

International OBE Symposium

Ahsanullah University of Science and Technology (AUST) Bangladesh
10 & 11th September 2022



Augmented Reality for an Interactive Learning Experience of Manufacturing Processes

Dr. Nashrah Hani Jamadon



Outline

1

Introduction

- Understanding the Realities
- Examples of AR use

2

Motivation

- The needs of AR

3

UniteAR as AR Platform

- UniteAR in T&L the Manufacturing Process course

4

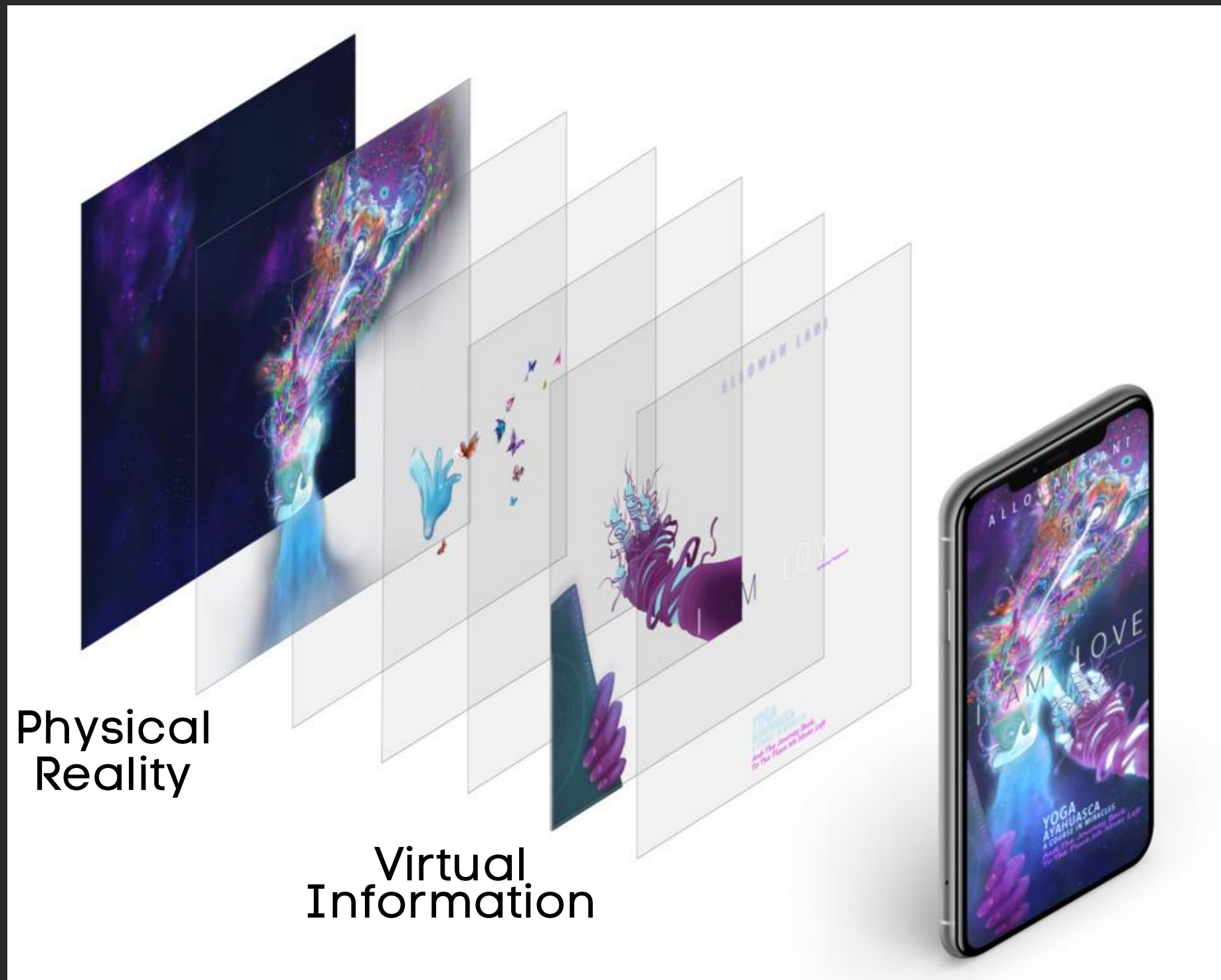
Current Work Direction

- Development of AR apps

5

Conclusion





1 Introduction

Understanding the Realities

- AR
- VR
- MR



xR

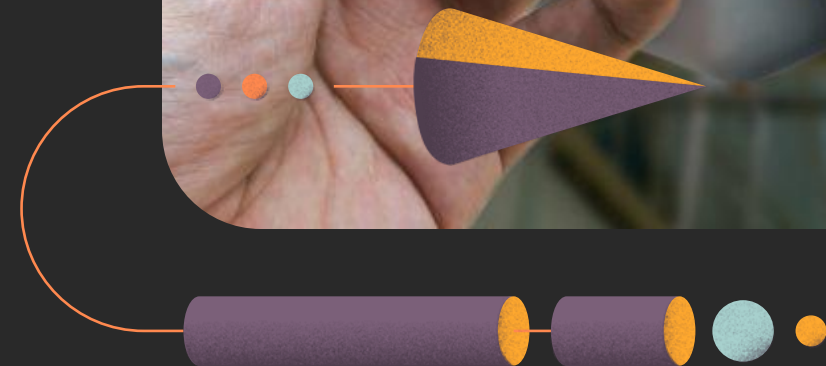


AUGMENTED REALITY

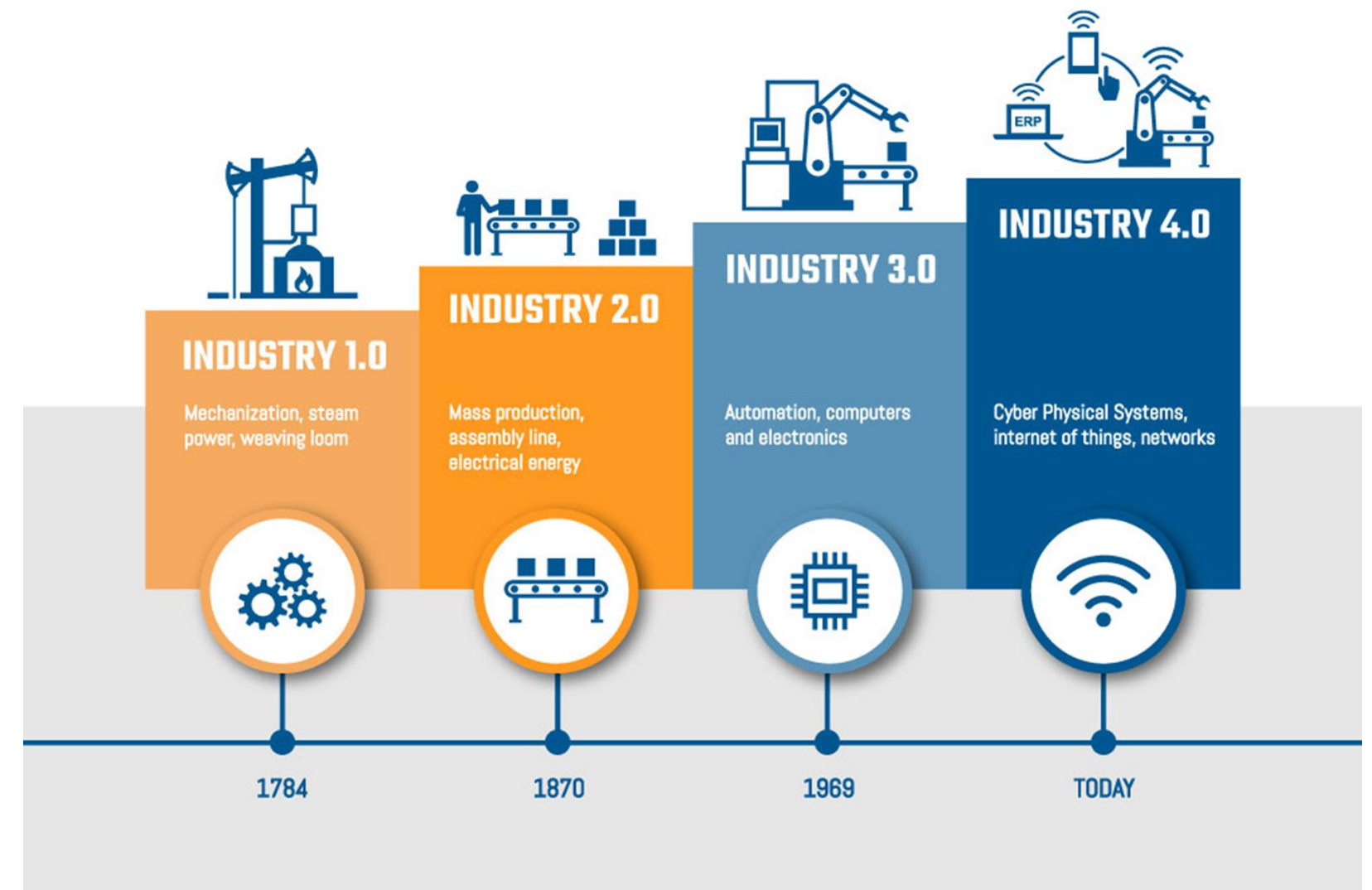
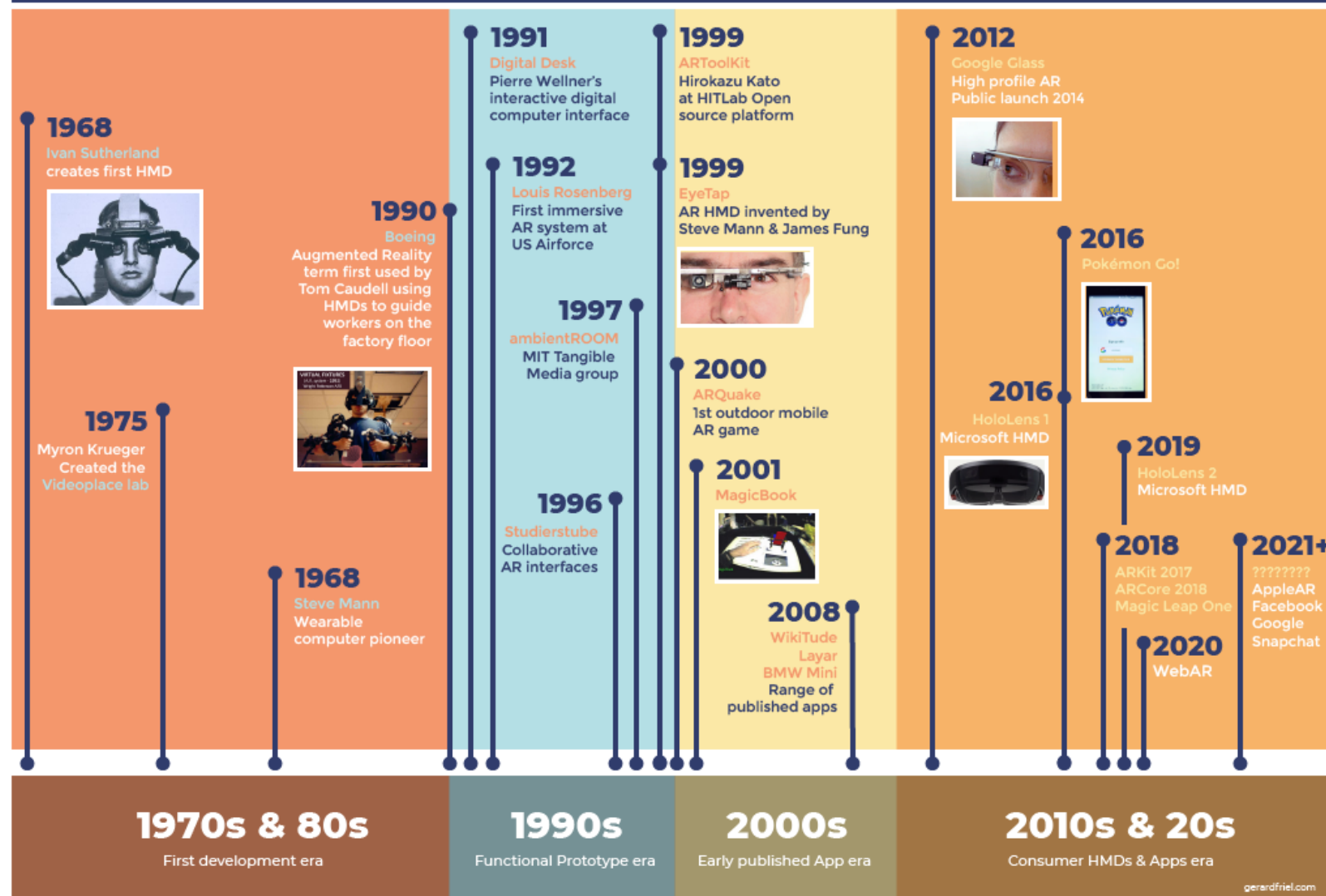


Is a human-machine interaction tool that overlays computer-generated information on the real-world environment:

1. combination of real and virtual objects in a real environment;
2. real-time interaction with the system, able to react to user's inputs;
3. geometrical alignment of virtual objects to real ones in the real world

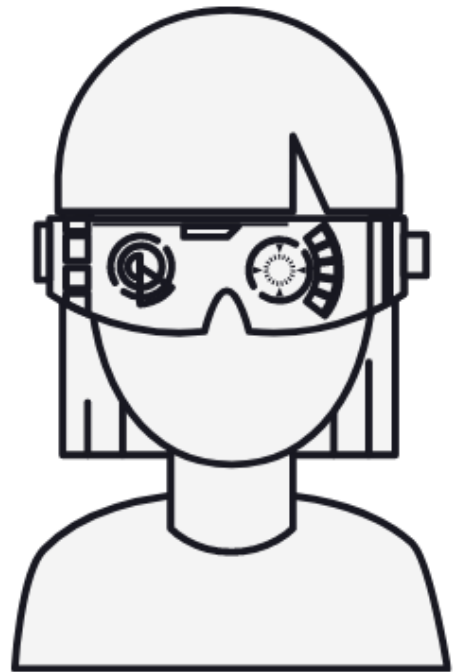


The History of AR



GLOBAL AUGMENTED REALITY SERVICES MARKET

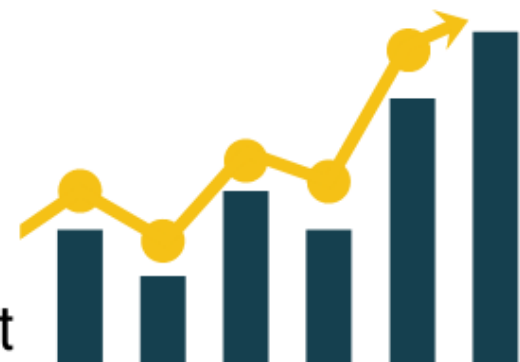
Information sourced from The Business Research Company
thebusinessresearchcompany.com



The augmented reality (AR) services market consists of sales of augmented reality services. Augmented Reality (AR) is an integration of digital information with a real-time environment. The AR services include services for the applications of training, preparation of annual reports and augmented brochures, architectural projects/new construction, games, trade show environments, marketing campaigns, medical uses, data visualization, entertainment, and location-based education.

The COVID-19 Outbreak Is Enforcing Companies To Shift Towards More Advanced And Virtual Solutions

Is The Main Driver Of The Market



The integration of blockchain technology is gaining significant popularity in the augmented reality services market. Blockchain technology is the Distributed Ledger Technology (DLT) in which digital assets are assigned with unique attributes using cryptography and are distributed on a decentralized and public ledger.

Expected **Growth Rate**
Till 2023

44.8%

Expected **Market Size**
By 2023


**\$148.72
Billion**

Disclaimer: The facts of this infographic are believed to be correct at the time of publication but cannot be guaranteed. TBRC Business Research Pvt Ltd can accept no liability whatever for actions taken based on any information that may subsequently prove to be incorrect. This infographic should not be reproduced, re-circulated, published in any media, website or otherwise, in any form or manner, in part or as a whole, without the express consent in writing of TBRC Business Research Pvt Ltd. Any unauthorized use, disclosure or public dissemination of information contained herein is prohibited. Individual situations and local practices and standards may vary, so viewers and others utilizing information contained within a presentation are free to adopt differing standards and approaches as they see fit.

BIGGEST INDUSTRIES

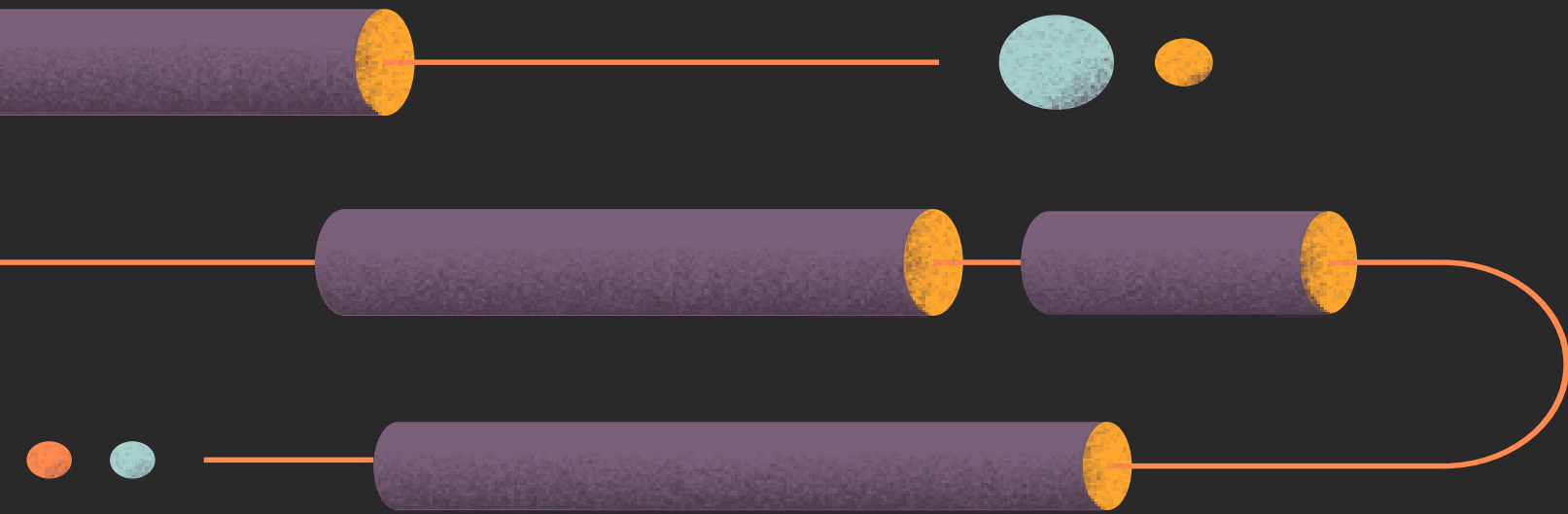
for augmented and virtual reality, by potential 2025 revenue



-  **VIDEO GAMES**
\$11.6 BILLION
-  **HEALTH CARE**
\$5.1 BILLION
-  **ENGINEERING**
\$4.7 BILLION
-  **LIVE EVENTS**
\$4.1 BILLION
-  **VIDEO ENTERTAINMENT**
\$3.2 BILLION
-  **REAL ESTATE**
\$2.6 BILLION
-  **RETAIL**
\$1.6 BILLION
-  **MILITARY**
\$1.4 BILLION
-  **EDUCATION**
\$7 MILLION

The Diverse Potential of VR & AR Applications

Popular AR Examples



POKEMON GO



IKEA

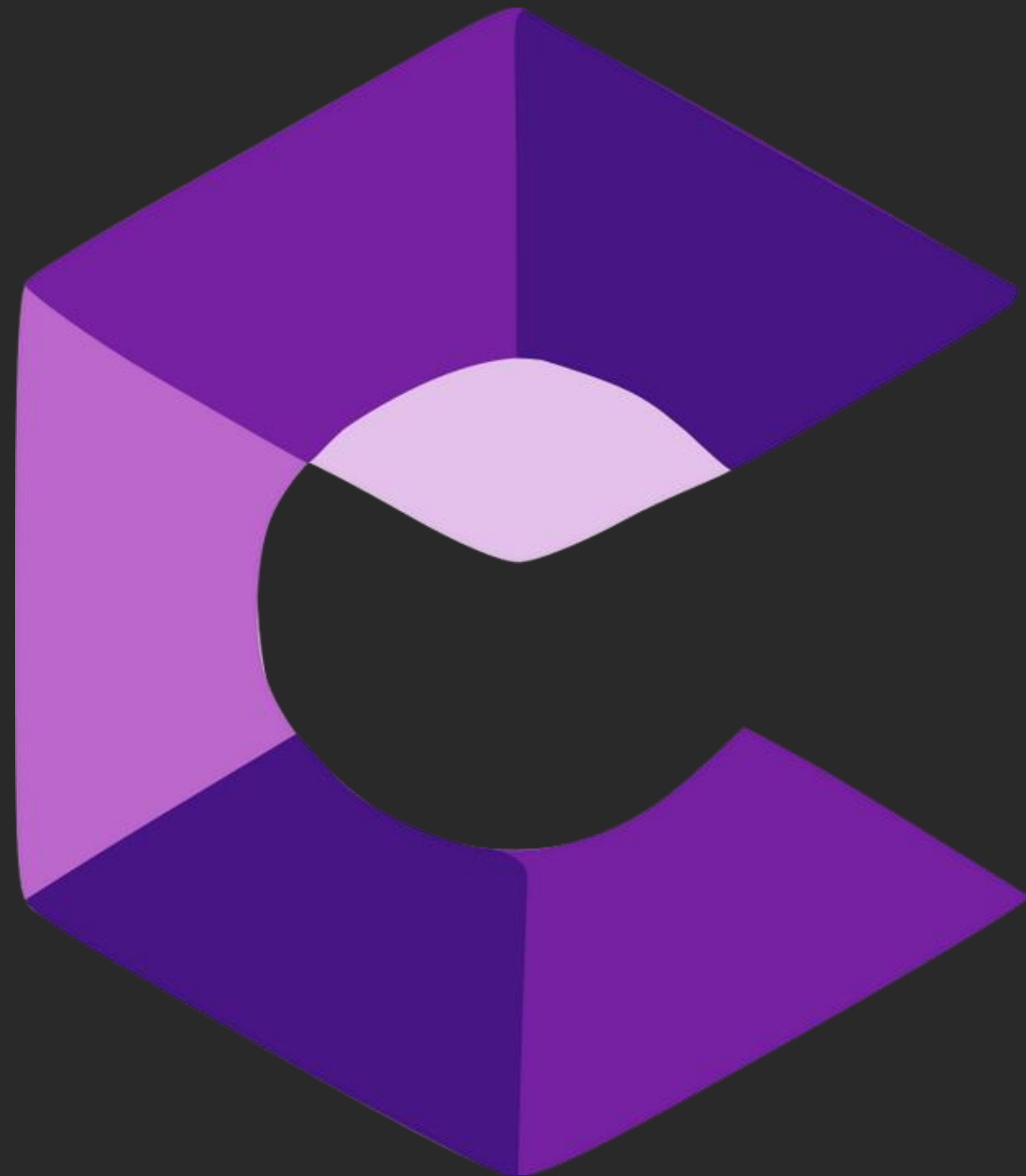


TOKYO OLYMPIC 2020



Google

Apple



ARCore

ARKit

...

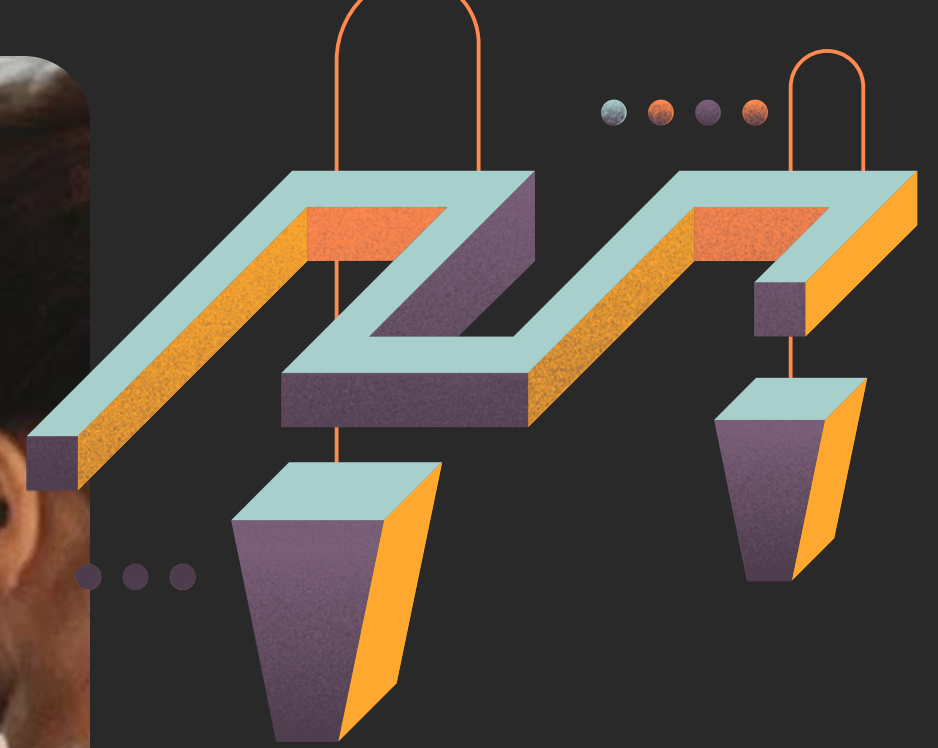
Application of AR in Education





Pre-School

- create a sense of reality
- make information colourful-visual
- a fun learning environment





Secondary & High School

- System of Augmented Reality for Teaching (SMART)
- Teach math, language arts, and scientific literacy skills
- AR is similar to a gamified application; kids were highly motivated to keep playing the game.



Higher Education

- From traditional to non-traditional learning



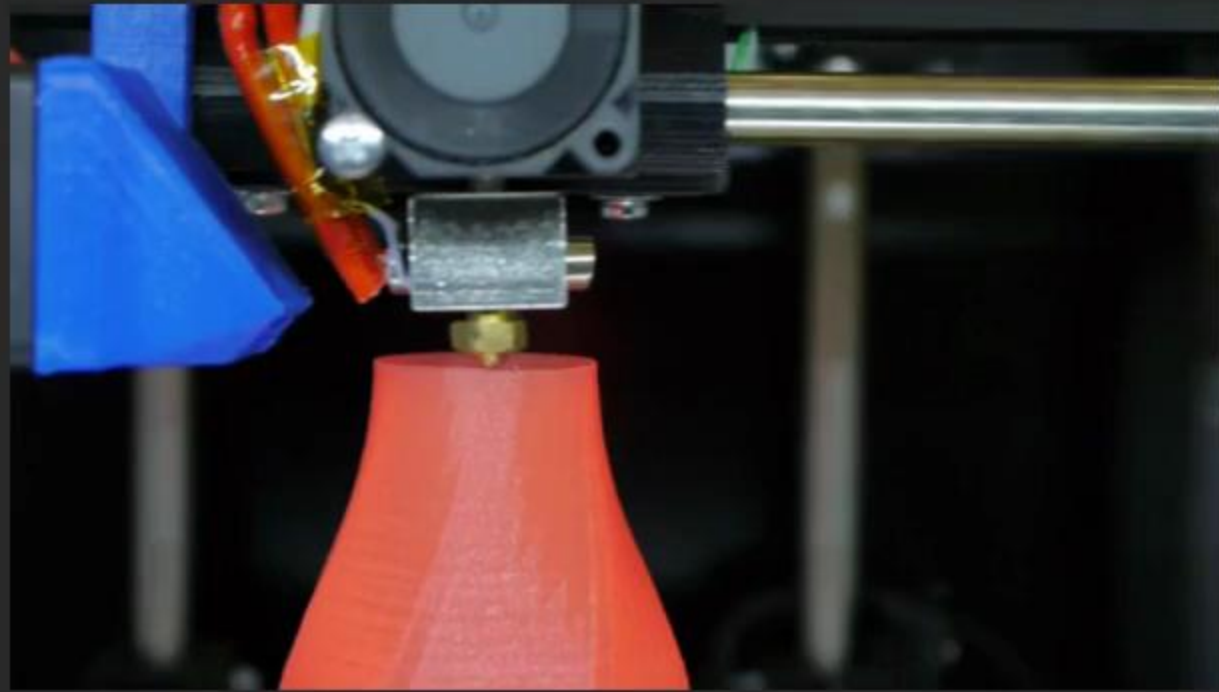
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2

MOTIVATION



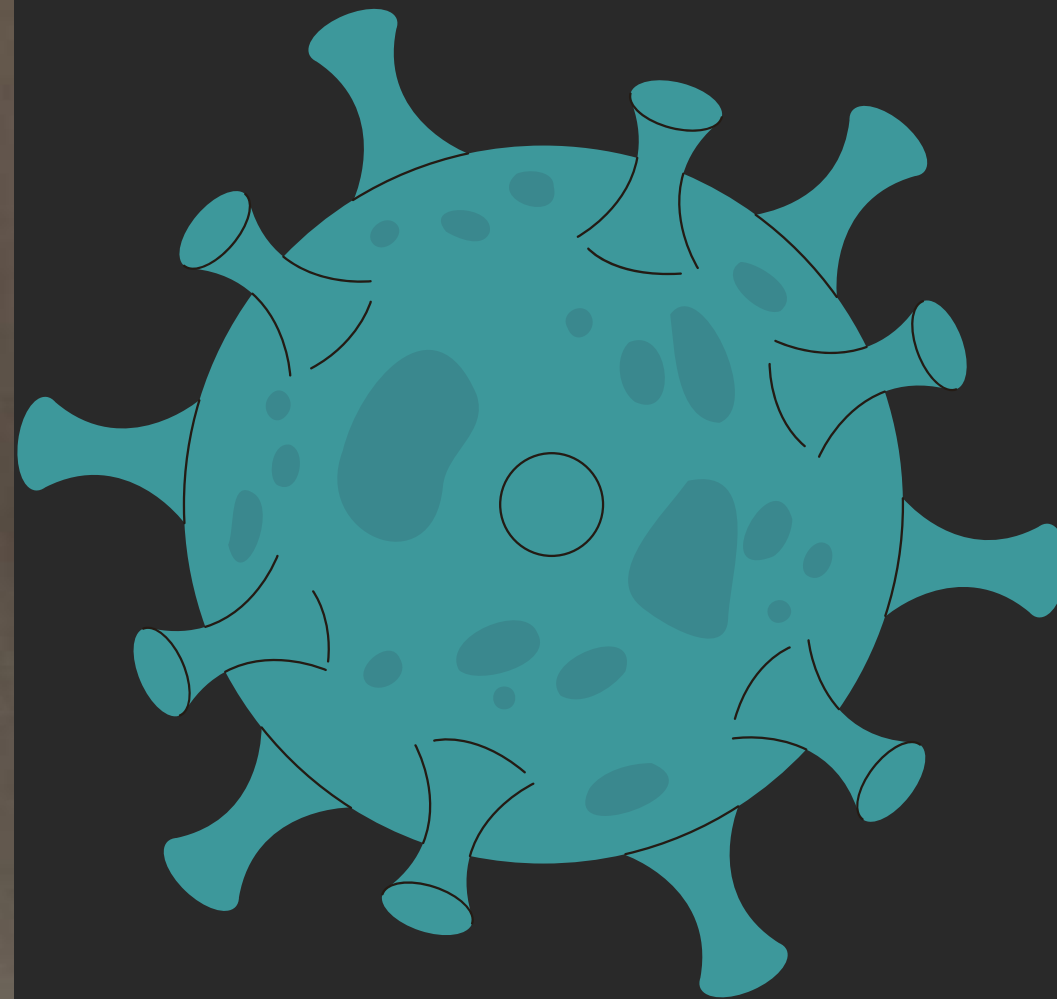
1. Manufacturing Processes



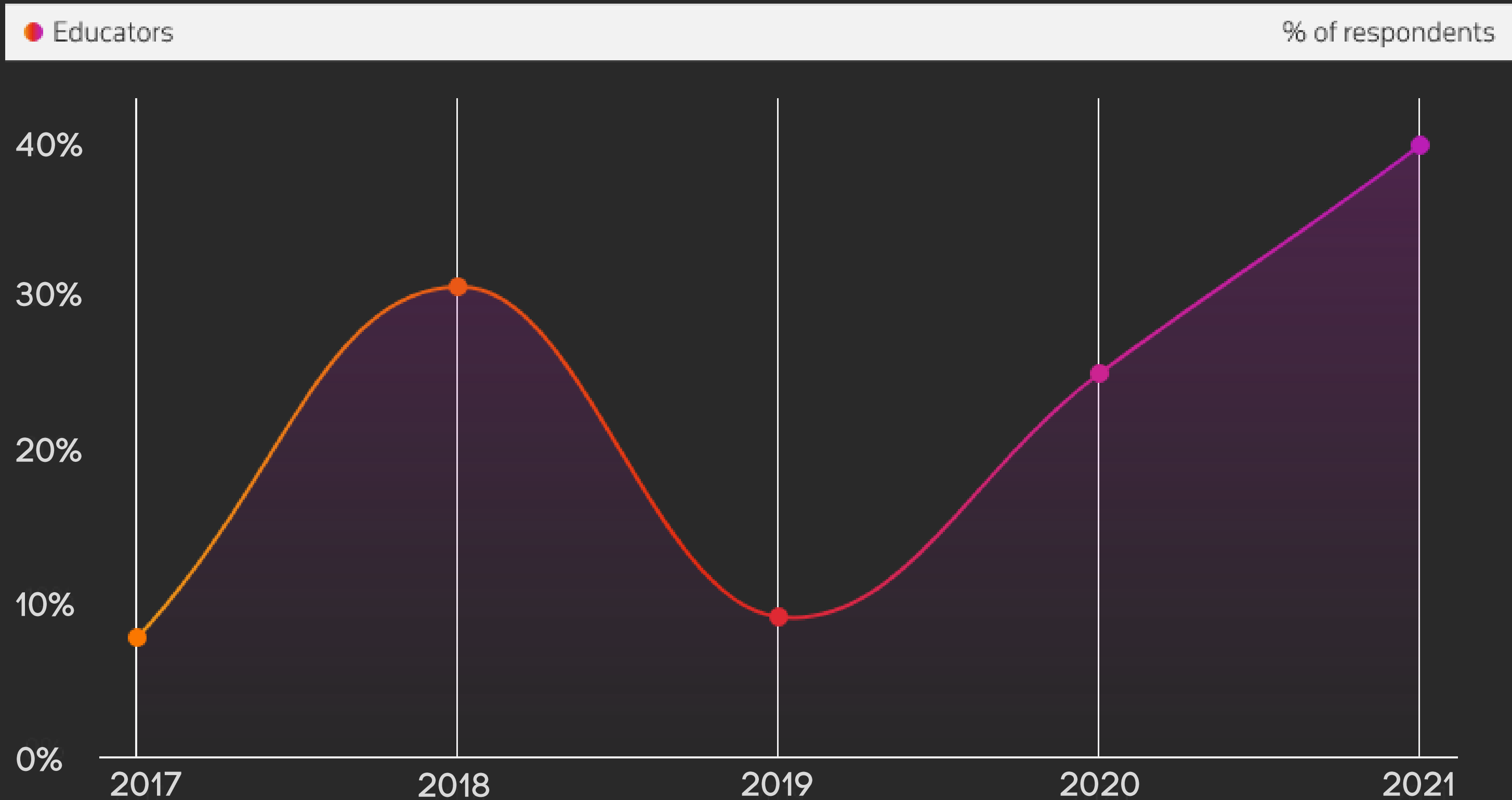
2. Site visit and hands on



3. Pandemic Covid-19



Educators agree to rely on technology to enhance learning



Data source: resourced.prometheanworld.com - The State of Technology in Education, 2020/2021

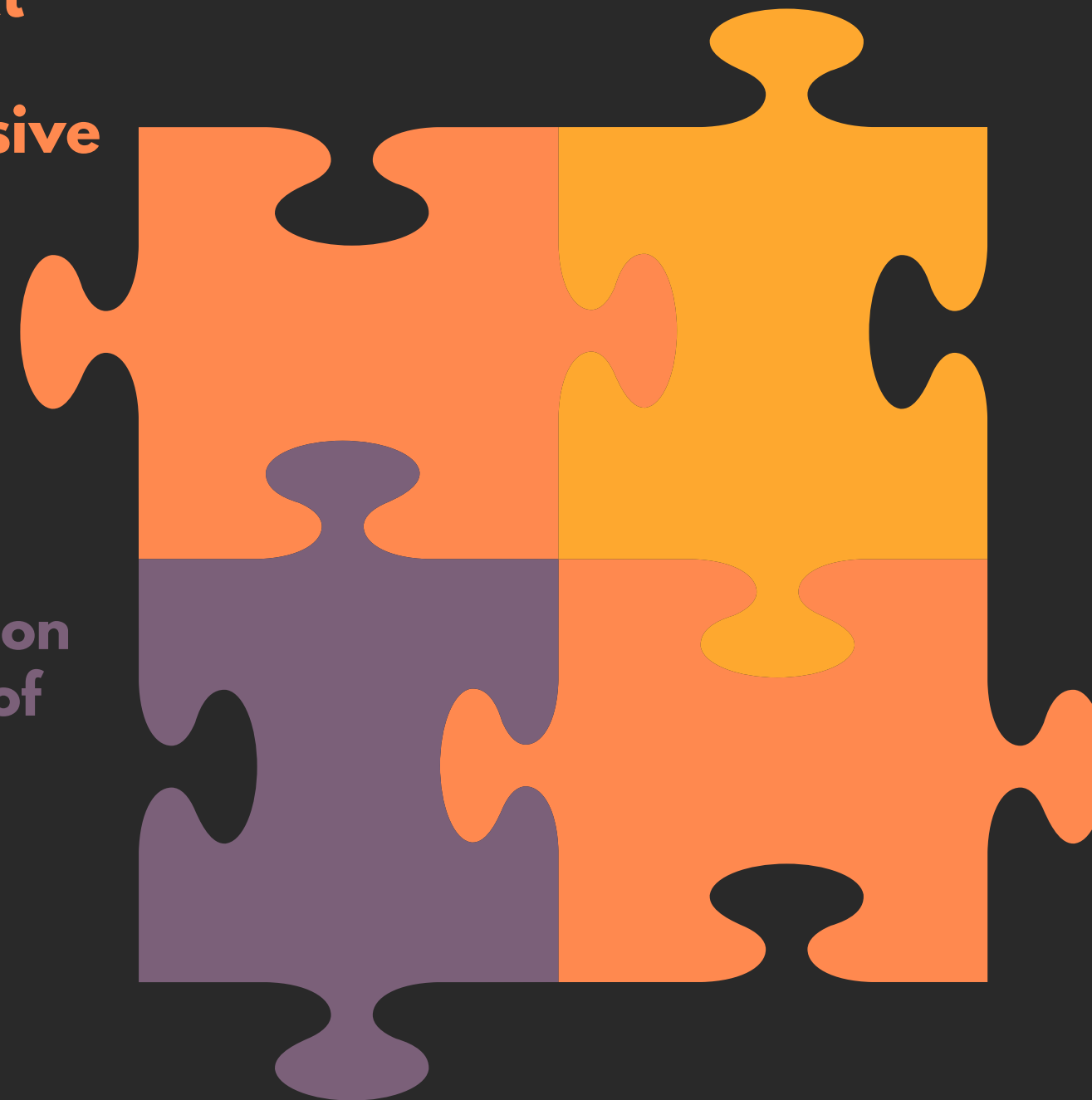
Improving education experience with Augmented Reality (AR)

Enables students safely conduct dangerous experiments, and interact with otherwise expensive machinery

Ex :
the impact of corrosive chemicals on a real-world environment

Achieve better knowledge retention and deepen their understanding of a specific subject

Ex :
Visual historical places/buildings from various countries



Obtain more accurate and detailed information by visualize complex objects

Ex :
Obtaining information through visuals from the relative size of various perspectives

Student-centered and personalized learning

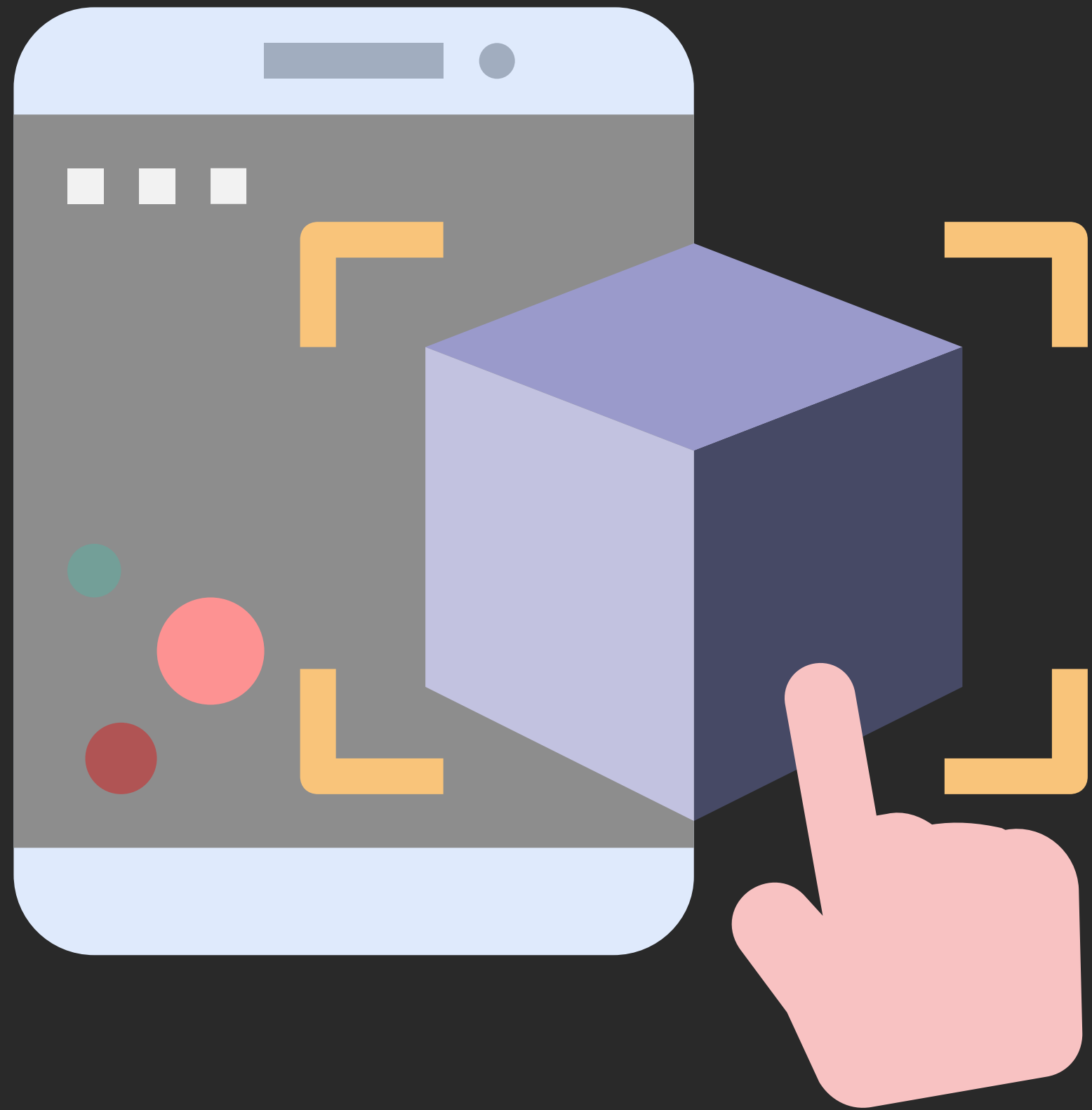
Ex :
Easy access to learning materials anytime, anywhere

Pre-Assessment:

Is the course ready for AR?



- How is AR presently used in engineering courses?
- Can AR be used a learning tool and meet pedagogical practices?
- Lecturer's readiness in embracing AR as an enhancement teaching tool
- Preparing students for AR



Augmented Reality (AR) as an Enhancement Teaching Tool in Manufacturing Processes

...

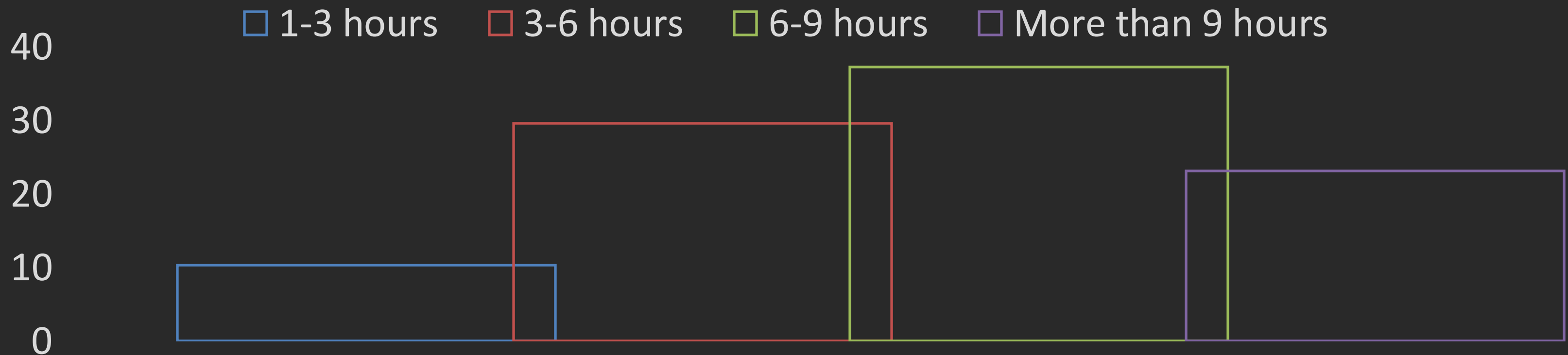
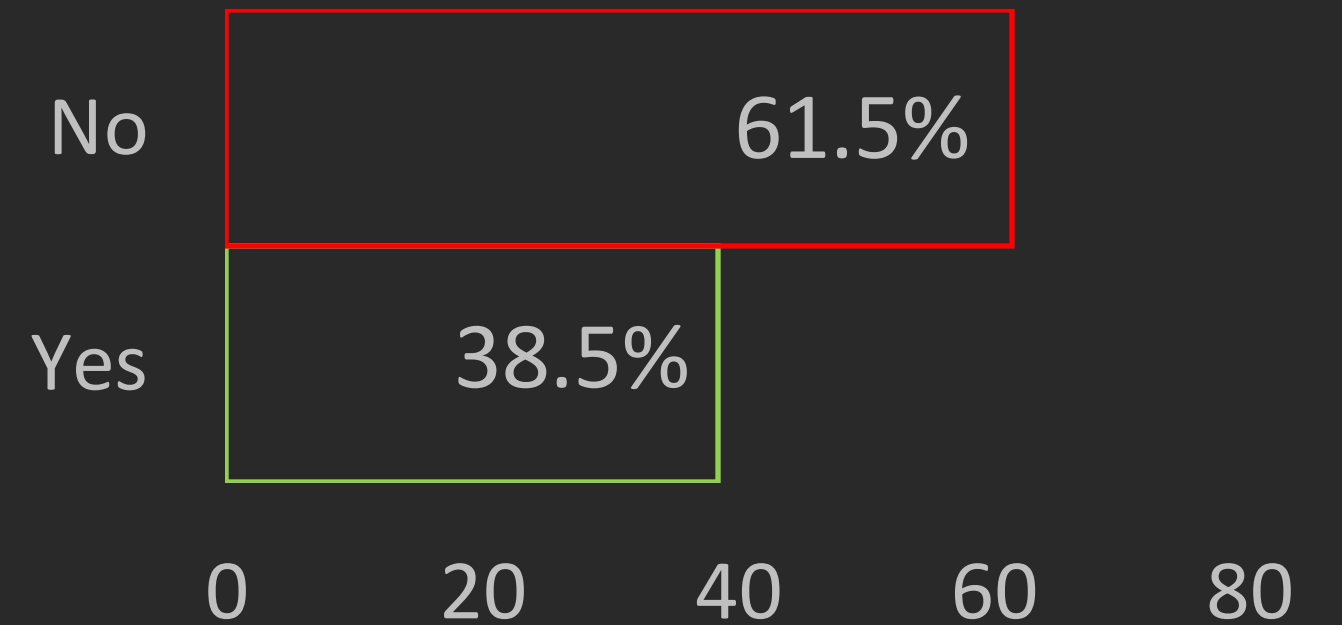
Way to start

1. STUDENT READINESS

Begin with a questionnaire on student readiness for the device, interest, etc



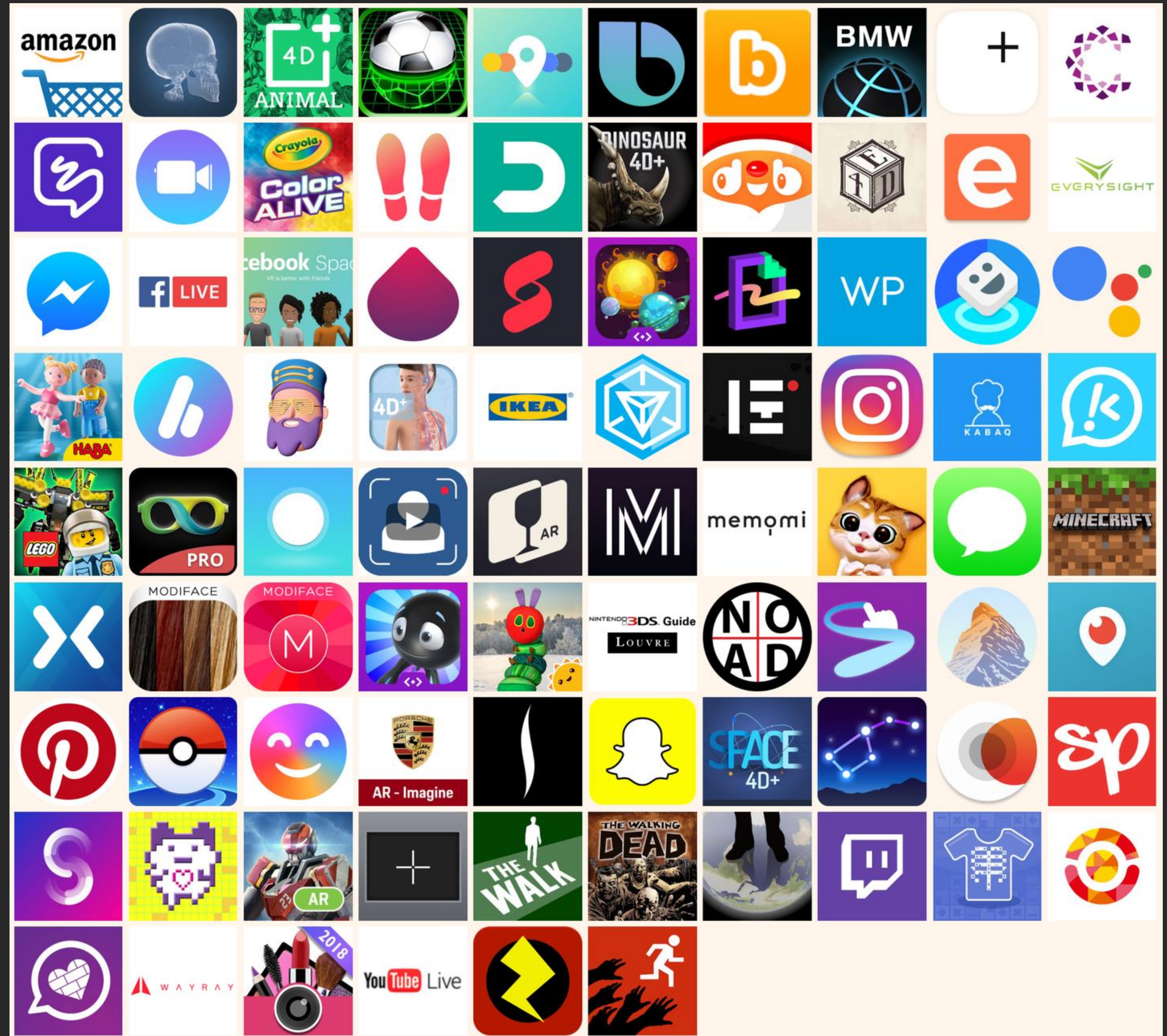
Experience using AR



Hours spend on phone per day

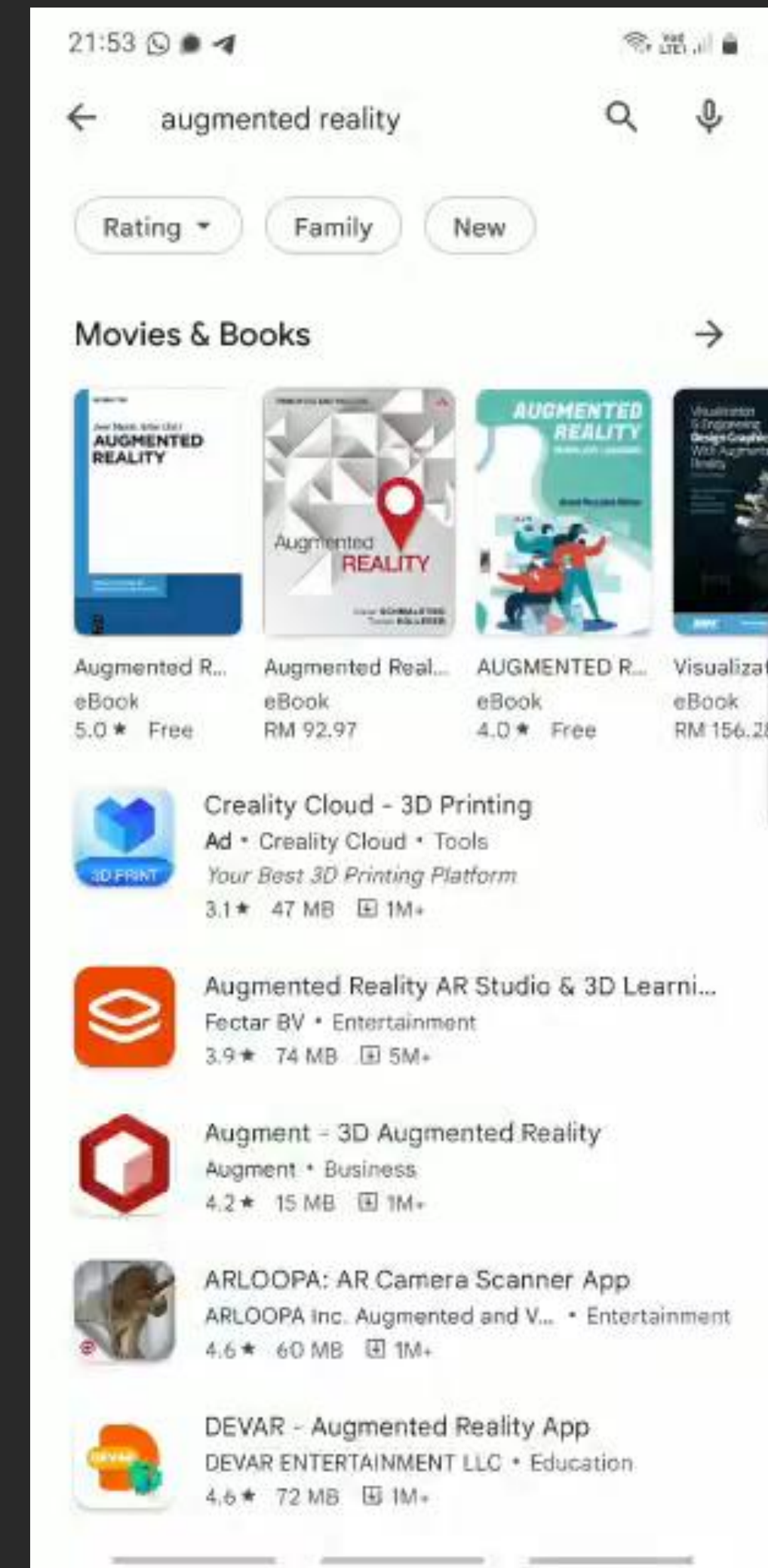
*Survey obtain:
KKMM2833 Manufacturing Processes
Year 2, Mechanical Engineering
Cohort 2021/2022, 115 students

2. Identify AR apps



Features selecting AR apps

- Adequate/suitable for the courses
- Easy to access
- Assessment workloads
- Visuals that are more informative and interactive

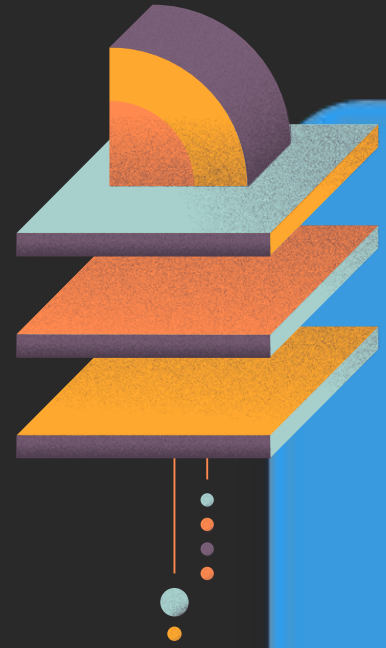


●●● 3. Aligning with Course Learning Outcomes

KKMM2833 Manufacturing Process

Year 2

	Course Learning Outcomes	Taxonomy	Delivery Method
1	Ability to use basic concept of engineering and knowledge of manufacturing processes of metal and non-metal based materials for solving problems in manufacturing engineering.	C3	Lectures, Problem based learning
2	Ability to provide justification on the selection of manufacturing methods for certain products based on the relationship between material, geometry, manufacturing quantity and its application for solving complex engineering problems.	C5	Lectures, Problem based learning
3	Ability to develop solutions for issues in manufacturing processes in order to fulfil engineering requirements.	C6	Lectures, Problem based learning
4	Ability to synthesise solutions for problems in manufacturing processes after analysis and interpretation of information through research methods.	C4	Laboratories (Open-ended/Guided)



UniteAR as AR Platform





AR GALLERY

Search for AR contents



Education
151

Architecture
70



Character
11

Animals
50



Vehicles
34

Others
18



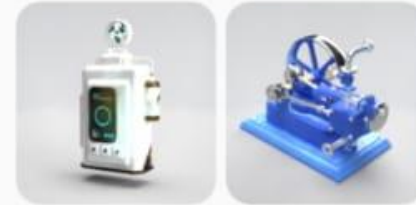
AR GALLERY

Search for AR contents



Accessories
51

Food
13



Machines
17

Musical Instruments
4



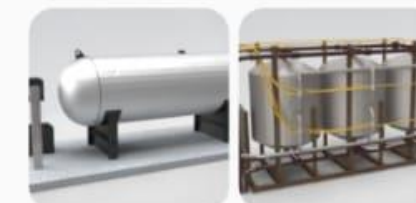
Vegetables
14

Fruits
19



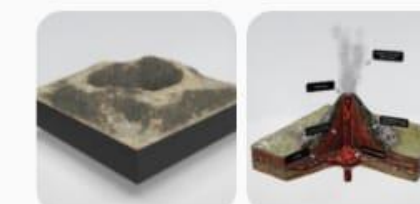
AR GALLERY

Search for AR contents



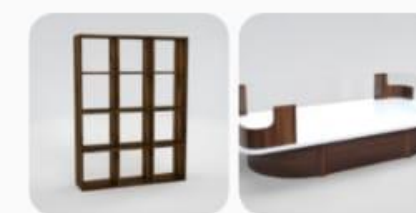
Industrial
31

Biology
8

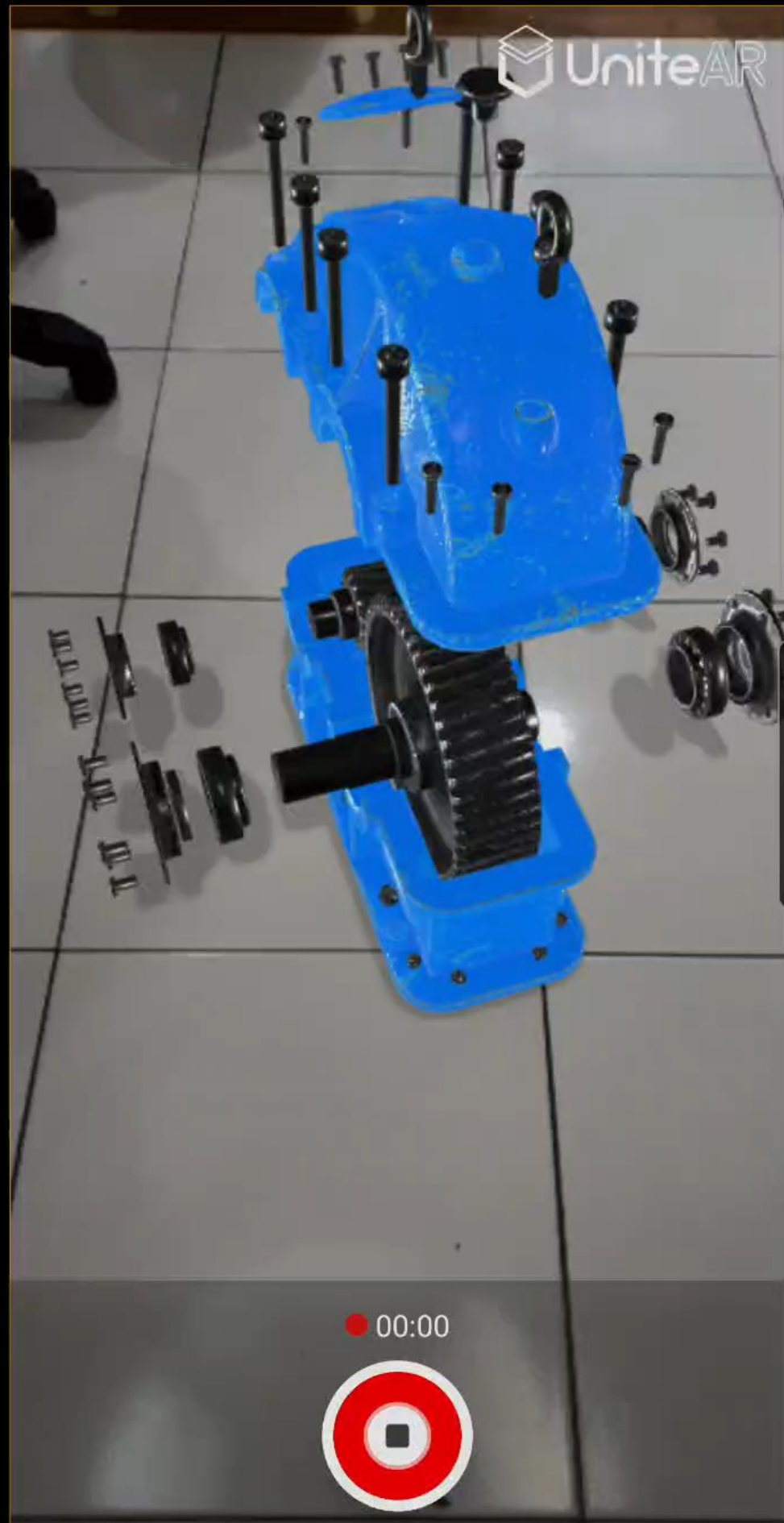


Birds
12

Science
8



Furniture
15



Record Video

Dr. Masruri Haniffahmadon, UKM



Record Video



Example of Self-Assessment for Cohort 2021/2022

Assignment on AR (5%)

Submission deadline 30th April 2022

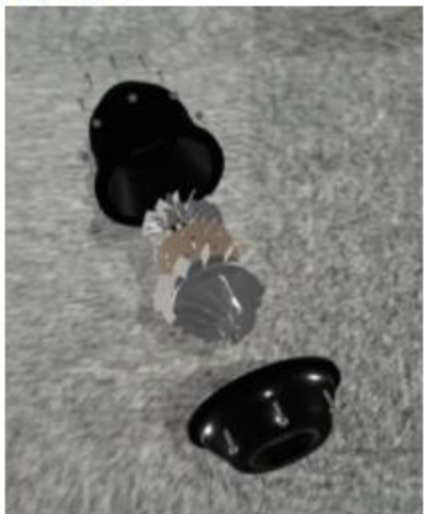
Assignment instructions

1. Install 'UniteAR' apps in your phone.



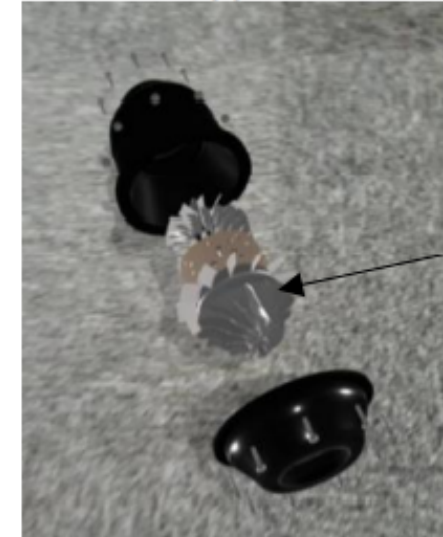
2. Select one content in 'AR Gallery'. Please select content that is related to machines or manufacturing technology/process.
3. Take photos for the selected content. It can be more than one photo because you can take from different angles.

For ex :



4. Write a report about the selected content.

- I. Discuss what is the function of the machine or component.
- II. Identify parts produced through the selected process. Use photo and labels the parts.
- III. What type of the processes involved?
- IV. What are the problems could occur at the indicated component, possible defects and how to prevent it?
- V. Suggest solution for the problems stated at IV



Turbine blade

Please submit by 30th April

Enjoy the game!

nhj

Report Assessment

e.g.

1. Discuss the function of the machine or component.
 2. What materials are used to make the component.
 3. What type of manufacturing process involved?
 4. Identify parts produced through the selected manufacturing process. Use photo and labels the parts.
 5. What are the potential defects and how may they be avoided?
- Solve real-life problems



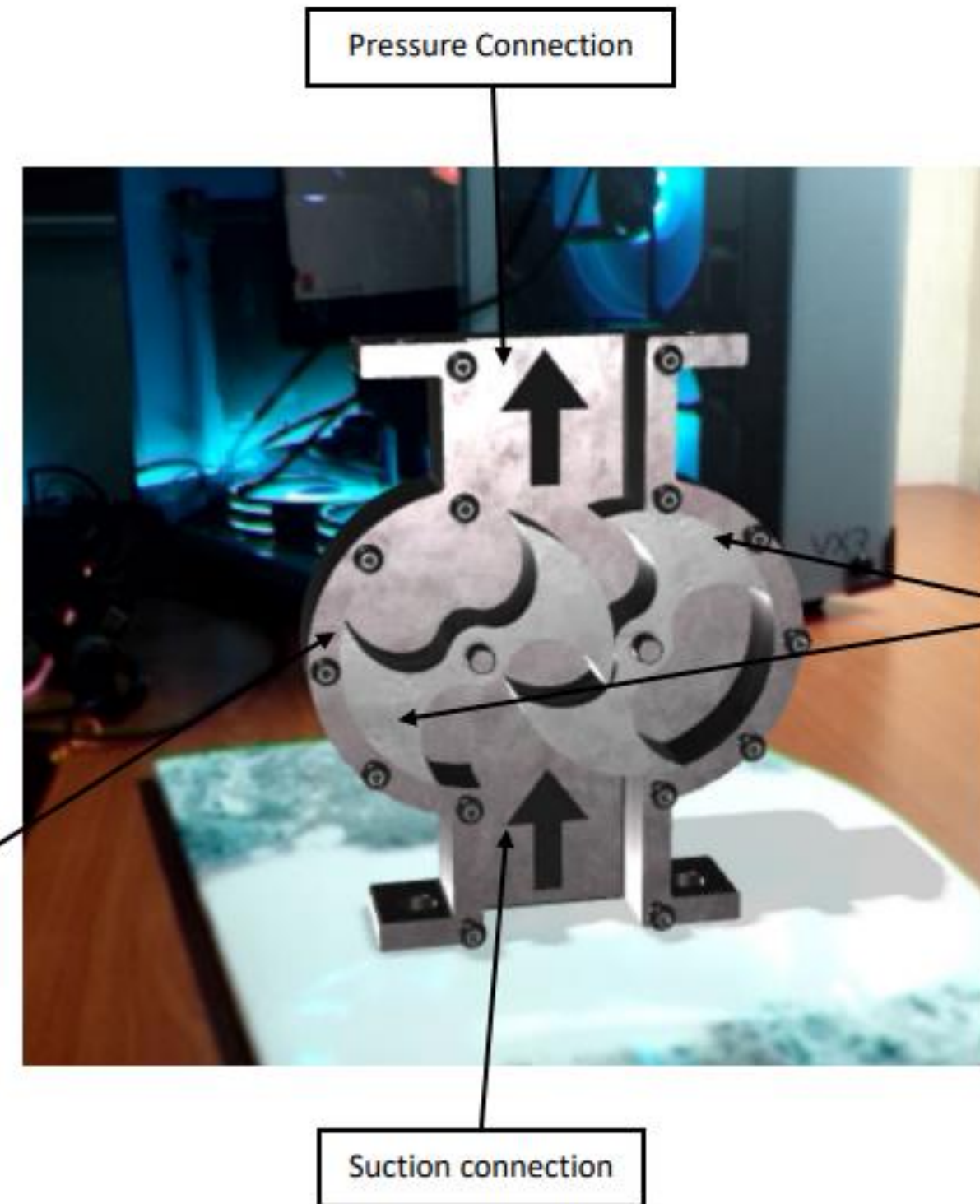
Student 1

COMPONENT IN THE MOTORCYCLE ENGINE THAT BEING CASTED



- Cylinder
- Piston
- Con rod
- crank

Student 2



Compressor Housing

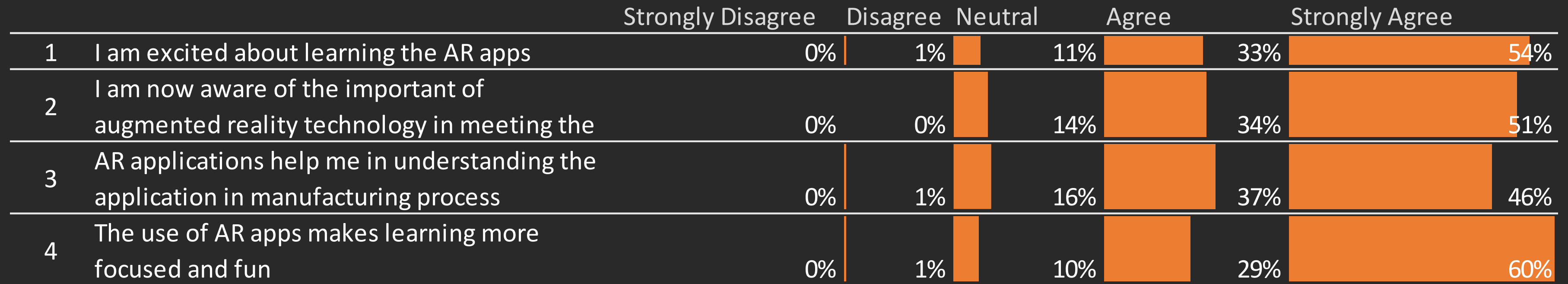
Pressure Connection

Rotor

Suction connection

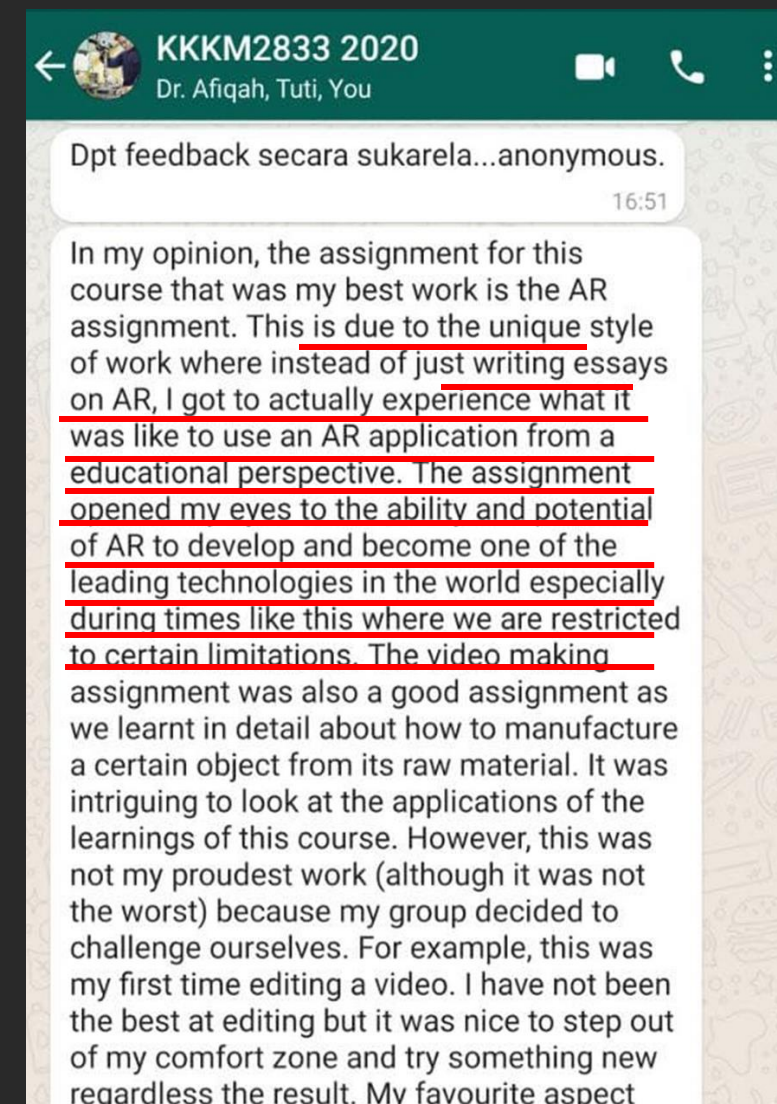
Figure 3 shows the rotary pump blower

Feedback from Students



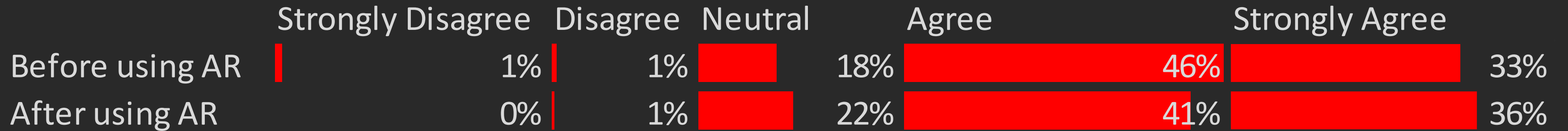
4. Could you please provide us with feedback on the use of AR apps in our class?

- It is easier for me to understand the topic as it gives me visual image that I can see.
- It is fun to use AR to learn. Hopefully we can have more opportunities to learn using AR in the future.
- Fun and exciting to explore each of the features and items in the apps.
- Very intriguing
- I like it
- it will be helpful for student to more understanding about manufacturing process
- I find that it is easier to understand with more visual based learning because it is easier to imagine the process than just learning theory
- Interesting, interactive, makes learning more fun
- It makes the class more fun and unique



*Survey obtain:
 KKMM2833 Manufacturing Processes
 Year 2, Mechanical Engineering
 Cohort 2021/2022, 115 students

Do you think that AR apps have the potential to be used as teaching and learning tools in manufacturing processes?



How do you feel about the use of AR in the classroom?



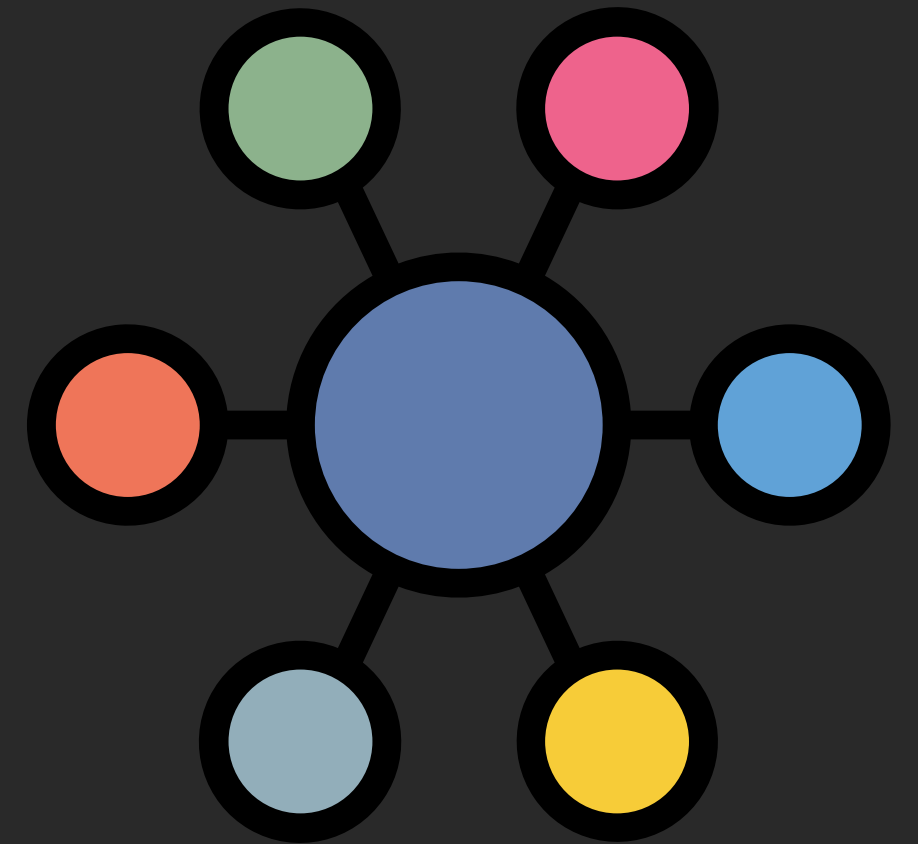
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 KKMM2833 Manufacturing Processes
 Year 2, Mechanical Engineering
 Cohort 2021/2022, 115 students



Limitation of UniteAR



AR apps with customizable content that fit our needs.





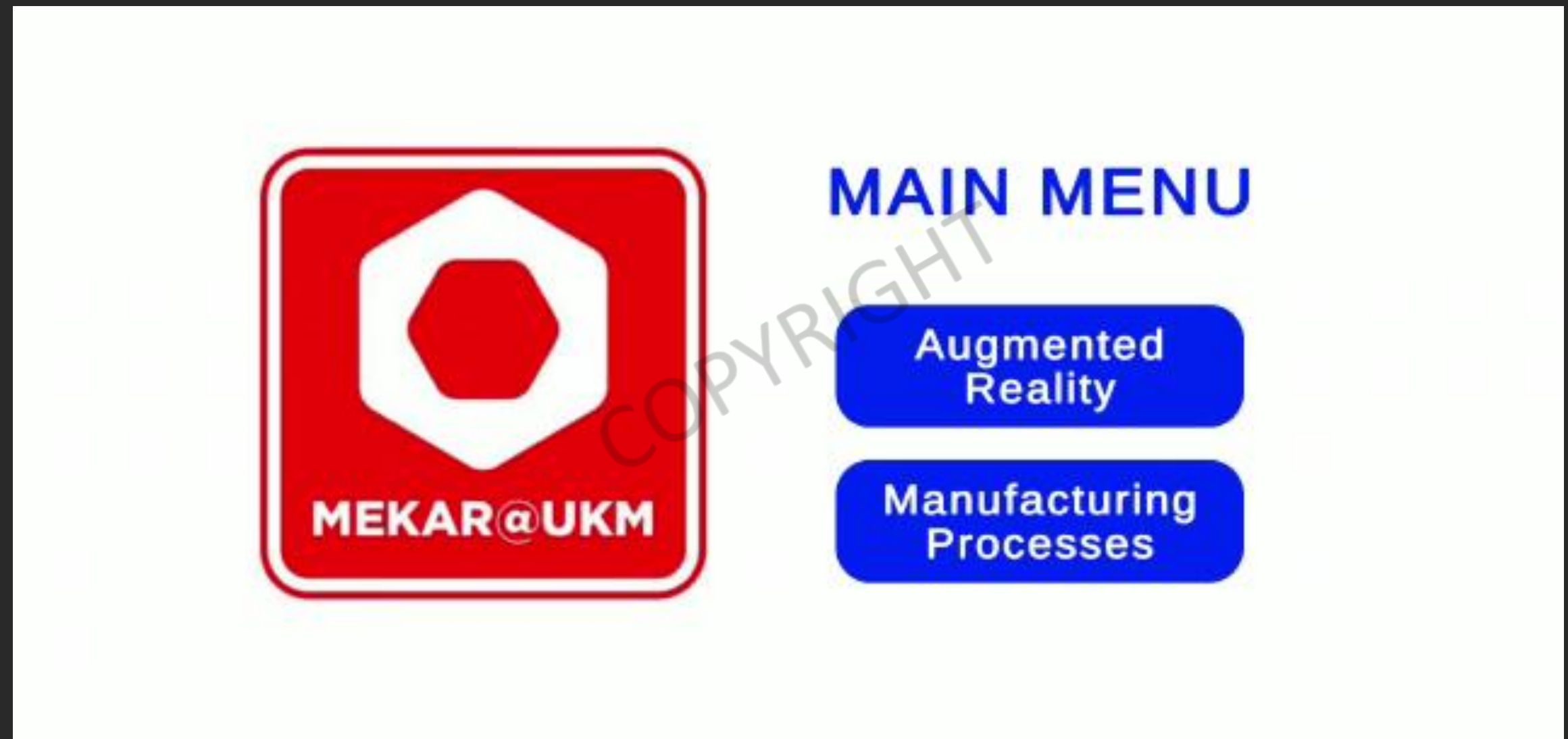
4

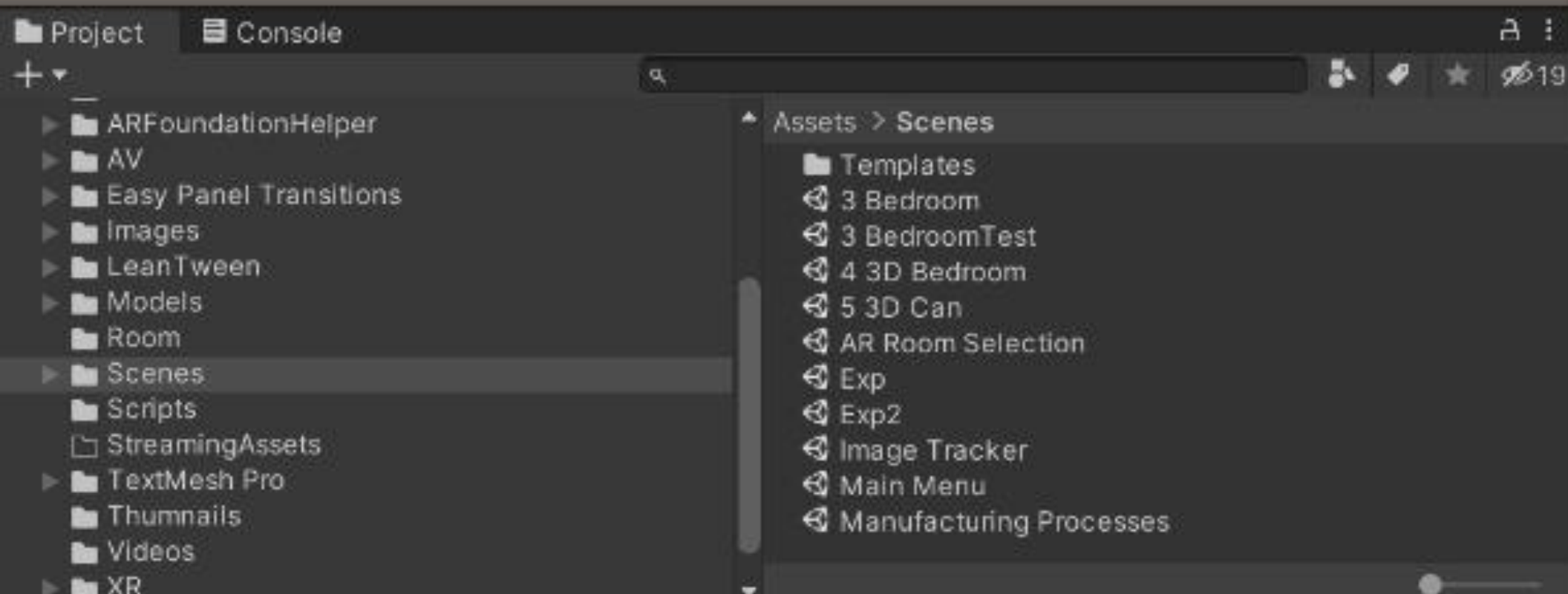
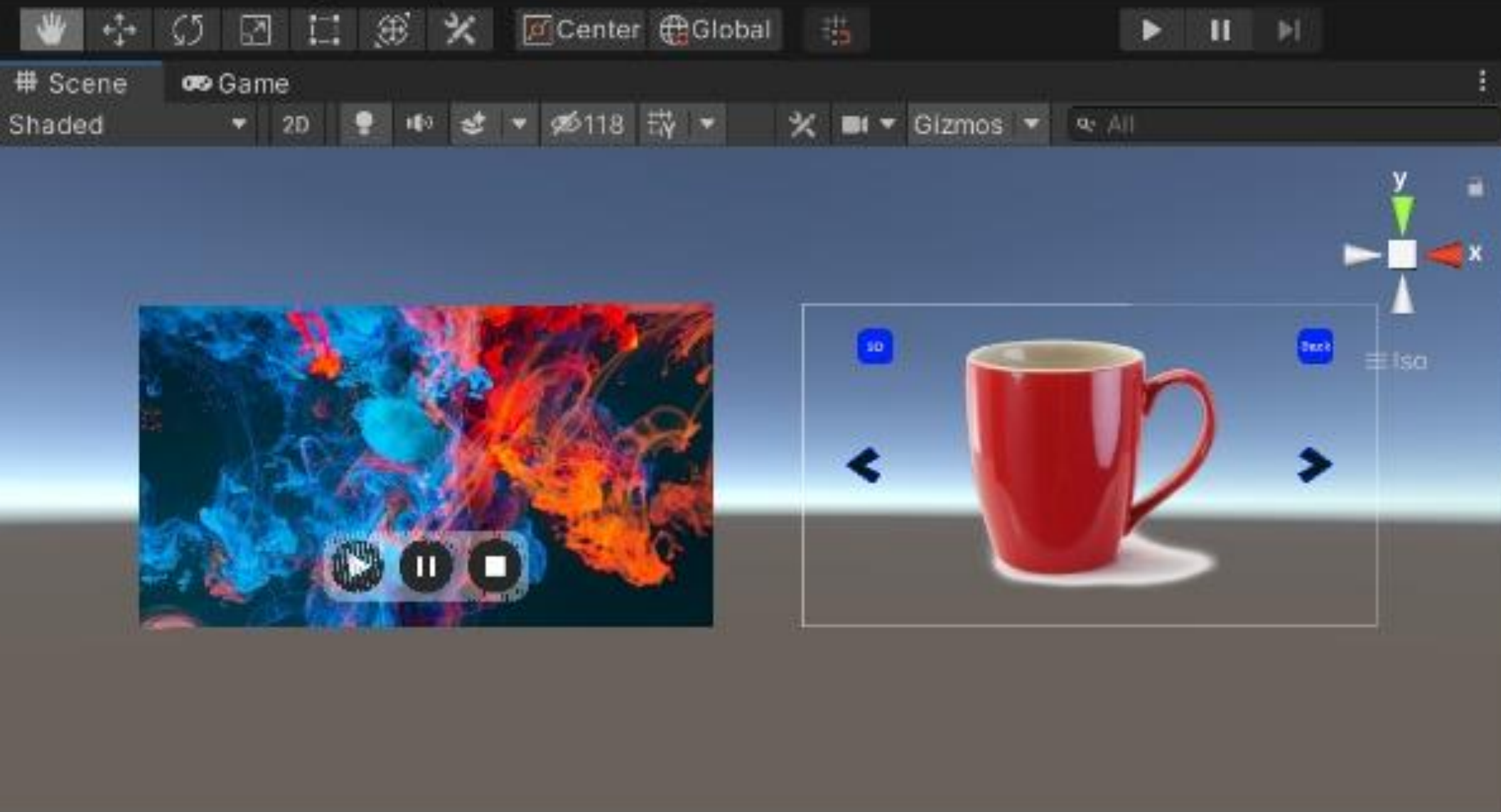
Current Work Direction Development of AR Apps

Mekanikal + AR
MEKAR@UKM

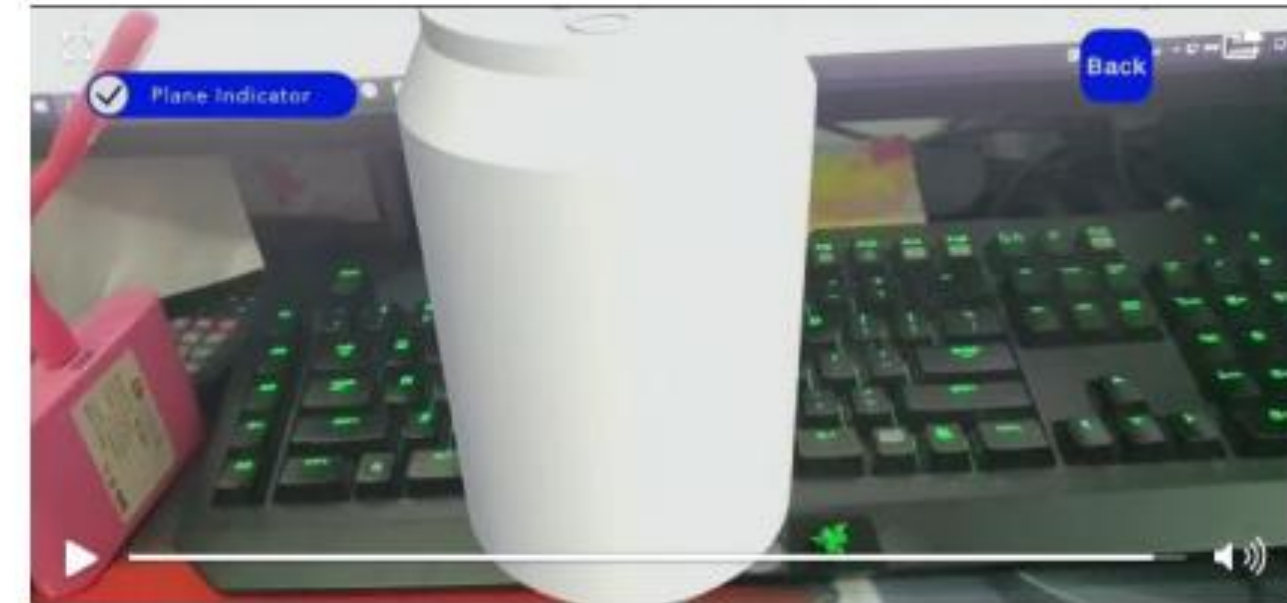
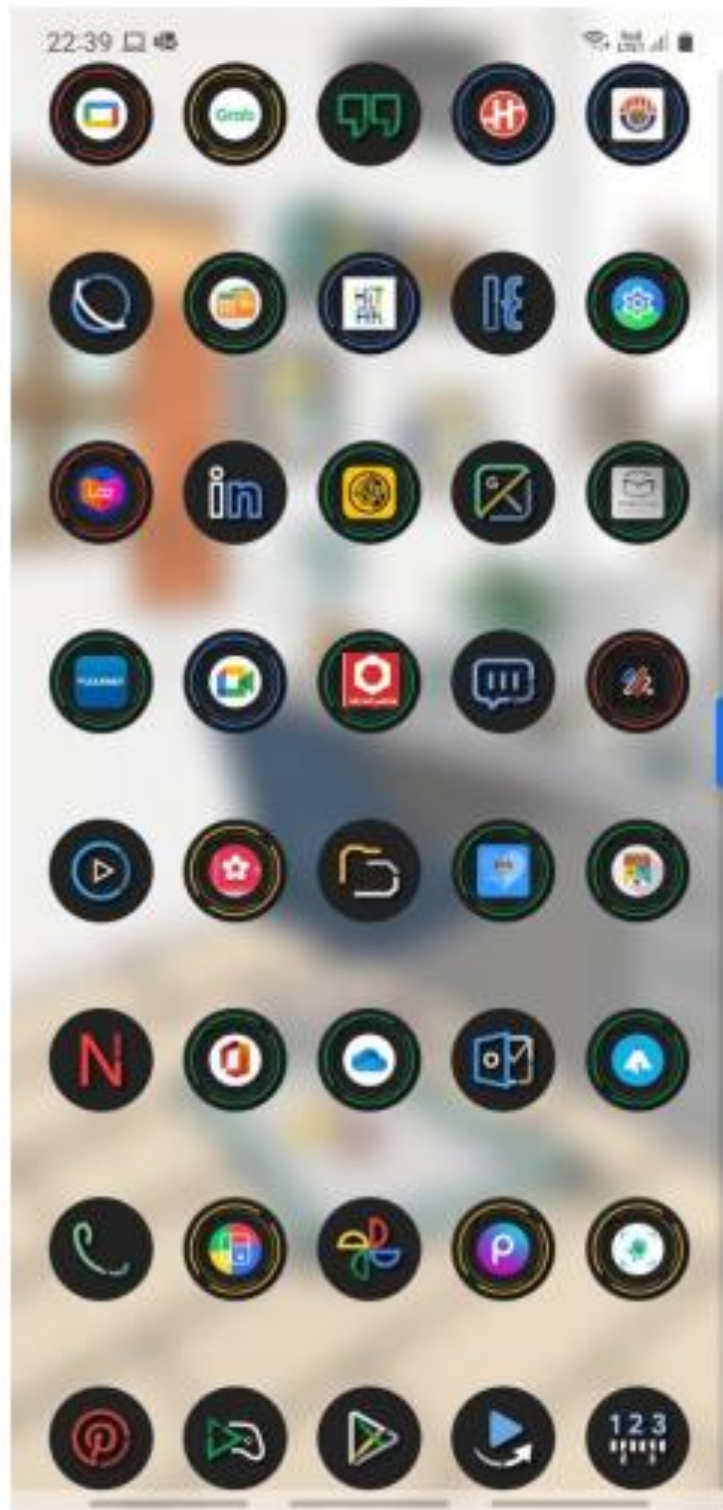


Sneak peek





Aplikasi MekAR





Challenges with AR

Implementation risk for AR

It takes experimentation to get the most out of AR

Technology and skills gap

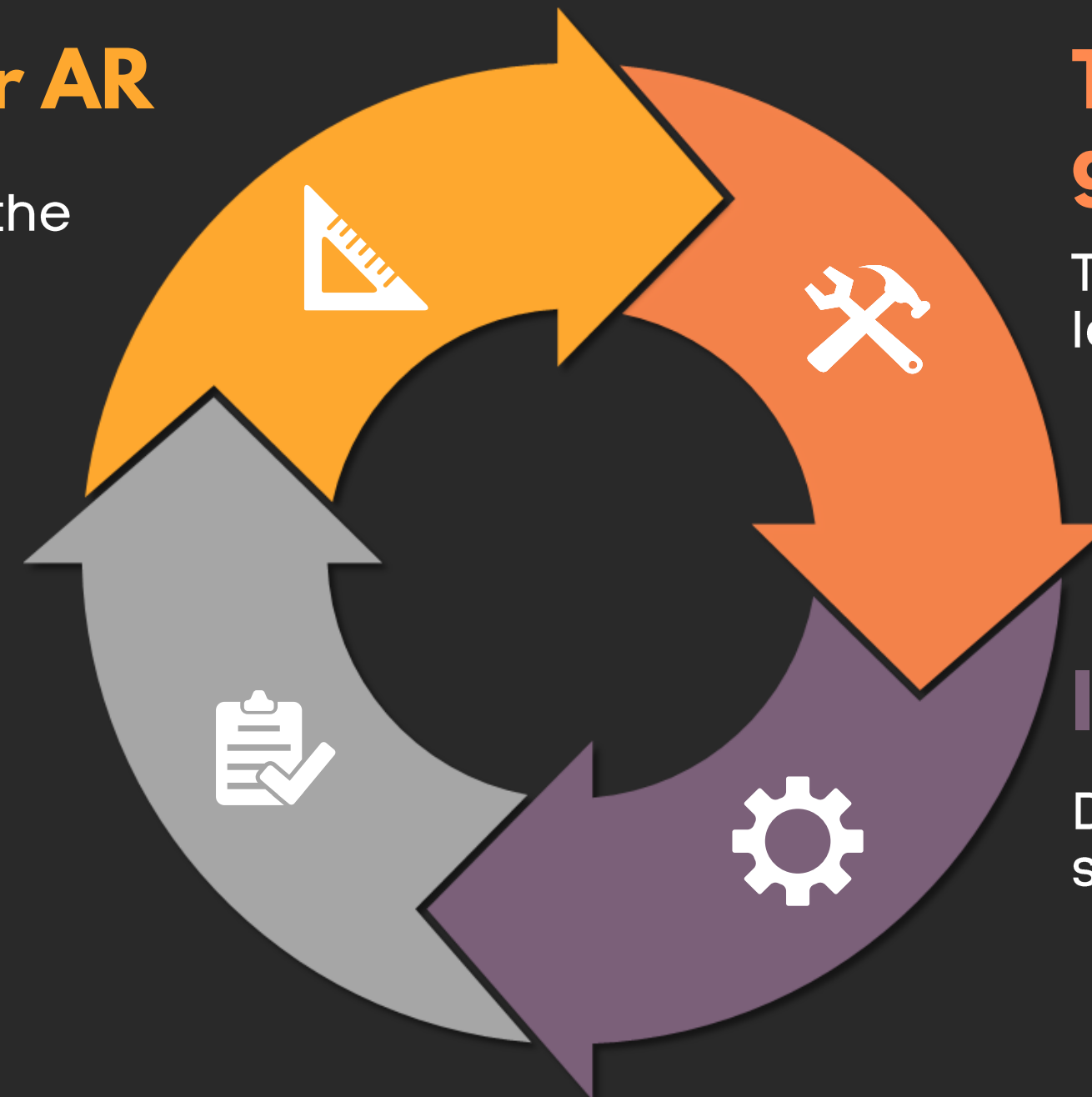
The lack of knowledge and skills in lecturers

Cognitive Challenges

Manage various tasks such as teaching, answering questions, operating devices etc

Institutional support

Develop your own AR apps or subscribe to an existing one





Conclusion



1. Students go through the experience of operating AR applications individually. The experience gained throughout this study can equip students with the up-to-date technology, knowledge in problem-solving and self-independent.
2. The majority of students thought that the task AR provided was helpful in their understanding of manufacturing processes.
3. It has been found that AR has not been intensively used in most education areas; thus, its potential has not yet been fully exploited.

Awards & Recognition



Sijil Pemenang Pingat Gangsa
(KATEGORI PENSYARAH)

DENGAN UCAPAN SETINGGI-TINGGI TAHNIAH DAN PENGHARGAAN KEPADA

**NASHRAH HANI BINTI JAMADON
ABDUL HADI BIN AZMAN
ZALIHA BINTI WAHID
ANDANASTUTI BINTI MUCHTAR
MOHAMAD HILMAN BIN NORDIN**

DALAM

**PERTANDINGAN REKACIPTA & INOVASI NASIONAL (PRIN 2021)
7 – 9 SEPTEMBER 2021**


Prof. Dato' Ir. Dr. Wan Hamidon Wan Badaruzzaman
Dekan, Fakulti Kejuruteraan dan Alam Bina, UKM

ANJURAN: JABATAN PENDIDIKAN KEJURUTERAAN (JPK), FKAB, UKM

FAKULTI KEJURUTERAAN DAN ALAM BINA www.ukm.my/jurutera



*Evolusi ke Arah Pembelajaran Tanpa Sempadan: Langkah Kehadapan
Evolution Towards Borderless Learning: A Way Forward*

PINGAT PERAK

Sijil pencapaian ini dianugerahkan kepada

**NASHRAH HANI JAMADON
ABDUL HADI AZMAN
ZALIHA WAHID
ANDANASTUTI MUCHTAR &
WARISCAN SDN. BHD.**
atas Inovasi

APLIKASI REALITI TERIMBUH (AR); TEKNOLOGI
PEMBELAJARAN TANPA SEMPADAN BAGI DISIPLIN KURSUS
KEJURUTERAAN MEKANIKAL DAN PEMBUATAN



17 - 18 Ogos 2021
DALAM TALIAN (SECARA MAYA)


PROF. DR. MOHAMMAD BIN KASSIM
Pengerusi KNOVASI P&P Ke-7 2021
Timbalan Naib Canselor
Akademik & Antarabangsa, UKM

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WATAN KITA
 NARATIF BAHARU UKM

Webinar Pengajaran - FEP Siri 1/2022:
'Demonstrasi Pengajaran Hibrid'

PENCERAMAH
DR. NASRAH HANI JAMADON
DUTA PEMBELAJARAN AKTIF
 (Penyelaras Industri, Alumni dan Masyarakat)
 Jabatan Kejuruteraan Mekanikal dan Pembuatan
 Fakulti Kejuruteraan dan Alam Bina, UKM

MODERATOR
DR. KHAIRUL NAZIYA BINTI KASIM
 (Penyelaras Pengajaran dan Citra)
 Fakulti Ekonomi dan Pengurusan, UKM

KHAMIS
24 MAC 2022
9.30PAGI - 11.30PAGI

UNIVERSITI MALAYA
 Faculty of Engineering

**Challenges to Overcome :
 Online Learning During Covid-19 Pandemic**

Content:
 It is clear that this pandemic has disrupted our education system. Could the move to online learning be the catalyst to create a new, more effective method of educating students? This webinar will explore the challenges, effectiveness and experiences from the perspective of a young academician.

Presented and moderated by:
Dr. Nashrah Hani Jamadon
 (Department of Mechanical and Manufacturing Engineering,
 Faculty of Engineering and Built Environment, UKM)

Date: 29 Sept 2020
Time: 10AM-11AM
Registration form:
<https://forms.gle/2UaResazh1JyeUz46>
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SIRI BENGKEL
 PEMBELAJARAN
 AKTIF
 04/2022

**Potensi
 Teknologi Realiti
 Terimbuh (AR)
 dalam PdP;
 Interaktif
 dan Efektif**

12 & 13 APRIL 2022
 (SELASA & RABU)
9.00 pagi - 12.00 tgh hari

dengan kerjasama
WARISCAN SDN. BHD.

Dr. Nashrah Hani Jamadon
 Fakulti Kejuruteraan & Alam Bina,
 Universiti Kebangsaan Malaysia

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● ● ●

Thank you
Terima kasih

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nashrahhani@ukm.edu.my

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 FACULTY OF ENGINEERING & BUILT ENVIRONMENT

WEBINAR PENGAJARAN FKAB SIRI 4
Pengenalan Konsep PDP Hibrid: 4S
Smart, Senang, Sesuai dan Santai

03 DISEMBER 2021 | JUMAAT
 11.30 PAGI - 12.30 TENGAHARI

<https://bit.ly/WPSiri4>
 Meeting number: 2643 573 9104
 Password: T4qU2TFpx9w
 melalui aplikasi Webex

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 Penceramah
 Felo Bersekutu P3K
 Pensyarah, JKMP

Dr. Abdul Hadi Azman
 Pemudahcara
 Pensyarah, JKMP

Penganjur : Urusetia Pengajaran & Citra, JKMP, P3K dan Unit ICT FKAB

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