GLOBAL EDUCATION FUTURES

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Skills of the Future: What Does the Workforce of Tomorrow Need, and How Should we Prepare for It

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Global Education Futures: what is it

Global Education Futures is an **international platform** that brings together **shapers and sherpahs of education & training systems and their industrial & political counterparts** to discuss the future landscape of skills and global education & training ecosystems

Over 500 global experts from 50 countries (including official & technical delegates of WorldSkills from 35 countries) participated in sessions held in Europe & Russia, United States, India, South Africa, Brazil & Argentina, New Zealand, etc.

Systemic innovations being **scaled up** on Russian & international level as a part of this effort since 2011

AGENCY FOR STRATEGIC INITIATIVES

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SKOLKOVO Moscow School of Management

ASHOKA Everyone A Changemaker™

International Labour Organization

BRICS Business Council

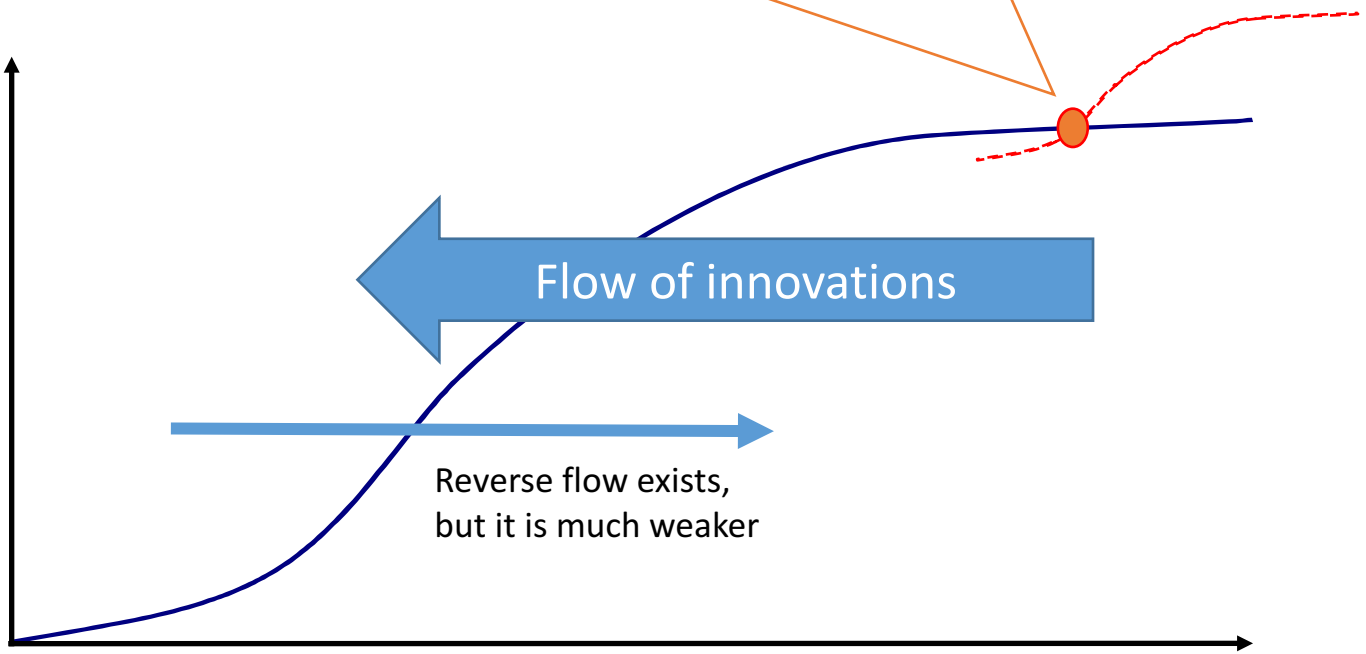
ITBA Instituto Tecnológico de Buenos Aires

STAD makerij

Relmagine™ Science

What should be the focus in understanding the future of skills & education?

Our focus: looking at the cutting edge of technological & educational practices



Early industrialized regions

Ca. 40% of the world's population (more in Africa, Latin America, Central Asia)

Industrialized regions

Ca. 45% of the world's population (more in China, India, the Arab World, SEA, parts of EU & North America)

Regions with dominant new or post-industrialized practices

Ca. 15% of the world's population (more in OECD countries + "pockets" within emerging economies)

How can we understand the future of skills & education?

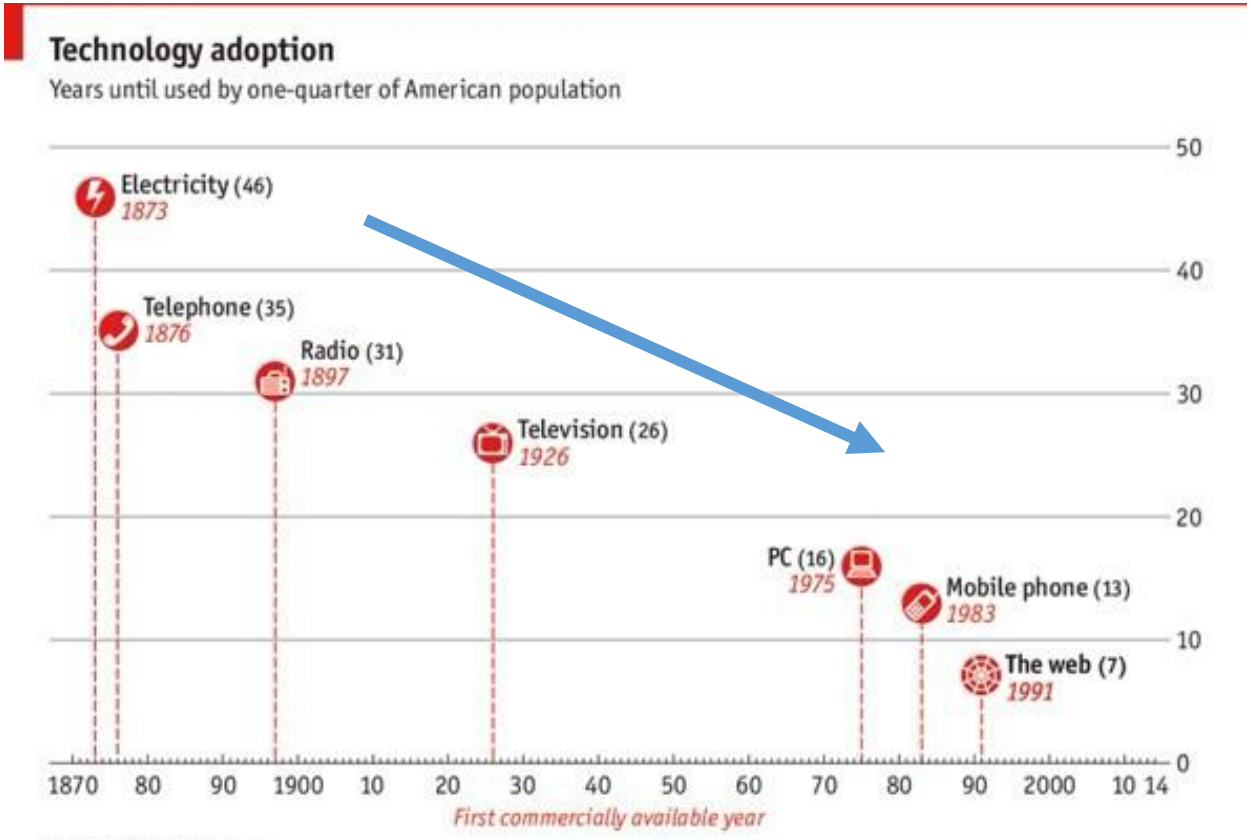
How will the world change in next 20 years?

What will people do (and not do) in this changing world?

What skills & knowledge will be required?

How can these skills be acquired?

Universal (meta-)trend: acceleration of technological & social change



From electricity to Internet & smart phones, in less than 150 years the rate of adoption has dropped from half a century to 5-6 years

Source: Singularity.com, Economist.com

Universal (meta-)trend: acceleration of technological & social change

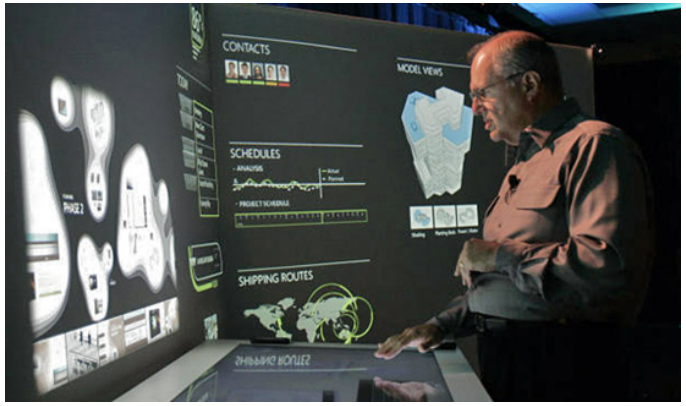
Number of children in a family

Matrimony age

Though slower, social norms have been changing at a remarkable pace as well – e.g. in terms of family-related new norms

Key trend #1: Digitalization of Economy & Society

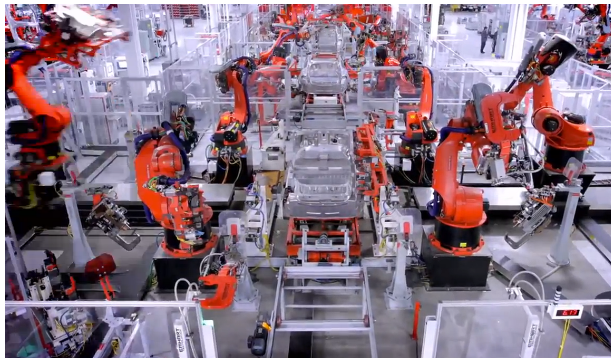
- **IT is everywhere**:
  - Superconnected world, growing share of population online 24/7
  - Data, more data
- **Smart environments**: smart working places, smart homes & cities, home & street robotics, Internet of Things
- **New tools coming**
  - AI / artificial agents (personal assistants for everyone)
  - AR / VR after 2020
  - Brain-machine communication (BCI) after 2030?



Challenge of digitalization: Balance between ‘analogue’ and ‘digital’ worlds: negative impact on individual & collective mind (nociolasing, ADHD & beyond)

Key trend #2: Automation of Industrial World

Technologies of automation & autonomization (2015-30): AI & Big Data, robotics & IoT, autonomous generation & smart grids, unmanned transportation etc.



Existing (industrial) model: 60-70% of jobs directly or indirectly serve systems of mass production

Economy 2035: production & logistics can be up to 95-99% unmanned, and up to 50-70% of jobs in related services can be replaced by AI

Challenges of automation / autonomization: high speed of displacement:

- Inevitable growth of inequality created by new technologies
- Growth of skills gap (what economy needs and what E&T can deliver)
- Clashes between old & new economy paradigms in job market and beyond (e.g. owning – sharing - giving)

Key trend #3: Greening of Human Practices

- **High localization & customization** for adaptability & efficient resource use:
  - 3D printing & similar
  - Local food production (e.g. city farming)
  - Local energy gen on demand
- **Zero waste / zero emission effort** in manufacturing, energy, services etc.
  - Sustainable energy, biofuels, biomaterials, …
  - Cities as territories that re-create nature (artificial ecosystems)

Challenges of greening:

- Creating momentum for greening of economy & society:
  - New R&D: how to make human impact on nature beneficial
  - Rebuilding our cities
- Transition to thrivable eco-civilization by changing way we think and act

Key trend #4: Rise of the net-centric society

- **VUCA environments**: hence everyone is entrepreneurial, and hence organizations become flatter
- **Removal of artificial boundaries**: 'fluid' working communities that naturally blend work, life, game, and creativity
- **'Focus on what robots will not do'**: social practices that are not beneficial to automate, e.g. human-centered services
- **New 'finance'** (blockchain) to support new social relations through 'reputation management'

Values & motivation "beyond money": human attention, authenticity, wisdom, care & compassion & love

Challenge of net-centric society: increased and growing complexity

- What worked before may not work in the future (new practices / skills / jobs)
- Need new systems of governance: collective intelligence + AI
- Complex but fragile: local & global security depends on grassroot resilience & peacemaking

World 2035: where are we going *

WHAT GOES UP

- Highly autonomous industrial cyber-physical manufacturing +
- Highly local manufacturing, food production & energy gen on demand
- Green production, energy & services
- Unmanned transportation is ubiquitous
- Smart human-centered technological environments (cities, homes, …)
- Highly personalized services in healthcare & wellness, education, entertainment etc.
- Total connectivity + hybrid reality + wide use of brain-machine communication
- Human practices of 'ludic' communities that naturally blend working, living, and creativity

WHAT GOES DOWN

- Large industrial facilities as employers
- Cities as centers of industrial mass production
- Centralization of infrastructure, coordination & development
- Manual labor in the majority of manufacturing operations (and in many service operations)
- Middle management and many industry-related services (incl. jobs in sales & marketing, supply chain management, accounting, IT support etc.)
- Boundaries between work, creativity, learning, play, and life

* These are 'global best practices'. We acknowledge the diversity of geopolitical & economical scenarios that different countries of the world may face in next 20 years

Future of manufacturing sector and skills for it

Manufacturing sector	Sector specific skills	Universal skills
Mass-scale industrial manufacturing (e.g. energy, natl resources, food, chemistry & new materials, machinery & equipment etc.): *highly autonomous* cyber-physical manufacturing systems	• Cyberphysical manufacturing facility operation & maintenance • Skills for Internet of Things: system engineering, M2M lang, dynamic programming, etc. • AI development / training of AI • Skills for chemistry & new materials dev & production (e.g. for electric materials) • Flexible supply chain management • Technology ethics	• Information worker skills (search, programming, etc.) • Collaboration • Working in dynamic / high-uncertainty environment • Working in multidisciplinary environments • Creativity • System engineering • 'Green thinking' • Languages: foreign + universal 'lingua franca' (based on IT + finance + system engineering?) • Ability to unlearn / relearn (supported by mind-stimulation)
Networks of unmanned transport for industrial & consumer logistics		
Customized end-user manufacturing (consumer electronics, consumer transport, apparel, furniture etc.): *localized personalized* production based on 3D manufacturing	• Product co-creation with customer • Creativity for unique product creation • 3D-scan-supported reverse engineering for customization ("same watch, different color") • '*Beautiful exceptions*' of manual work dominated by artisans	

Source: GEF Kazan

Future of service sector and skills for it

Service sector	Sector specific skills	Universal skills
Digitalized & machine-assisted **massive use services** (e.g. digital health, digital entertainment, unmanned transportation, post-retail distribution, etc.)	• Engineering of socio-technical systems • Sustainable design (incl. balance between personal & social structures) • Green design • New skills for working with 'smart machines' (e.g. human-machine psychiatrist)	Similar to those for Manufacturing sector plus: • Concentration / attention management • Empathy / bonding ("I am a person because of another person")
Uber-like direct service provider markets		
Customized **highly-personalized services** (e.g. wellness, psychotherapy, fitness & tourism, hospitality, personalized art & entertainment, etc.)	• Authentic serving (serving others as a personal 'quest') • Psychology skills • Ethics of service including the principle of "We belong, we care, we serve"(also, principles that serve local communities, e.g. 'slow food') • Storytelling ("every personalized service is a story")	

Source: GEF Kazan

Growing segment of jobs for green urban living

Transformation of our civilization towards green / sustainable living is primarily transformation of cities. It will create multiple jobs for multiple aspects of city life, catering to needs of various population groups: new skills & existing skills increasing in importance.

Jobs that support …	Some skills that will be required in this sector
Green city living	• Sustainable design • Smart grid design & maintenance • Electric transport repairing • Urban farming • Environmental law
Healthy city living	• Personal wellness advising / healthy habits coaching • Healthy aging consulting • Adaptation psychology
Connected city living	• Cyber-security management • IoT design / maintenance • Home robotics maintenance
Harmonious city living	• Re-education for adults • Smart political design • Inter-cultural communication • Cloud police • Cyber law

Source: GEF Kazan

Shape of things to come: a hypothesis on future job market landscape

Massive shifts of job market structure within less than one generation will require multiple mechanisms to smoothen transformation (including education & training)

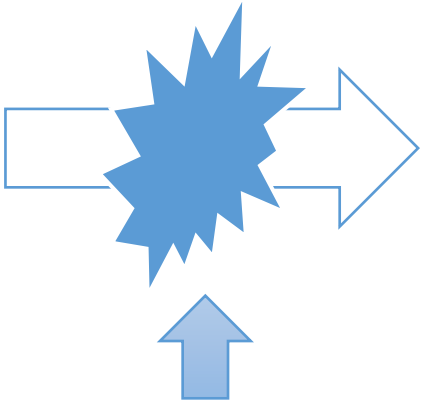
Existing (industrial) model

~60% of jobs directly or *indirectly* serve systems of mass production (incl. design & engineering, finance, marketing etc.)

~5-10% of jobs "feed" us (agriculture)

~10% of jobs: urban-related services & products

~20-25% of jobs are human-to-human services (incl. education, healthcare, wellness, govt etc.)



Technological & social shifts of next 15-20 years

Emerging model of 2035

Not more than 10-15% of high-skilled jobs (direct + indirect) remain in food, commodity & goods mass production due to automation

25-30% of jobs migrate into personalized manufacturing & urban-related jobs

Explosive growth to 50-60% of jobs in human-centered services (incl. new services) as they are least susceptible to automation

Source: GEF estimates

Professional, soft & meta- skills of workers & citizens of the future

Key professional skills

- Multidisciplinary work (T-specialist to m-specialist)
- Multicultural + multi-lingual competencies
- IT competencies
- Working in distributed (IT enhanced) environments

Soft skills

- Problem- and *opportunity* oriented thinking (*not* critical thinking)
- Entrepreneurial skills: acting in uncertainty & taking responsibility (for VUCA environments)
- Creativity (incl. “right-brain” creativity)
- Collaboration
- Empathy & emotional intelligence
- “Ethics of responsibility” (social + environmental)
- “Information hygiene”: assessing quality of information, employing good communication practices

Meta-skills

- Concentration & attention management
- Flexibility & adaptability
- Resilience & personal (physical / psychological) health management
- Self-development + ability to unlearn / relearn throughout life

Voice of Youth: does anything of this feels relevant to the next generation?

Ongoing Global Education Futures project:

- engaging young learners (age 9 to 16) into discussion and active changemaking of the education system in the interest of learners
- Pilots conducted in Russia, Argentina, and the US. Continuing in 2016-17, expanding to 20 countries.

What do children say:

- **Technologies** (of automation & digitalization) are good as they **free people** for human interaction and creativity, and "bring parents back home"
- Want to see **shared** (borderless) **global world** with no wars (want to study cultural literacy and peacemaking as basic skills to do it)
- **"Greening"** as their primary collective task: learning to "feel" nature and restore our contact with it, stop harming it
- Want to **stop animal abuse**, and learn how to be kind to each other
- They are ready to be change participants and change makers
- Their **biggest fear**: "**adults won't let us do it**, and future won't happen"

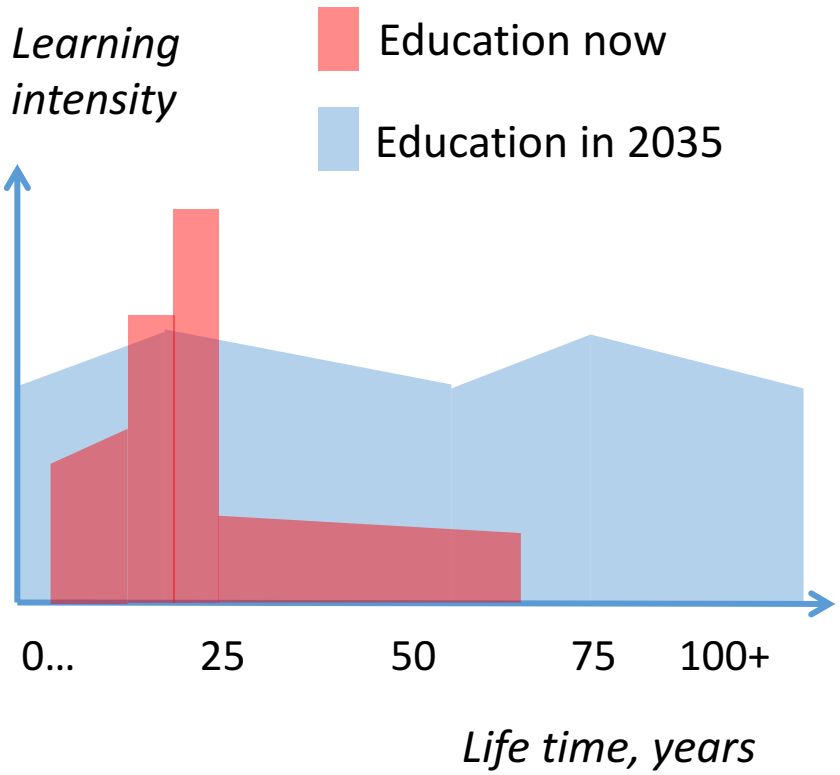
What is How: adaptation of education to future skill demand

The current educational model is flawed by design: it prepares people for skills of the past, not skills of the future!

- We cannot teach people to be creative by giving them standard tasks
- We cannot teach people to be collaborative by putting them in competition against each other
- We cannot teach people to be lifelong learners if we deprive them of self-exploration and courage to learn, if we blame them for mistakes
- We cannot teach people to be empathic / emotionally intelligent by removing emotion and focusing on cognitive abilities only
- We cannot teach people to use IT properly if we remove it from the school
- We cannot teach people to be mindful if we are not mindful

Educational processes and formats need to be redefined to enable the development of 21 century workers / citizens / humans

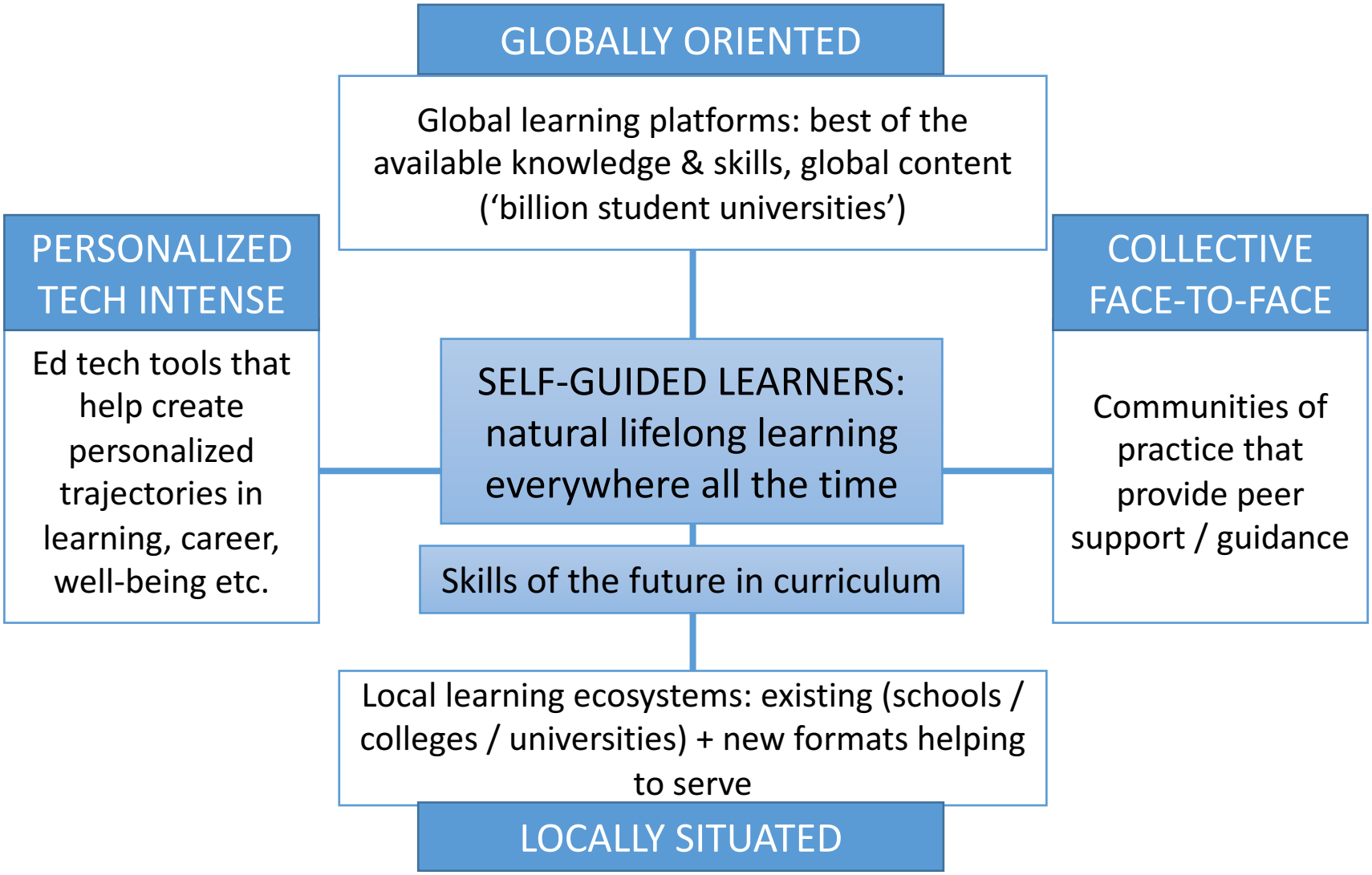
Transition to lifelong learning



Key transformations:

- There is no way to prepare for life in the increasingly uncertain world
- (Thus) education is not about the start of life, it is about all of life
- Education is not about getting a professional skill, it is about living through your life
- Nobody can own or control your development & growth - but you. So you need to learn to become your own master, you need to learn how to learn
- If learning is a lifetime journey, then it is not about goals, it is about quality of the process. Enjoy the way

Big shifts ahead: learner-centered lifelong education



Key areas of change in education: what regulators & administrators should do

Industrial / national / international qualification & competence systems: getting ready for self-guided lifelong learning, incl. lifelong 'competence passports' / personal portfolios / unbundling of degrees etc.

Traditional education system (schools / TVET / HE):

- rebuilding curriculum for 21 century skills (incl. collaborative not competitive design of education processes)
- opening to practical, socially embedded, green-minded, cross-generational learning
- teacher & learner(s) as partners
- learning is flipped
- new teacher skillset

Online learning:

- take over routine elements of flipped school / university
- create opportunities for mobile 24/7 personalized learning
- integrate with game universes & social media & professional networks

Urban / community learning:

- integrate opportunities for lifelong learning & development (incl. family, personal crises etc.)
- urban learning hubs for social innovation & entrepreneurship


Future
Past

Proposals for WorldSkills: competitions of the future & development of the movement

Some proposals made by Global Education Futures forum attendees representing WorldSkills movement

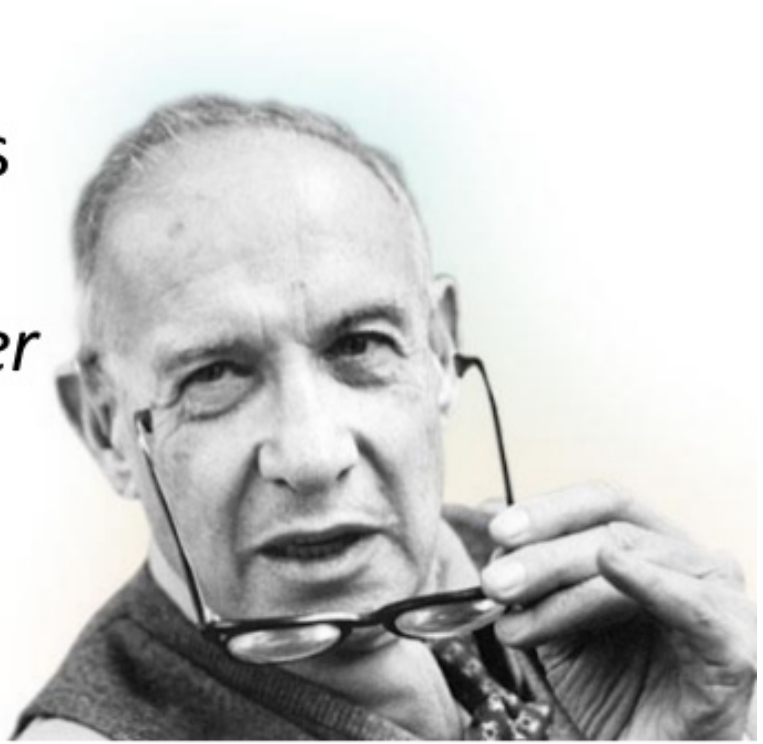
New types of competitions for WSI

- Competitions for collaboration / teamwork, including product lifecycle management (PLM) competitions for teams
- Soft skills competitions, including cross-cultural communication & public presentation
- Problem-solving challenges
- Competitions for WS experts (assessment & communication)
- Challenges for educators & trainers
- Specific “future skills”: cybersecurity, mobile app development, Industrial Internet analysis & configuration, recycling management, smart grid design, electric vehicle repair etc.

New role of WSI

- Massive WS competitions (natl & internatl) as skill validation centers
- WS to provide international industry credentials for student participants
- WS can build global online learning platform for skills (with use of AR) and use it for international skills validation (in distant perspective)
- WS can become a ‘skill archive’ for traditional & disappearing skills

"The best way to predict the future is to create it."
– *Dr. Peter F. Drucker*

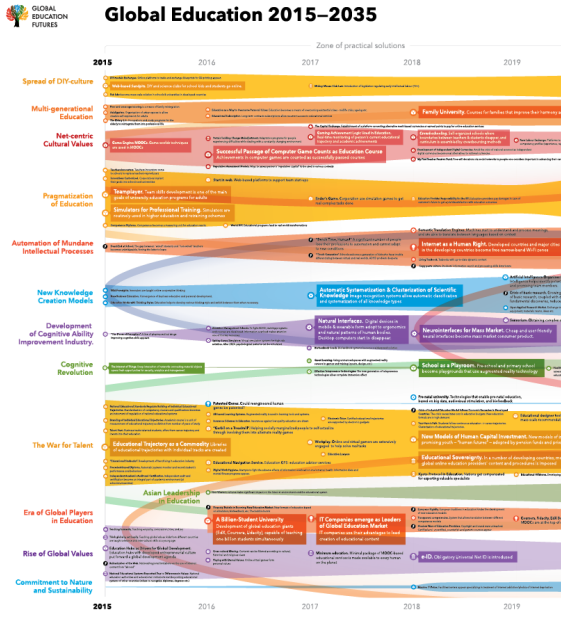


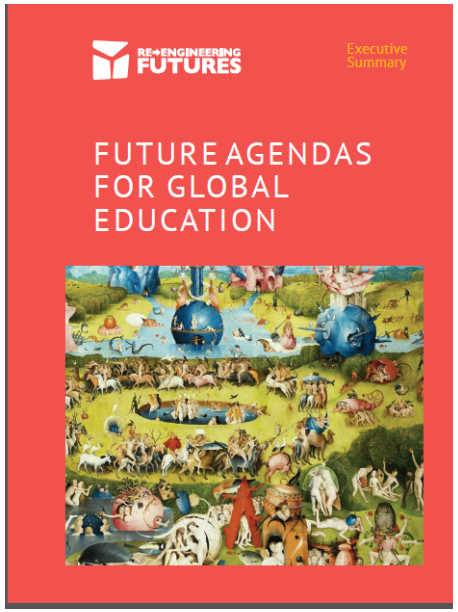
Would you like to know more?

Map of Global Education 2035

Future Agendas for Global Education report

GEF Infographics





These and other materials available at www.edu2035.org