

## The Future of Learning and Education



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02.03.2011, Paris



**Presentation based on:** 

- Desk research of foresight studies (TNO)
- General foresight research (Miriam Leis)
- Project: New Skills for New Jobs (TNO for DG Enterprise)
- Project: Future of Learning 2030 (TNO for IPTS & DG EAC)
  - Desk research
  - Expert survey
  - Expert workshop
  - Discussion lists

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## Foresight Studies very much focus on ICT, but less on topics like the future of arts and humanities education.

- 1. The Digital World in 2025
- 2. European Education and Training Systems in the Second Decennium of the Lisbon Strategy (2008)
- 3. Future Learning Spaces: new ways of learning and new digital skills to learn (2007)
- 4. Changing professions in 2015 and beyond (2006)
- 5. 2007 State of the Future. (With special feature on Education and Learning 2030) (2007)
- 6. Cyberinfrastructure for Education and Learning for the Future: A Vision and Research Agenda (2005)
- 7. Education for a Smarter Planet: The Future of Learning (2009)
- 8. Learning in and technology-enhanced world (2009)
- 9. New Skills for New Jobs. Anticipating and matching labour market and skills needs (2009)
- 10. Opening Education 2020 and beyond (2007)
- 11. School's Over: Learning Spaces in Europe in 2020: An Imagining Exercise on the Future of Learning (2009)
- 12. Research Challenges in the Design of Persistent Immersive Synthetic Environments for Education & Training (2007)
- 13. Skill Needs in Europe Focus on 2020 (2008)
- 14. The Future of European Education and Training Systems: Key Challenges and Their Implications (2008)
- 15. The Future of Learning Institutions in a Digital Age (2009)
- 16. The Future of Learning in the Knowledge Society: Disruptive Changes for Europe by 2020 (2005)



## Foresight Studies very much focus on ICT, but less on topics like the future of arts and humanities education.

- 17. Leading Future Education: Development of Digital Textbooks in Korea (2009)
- 18. Metaverse Roadmap. Pathways to the 3-D Web. A Cross-Industry Public Foresight Project (2007)
- 19. The Future of Key Research Actors in the European Research Area (2007)
- 20. Being Human Human-Computer Interaction in the Year 2020 (2008)
- 21. Human Enhancement Ethical Reflections on Emerging Nanobio-technologies (2007)
- 22. Creative system disruption: towards a research strategy beyond Lisbon (2005)
- 23. Digital Ecosystem Convergence between IT, Telecoms, and Entertainment (2007)
- 24. Higher Education in the Metaverse (2008)
- 25. Road Map for Arts Education. Building Creative Capacities for the 21st Century (2006)
- 26. ICT for Learning, Innovation and Creativity (JRC Technical Notes) (2008)
- 27. New Learning Environments for the 21st Century (2005)
- 28. E-Skills, Competitiveness and Employability Knowledge Societies' Next Frontier (2008)
- 29. Trusteeship, Wisdom and the Creative Future of Education (2008)
- 30. Emerging Science and Technology priorities in public research policies in the EU, the US and Japan (2006)
- 31. The Future of Education School 2020 (2007)
- 32. Learning 2.0 Case Database. (2009)
- 33. Learning while Mobile. In: International Society for Technology in Education (2008)
- 34. The future of higher education: How technology will shape learning. (2008)



### **Facts and Figures: Demography**

• Declining birth rates and increase in share of population 70+ until 2030





### **Facts and Figures: Migration**

"[t]he size of Western and Central Europe's labour force is 227 million. In the absence of immigration and at constant labour force participation rates this labour force would **shrink to 201 million in 2025** and to 160 million in 2050. In order to maintain it constant over the analysed period a **net inflow of 66 million labour migrants would be necessary**"

(HWWI/OECD)

Incerasing share of children with non-EU migration background in European schools

#### **Challenges:**

- Integration and education of migrant pupils/students
- Additional supporting for migrant children
- Sensitive topic to address



### Facts and Figures: Early School Leaving

*"in 2008, 14.9 % of those aged 18 to 24 (16.9 % of men and 12.9 % of women) were early school leavers, with at most a lower secondary education"* 

(Eurostat)

Early school leaving deprives young people from future chances and increases the risk for unemployment and low income.

#### Challenges:

- What are the reasons for early school leaving?
- How to tackle this issue?
- Seems to be a very complex "case-by-case" issue



### Facts and Figures: Knowledge Acceleration

"The "half-life of knowledge" is the time span from when knowledge is gained to when it becomes obsolete. Half of what is known today was not known 10 years ago. **The amount of knowledge in the world has doubled in the past 10 years and is doubling every 18 months** according to the American Society of Training and Documentation (ASTD)."

Scientific, technological and social changes (at least seem to) happen increasingly faster, i.e. accelerate. (One driver: Moore's "law" and the overarching role of ICT).

#### Challenges:

- What you learn today may soon be outdated!
- How to prepare for future job and skills needs?
- How to cope with (seeming) acceleration?
- Interrelation of innovativeness and education/skills



## Learning Technologies

An incerasing number of educational technologies, online resources, dictionaries, translation software, databases, decision support – and in the future advanced AI-systems – are available.



#### Questions:

- What does this mean for learning and learning content?
- Who assess and controls the information being provided?
- How to deal with information overflow?
- Can you understand things by "copy-paste"?
- Just-in-time knowledge and then forget it?
- Do we still need to learn things by heart and memorise?
- Does 'intelligent' technology makes us passive and uncritical?
- Cognitive Enhancement, something to worry about?



## **Future Jobs and Skills Requirements**

- Solving complex (information) problems (theories, devices, regulations etc. get more complicated and complex)
- Need to continuously update ones knowledge and (technical) skills (decreasing half-life of knowledge and information, lifelong learning)

## Multi/Interdisciplinarity (the boundaries of subjects are blurring and require modern "polyhistors/polymaths")

- Increasing relevance of social / soft and (inter)cultural skills (in a global, interdisciplinary, multicultural and diverse society)
- Self-Management / Regulation Skills / Time management (accelerating pace of society)
- Responsibility / Accountability (within an increasingly complex, interlinked and "anonymous" world)



## By 2030, do we have enough...

- Neurosurgeons?
- Quantum system experts?
- Molecular nanoengineers?
- Robot trainers?
- Genetic data experts?
- Vertical farmers?
- Nano medics?
- Ageing experts?
- Space tourist workers?
- Emerging Technology ethicists and lawers?
- Artificial Intelligence controller?
- Human Enhancement Medics?
- Energy experts?
- Complex systems modellers?
- Personal health managers?
- Al advancement supervisors?
- Regenerative Medicine experts?





## By 2030, do we still have...

- Construction workers?
- Standard service providers in Europe?
- Housekeepers?
- Industrial workers?
- Routine knowledge workers?
- Accountants?
- Taxi/bus/metro drivers?
- Routine programmers?
- Human teachers?

















## The Curriculum of the Future is already Reality Now!

- Futures Studies & Forecasting
- Policy, Law & Ethics
- Finance & Entrepreneurship
- Networks & Computing Systems
- Biotechnology & Bioinformatics
- Nanotechnology
- Medicine, Neuroscience & Human Enhancement
- AI & Robotics
- Energy & Ecological Systems
- Space & Physical Sciences



"Singularity University's mission is to assemble, educate, and inspire leaders who strive to understand and facilitate the development of exponentially advancing technologies in order to address humanity's Grand Challenges."



## **Needs for Changes in Education**

#### Growing interest and importance of ICT

- $\rightarrow$  ICT skills and thoughtful application of ICT in schools and education
- $\rightarrow$  More ICT developments for educational purposes

#### Growing interest and importance of gaming in education

- $\rightarrow$  Discover and assess the value of gaming
- $\rightarrow$  Get rid of prejudice of gaming (e.g. gaming just distracts, leads to violence etc.)

#### Reassessing testing and certification

- $\rightarrow$  In how far does testing lead lead to knowledge and certification to competences?
- $\rightarrow$  Balancing need for efficiency with need for freedom
- $\rightarrow$  How to measure "the ability to creatively solve a problem"?

#### Individualisation and learning innovations

- → Adjust curricula to individual learning styles and interests
- → Interdisciplinary education
- $\rightarrow$  Balancing directed and undirected approaches to learning



## **Beyond Technology**

Technology, especially ICT opens up many new ways for learning, collaboration, communication, experiences, experimentation and research, but this also requires an according societal climate and ways to provide answers and advises:

- that encourages interdisciplinary cooperation
- that advises on how to learn and how to deal with data and information
- that serves the humanistic side of learning and education
- that allows for better equality in access and opportunities
- how to assess what has been learned?
- that make sure that we learn and know the right things and foster curiosity and creativity
- to ensures that people understand what they access and trustworthy sources and technologies



## Lifelong Learning is Central for the Future

- Lifelong Learning includes learning for personal, civic and social as well as for employment-related purposes.
- It takes place in and outside the formal education and training systems.
- Lifelong learning implies raising investment in people and knowledge; promoting the acquisition of basic skills, including digital literacy; and broadening opportunities for innovative, more flexible forms of learning.

Technological progress requires increasing Lifelong learning but also provides support for achieving this.

But technology only supports learning and improves accessibility, but people still need to have the willingness and 'discipline' to learn.









## **The Future of Learning**

New Ways to Learn New Skills for Future Jobs

A foresight study on behalf of DG EAC

Conducted by TNO led by IPTS for DG EAC



#### **Research Questions:**

- How can schools meet future learning needs?
- How can demand and supply of skills be matched? (avoid skills mismatches)

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How can people continuously update their skills? (Lifelong Learning)

#### Method:

- Desk research about current and expected future challenges in education, jobs, skills and competences requirements
- Online expert surveys tackling major challenges in education until 2030 (N > 90)
- Expert workshop
- Policy recommendations



Survey Findings: New jobs, dying jobs and frequent career changes

78% of experts expect that in 2025 an increasing number of today's jobs will become obsolete and an increasing number of totally new jobs will be created.

76% believe that it will be common for citizens to change their professional profiles completely, even repeatedly, over the course of their life.



for life

🗧 strongly disagree 🔚 disagree 🔄 not inclined either way 👘 agree 🔚 strongly agree 👘



#### Survey Findings: Teachers will remain, but their role may be extended

71% believe that teachers will be guides, mentors, friends and partners in self-regulated, personalised and collaborative learning processes.

86% oppose to the supposition that online resources and digital tools will be so powerful that teachers are no longer needed.

58% doubt that teachers will be replaced by "learning coordinators" who are not directly involved in learning processes, but compile sets of learning tools.



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■ strongly disagree ■ disagree □ not inclined either way □ agree ■ strongly agree



#### Survey Findings: More individualisation, but degrees and testing will remain

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#### Survey Findings: Learning will become more personalised





#### Survey Findings: Better recognition of non-formally acquired skills/comptences

86% argue that skills and competences obtained in non-formal ways need to be better recognised and accepted as formal qualification criteria.

56% think that, by 2025, informal learning experiences will have been recognised as a valuable asset for a new job.

<b>38//</b> 8%	31%	55%				
5%8%	31%	419	6	15%		

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strongly disagree disagree not inclined either way agree strongly agree



#### Survey Findings: Importance of real-life experience, general competences

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#### Survey Findings: Classrooms will become more diverse, multi-cultural

71% believe that multicultural classrooms will become the norm, thus requiring new strategies for teaching and learning.

By 2025, it has become normal for schools to provide support and training for pupils with insufficient language skills.



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#### Survey Findings: Self-responsibility for learning will become a necessity

87% think that people will need to become increasingly self-responsible for their own qualifications.

87% expect that it will be normal that people will need to supplement their official qualifications with extra on the job training.



http://www.innovation for life

strongly disagree disagree not inclined either way agree strongly agree



#### Survey Findings: New tools for learning and education will be available

75% believe that there will be abundant training opportunities that assist highly qualified people in reskilling for a new job

53% think that a range of sophisticated learning tools and programs will make it easy to prepare for career challenges.

84% think that people with low qualifications should opt for online and part-time training courses.

<mark>0%</mark>	20%	- 40 -	9 <mark>%</mark>	60	<mark>0%</mark>	80	9 <mark>%</mark>	100%
78/0	<mark>18%</mark>		45%			:	30%	•
<mark>%1</mark>	8%	27%			419	6	1	1%
-	1%		619	6			239	%

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■ strongly disagree disagree not inclined either way agree strongly agree



#### Survey Findings: ICT and technology assist in personalised education

85% believe that technology will allow schools and educators to create tailor-made learning experiences which increase learning outcomes.

76% think that a range of technological tools will help [students] to design [their] own learning trajectory, combining face-to-face tuition at school with online university courses and online learning communities.

92% emphasize that the advantages of technologies need to be better exploited for personalising school education.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	
<b>4</b> 8/6	11%		52%				Γ	33%			
<b>3</b> %	6 17	%	46%					30%			
<mark>98</mark> 9	6	3	7%	ł			55%	55%			

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■ strongly disagree ■ disagree □ not inclined either way □ agree ■ strongly agree



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#### Tackling Challenges: Inclusion



Cambodian elementary school child with migration background living in France

Challenge: Language, integration

Ideas:

- EU-wide learning tandems/learning networks
- (Voluntary) cultural exchanges with mutual learning effects
- Teachers with migration background
- The integration especially of children with migration background is socio-economically very important.
- Acquiring language skills is central
- The challenge also involves home and family







9<sup>th</sup> grade boy who is hyperactive, has lots of hobbies but is not interested in school and is in danger of early school leaving Challenge: Keep children interested in learning and school Ideas:

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- Better matching of personal interests and education/curriculum
- Different grading system that is not discouraging for children
- Better look at different learning styles and "cognitive diversity"
- Early school leaving can have different reasons ('case-by-case')
- Not all early school leavers / underachievers are stupid or lazy as such
- Learning and education is key, not 'school' as such
- Balancing the need for 'discipline' with freedom and creativity



#### Tackling Challenges: Re-entering the Labour market



A stay-at-home father in his mid-40<sup>th</sup> wanting to re-enter the job market. Although he has gained a lot of life-experience, he lacks formal qualification.

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Challenge: Certification of life experiences

Ideas:

- Getting training and certification upon informally/non-formally acquired knowledge and skills
- More flexible assessment and certification systems
- Especially in the context of Lifelong Learning and increasing requirements for self-responsibility for ones education, broader and flexible assessment schemes are necessary



#### Tackling Challenges: Re-entering the Labour market



A 59-year old expert who has discovered that her expertise has become obsolete

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Challenge: Skills updating, finding a job with advanced age

Ideas:

- Learning networks to keep up-to date with latest developments
- Foresight activities also in HR departments
- Finding links within multidisciplinary contexts
- As science, technology and societal developments are expected to change increasinly faster, knowledge and skills may become outdated sooner.
- Constant "environmental scanning" and "foresight" is integral to Lifelong Learning.



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#### The Educational World Around 2030

- ...knowledge, technologies and jobs will change more rapidly
- ... the half-life of knowledge will decrease
- ...people will retire later and experience more career changes throughout their life
- ...nearly all jobs will need higher skills, more knowledge and multiple competences
- ...people constantly need to keep their skills, knowledge and competences updated, reskill and upskill
- ...transversal skills and soft skill will become more important
- ...hard skills will change more often
- ...knowledge and competences obtained informally/non-formally will be accredited
- ...Lifelong learning is crucial and the key for everything



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#### The Educational World Around 2030

#### Schools:

...will still exist

...will be more multi cultural

...will utilize more technology/ICT or even robots

...will still be face-to-face but supplemented by virtual reality

...will still do assessments and grading but also look at extracurricular achievements

...should become more customized towards individual needs and interests

...should include more interests of the individual

...should cooperate closer with industries and universities



#### Challenges

- Integrating elderly on the job market
- Keeping ones skills updated in a fast-paced world
- Encouraging children and adults to educate themselves
- Making use of informally/non-formally acquired skills and competences

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- Balancing work, learning and free time
- Balancing 'discipline' (e.g. self-management) and freedom
- Balancing standardisation and individualisation



## Merci **Thank You**

# Questions ?

