这样一个机器人

It is called robot waiter

也就是机器人服务员

Think about the programming that was behind these robots

大家想下机器人背后的编程难度

It has to sense where the table is located

这个机器人要感知桌子的位置

and how to move, how to rotate itself to get into the table in the right position

也要移动 转身 找到桌子的正确位置

Ok, it stopped there.

好 这个机器人停在那儿了

but the robot did not succeed in its task

它并没有成功完成任务

This is part of our message that we sometimes do not succeed

但这正是我想传递的信息 有时候失败在所难免

But we accept that we do not succeed all the time

我们要接受我们无法一直都成功的现实

And the robot did not succeed in its task,

虽然机器人没有成功完成任务

but nevertheless,

但相对于其他队伍

they won the competition

这三名学生还是很成功的

because it was so successful relatively to the other teams

所以他们拿了比赛的第一名

And this robot was so impressive that when president Obama visited Israel

不仅如此 当奥巴马总统访问以色列时

And saw these set of pictures before,

他看过关于这个机器人的图片

this robot was chosen as one of the demonstrations

所以这个机器人

that were presented as technical innovations

也被选为技术创新展示的作品之一

So we showed the robot, we showed the snake

我们也展示了其他作品

And it was the only one that was developed by middle school students

但这是唯一一个由中学生开发的机器人

It was very impressive

非常棒

It was one of the four Technion's presentations to Barack Obama

所以它也成为我们理工学院向奥巴马总统展示的四件作品之一

OK, how is change

这就是我想讲的"改变"概念

remember how our rows are on the table

记住它在我们表格上的位置

how change is expressed in robotics education

同时注意它是如何体现在机器人教育中

Change is expressed in the idea that we should change our perspectives

"改变"体现在我们应该转变教与学的理念

toward how learning and teaching process should be cultivated

"改变"体现在我们应该转变教与学的理念

So the first one is problem base learning

第一点是问题学习法

You know, traditionally,

传统上

when a teacher teaches something in his or her class

当教师在教授新知识点时

first of all, in many cases, teachers just tell the students what they should learn

他们首先告诉学生需要学什么

Then he or she ask them to memorize it

然后让学生熟记这些内容

and finally to solve problems

最后才是解决问题

In the case of problem based learning,

在问题学习法中

students are first given a problem

学生们首先拿到一个问题

Think about the students who had to solve the waiter program

想一下那三名需要解决服务员机器人编程问题的学生

they had to study so many different things

他们要学习很多不同的知识

So this is a totally different way than the usual path

这种学习方法跟传统的方法完全不一样

So they get a problem

学生们先得到问题

they have to identify what to learn in order to solve it

接着确定他们需要学习的内容

and of course to learn it

当然他们要进行学习

and finally to apply this knowledge

最后将所学知识

and implement it in the construction of what they built

应用到实践中

so it is totally different approach to teaching and learning processes

这是一种截然不同的教与学的过程

The second pedagogical concept that we should change

我们需要转变的第二个教育理念是

is that we should allow collaborative learning

允许合作学习

And it is once again so different from the traditional way

这跟传统上学生"单打独斗"的学习方式也很不一样

in which we evaluate each student by his or her own individual work

这跟传统上学生"单打独斗"的学习方式也很不一样

It is not possible if we want to create some innovation, to create something new

没有合作学习 我们是不可能进行创新的

Think of the pupils who designed the robot

比如那几名设计机器人的学生

They would not be able to do it by themselves

"单打独斗"是完成不了任务的

they had to collaborate

他们必须进行合作

and to work together

一起解决问题

I could not read what is written there

我不知道屏幕上写的是什么

but basically it means it is very important collaborative learning

但合作学习是非常重要的

it is very important for innovation,

无论对创新

for economy, for the new world that we are facing today

经济还是当今世界来说　都是如此

The third pedagogical change that we should adopt is about the experiential learning

我们需要采用的第三个教育理念是 经验学习

And we should allow failure

我们要允许失败

We should allow students to have mistakes

允许学生犯错

It is very different from the traditional way of teaching and learning

这也跟传统的教学方式很不一样

But we should allow them to fail, to not succeed, to get into dead ends,

但是我们要允许学生失败　走进死胡同

to come back, to apply new paths, to continue until they succeed

然后回来　运用新方法　坚持不懈　直至成功

And think of the three students from middle school who do the program of the robot

那三名中学生就是一个例子

And finally, there is an interaction with the robot

最后　学生跟机器人之间也有互动

once again you should also allow interaction with something that the pupils create

这就意味着大家要允许学生跟他们的作品互动

In this case, we will see a very short movie

我想通过一个简短的视频来说明这一点

that was shot in an Israeli museum of science and technology which is affiliated to Technion

这个视频是在以色列理工学院附属的科技博物馆拍的

This is an example of collaboration between sectors

这也是各组分之间合作的一个例子

You will see in this short movie how a robot teacher teaches elementary school students

大家会看到机器人老师如何给小学生上课

how they are interacting with each other

他们是如何互动的

It is not them construct it

这个机器人不是这些小学生开发的

They interact with it

但他们跟机器人进行互动

[video]

视频

That's very, very impressive about them collaborating with the robot

他们跟机器人的互动真的太棒了

and they listened to it

孩子们听机器人老师的话

and did what it asked them to do

完成它给的任务
OK, so we just finish the idea of change in robotics education
好 这就是机器人教育里的"改变"概念
we should change the pedagogical principles based on which we teach
我们要转变教育原则
and encourage the students to learn
鼓励学生进行学习

多元在机器人教育中的体现

We now go to the diversity
现在我们来看看多元
As it turns out, robotics education promotes diversity
事实证明 机器人教育促进多元
just as professor Fagan said, diversity is very important
费根教授刚刚提到 多元非常重要
when you want to foster innovation and creativity
如果你想培养创新和创造力的话
I will not talk about the general term of diversity now
在这里我想讲的不是多元的一般概念
but I would like to highlight how robotics education may enable each student
而是机器人教学如何帮助学生表达他们的思想优势
to express his or her strength mentally, from the mental perspective
而是机器人教学如何帮助学生表达他们的思想优势
I would like to introduce Gardner's theory of multiple intelligence
我想给大家介绍 Gardner 的多元智力理论
which very basically says that we are different
该理论的基本观点是人各有异
Each of us has different strength
每个人都有自己的优势
Some of us think mathematically,
有的人擅长数学思维
some of us think in terms of physical objects,
有的人擅长物理思维
some of us think in terms of music
有的人则擅长音乐思维
And Gardner distinguishes between eight intelligences
Gardner 区分了八种智力
First is musical rhythmic
第一是音乐-节奏智力
which means people who good with music,
这类人擅长音乐
they create new musical compositions
他们谱写新的乐曲
There are people who are good at structural spatial

有的人擅长视觉-空间智力

think of architect and sailor

比如建筑家和水手

They are good at 3D elements

他们很擅长 3D 空间想象

Verbal linguistic are people who are very good at

言语-语言智力指个体擅长

how to verbalize things, how to express ideas

用语言描述事件 表达思想

logical mathematics

逻辑-数理智力

Sometimes we confuse this ability with intelligence

有时候我们把它等同于智力

but as you can see,

但大家已经看到

intelligence is composed of many kinds of intelligences

智力有不同的方面

bodily kinesthetic means people

身体-动觉智力是指

who are good at expressing themselves with the body

个体善于利用身体表达自己的思想和情感

think about dancers

比如舞蹈家

think about how they create new ideas by the body

他们运用四肢进行创造

Interpersonal are people who are good at collaboration

交往-交流智力指个体善于与人相处

And we saw the case of the robot, how they enhance this kind of learning

我们也看到了机器人如何提高这方面的智力

And intrapersonal means that pupils are good by their own

自治-自省智力指个体能够很好认识 反省自身的能力

they learn better when they are just by their own

在不受打扰的情况下

and think deeply when no one is around it.

他们能学得更好 思考更深入

And the last one is what I think the robotic education is promoting very intensively.

最后这个智力我认为是机器人科学正在大力倡导的

It is naturalistic

叫自然观察智力

These people learn best when they are asked to touch, to build, to construct, to feel

这些人通过触摸 构建和感受 能够学得更好

and I would love to show you one very short clip

我想给大家看一个简短的视频

about what is done in our department

是我们系的一些活动
There is one lesson that middle school students in the nature
在一个活动中
are asked to first of all explore some phenomenon
我们让中学生去探索大自然的一些现象
and then to build a model from the robot
然后构建一个机器人模型
that mimics the phenomenon they have just explored
来模仿他们探索的现象
It is not this one. It is not this movie. It is not this one
不是这个视频
[video]
视频
Ok, this is another clip
这是另外一个视频
This illustrates another kind of diversity in Israel which is cultivate with the robotic education
这是以色列机器人教育展现出来的另一种多元
It is taken from a far away city, very small city
这个视频是在一个边远小城拍的
which many people have not been there before
很多人以前都没去过那儿
This is Yerucham
叫 Yerucham
The male that you just saw before
大家刚刚看到的那位男老师
he decided to promote education in Yerucham by robotics education
正是他决定通过机器人教育来推动当地教育的发展
Now it is a leading technician in robotics education
现在他是机器人教育的领军人物
Its model is mimicked by other cities
他所建立的模式也被其他城市模仿
and about one third of the pupils in Yerucham participate in some programs in this initiative
Yerucham 三分之一的学生都参与到这个项目中
They win many worldwide competitions
他们赢得了很多世界大赛
I will show you in a minute the First competition
他们在 First 大赛中屡次夺冠
that they win all the time the first place
这个大赛我待会再给大家介绍
Not only does robotic education promote diversity,
机器人教育促进多元
it allows students from different backgrounds, different experiences to work together
让不同背景 不同经历的学生走到一起 共同合作
And they do not mind about the background when they work together on robotics

而不介意对方的背景
Everyone can be ambassador
一个人能成为 10 个人的大使
to 10 people and these 10 people to 100,
从 10 个人到 100 人
to the entire world
最后到全世界

生态体系在机器人教育中的体现

Finally we will go and see
现在我们看看
how the ecosystem concept is expressed in robotics education
生态体系如何体现在机器人教育中
We saw the concept of change, how it is expressed in robotics education
我们已经讨论了"改变"在机器人教育中的体现
We saw diversity
我们也讨论了多元
and now we are going to see ecosystem
现在我们看看生态体系
In Technion we have two centers for robotics education
在以色列理工学院我们有两个机器人教育中心
One is located in the faculty of mechanical engineering
一个在机械工程系
one is located in our department
一个在我们系
in both cases industry is involved
这两个中心都跟企业紧密联系
In the first case it is a huge Bank
第一个中心跟银行合作
The second it is PTC, which is a US software company that supports this center
我们的中心则跟 PTC 合作 PTC 是美国的一个软件公司
and I can witness that in some cases,
我自己也亲眼看到
students and pupils who work in this center find solutions
有时候我们的学生为 PTC 公司提供解决方案
that the companies do not find by their own engineers
那些他们工程师没有找到的解决方案
So this is the role that company can play in this case
这是企业在机器人教育中的角色
And we will see the First competition
现在我们看看 First 大赛
First stands for "For inspiration and recognition of science and technology"
First 代表 " 促进科技灵感与重视 "
and this competition is organized by the center in the faculty of mechanical engineering

这个大赛是由机械工程系的机器人中心组织的
We will see in a minute there is a huge range of initiatives
First 的覆盖范围很广
from kindergarten to elementary school and high school students
从幼儿园一直到高中
and because many of you are from the elementary school system
因为在座各位大多来自小学
I would love to show you this video of the competition
所以我想给大家播放
that is dedicated to this age of children
这个专门针对小学生的视频
FLL is one of the program in the First organization
FLL 是 First 组织的一个项目
[video]
视频
OK, we do not have time to see another clip, it is about First
时间关系 我们没有时间看 First 的另一个视频
It is for the high school students
First 的高中项目视频
It is much more complicated challenge
这个项目更具挑战性
it requires all the pedagogical changes that we have just mentioned before
需要我们转变教育理念
[video]
视频
It is about the First, about much more complicated challenge
这是 First 的另一个视频
You can see how they work
大家可以看到学生是怎么合作的
They are going to solve the problem that they are assigned to solve
他们要去解决分配给他们的任务
It is programed to play some game
这台机器人要玩游戏
just think about the complexity of this program because it will play the game
大家可以想象编程的复杂程度
it will not do by itself
机器人不是自己玩
it should interact with something around you
而是要和其他东西互动
And they have to consider many different positions of the other players in this game
这些学生要考虑其他机器人玩家的不同位置
They are very happy
他们非常开心
You can see not only pupils, not only high school pupils,

大家可以看到不仅有学生

but also engineers, science engineers, full academia advisors, the government agencies

<mark>还有工程师 科学家 学术界和政府部门都参与其中</mark>

He said

他说

that the students get so many important skills that are so needed in hi-tech industry

<mark>学生获得了高科技产业需要的很多重要技能</mark>

in order to promote innovation, to promote collaboration between cultures

可以帮助推动创新发展以及文化间的合作

This is a professor from Technion

这是以色列理工学院的一位教授

He explains very sophisticated skills

他正在解释

that the children gained while developing the robot

开发这台机器人所需的复杂技能

This student say they are from different places

这个学生说 他们来自各方

now they are working together

但现在他们走到一起

to create something new which has not been solved before

共同创新 解决问题

It promotes teamwork

机器人促进了团队合作精神

It is very important

这点非常重要

Robotics education is fun

机器人教育很有趣

but it means to promote other skills that are so needed in our world today

但也旨在发展当今世界所需的技能

This is a team of students

这是一个学生团队

they come from different backgrounds and are doing something great together

他们背景不同 但正在一起解决问题

we can't continue now. Thank you

时间关系 我们只能看到这里

Let's summarize the first example

我们来总结下第一个例子

It is about the robotics education

机器人教育

We saw how change is expressed in robotics education

我们看到改变是在机器人教育中的体现

when we have to change our pedagogical concept

我们必须转变教育观念

when we teach and learn robotics education

我们必须转变教育观念

The second idea is about ecosystem

第二个概念是生态体系

It is about collaboration between academia, the industry,

也就是学术界 企业

the third sector and of course, the school

高新产业和学校之间的合作

Finally diversity is expressed in several ways

最后是多元 多元体现在几个方面

in the demography, the backgrounds of the students,

比如人口 学生背景

different intelligences that robotics education promotes

及机器人教育提倡的多元智力

项目二：计算机科学课程

So we now go to the second example

现在我们看第二个例子

In our table, remember it is in the second column

在我们的表格中 这个例子在第二列

It is about high school computer science curriculum

高中计算机科学的课程设置

And again I will highlight it and explain it from the ecosystem perspective

我还是会从生态体系角度切入

This report was published by the CSTA in 2006

这是 2006 年 CSTA 发布的一个报告

CSTA is the computer science teacher association

CSTA 指的是计算机科学教师协会

it is a huge teacher association in the US

这是美国一个非常大的教师协会

You will find all the computer science teachers in the United States

成员包括美国所有的计算机科学教师

It tries to understand what happens in Israel

这个报告试图研究以色列

how we succeed in developing a successful curriculum

研究我们如何开发出如此成功的课程

In this report, it first review what is going on in the world

该报告首先回顾了其他国家的情况

That is what they decided, to review a background for their report

作为这个报告的背景

They decided to review three places

他们回顾了三个国家的课程

one is the United States

美国

one is Israel

以色列

one is Europe

欧洲

It is very impressive

这个报告非常好

when we look inside and saw what is written about Israel

我们可以看看其中关于以色列的描述

It says: The success of the high school computer science curriculum in Israel

"以色列在高中计算机科学课程方面所取得的成功

is largely due to the care

主要归功于

with which the government planned the implementation process

政府的重视及举措

and the resources that were put in place to support that implementation

以及投入的充足的资源

This support included the development of course materials

政府的支持包括课程材料的开发

and the teacher preparation program and other materials as well

以及教师的培养

I will now highlight it,

现在

as I said before, from the ecosystem perspective

我会从生态体系角度切入来讲这个例子

First of all, I would like to highlight the core education system element

首先 我想强调教育体系的核心因素

We try also in Israel to understand how we happen

现在我们自己也在研究以色列

to have such a successful computer science curriculum in the high school

是如何在高中计算机科学课程方面获得了如此大的成功

We found that it is not only that the government put lots of resources

我们发现除了政府的投入以外

but a sound ecosystem

主要是因为健全的生态体系

It is composed of five elements

该体系包括五部分

One is that we have very good learning materials

一是良好的学习材料

one is computer science

二是计算机科学

we require teachers to own a teaching license in order to teach computer science

我们要求教师必须持有相关证书才能教授计算机科学

One is research

三是科研

this is what we do computer science education

即计算机科学教育

another one is the learning materials that we keep developing

四是不断开发教材

And the last one is national computer science teacher center that we have in Israel

最后是我们的全国计算机科学教师中心

All these components together create something

这五个组分之间相互作用

which is bigger than each of these components can create by itself

共同搭建起有效成功的计算机教育体系

Think about it, let's take two components

拿其中两个组分来说

If you require teachers to have a teaching certificate to teach computer science

如果我们要求老师必须持证上岗

you should provide them with teacher preparation program

就必须提供教师培养项目

if you develop a curriculum and learning materials

如果你想开发课程及教材

you should accompany the content of the learning materials with some research

就必须把学习材料的内容和科研联系起来

So these components influence each other mutually

正是这些组分之间相互作用　相互影响

and contribute to the creation of this successful story

以色列得以取得成功

In fact,

事实上

we have a lot of experience in Israel in teacher preparation programs in computer science

我们在计算机科学教师培养方面的经验是比较丰富的

We encapsulated all these experience in a book

我们将这些经验集结成册

that was published three years ago by Springer

三年前由 Springer 出版

It is going to publish its second edition in January

明年 1 月第二版也将发行

It is about how to teach computer science

这本书谈的是计算机科学教学

As far as we know

据我们了解

it is not only used by high school teachers

不仅是高中老师使用这本书

it is also used in the universities, in middle schools and even in elementary schools

大学老师　中学老师甚至小学老师也在使用这本书

because we lay out in this book several general ideas, pedagogical ideas

因为我们在书中提出了教育的几个基本理念

it is an activity based book on how to teach computer science

这本书主要基于活动来谈计算机科学教学

These were the school components of the ecosystem

以上是生态体系中的学校组分

in the high school computer science curriculum

以上是生态体系中的学校组分

and now we move to academia

我们来看看学术界组分

You know that Israel is a small country, I guess by now you know

各位已经知道以色列是个很小的国家

But we have only 70 universities in Israel, only 70 universities

我们只有 70 所大学

Each of them has computer science department

每所大学都有计算机科学系

But look at this remarkable achievement

但看看我们所取得的成就

They were ranked by the Shanghai Jiaotong University

这是上海交大的一个排名

As it turns out,

大家可以看到

Out of the 70 universities that are considered the best of the world

在世界公认最好的 70 所大学中

Look about the Technion department of computer science department.

以色列理工学院的计算机科学系一直位居前列

It keeps its place as one of the best computer science department in the world

以色列理工学院的计算机科学系一直位居前列

So we believe

我们相信

it has some relationships with the high school computer science curriculum

这跟我们高中的计算机科学课程是息息相关的

The third component in this ecosystem

第三个组分

is the start-up nation that you have just hear about

是刚刚所说的新兴企业

We have so many companies in Israel

以色列有很多企业

They have some interaction with the local high school computer science curriculum

这些企业都跟当地高中的计算机科学课程有所联系

and I would like to highlight something that you may not know yet

大家可能不知道

Israel is one of the hubs

很多跨国公司

with the biggest number of R&D centers of multinational companies.

都在以色列建立研发中心

So in Israel,

所以在以色列

we have many main hi-tech companies in the world

我们有很多全球主要的高科技企业

that means that we have many centers in Israel,

你可以看到谷歌 Facebook 英特尔等等

it's google, it's facebook, it's intel, it's everyone,

你可以看到谷歌 Facebook 英特尔等等

If you search multinational companies in Israel

如果你去搜索下以色列的跨国公司

you will find many, many names

你可以找到很多企业

You will find also two Chinese companies

其中就有两家中国公司

one in Chemicals, one in telecommunications

中国化工和中国电信

I think you are all familiar with these two companies

大家应该很熟悉这两家企业

So this is the summary of the second example

现在我总结下第二个例子

it is about the computer science curriculum at high school

高中计算机科学课程设置

remember it is the second column

记住它在我们表格中的第二列

we have the "change" idea implemented in this initiative

在这个例子中

by allowing the government to invest

"改变"体现在吸引政府投资

and to dedicate full attention to this direction

获得政府重视

The second one is ecosystem

第二个概念是生态体系

It is expressed by the interaction and collaboration

体现在学术界 学校和企业之间的互动与合作

between the academia, schools and the industry

体现在学术界 学校和企业之间的互动与合作

And diversity,

第三是多元

one way by which it is expressed

体现在跨国公司在以色列共存

is the existence and presence of so many centers ofmultinational companies in Israel

体现在跨国公司在以色列共存

项目三：教师培养项目

And the third example that we are going to discuss today

我今天想讲的第三个例子

that shows the ecosystem perspectives in the STEM innovation and education in Israel

是以色列的 STEM 创新与教育 我还是从生态体系角度切入

It is about STEM teacher preparation

主要是关于 STEM 教师的培养

The main role of our department is to prepare our high school teachers

我们系的一大职责便是培养高中老师

in one of the STEM subjects that we mentioned before

我刚才提到了 STEM 的一个科目

We decided that due to the different social problems in Israel,

由于以色列的社会问题

we do not have sufficient number of qualified STEM teachers in high school

我们高中并没有充足的优秀 STEM 师资

We decided to launch a very proactive approach

所以我们决定采取积极举措

We launched the Views program, the Views in Hebrew mabatim.

我们启动了 Views 项目

The term stands for engineering, science and technology education

Views 代表工程学 科学与技术教育

And it says very simple idea

它传达的想法很简单

You saw the talent of Technion graduates

大家看到以色列理工学院的毕业生都非常优秀

And we decided to allow all of them,

我们决定

to give them the ability to teach everywhere science and technology

培养他们教授科学与技术的能力

We believe that learning and teaching STEM topics is very important everywhere

我们相信学习和教授 STEM 科目在各地都是非常重要的

Think about any school, think about any organization,

任何学校 组织

think about any hi-tech company

或高科技企业都是如此

It's about learning and teaching STEM all the time

学习与教授 STEM 科目是一个永恒的主题

This happens anywhere

各地都一样

think about hospitals, think about any government organization

无论是医院还是政府组织

it should all know how to teach Technion technology all the time

他们都应该知道如何教授科技

So basically what Technion decided to do is to give its graduates additional professions

所以我们学院决定为毕业生提供额外的专业

So in addition to be engineers or scientists

他们不仅仅是工程师或科学家

they are also educators today

他们也是教育家

The principle is very simple

原理很简单

Technion provides them full study scholarship

学校给他们提供两年的全额奖学金

for two years to compete the teaching certificate

让他们得以获得教师资格证

So come to Technion once a week for two years, once a week for two years

他们每周上一次课 学制两年

It is like a MBA program in the length of study

跟工商管理硕士项目差不多

They can go on working, in parallel to research and studying

他们在科研与学习的同时也可以继续工作

they may also implement what they are studying in the department in their workplaces

他们可以把所学知识运用到工作中

we give them full study scholarship

我们给他们提供全额奖学金

we ask them, we allow them to choose how they will implement their knowledge

我们也允许他们通过不同的方式来运用所学知识

They can go to schools

他们可以去学校

They can go to the industries

他们可以去企业

They can do it anywhere. With their children, anywhere

他们可以和子女去任何地方

One of the graduates of this program is here, he is teaching tomorrow

这个项目的一名毕业生现在就在这儿 他明天将会给高中生上课

we will able to see how he implements his knowledge

我们可以看看

from the industry when he teaches the high school students

他如何将工作上的知识运用到教学中

It will be so clear.

明天大家就可以看到了

This is a program. it has been established for 4 years

这个项目已经开展四年了

it has about 400 Technion graduates who started in the program

共有 400 名毕业生参与到这个项目中

About half of them complete the study

有一半完成了学业

and half of them decided to implement the knowledge in the school

一半决定将知识运用到学校中

But remember, they can implement it everywhere

当然 他们也可以将知识运用在其他地方

So let's see how the three concepts we discussed are expressed in this program

现在我们看看"改变""生态体系"和"多元"在这个项目中是如何体现的

Change is expressed in this program by changing the perception of the STEM teacher

"改变"体现在对 STEM 教师的看法上

It is not possible all the time to let someone teach STEM from the age of 20 or 25

我们不能让一个人从 20 多岁开始教 STEM

till 60 or 65

一直教到 60 多岁

We should allow some mobility in the job market

我们要允许就业市场的一些流动

And this program, this Views program allows the exact mobility at the current job market

而我们的项目正是允许了这样的流动

The second idea is about the diversity

第二个概念是多元

If you look at the variety of students, you can see many, many of them mention diversity

我们的学生是多元的

But I would love to highlight one of them,

我想强调其中的一个方面

which is connected to what have saw before

这个方面我们前面也提过

It is one of the companies they work at

就是他们所在的企业

You should remember

大家知道

that come to the Technion once a week, one day each week to study

他们每周来一次学校

and they go on working in these companies

同时继续在公司工作

just think about what they brings with them to their studies

大家可以想想他们把什么带到了学习中

when they combine work, studying and teaching in the school

他们结合工作 学习和教学

If you look at the list of the companies which they work at

如果你看下他们工作的企业

You will find it is very similar to the list of multinational companies in Israel

你可以看到大部分是我们刚刚看到的跨国企业

And finally the ecosystem perspective

第三点是生态系统

is expressed in this Views program in two ways

在这个项目中有两种体现方式

One of them is that everyone wins

一是共赢

Technion graduates win because they get additional profession

我们学校的毕业生赢了 因为他们获得了额外的职业

They are not only scientists, engineers any more

他们不仅是科学家 工程师

they are also educators

也是教育家

The technology industry wins because it gets more people with more skills

技术产业赢了 因为他们的员工拥有更多的技能

teaching and learning skills are so important in this industry

在这个产业中 教授与学习技能是非常重要的

and this program provides these skills

而我们的项目正是培养了这些技能

Technion wins

以色列理工学院赢了

because it get its future students that would be better

因为潜在学生的质量更高了

because they are students who are educated by Technion graduates

因为他们的老师是我们学院的毕业生

who has very solid and strong scientific and engineering knowledge

这些毕业生都具备扎实的科学工程知识

our department wins

我们系也赢了

because it gets so good students

因为我们得到很好的生源

it cultivates this discussion atmosphere

也营造了讨论氛围

so high school education system wins

高中教育体系也赢了

because they will get better students and teachers

因为他们会有更好的学生和教师

And the government and state wins

政府和国家也赢了

because its manpower will be improved

因为国家的人力质量得以提高

Ok, this is another perspective to show,

生态体系在这个项目中的另外一个体现方式是

another way to show the ecosystem perspective in the Views program

生态体系在这个项目中的另外一个体现方式是

It looks like technological aspects and social aspects meet in this program

科技层面和社会层面得以交互

because on the one hand

一方面

we know the job market

我们知道在就业市场中

is characterized by two or three careers that each person pursues in his or her life

一个人一生中可能从事两到三种职业
And we also have a problem with the number,
大家也知道
that is, as I said before, the high school STEM teachers of high quality
我们高中没有充足的优质 STEM 教师资源
on the other hand
另一方面
the Views program brings into the schools very sophisticated
我们的项目也给学校带去了复杂的技术知识
both technological knowledge about nanotechnology, robotics
如纳米技术 机器人等
which schools do not have in many cases
这些都是学校所没有的
In addition
另外
they bring some knowledge of about learning technologies
我们的毕业生也给学校带去了很多新的技术知识
like how to teach with mobile devices, etc
比如如何运用移动设备进行教学等
So we can see now
除了费根教授刚才提到的
in addition to what you have heard from professor Fagan
大家也可以看到我们项目的成果
who leads many innovations in Israel
Fagan 教授是以色列很多创新的领头人
And we believe in the future STEM education in Israel
我们对以色列未来的 STEM 教育充满信心
and we are positive about it
我们也持乐观态度
because Israel is so small that Technion has such a central role in Israeli economy
因为以色列非常小
that you will able to see the influence from the very, very short term
因此我们理工学院在经济中发挥的主要作用很快就能看到效果

结语

So we are about to conclude
下面是一些结语
So this is the table that I asked you to draw in your mind in the beginning
这是我在演讲开始时让大家画的表格
On the column, you can see the three initiatives that I have described
纵列是我刚刚描述的三个例子
they are robotics education,
机器人教育
Computer science curriculum and STEM teacher preparation program

计算机科学课程和 STEM 教师培养项目

On the row you can see the three concepts that are highlighted in each case

横排是我用来分析每个例子的三个概念

It is about change, about ecosystem and about diversity

改变 生态体系和多元

So let's just take one or two examples

我们举一两个例子

In the case of education,

机器人教育方面

we saw the needs to change your concepts when you teach robotics

我们要改变机器人教学的理念

In the case of computer science curriculum,

计算机科学课程方面

we saw the ecosystem of academia, industry and the schools

我们讲了学术界 产业界和学校之间的生态体系

In the case of the STEM teacher preparation program,

STEM 教师培养项目

we saw the diversity, of different backgrounds,

我们看到多元是如何体现的

different professional experiences that all the students have in this program

即不同背景 专业和经历的学生都参与到项目中来

Ok, this is the conclusion

我的演讲即将接近尾声

I was asked to deliver some message that you can take from here

主办方让我跟大家分享一些理念

So it is not so easy

这并非易事

But if you want to promote innovation and creativity

但如果你想促进创新和创造力

you should embrace three very complex and simple concepts at the same time

你要同时接受这三个既复杂又简单的概念

which are change, ecosystem and diversity

改变 生态体系 多元

xiexie

谢谢