

13:30–14:30

Moving mainstream with AR and VR in Higher Education

Developing

XR

Apps

at a University lab

Mikhail Fominykh

Norwegian University of Science and Technology ++

19.11.2020



ONLINE



**IMTEL**

Immersive Technologies for Learning



**Explore**

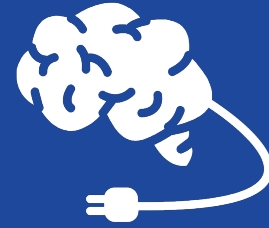


**Educate**



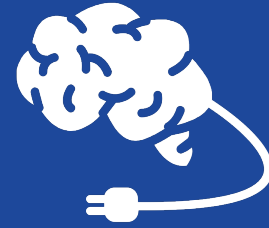
**Experiment**

# Practical considerations



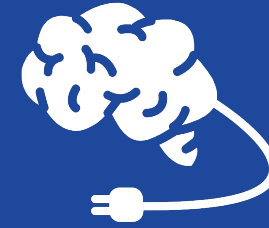
- > Software installation for computer class
- > Hardware maintenance and repair
- > Cleaning
- > Managing equipment and accounts: lab-centered vs BYOD
- > Project work/homework challenge: equipment available only in the lab
- > Network (Wi-Fi) requirements and protected networks
- > Software licenses

# Practical considerations



- > Storing/reusing the code: GIT for student collaborative projects
- > Evaluation of student projects
- > Content creation challenge: Libraries of free 3D content vs. creating own content
- > Publishing and distribution of student apps
- > Copyright issues
- > Ethics considerations

# Practical considerations



- > Storing/reusing the code: GIT for student collaborative projects
- > Evaluation of student projects
- > Content creation challenge: Libraries of free 3D content vs. creating own content
- > Publishing and distribution of student apps
- > Copyright issues
- > Ethics considerations

Knowledge and expertise building: AR/VR development skills + AR/VR user skills ++

Moving  
Mainstream ?

growth of 1400% in  
demand for AR/VR  
engineers during 2019

## Moving Mainstream ?

AR skills have the highest  
projected growth in demand  
(207% in 10 years)

nearly all surveyed  
companies (97%) reported  
missing XR skills



growth of 1400% in demand for AR/VR engineers during 2019

## Model AR Curriculum

Fominykh, Wild, Klamma, Billinghamurst,  
Costiner, Karsakov, Mangina, Molka-  
Danielsen, Pollock, Preda, Smolic  
(to appear)

“A 2019 skill survey by Burning Glass and Epic games in cooperation with Unreal, focused on creative and 3D graphic skills, but also included AR [19]. Their findings confirm that all 3D skills, including those in AR, are undersupplied. The report also identifies that the number of hybrid jobs that require both creative and technical skills is growing. Their results also highlight the growing demand for 3D skills, where the AR skills have the highest projected growth in demand (207% in 10 years). The growth in demand is also reported by Hired that registered a growth of 1400% in demand for AR/VR engineers during 2019 based on the data from employers and job seekers [14].

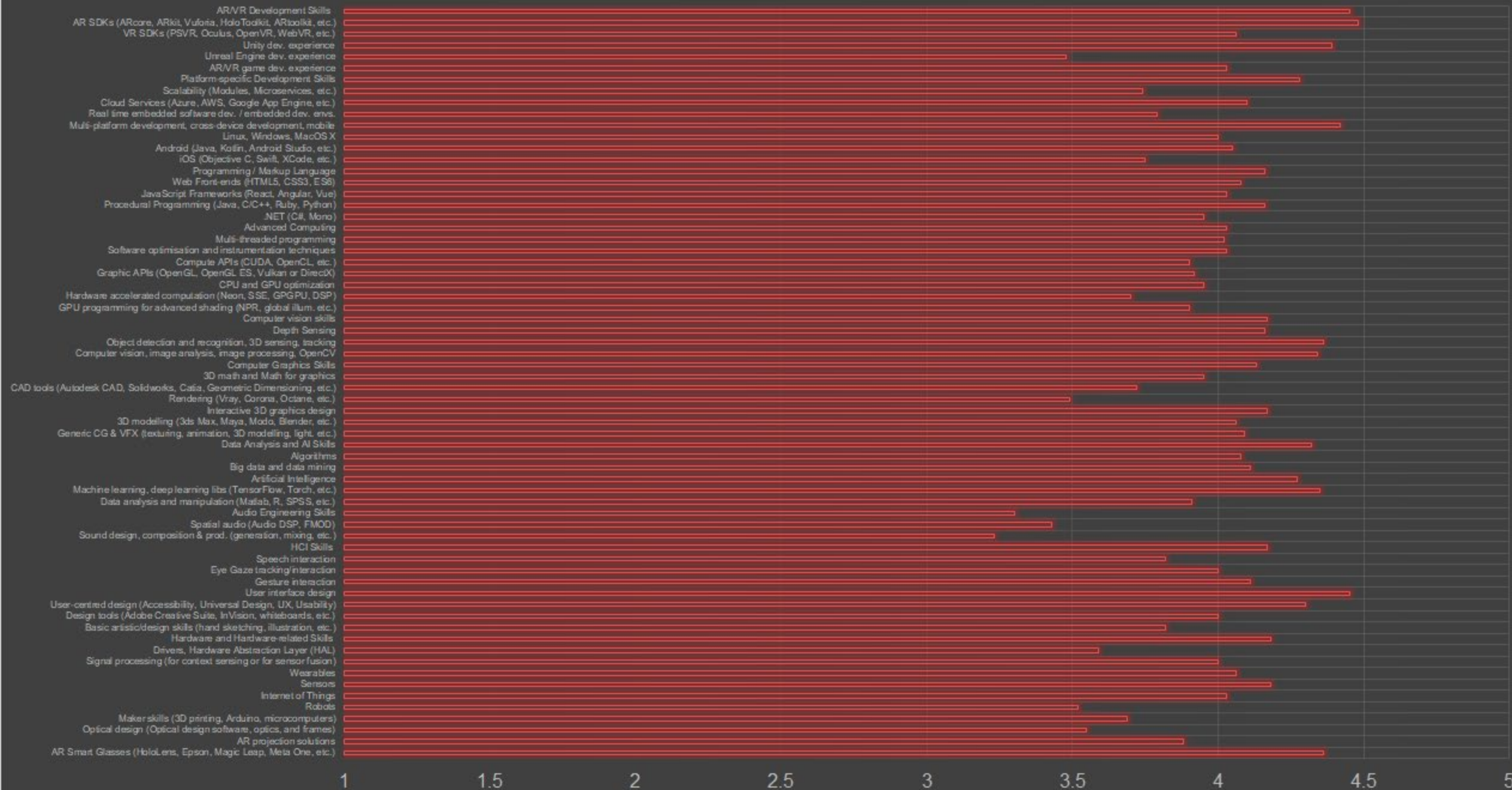
Story Futures report a significant gap in immersive or XR (Mixed Reality or both AR and VR) skills based on a survey of the creative industry in the UK [3]. Nearly all surveyed companies (97%) reported missing XR skills, while 65% of them consider this as a major barrier to their growth. The report also identifies that there is a need for both technical and creative skills. The report stresses that the field of XR is interdisciplinary, meaning that teams must be built to work across a range of technologies and creative processes.

The private sector is concerned there is a lack of graduates with relevant skills to keep up with demand in the emerging discipline. This can be seen as a broken skills pipeline. Formal training and education are not part of the culture in the creative sector, and thus a contributing factor to the absence of curricula models in AR.”

AR skills have the highest projected growth in demand (207% in 10 years)

nearly all surveyed companies (97%) reported missing XR skills

# AR Skills evaluation (mean on a scale: 1 not important, 3 neutral, 5 very important)







# Existing Teaching Practices and Future Labour Market Needs in the Field of Augmented Reality

Analytical report

Editor: Mikhail Fominykh

Authors: Anna Bilyatdinova, Mikhail Fominykh, Istvan Koren,  
Joanna Jesionkowska, Andrey Karsakov,  
Aleksandr Khoroshavin, Ralf Klamka, Alexandra Klimova,  
Judith Molka-Danielsen, Jazz Rasool, Carl H Smith, and  
Fridolin Wild

Augmented Reality in Formal European University Education – AR-FOR-EU – project has  
received funding from the European Union's Erasmus Plus programme, grant agreement  
2017-1-ND01-KA203-034192.



2017-1-ND01-KA203-034192  
Augmented Reality in Formal European University Education – AR-FOR-EU – project has  
received funding from the European Union's Erasmus Plus programme, grant agreement  
2017-1-ND01-KA203-034192.



Fridolin Wild  
Judith Molka-Danielsen, Jazz Rasool, Carl H Smith, and  
Aleksandr Khoroshavin, Ralf Klamka, Alexandra Klimova,  
Joanna Jesionkowska, Andrey Karsakov,  
Anna Bilyatdinova, Mikhail Fominykh, Istvan Koren,

<https://codereality.net/report/>

# Pandemic-Induced Constraints

Jesionkowska, Wild, Fominykh, Molka-Danielsen (2020):  
Pandemic-Induced Constraints on Rapid Transformation to Digital Education

## Before pandemic

### Access to equipment

- Full access to campus and equipment
- Simple booking system possible
- Simple cleaning

### Infrastructure

- Group-work possible
- Fast Bandwidth

### Work-Life balance

- Personal and professional can be clearly separated

### Social Distancing

- Small groups
- Bonding experience via social programme

### Research

- Study participants from target group
- Assemble in lab or reserved room

### Assessment

- Simple invigilating
- All forms of exams possible

### Circadian Rhythms

- Managed by institute/school, paced daily schedule

### Mental Health

- Background levels of mental health challenges

### Physical Health

- Possible to take care of health: be active, healthy eating, sport

### Social Awareness

- Motivation through audience feedback, reactive Q&A

### Attrition

- Background levels of attrition

### Openness

- Limited: restricted to places available in room booked

### Student Support

- Drop-in hours, 1:1 sessions, easily available resources and services at uni

## During pandemic

- Reduced access -> Use emulators, buy online, or mail equipment
- Not clear what is the best way of disinfecting
- Limited access to special hardware

- Too few/weak computers per household, low connectivity, fallback to mobile devices
- New online learning management tools needed, bandwidth, and CPU power

- Retreat into the private: props needed, lack/less dress code, kids around & interrupting
- Disruptions, longer hours of work
- No need to commute, no travel gives more time

- Lack of interaction
- Meeting virtually via chat applications
- Can be an improvement for people with difficulties in social interaction

- By experts, switching from quantitative to qualitative, using remote access or based on demo film recordings
- Pre-tests or verification are equally affected

- Difficulties in proctoring
- No face to face exams

- Disruption of daily life, missing time 'anchors', missing daylight markers due to indoor environment
- Family life may require not to be available at core working hours

- Coping with anxiety and worry
- Living through a crisis, uncertainty, distress: can be traumatic
- Coping with isolation, social shift
- Coping with grief

- Limited access to health care
- No sport facilities available
- Excess screen time, fatigue, limited outdoors time

- Lacking awareness

- Some dropouts due to illness
- Lowered expectations ("we are just asking you to work as much as you can")

- Unlimited, if online hosting allows
- Commitment of learners can vary
- Can be beneficial for people with disabilities

- Only online sessions and limited resources

# Pandemic-Induced Constraints

Jesionkowska, Wild, Fominykh, Molka-Danielsen (2020):  
Pandemic-Induced Constraints on Rapid Transformation to Digital Education



Developing

XR

Apps

at a University lab

Mikhail Fominykh

Norwegian University of Science and Technology ++

Mikhail.Fominykh@ntnu.no

19.11.2020



ONLINE