**Key Action: KA2**: Cooperation for Innovation and the Exchange of Good Practices, KA201 - Strategic Partnerships for school education
**Project name:** STEAM education and learning by Robotics, 3D and Mobile technologies - FabLab SchoolNet
**Project No.:** 2018-1-LT01-KA201-047064

# INTELLECTUAL OUTPUT (IO) 2 - ASSESSMENT METHODOLOGY

| **Output Type: Methodologies / Guidelines – Methodological framework for implementation** | |
|---|---|
| **Activity Leading Organisation** | Universitatea „Dunarea de Jos" din Galati |
| **Participating Organisations** | CONSIGLIO NAZIONALE DELLE RICERCHE<br>2 EPAL TRIKALON<br>FabLab Palermo APS |

| | |
|---|---|
| Due Submission Date: | 28/02/2019 |
| Actual Submission: | 01/04/2019 |
| Project Number | 2018-1-LT01-KA201-047064 |
| Instrument: | Coordinate and Support Action |
| Start/Finish Date of Project: | 01.11.2018 – 31.10.2020 |
| Duration: | 24 months |

| Abstract |
|---|
| In this output an assessment methodology and its related materials will be produced. In particular, a questionnaire related to the initial student's skills and competences in FabLab School net technologies will be produced. This questionnaire should identify if the students are familiar with terms as rapid prototyping, modelling and design, as well as business opportunities in apply FabLab School net technologies in real contexts. This data will be collected and processed and after the completion of the courses a second questionnaire will be applied on students in order to measure the knowledge acquired during the training programme. This will be also an important tool in measuring the quality of the implemented courses both on teachers and students. |


| **Output Type: Methodologies / Guidelines – Methodological framework for implementation** | |
|---|---|
| The academics and the technological partners of the project will develop the assessment methodology in order to produce a tool, specifically tailored on the contexts and topics in which the schools involved in the project operate. The assessment methodology strategy will focus on:<br>**Ex-ante evaluation.** During the ex-ante evaluation, the following aspects will be analysed:<br>- Monitoring of the organizational phase with reference to structural and technological resources employed in the project;<br>- Monitoring the learning outcomes and the results achieved during the learning phase.<br>**Ex-post evaluation.** This phase will monitor the effective implementation of the learning objectives proposed in the project, assess the main activities and correlate the expected outcomes to the actual results, according to a real achievement of specific objectives set.<br>The final evaluation is based on interviews with the project participants. A series of online questionnaires will be designed in order to gather feedback from all students, while informal interviews will be conducted to provide additional information.<br>**Follow-up.** During the follow-up, the data collected will be processed, streamlined and collected on the project website, along with other documents and training materials/information, in order to create a virtual opened database, which will be able to provide maximum visibility of the initiative, which aims to define the actual quality of the project activities. | |
| **Activity Leading Organisation** | Universitatea „Dunarea de Jos" din Galati |
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# 1. Introduction

The first step in setting up an assessment methodology is to define the purpose for the performance or product and the purpose for the assessment. With this information, the person whose performance is being assessed or the group who have developed a product (assesser) can better determine what is important to assess, and the person who is observing the performance or collecting information about the product (assessor) is equipped to give accurate and appropriate feedback

Measuring the success of a project once it's brought to completion is a valuable practice. It provides a learning opportunity for future undertakings, and, the opportunity to assess the true effectiveness of the project. In order to have a holistic view, objective and subjective criteria need to be considered.

**1. Objectives and scope.** This section is dedicated to the intended result of a project and what is required to bring it to completion. To get a real measure of your project's success you want to determine if it achieved its objectives within the given framework.

**2. Schedule.** This criterion is important in order to measure and understand if the consortium achieved the milestones on time, if the IO's are delivered on time, and important measure for reschedule activities.

**3. Budget.** Did you manage to deliver your project within budget? Was it over or under? And if so, by how much? I'm sure it comes as no surprise that your ability to deliver your project within budget is usually considered one of the greatest indicators of success.

**4. Team satisfaction.** This is more subjective in nature and is often overlooked when evaluating project success. But I beg to say that team satisfaction should be at the top of your success criteria. They're the ones who were deep in the trenches, and they'll be the ones by your side on the next project adventure too. They also have deeper insights that even the top stakeholders may not have.

**5. Target group satisfaction.** Along with your team, you also want to get the feedback of your clients. Are they content with the results? Were their needs met? Find a way to track client satisfaction through the project life cycle all the way to delivery.

**6. Quality.** The point isn't only to deliver the intended work but also, to exceed expectations. It's important to track quality and make adjustments where necessary. Even after the project is delivered, quality assurance is often an ongoing piece of the project puzzle.

# Ex-ante evaluation

## Pre-Test Questionnaire on 3D Printing

**Pre-Test for teachers (10 questions)**

1) Mark one or more of the following softwares and specify your knowledge level (from 1: "I've heard about it" - to 10: "I use it like a pro")

- SugarCAD (Indire-Italy)

- TinkerCAD (Autodesk)

- 3D Builder (Microsoft)

- SketchUp (Trimble)

- 123D Design (Autodesk)

- Fusion360 (Autodesk)

- Rhino3D (McNeel)

- AutoCAD (Autodesk)

- Solidworks (Dessaults Systemes)

- Other (specify) _____

2) Mark one or more of the following Additive Manufacturing Technologies and specify your knowledge level (from 1: "I've heard about it" - to 10: "I use it like a pro")

- Filament 3D printer (FDM-FFF)

- Resin 3D Printer (DLP)

- Resin 3D Printer (SLA)

- Other (specify) _____

3) Mark one or more of the following Slicing Software and specify your knowledge level (from 1: "I've heard about it" - to 10: "I use it like a pro")

- Ultimaker CURA

- Slic3r

- Simplify3D

- Matter Control

- Other (specify) _____

4) Do you know any educational project that involves 3D printing? Could you describe one or more?

_____
_____
_____
_____
_____

5) For which educational subjects do you think that 3D printing could be useful to improve learning?

6) From 1 to 10, how difficult do you think could be the use of a 3D printer, for a teacher?

7) From 1 to 10, how difficult do you think could be the use of a 3D printer, for a student?

8) How many monthly hours do you think you can spend for 3D Printing in you classroom?

9) Does your school own one or more 3D printers?

10) Do you feel the need for a whole learning tool that allow you to find all the information you need in order to teach 3D Printing in your classroom?

**pre-test for students (10 questions)**

1) Do`you regularly use a PC or a tablet?

2) Mark one or more of the following softwares and specify your knowledge level (from 1: “I’ve heard about it” - to 10: “I use it like a pro”)

- word-processing (for example: Microsoft Word)

- spreadsheet (for example: Microsoft Excell)

- slide software (for example: Microsoft Power Point)

- Photo editing (for example: Adobe Photoshop)

- 2D graphics (for example: Corel Draw; Adobe Illustrator)

- 3D modeling (for example: Autodesk AutoCad; Autodesk Fusion360; McNeel Rhino3D)

- video games

- browser (Mozilla Firefox, Google Chrome, Microsoft Internet Explorer)

3) Mark one or more of the following softwares and specify your knowledge level (from 1: "I've heard about it" - to 10: "I use it like a pro")

- SugarCAD (Indire-Italy)

- TinkerCAD (Autodesk)

- 3D Builder (Microsoft)

- SketchUp (Trimble)

- 123D Design (Autodesk)

- Fusion360 (Autodesk)

- Rhino3D (McNeel)

- AutoCAD (Autodesk)

- Solidworks (Dessaults Systemes)

- Other (specify) _____

4) Mark one or more of the following Additive Manufacturing Technologies and specify your knowledge level (from 1: "I've heard about it" - to 10: "I use it like a pro")

- Filament 3D printer (FDM-FFF)

- Resin 3D Printer (DLP)

- Resin 3D Printer (SLA)

- Other (specify) _____

5) Mark one or more of the following Slicing Software and specify your knowledge level (from 1: "I've heard about it" - to 10: "I use it like a pro")

- Ultimaker CURA

- Slic3r

- Simplify3D

- Matter Control

- Other (specify) _____

6) Write up to 3 objects you would print if you could use a 3D Printer

_____

_____

7) For which subject would you use a 3D Printer in your classroom?

_____

_____

8) From 1 to 10, how difficult do you think could be the use of a 3D printer?

9) Could you describe the 3D printing activity of anyone you know directly, that use a 3D Printer for work or for fun?

_____

_____

10) Excluding your school, have ever seen a 3D printer working? Where?

_____

_____

**Technical post-test for students and teachers (15 questions)**

1) What kind of 3D printers have we worked with?

(A) filament 3D printer (B) resin 3D printer (C) powder 3D printer

2) What is the use of 3D printing appropriate for?

(A) To build copies of standard objects you can already buy cheaply

(B) To build mechanical parts, tougher than metallic ones

(C) To build a small amount of new or customized objects

3) Which are the steps that lead to create objects using 3D Printing?

(A) CAD modeling or 3D scanning → model Slicing (CURA) → 3D Printing

(B) hand sketching → digital scanning → 3D Printing

(C) You can just 3D Print any 3D model directly

4) What can you do, if you want to print a downloaded 3D file?

(A) Download an STL file file from a website (like thingiverse) and than make the slicing (CURA)

(B) Download the g-code file, searching it on Google

(C) You can't, you must model it using a 3D CAD

5. What is the slicing process (CURA) meant to ?

(A) To improve the 3D model, adding details

(B) To transform the 3D model in a list of instructions for the 3D Printer

(C) It's an optional step, you can just print the 3D model directly

6) Which key features of a 3D Printer you must set on CURA?

(A) Printing volume dimensions, nozzle size, filament size

(B) Type of belts and bearings

(C) Filament color and power supply

7) Which is the primary parameter in printing quality?

(A) Printing bed temperature

(B) Layer height

(C) Supports configuration

8) What happens if you increase the layer height?

(A) You will print a bigger object

(B) You will use more filament

(C) You will print faster at a lower quality

9) How is the inner part of a 3D Printed object?

(A) Always totally empty

(B) Always totally filled

(C) It contains a grid of which you can choose the filling grade

10) What is the link between printing speed and quality?

(A) The faster you print, the better is the result

(B) A slower print will be look better

(C)There is no link, just the printing time will change

11) Which material did we use for 3D printing?

(A) PLA, a polymer derived from renewable biomass

(B) 'ABS, a polymer derived from petroleum

(C) A generic plastic wire

12) What are printing supports?

(A) Files made to start the printing process

(B) Supports made to avoid vibrations of the 3D printer

(C) Structures, created by the Slicing software (CURA) to support protruding parts

13) How can you change the filament spool?

(A) Heating up the printing nozzle to about 200°C and then pulling out the filament

(B) Hating up the printing bed until the filament starts to extrude

(C) I must disassemble the nozzle and pull out the filament by hand

14) How can you crate a CAD model for 3D printing?

(A) By using a 2D graphic design software

(B) By using a 3D CAD modeling software

(C) Just using digital scanning

15) What should you be careful not to hurt myself with the 3D printer?

(A) Not to look the printing too long

(B) You have to watch out for filament splinters

(C) Just keep in mind that the nozzle could reach 200°C and it burns your skin

## Pre-Test Questionnaire on Augmented Reality

10 question to check How much you really know about Augmented Reality

1. Which definition best fits “Augmented Reality”?

   It is a computer technology that turns physical objects into digital objects

   It is a technology that overlays digital information on top of real world items

   It is a technology that completely immerses users in a new digital environment

   It is a computer-generated graphics technology to create an entire virtual world

2. What device is compatible with Augmented Reality?

   Computers

   Smartphones

   Tablets

   Smart glasses

   All of above

   None of above

3. What of the following games is an example of augmented reality, where computer- generated images are overplayed on the real world?

Super Mario Bros

Pokémon Go

FIFA 2019

Fortnite

League of Legends

Minecraft

4. Which of the following headsets is NOT suitable for AR applications?

(You can choose more than one)

Google Glass

Oculus by Facebook

Sony Playstation VR

Microsoft HoloLens

HTC Vive

Samsung VR

Magic Leap

5. What does SDK stand for?

Safe Distance Kit

Software Development Kit

Standard Data Kit

Scene Development Kit

None of above

6. When we talk about the immersive technology, what does MR stand for?

Mixed Reality

Measured Reality

More Reality

Mirrored Reality

None of above

7. In which decade are introduced the first definitions of augmented reality in science field?

- 1960s
- 1970s
- 1980s
- 1990s
- 2000s

8. What is the difference between Augmented Reality and Virtual Reality?

There is no difference

Virtual Reality immerses users in a fully artificial digital environment, while Augmented Reality delivers virtual elements as an overlay to the real world environment

Virtual Reality is only through wearable technology and Augment Reality is only through smartphone

Augmented Reality is an educational tool and Virtual Reality is for leisure

9. What of the following sentences are true?

You need an Internet connection to use Augmented Reality

You do NOT need any software to use Augmented Reality

You can access Augmented Reality only through a VR headset

Augmented Reality allows real-time information overlaid to the real world environment.

Your smartphone must have a camera in order to activate the Augmented Reality

10. What is the difference between marker-based AR and marker-less AR?

Marker-based type AR is a simulated method define targets for the placement of virtual objects, instead Marker-less AR use only the GPS to define the target

Marker-based type AR uses only QRCode as target for the placement of virtual objects; Marker-less AR allows physical object as the target

Marker-based type AR uses a marker to trigger a response in the device when pointed at it; Marker-less AR allows the use of any and all parts of the physical environment as the target

None of above

## Pre-Test Questionnaire on Educational robotics

**Pre-Test Questionnaire on Educational Robotics**

**Short-Term Joint Staff Training Event**

**Galati, 25-29th March 2019**

Please identify a time and place where you will be able to complete this pre-test questionnaire without being interrupted. This should require no more than 20 minutes. To make it as easy as possible for you to respond, most questions may be answered simply by ticking the appropriate rectangle.

**Teacher Background Information**

1. Teachers' personal information:

| Name | Surname | Institution | Nationality |
|---|---|---|---|
| | | | |

2. Age:

☐ Under 25 ☐ 25-29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ Over 60

3. The highest level of formal education you have completed:

☐ ISCED 3 ☐ ISCED 4 ☐ ISCED 5b ☐ ISCED 5a First degree ☐ ISCED 5a Second degree ☐ Higher

4. Gender:

☐ Male ☐ Female ☐ Not defined

5. Major/main area(s) of study:

☐ Education ☐ Math ☐ Science ☐ Technology ☐ Arts ☐ Other

**Educational Robotics. Generalities**

6. I know the parts that transform a device into an educational robot:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

7. I am familiar with the main components of an educational robot:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

8. I know about how the sensors and motors work on an educational robot:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

9. I know how to apply the Engineering Design Process in educational robotics activities:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

10. I understand how to organise the educational robotic-based learning activities in a class:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

11. I know how to teach the construction aspects of educational robotics:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

12. I know how to teach the programming aspects of educational robotics:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

13. I am able to implement student-centered educational robotics projects in class:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

14. I know integrate educational robotics into other discipline's syllabus (i.e. math, physics, informatics, science, technology, etc.):

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

15. I know how to assess students' learning outcomes in educational robotics:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

**Educational Robotics. Technical knowledge**

16. I have used in the past Lego Mindstorm Education EV3:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

17. I am able to construct a robotic platform using Lego Mindstorm Education EV3:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

18. I am able to construct a moving and sensing robot using Lego Mindstorm Education EV3:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

19. I know how to program robots designed using Lego Mindstorm Education EV3:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

20. I know the differences between Lego Mindstorm Education EV3 sensors (Ultrasonic, touch, IR, Gyro and Color sensors):

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

21. I know the functionalities of the Lego Mindstorm Education EV3 brick:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

22. I know how to connect sensors and motors on the EV3 brick using proper ports:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

23. I know about alpha, numeric and PC ports from the Lego Mindstorm EV3 brick:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

24. I am familiar with the Wait, Switch and Loop Blocks and their functionalities in EV3 programming environment:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

25. I know how to transfer programs from computer to the Lego Mindstorm EV3 brick:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

26. I have used in the past MakeBlock robotic kits:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

27. I am able to construct a robotic platform using MakeBlock Mbot Ranger:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

28. I am able to construct a moving and sensing robot using MakeBlock Mbot Ranger:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

29. I know how to program robots designed using MakeBlock Mbot Ranger:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

30. I know the differences between MakeBlock Mbot Ranger sensors (Ultrasonic, Line Follower, integrated sensor in Me Auriga mainboard):

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

31. I know the functionalities of the Me Auriga mainboard:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

32. I know how to connect sensors and motors on Me Auriga mainboard using proper ports:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

33. I am familiar with the ports from the Me Auriga mainboard:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

34. I am familiar with the graphical blocks from mBlock programming environment and their functionalities:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

35. I know how to transfer programs from computer/tablet/smartphone to the Me Auriga mainboard:

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☐ Strongly Agree

## Questionnaire on User Acceptance of Educational Robotics, 3D Printing and Augmented Reality Applications on Mobile Technologies

Mark with a cross your degree of agreement with the following statements in a scale from 1 to 7, where 1 means that you completely disagree and 7 means that you completely agree.

## Educational Robotics

## Perceived Usefulness

1) Use educational robotics attend class can improve my degree of understanding

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

2) Use educational robotics attend class is helpful in learning

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

3) Use educational robotics attend class can enhance my learning effect

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

## Perceived ease of use

4) The environment of use educational robotics attend class is easy to understand

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

5) Use educational robotics attend class is simple and clear

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

6) For me, steps of use of educational robotics is easy to remember

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

7) Overall, I think that environment of educational robotics attend class are easy to use

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

## Attitude toward using

8) I like to use the educational robotics attend class

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

9) Educational robotics let me want to use it to learn constantly

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

10) Use educational robotics attend class is the experience of pleasure

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

11) I found that use educational robotics attend class is fun

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

12) I am very pleased to have an experience that to use educational robotics attend class

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

## Behavioural intention to use

13) I hope that use educational robotics to help me in learning later

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

14) I hope the course increase the use of educational robotics

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

15) If I opportunities to access educational robotics, I will use it

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

16) Use educational robotics class to me was a wise decision

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

## Educational robotics self-efficacy

17) The using of educational robotics experience was better than I expected

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

18) Educational robotics provides the picture better than I expected

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

19) The picture of educational robotics can meet the requirements of mine

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

20) I am very satisfied with the function of educational robotics class

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

## Facilitating conditions

21) Educational robotics attend class environment provides an attractive learning environment

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

22) Educational robotics is a system that has fun to use

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

23) Classes using educational robotics can provide complete information

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

24) I believe educational robotics easily implement what I want it to do

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

## Subjective norm

25) I was attracted by educational robotics strongly

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

26) I focus on the educational robotics

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

27) I am very interested in classes for the use of educational robotics

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

# Augmented Reality Applications on Mobile Technologies

## Perceived usefulness

1) Using Augmented Reality application would enable me to understand educational concept quickly

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

2) Augmented Reality application would make it easier to do my study

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

3) I find Augmented Reality application useful in teaching and learning

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

## Perceived ease of use

4) Learning to use Augmented Reality application would be easy

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

5) I would find it easy to get Augmented Reality application to do what I want it to do

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

6) It would be easy for me to become skilful at using Augmented Reality application

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

7) Overall, I would find Augmented Reality application easy to use

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

## Perceived enjoyment

8) Augmented Reality application is fun to use

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

9) Augmented Reality application is pleasant

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

10) Feel enjoyment

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

11) Unhappy the session over

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

12) Willing to repeat the same experience

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

13) Interesting experience

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

## Intention to use

14) I intend to use any system using Augmented Reality application when it becomes available in my school

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

15) I intend to use other Augmented Reality application (like the one I see) in other subjects

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

16) Given that I had access to the system, I predict that I would use it frequently

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

17) Assuming I had access to the system, I intend to use it

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

## Personal innovativeness

18) Look forward to experimenting with new technologies

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

19) The first person to try new technologies

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

20) Not hesitant to try new technologies

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

21) Like to experiment with new technologies

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

# 3D Printing Technology

## Performance expectancy

1) I would find 3D Printer useful in my study

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

2) Using 3D Printer enables me to accomplish tasks more quickly

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

3) Using 3D Printer increases my productivity

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

4) If I use 3D Printer, I will increase my chances of getting high ratings

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

## Effort expectancy

5) My interaction with 3D Printer would be clear and understandable

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

6) It would be easy for me to became skilful at using 3D Printer

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

7) I would find 3D Printer easy to use

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

8) Learning to operate 3D Printer is easy for me

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

## Attitude toward using technology

9) Using 3D Printer is a good idea

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

10) 3D Printer makes work more interesting

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

11) Working with 3D Printer is fun

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

12) I like working with 3D Printer

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

## Facilitating conditions

13) I have the resources necessary to use 3D Printer

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

14) I have the knowledge necessary to use 3D Printer

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

15) 3D Printer is not compatible with other systems I use during my study

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

16) A specific person (or group) is available for assistance with 3D Printer difficulties

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

## Behavioural intention to use

17) I intend to use 3D Printer in the next months

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

18) I predict I would use 3D Printer in the next months

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

19) I plan to use 3D Printer in the next months

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

## Self-efficacy

I could complete the task using 3D Printer…

20) If there was no one around to tell me what to do as I go

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

21) If I could call someone for help if I got stuck

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

22) If I had a lot of time to complete the task

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

23) If I had just the built-in help facility for assistance

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|