

FUTURE FARMS

small and smart



SURVEY DRONES

Aerial drones survey the fields, mapping weeds, yield and soil variation. This enables precise application of inputs, mapping spread of pernicious weed blackgrass could increasing Wheat yields by 2-5%.

FLEET OF AGIBOTS

A herd of specialised agibots tend to crops, weeding, fertilising and harvesting. Robots capable of microdot application of fertiliser reduce fertiliser cost by 99.9%.

PENDIDIKAN PERTANIAN UNTUK TERWUJUDNYA PERTANIAN YANG INOVATIF DI ERA REVOLUSI INDUSTRI 4.0

FARMING DATA

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DIPRESENTASIKAN PADA SEMINAR NASIONAL INOBALI

DI DENPASAR, 20 DESEMBER 2019

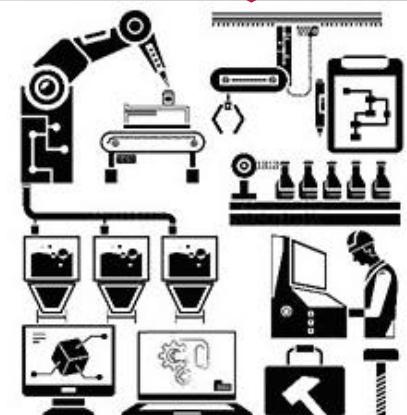
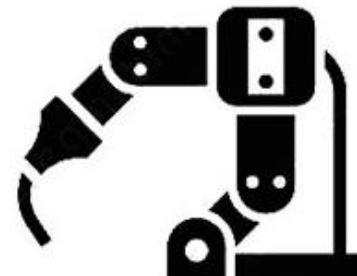


OUTLINE

- Apa itu era revolusi industri 4.0?
- Seperti apa pertanian inovatif di era R.I. 4.0?
- Seperti apa model pendidikan di era R.I. 4.0?
- Apa tantangan bagi pendidikan pertanian di era R.I. 4.0?
- Bagaimana Arah kebijakan pendidikan tinggi di Indonesia
- Bagaimana Arah Kebijakan Pengembangan SDM Pertanian di Indonesia 2020-2024
- Framework pendidikan pertanian di era 4.0: sebuah pemikiran
- Penutup

REVOLUSI INDUSTRI

Digital disruption



— 18th Century —

19th Century

20th Century

Today

Industry 1.0

Mechanical production equipment powered by steam

Industry 2.0

Mass production assembly lines requiring labour and electrical energy

Industry 3.0

Automated production using electronics and IT

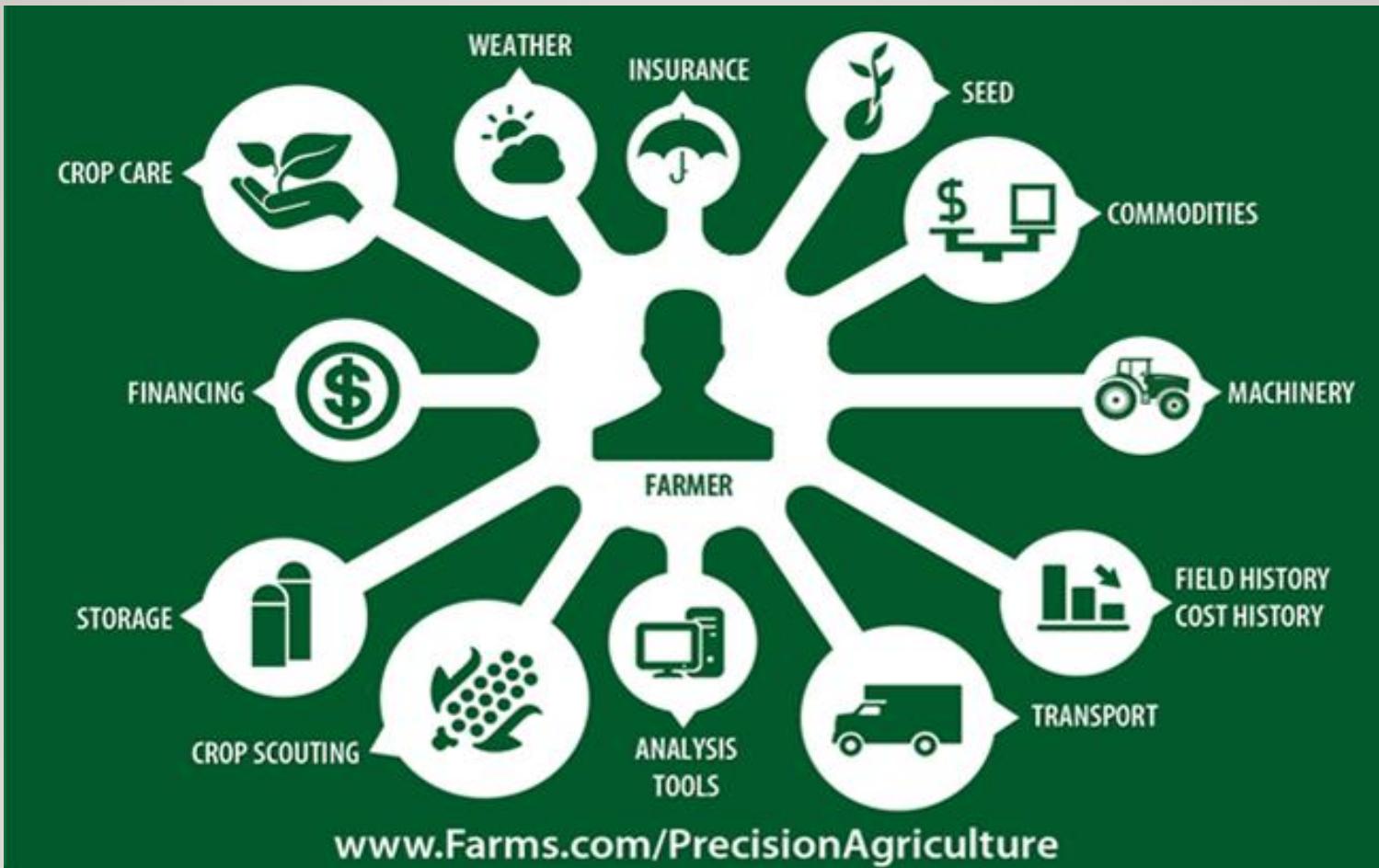
Industry 4.0

Intelligent production incorporated with IoT, cloud technology & big data

DIGITAL DISRUPTION IN AGRICULTURE



AGRICULTURE 4.0



Insight

WHAT IS AGRICULTURE 4.0

- Secara definitif; Agriculture 4.0 adalah analog dari Industry 4.0
- Dimaknakan sebagai keterpaduan jejaring internal dan eksternal dalam suatu usaha pertanian
- Dimana, seluruh bentuk informasi digital yang ada dimanfaatkan dalam seluruh proses produksi pertanian.
- Komunikasi dengan mitra eksternal seperti penyedia input dan pelanggan produk dilakukan melalui media komunikasi elektronik, transmisi data dan diproses secara otomatis.
- Portal internet digunakan untuk dapat menangani volume data yang sangat besar (big data management) dalam jejaring antara usahatani dengan mitra eksternalnya.

TRANSFORMASI PERTANIAN

DARI		KE
USAHATANI TRADISIONAL		USAHATANI CERDAS (Smart Farming)
UMKM TRADISIONAL		START UPS (Merintis jenis usaha baru)
Usaha Jasa Tradisional		Usaha Jasa bernilai tinggi (High Values)
Tenaga kerja tidak trampil		Tenaga kerja cerdas dan trampil
Membeli Teknologi		Membuat teknologi

**Seperti apa model pendidikan
di era R.I. 4.0?**

TRANSFORMASI DALAM PENDIDIKAN

EDUCATION 1.0	LECTURERS AND MEMORIZATION
EDUCATION 2.0	INTERNET-ENABLED LEARNING
EDUCATION 3.0	KNOWLEDGE-PRODUCING EDUCATION
EDUCATION 4.0	INNOVATION-PRODUCING EDUCATION

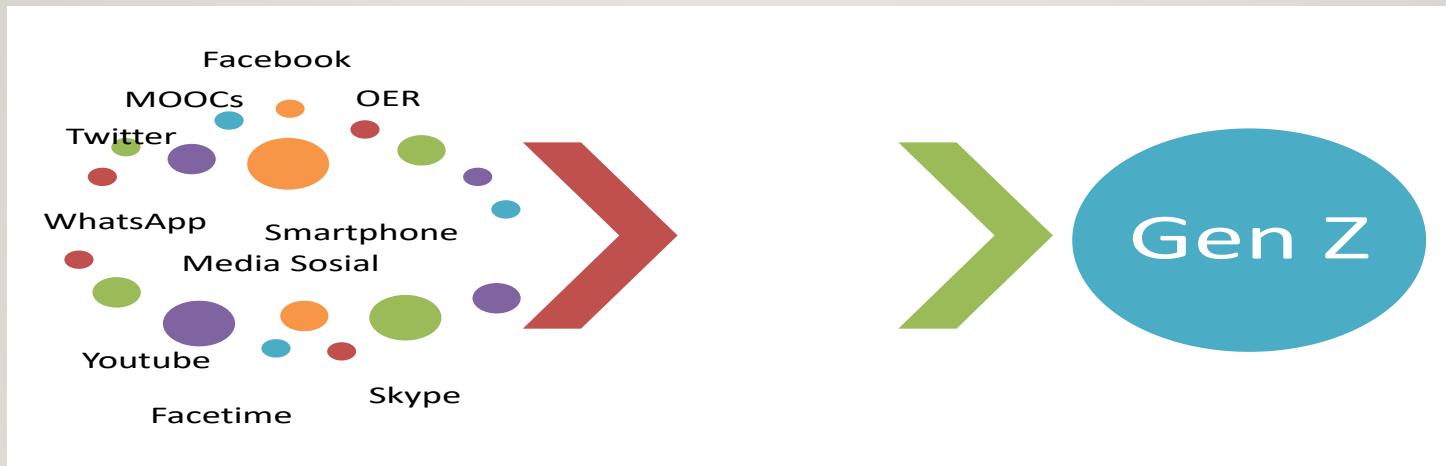
**Tantangan bagi pendidikan
(termasuk pendidikan pertanian)
di era R.I. 4.0?**

THE TARGET GROUPS ?

Generation Z	Born: 1999 through present (Age 17 or younger)
Generation Y – the Millennial Generation	Born: 1981 through 1998 (Age 35 to 18)
Generation X	Born: 1965 through 1980 (Age 50 to 36)
The Baby Boomer Generation	Born: 1946 through 1964 (Age 70 to 52)
The Silent Generation – Children of Great Depression and World War II	Born: 1928 through 1945 (Age 88 to 71)
The Greatest Generation – Generation that fought and won World War II	Born: Before 1928 (Age 89 or older)

MILLENNIAL CHARACTERS

Technology	tech-savvy, web-savvy, app-friendly generation
Social	Very intensive interaction in social media
Expressive	tend to be tolerant with cultural differences and very concerned about the environment
Unstable	Quickly move from one thought / job to another thought / work



STATISTICS OF GENERATION “Z”

- Spending around 7.5 hours per day, interacting with digital devices (almost 11 hours to enjoy content and interact with digital devices)
- 22% of generation Z teenagers enter social media accounts more than 10 times every day (2009 data)
- About 75% of generation Z teenagers have their own cellphones, 25% are used for social media, 54% for texting, and 24% for instant messaging
- Prefer texting or instant messaging rather than telephone
- More often "multitasking" (fast-switching)
- The last hours before going to bed, more than half of the generation Z teenagers send messages (texting) to their friends
- One third of the Z generation of smartphone owners go online immediately after waking up

BAGAIMANA ARAH KEBIJAKAN PENDIDIKAN TINGGI DI INDONESIA



STATEMENT KEMRISTEKDIKTI TENTANG REVOLUSI PENDIDIKAN TINGGI

- **Disampaikan dalam Rakernas Kemristekdikti, Medan, 16-17 Jan 2018**
- **Indonesia Siap Menyambut Globalisasi Pendidikan dan Revolusi Industri ke-4 (RI 4.0)**
- **Tiga bidang/faktor yang harus dikuasai oleh suatu negara untuk memajukan indeks daya saing bangsa, yaitu**
 - (i) Pendidikan Tinggi dan Pelatihan,
 - (ii) Ilmu Pengetahuan dan Teknologi (IPTEK) dan Kesiapan Teknologi,
 - (iii) Inovasi dan 'Business Sophistication'.

Challenges The Development of Human resources in Indonesia

In the 4th Industrial Revolution era

(WEF, 2017)

36th /137 C's
Indonesian Competitiveness Index

(BPS, August 2017)

8,8% / 618
thousands

Unemployed university graduates

3rd rank: Singapore
23rd rank: Malaysia
32nd rank: Thailand

Education and work (job) should be adjusted into the development of Science and Technology, but still attention should be given to humanism aspects



"Employers complains that the employees do not have the appropriate skills"



58 % of Employers

72 % of Educators



Reference:
Mourshed, Farrell, Barton (2012), Education to Employment: Designing a System that Works (survey 8.000 universities, and industries from 24 countries)

Markets need the human resources with multiple skills, which is so different with the old system of higher education
(Marmolejo, World Bank, 2017).

Indonesia needs to have

New literation – facing 4-IR

- In order to produce qualified graduates, curriculum needs a new orientation, due to the 4th IR
- The old literacies (reading, writing and math), have to be strengthened as well as by adding the new literacies, if we would like to produce qualified human who can thrive in digital era

“The strategy is how to convince students that the new literacies could bring them to a competitive person?”

Are we ready?

Preparing competitive graduates

New literacies :



(Aoun, MIT, 2017)



1. Data Literation

The ability to read, to analyze, to use information (*Big Data*) in the digital world.

2. Technology Literation

The ability to understand mechanical (system) work, to use the application of technology like (*Coding, Artificial Intelligence, & Engineering Principles*).

3. Human Literation

Humanities, Communication and Design

HUMAN LITERATION



“

Universities should always find methods for developing the cognitive capacity of the students, through implementing *higher order mental skills, critical and system thinking* ➔ It is important to keep survive in the 4th industrial revolution

Goal: humans should be useful in their society; therefore, they need to implement humanities approach, communication and design

Skills:

1. Leadership
2. Teamwork

Cultural Agility:

Provide students with the ability to interact/ work in various global environment (cross - cultural situations)

Entrepreneurship (including social entrepreneurship):

This should be introduced again that Entrepreneurs be the basic capacity which is owned by each student

How to teach in the 4th industrial revolution era ?

(Aoun, 2017)

- 1. *Thematic study on various discipline , connecting it to the real world*
- 2. *Through General /liberal arts Education.*
- *Internship/co-operation program (ie. higher order skills, leadership, team work) (Northeastern, 2014)*

Policies

HIGHER EDUCATION IN THE 4TH INDUSTRIAL REVOLUTION ERA



Curriculum Reorientation

- New Literature (data, technology and *humanities*) is developed and taught.
- Extra curricular activities in order to develop the leadership skill and team work, should be implemented
- Entrepreneurship and internship is compulsory.



Hybrid/Blended Learning, Online

Applying *Hybrid/Blended Learning* through SPADA-IdREN.



Establishing *Life-long Learning* unit

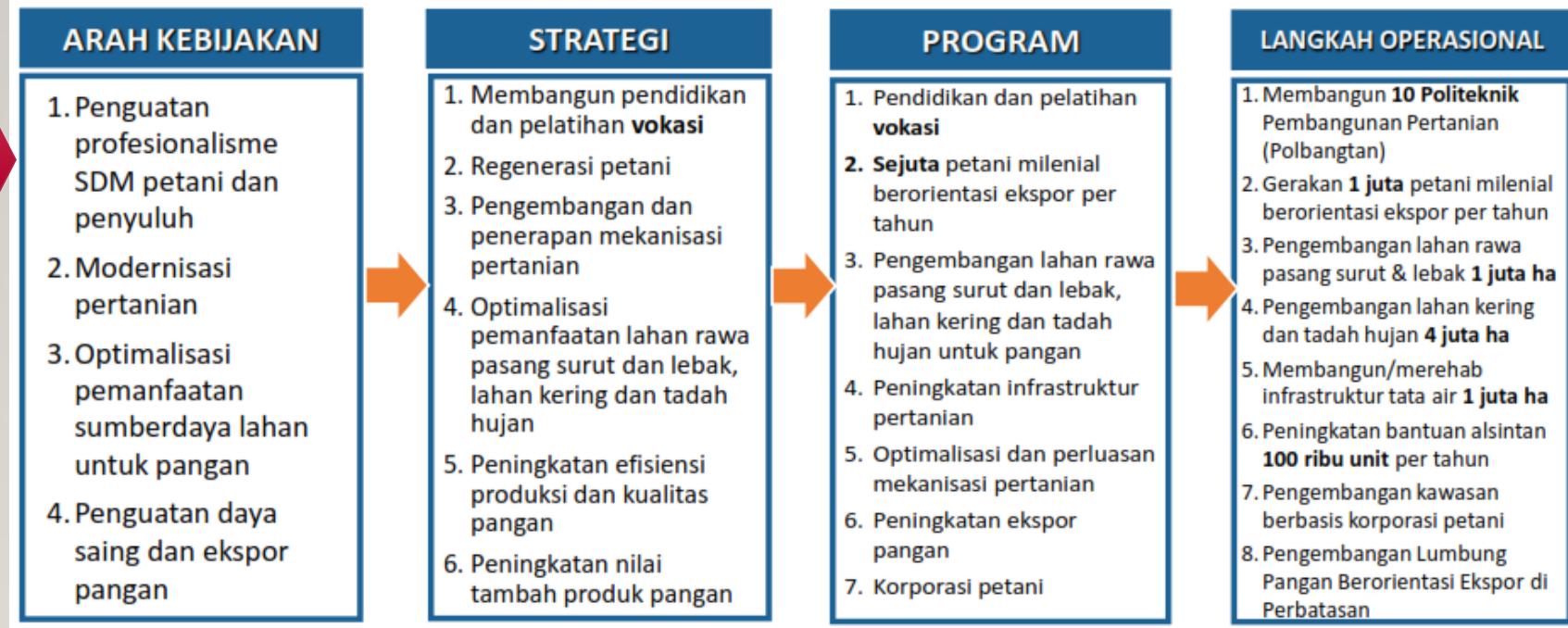
It is recommended that higher education institutions have working unit for providing *life-long learning* services



Providing grants and technical guidance services for curriculum reorientation (GEN-RI 4.0) for 400 universities

ARAH PENGEMBANGAN SDM PERTANIAN

ARAH KEBIJAKAN, STRATEGI, PROGRAM DAN LANGKAH OPERASIONAL PEMBANGUNAN PANGAN 2020-2024 (KEMENTERIAN)



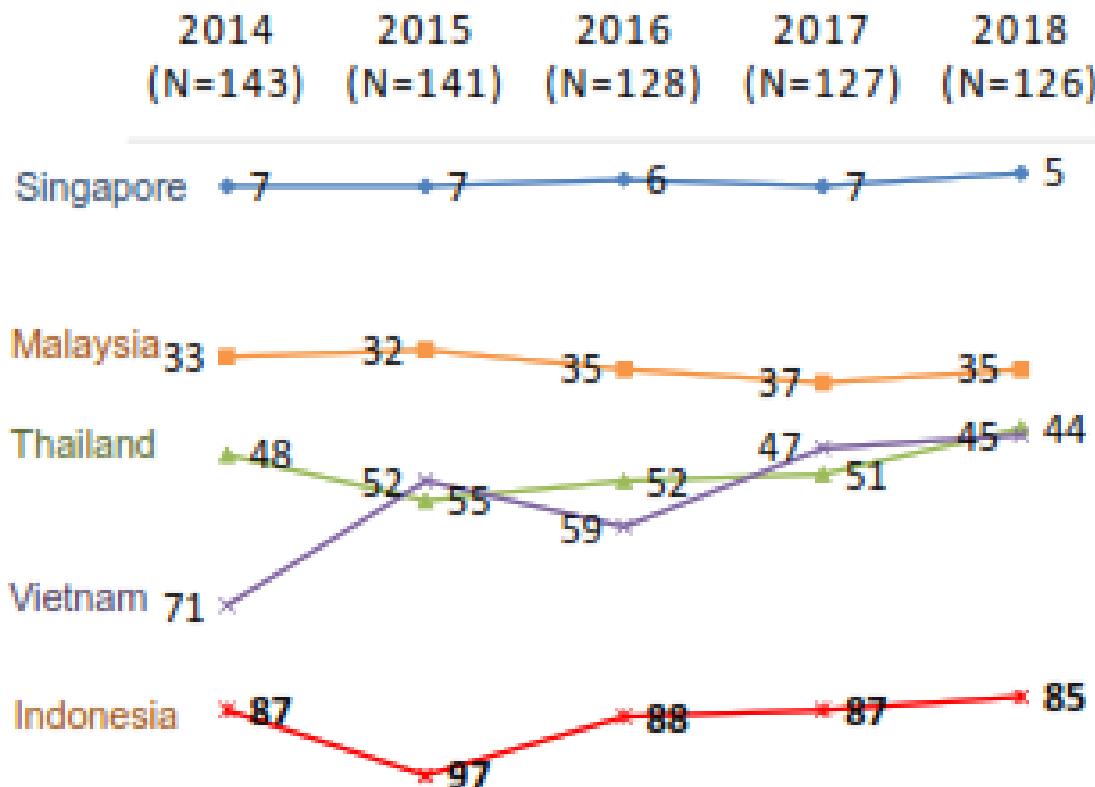
FRAMEWORK PENDIDIKAN PERTANIAN DI ERA 4.0: SEBUAH PEMIKIRAN

INNOVATION-PRODUCING EDUCATION
(PENDIDIKAN YANG MAMPU MENGHASILKAN
INOVASI-INOVASI BARU)



Global Innovation Index

rankings of 5 ASEAN Countries 2014 – 2018 – WIPO vers.



Indonesia
di bawah
Vietnam,
Thailand,
Malaysia &
Singapura

9 KEY ELEMENTS OF EDUCATION 4.0



Anywhere Anytime



Personal



Flexible Delivery



Peers and Mentors



Why/Where not What/How



Practical Application



Modular and Projects



Student Ownership



Evaluated not Examined

innovation-producing education

3 ELEMEN KUNCI MODEL PENDIDIKAN PERTANIAN DI ERA 4.0:

- Learning objectives
- Learning methods
- Management of education

LEARNING OBJECTIVES

- critical thinking, creative thinking, innovative thinking
- Individual and teamwork
- IT competencies

CRITICAL THINKING AND CREATIVE THINKING

TWO KINDS OF THINKING

Critical Thinking

- analytic
- convergent
- vertical
- probability
- judgment
- focused
- objective
- answer
- left brain
- verbal
- linear
- reasoning
- yes but



Creative Thinking

- generative
- divergent
- lateral
- possibility
- suspended judgment
- diffuse
- subjective
- an answer
- right brain
- visual
- associative
- richness, novelty
- yes and

Creative thinking is divergent, critical thinking is convergent; whereas creative thinking tries to create something new, critical thinking seeks to assess worth or validity in something that exists; whereas creative thinking is carried on by violating accepted principles, critical thinking is carried on by applying accepted principles. Although creative and critical thinking may very well be different sides of the same coin they are not identical (Beyer, 1987, p.35).

Critical thinking emerges as a top area of need, but desired soft skills vary by market



Skills employees feel will be very important to the future of work



Australia



India



Japan



Singapore



“ In the **future** is **not** about the
competition of knowledge, it's a
competition of creativity,
competition of imagination,
competition of learning,
competition of independent
thinking

”

-Jack Ma-

LEARNING METHODS

- IoT based
- Practical vs class session
- Evaluation vs examination
- Project/Problem based

MANAGEMENT OF EDUCATION

- IoT based, academic management systems
- Infrastructure development

PENDIDIKAN PERTANIAN DI ERA “AGRICULTURE 4.0”: SEBUAH WACANA PEMIKIRAN

4 point penting:

- Role
- Governance
- Structure
- Curriculum

ROLE OF STUDY PROGRAM

- Sebagai sebuah lembaga pendidikan, program studi harus dapat menghasilkan lulusan yang:
 - berdaya saing dan bertanggungjawab terhadap masyarakat dan lingkungan sekitarnya
 - mempunyai pemikiran progresif dan kreatif di era 4.0 ini.

GOVERNANCE

- Program studi harus mampu mengintegrasikan budaya akademik dan budaya korporat -- bersifat “hybrid”
- Program studi harus dapat memenuhi tantangan global tanpa harus mengesampingkan akademik
- Program studi harus mampu mengedepankan “autonomous governance” nya

STRUCTURE

- Hypermarket structure:
 - akademik,
 - keahlian,
 - Penelitian/penyelidikan dan
 - soft skills.
- Inter ataupun intra disiplin

CURRICULUM

- Bersifat outcome based --- kompetensi
- Proses belajar harus lebih bersifat “student centered learning”
- Work based or project based – life and career skills
- Melibatkan industry atau stakeholders pengguna lulusan
- Penggunaan bahasa asing
- Optimalisasi penggunaan ICT: Internet of Things

PENUTUP : SEBUAH ILUSTRASI

Bayangkan, anda mengajar se kelompok MK yang berkaitan dengan kewirausahaan.

- Anda merancang materi secara terstruktur, mulai dari pengenalan konsep wirausaha, definisi wirausaha menurut pendapat ahli, pentingnya kewirausahaan bagi perekonomian nasional. Selanjutnya diberikan contoh-contoh wirausahawan sukses, karakter penting wirausaha, kunci sukses berwirausaha: berfikir kreatif, manajemen risiko dll. Tak lupa pula pengetahuan tentang pengelolaan produksi, SDM dan Pemasaran, serta aspek keuangan. Materi terakhir dibungkus dengan pengetahuan tentang business plan. Setelah pembelajaran berlangsung selama 6 bulan, dilakukan ujian. Alhamdulillah mahasiswa lulus 100%, mayoritas meraih nilai A.

Pertanyaan:

setelah itu, berapa orang yang menjadi pengusaha? Tak seorangpun! Mengapa?

MENGAPA?

- Kesalahan utama yang fatal adalah: TERLALU BESAR TARGET pada aspek COGNITIF, DIBANDING DENGAN aspek AFEKTIF DAN PSIKOMOTORIK
- Mari kita sama-sama mendalaminya!

**TERIMAKASIH BANYAK
ATAS PERHATIANNYA**