ARETE – DELIVERABLE (D6.2)

WP 6 – 6.2 Pilots Requirements, Design and Data Management Plan

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Dissemination level
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Executive Summary

This report addresses ARETE Pilots 1 and 2 requirements, design, and data management plans. The aim of this deliverable relies on the definition of the pilots' requirements, which is one of the crucial steps for the effective project pilots' design, which is the main objective of the Task 6.1: Pilot Definition, AR Interactivity Requirements & Specification. Indeed, during the ARETE project it is important not to overlook the appropriate understanding of the needs and expectations of the main stakeholders at primary schools, to address the project objectives with a reliable perspective. The contents of D6.2 are supplementary for D6.1 since the recruitment of the Pilot 1 and 2 has been finalised at the end of June 2021 (M20). Pilot 1 and 2 are testing and demonstrating the AR mobile apps' development works within the ARETE project. More specifically, ARETE Pilot 1 aims to study the effects of WordsWorthLearning's (WWL) interactive Augmented Reality (AR) solutions on teaching and learning English language literacy skills with primary school students typically underperforming in English language literacy tests. Pilot 1 pre-tests will be conducted between September and October 2021 (M23 and M24); the intervention phase will take place from October 2021 till April 2022 (M24 till M30); post-assessment will be conducted from May to June 2022 (M31 to M32). The goal of Pilot 2 is to test the efficiency of CleverBooks (CLB) Augmented Reality application for STEM education as a tool to help improve pupils' test-score and increase retention rate. Pilot 2 pre-tests will be conducted between September and October 2021 (M23 and M24); the intervention phase and post-tests will start in November 2021 and be finalised by April 2022 (M25 till M30); retention assessment will be conducted from May to June 2022 (M31 to M32).

Due to the participation of humans and of minors in the ARETE pilots, the pilot managers have adhered to the ethics requirements presented in WP1 and WP2 deliverables.

The recruitment process for Pilot 1 and Pilot 2 operatives has been conducted via a 2-step recruitment approach that allows the incorporation of early feedback from target groups and to better plan for the pilot implementation stage. The 1st step, which consisted of identifying teacher coordinators, has been successfully conducted. Three teacher coordinator workshops are also foreseen over the course of the project: the first one was already conducted in June and early July 2021 (M20/M21), the second will be in November 2021 (M25) while the third one in March 2022 (M29). The 2nd step, which consists in recruiting pilot teachers, is also terminated. However, a limited number of pilot teachers might be replaced during August if some of the selected persons are assigned to new schools and/or classes before the beginning of the school year.

Within the pilots' coordination, a COVID-19 risk analysis has been carried out at the WP6 level in order to evaluate the impact of the current pandemic situation on the deployment of pilots to schools and presented in D6.1.

Finally, Task 6.1 is related to the deliverables D2.3 and D2.9, as the design of the pilots adheres to the Data Management Plan presented in WP2. All exploratory and experimental user workshops and reports are defined within each pilot's requirements.

1. Introduction

WP6 primarily focuses on the examination and implementation of both WWL (Pilot 1) and CLB (Pilot 2) platforms, while maintaining the contact with Pilot 3, which is primarily reported by WP5. Task 6.1 is defining the requirements, design and DMP for the implementation of Pilot 1 and 2 (Task 6.1). The present deliverable reports on the work carried out by WP6 in preparing the pilots 1 and 2 rollout planned for September 2021 (M23):

- The final requirements for consideration of inclusion and exclusion criteria for Pilot 1 and 2 (led by EUN);
- The strategy and final recruitment and engagement of pilot operatives (lead by EUN);
- The design of the intervention and assessment/evaluation strategy for Pilot 1 and 2 (led by UNW);
- Ethics considerations for each pilot (lead by UCD);
- Data Management Plan for each pilot (lead by UCD)

Conclusions and overall observations are provided in Section 5.

2. Requirements gathering process

2.1 General user requirements for Pilot 1 and Pilot 2 via surveys

General requirements for both pilots have been gathered through student and teacher surveys as well as teacher interviews (**for details please refer to D4.2**). The surveys contained questions on general AR usage as well as feedback to a specific, recently used AR app in addition to demographic questions. From the general AR usage questions, context information for deploying the Pilot 1 and Pilot 2 AR apps at schools could be identified (e.g. availability of devices) and general requirements regarding time constraints, support needs, etc. for the pilot apps could be derived (e.g. “The AR activities must be short enough to fit in a lesson (~45’)”). From the feedback on a specific, recently used AR app, shortcomings of existing apps could be identified, to be avoided in the Pilot 1 and 2 apps (e.g. “AR apps should offer up-to-date, clear and clean sequences and user interfaces”), as well as positive aspects to be re-created (e.g. “AR applications should be portable and need to run in any major mobile or desktop operating system”). The results derived from the questionnaires have been transformed into requirements, to be considered for the Pilot 1 and Pilot 2 apps. The teacher interviews, which were conducted in addition to the surveys, used the same questions as the surveys, but allowed for a more detailed and scrutinising exploration of the topics, due to the nature of the approach. As with the survey results, the interview results were transformed into requirements (e.g. “AR applications should support different styles of presentation (e.g., teacher to class, students in groups, or students individually)”) for consideration in the development of the Pilot apps.

2.2 Pilot 1: AR Interactivity Requirements and Technological affordances

2.2.1 Specific user requirements via focus groups

To gather requirements from teacher coordinators during the 1st ARETE Pilot 1 Teacher Coordinators workshop, we used a combination of a focus group and an online feedback platform to facilitate the discussion. We used Padlet (https://padlet.com), an online feedback platform, to enable the teacher coordinators to note down their observations throughout the workshop and discuss their experiences of the AR tools and their ideas related to AR in education. The Padlet was password-protected and allowed the teacher coordinators to record their feedback via notes, audio clips, and shared images. Instruction documents were sent to the participating teachers prior to the workshop and introduction slides were used to remind the teacher coordinators of the task during the workshop. Teacher

coordinators could record their perceptions and observations on the first as well as the second day of the workshop. Screen capture of the Padlet containing teacher coordinators' feedback for Pilot 1 is shown in Figure 2.1. Teacher coordinators' feedback on the Padlet was used to facilitate discussion in a focus group on the second day of the workshop. The focus group ran for 1 hour with the two teacher coordinators attending the workshop. However, only the feedback of one of the teachers was considered, as the other one turned out not to be eligible to take part in the Pilot after the workshop[2].

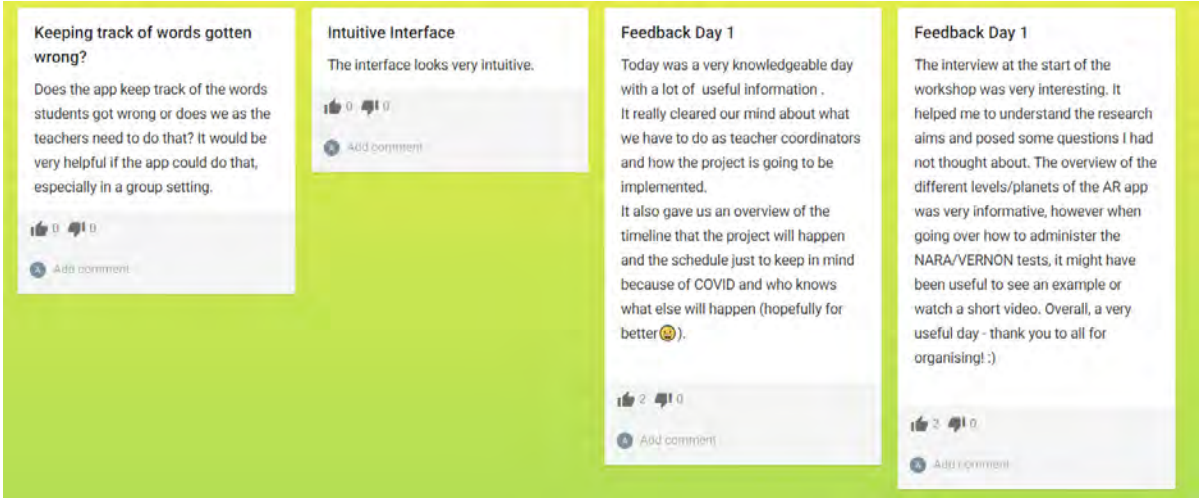

Figure 2.1 Screenshot of teacher coordinator's feedback on Padlet for Pilot 1.

During the focus group, we asked general questions to avoid bias, such as, "What are the application requirements?", "What do you like most?", and "What do you like least?". We are currently in the process of analysing the results, but we are going to present some preliminary results in the following. In terms of requirements, the teachers want an application that is accessible, especially, in regards to the teacher dashboard design. Teachers require the dashboard to show important information e.g., students' activities, progress over time, grade, and record of mistakes; however, teachers thought that these types of information should be hidden from students to prevent them from comparing among themselves and getting discouraged by the outcome. In addition, teachers commented that a fixed passing grade of 100% for the tests to unlock the next level might not be flexible enough for their classroom situation. To address this, the teachers would like to have a feature to manually progress students to the next level, overwriting the system decision. Another feature request is an export function that produces a report to share with the parents of the students. In terms of aspects of the application being liked by the teachers, they appreciated the look and feel of the application as well as "TipTop" the virtual avatar's appearance, saying that it is "child friendly", "colourful", and "should engage students". Teachers also commented that the application's user interfaces are clear and easy to understand. However, teachers said that they have not spent time with the application yet; therefore, they were worried that the application might overwhelm the students. Further analysis of the data collected during the focus group will be performed and details, as well as the derived requirements for the AR app for Pilot 1, will be reported in D4.5 (due in month M25).

[2] The ineligible coordinator has been replaced by one of the pilot teachers who has accepted to take over the role of coordinator.

2.2.2 Technology Affordances

The AR-App will require a stable internet connection and this is because we use voice recognition throughout for students reading speech sounds, words and sentences. The App requires AR functionality to be able to access the AR-3D animations and it is specifically designed to run on Tablet devices because of the type of onscreen data required. To activate the AR 3D models you will need a Tablet device with a front facing camera, and we recommend a larger screen size for a better experience.

Table 1.1 Pilot 1 technological Affordances

Processor (CPU) Manufacturer	Any
Processor Count	2
Processor (CPU) Speed	1.2 GHz
Recommended Minimum Display Resolution	1280×800
RAM Size	3 GB+
FREE Memory Storage Capacity (Hard Disk size)	0.5 - 1 GB
Operating System	Minimum Android 9.0+.x+, iOS 11+ with AR functionality
Connectivity Type	Wi-Fi to download app
Camera	Any (HD recommended)
Front Webcam Resolution	Not required

2.3 Pilot 2: AR Interactivity Requirements and Technological affordances

2.3.1 Specific user requirements via focus groups

As for Pilot 1 AR requirements gathering, we also used the Padlet platform and a focus group for the 1st ARETE Pilot 2 Teacher Coordinators workshop (see section 1.1 for details). We received more feedback in Padlet compared to Pilot 1, presumably at least partly caused by the higher number of participants. Screen capture of teacher coordinators' feedback for Pilot 2 is shown in Figure 2.2. The focus group was conducted with 9 teacher coordinators, and it ran for approximately 1 hour.

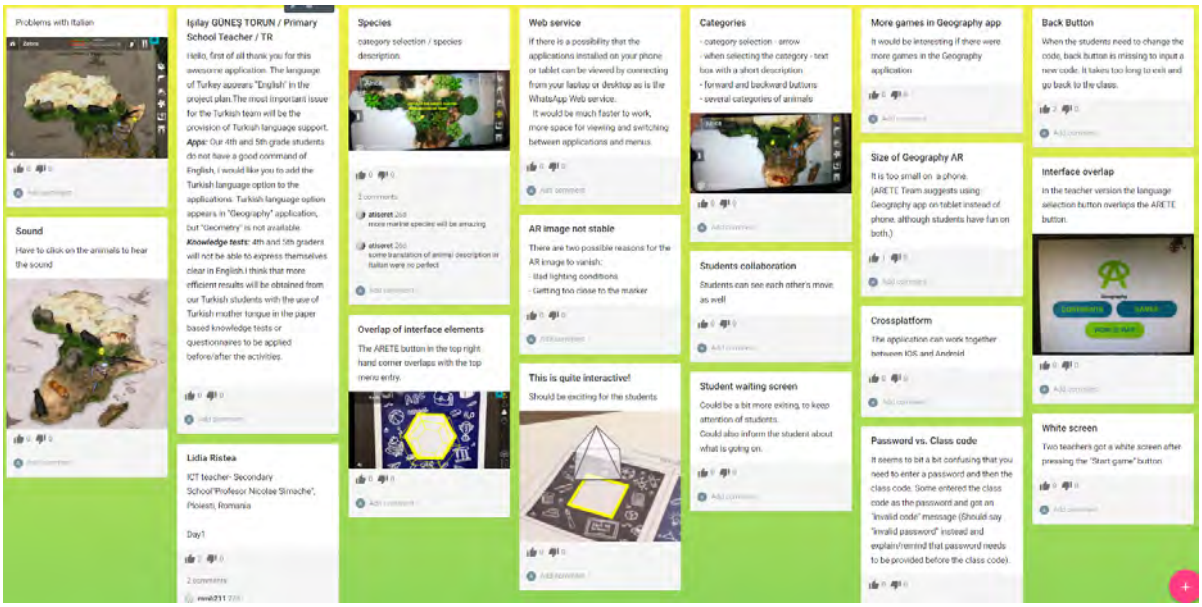

Figure 2.2 Screenshot of teacher coordinator's feedback on Padlet for Pilot 2.

In this workshop, teacher coordinators had hand-on activities to familiarize themselves with the CleverBooks AR applications from both student and teacher perspective. Thus, during the focus group we asked the teacher coordinators "What did you like most?" "What did you like least?" and "Do you have any improvement suggestions?" for both student and teacher perspectives. From the student perspective, teachers liked that the application is translated into local languages and that the application can be used to collaborate with each other across all mobile platforms. They also commented that the sounds of the animals in the geography application is a nice feature to improve students' engagement. On the other hand, teachers commented that some translations require improvement. Multiple teachers also agreed that some buttons should be removed from the student's client to avoid misuse and to clean up the interface by removing unneeded functionality. Another feature request is for help or support buttons, since there are buttons with ambiguous labels (e.g., "feed the animal"), as well as getting explanations or support from the app developers. From the teacher perspective, teachers liked that they could see the progress of the students and can assign tasks to students. Teachers also praised that the application is easy to use and think that it can be integrated in their curriculum. However, some teachers found bugs, such as user interfaces not being displayed properly on some of their devices or irrecoverable crashes. Teachers also would like to customise/personalise the quiz to match with their students' abilities. Further analysis of the data collected during the focus group will be performed and details as well as the derived requirements for the AR app for Pilot 2 will be reported in D4.5 (due in month M25).

2.3.2 Technology Affordances

ARETE apps for Geometry and Geography require hardware: mobile phones or tablets. The minimum hardware specification to operate ARETE apps has the following characteristics

Table 1.2 Pilot 2 technological Affordances

Processor (CPU) Manufacturer	Any
Processor Count	2
Processor (CPU) Speed	1.2 GHz
Minimum Display Resolution	1280×800
RAM Size	1 GB (2-4GB recommended)
FREE Memory Storage Capacity (Hard Disk size)	1 GB
Operating System	Android 4.1.x+, iOS 9+
Accelerometer	Not required
Gyroscope	Not required
Magnetometer	Not required
Other Sensor	Not required
Connectivity Type	Wi-Fi to download app, use multi-user interactivity and send statistics data
Camera	Any (HD recommended)
Front Webcam Resolution	Not required
Video	HD

3. Pilot 1: Requirements, Design and Data Management Plan (DMP)

3.1 Pilot 1: Requirements

3.1.1 Pilot 1: Stakeholders' Requirements

There is an established set of inclusion criteria which stakeholders should meet in order to be involved in ARETE pilot 1. In the case of students, there are also predetermined exclusion criteria.

Teachers are included based on the following criteria:

- Teaching one or several eligible students in English literacy attainment.
- Residing in Ireland, UK, Malta or Cyprus, or teaching at an international school in Europe where English is the main language in use.
- Willing to actively participate in the 1:1 or small group ARETE App intervention over the designated period.
- Proficient knowledge of English (understanding, writing, reading and listening).
- Interest and/or proven experience in the use of technology in education.
- Good digital skills.
- Availability of suitable devices and broadband.

Teacher coordinators should meet some additional criteria:

- Teachers should have proven experience in organising and facilitating (teacher) communities in the framework of other regional/national/international projects.
- Proven experience in creating educational content, disseminating, sharing and providing training of resources, methodologies and or other educational activities to other teachers.
- Availability to participate in three face-to-face workshops and online meetings.

Students need to meet the following criteria to be qualified for the study:

- Aged 9 to 12 years.
- 4th to 6th grader in elementary / primary school.
- English as their first language or lingua franca.
- Residing in Ireland, UK, Malta or Cyprus, or from an international school in Europe where English is the main language in use.
- Average I.Q.
- Underachieving in school standardized literacy tests (≤ 25th percentile rank).
- Must have a designated teacher or Special Needs Assistant (SNA) to deliver the intervention on a regular basis (3 to 5 times per week).
- Must have suitable devices and broadband.
- Significant hearing or visual impairments and intellectual disability were defined as exclusion criteria.

3.1.2 Pilot 1: Consort Diagram

Pilot 1 Consort Diagram is provided at Annex A.1.

3.1.3 Pilot 1: Ethics requirements

2.1.3.1 Pilot 1: Information Sheets (Parents-Students-Teachers)

Pilot 1 Information Sheets for all stakeholders have been provided at D2.9 (M18).

2.1.3.2 Pilot 1: Consent Forms (Parents-Students-Teachers)

Pilot 1 Consent Forms for all stakeholders are provided at Annex A.2.

2.1.3.3 Pilot 1: Data Protection Impact Assessment (DPIA)

Pilot 1 DPIA has been provided at D2.9 (M18).

2.1.3.4 Pilot 1: Record of Processing Activities (RoPA)

Pilot 1 RoPA is provided at D2.9 (M18).

2.1.3.5 Pilot 1: Mobile AR-App Privacy Policy

Pilot 1 Mobile Privacy Policy is provided at Annex A.3.

3.2 Pilot 1: Recruitment and engagement with Stakeholders

The selection process of the stakeholders to be involved in Pilot 1 resulted in the recruitment of 17 teachers, including two coordinators (Figure 3.1). To engage the highest number of pilot teachers, a wide range of measures were undertaken to further disseminate and advertise the ARETE Pilot 1 Call (Figure 3.2). At first, an intense dissemination campaign took place via social media. Then, the call was disseminated among 33 Ministries of Education both via email and at events and meetings. To increase its visibility, the call was also disseminated to industry partners, associations and other stakeholders usually involved in projects with schools across the EU and beyond. In addition, the network of European Schools was contacted, and the ARETE Call for pilot 1 teachers was advertised among teachers of the English section. A similar dissemination campaign targeted English private schools in Europe e.g. over 40 schools were contacted via email. Finally a snowball approach was

employed as selected teachers were also invited to contact and disseminate the ARETE pilot 1 call within their school and among their colleagues.

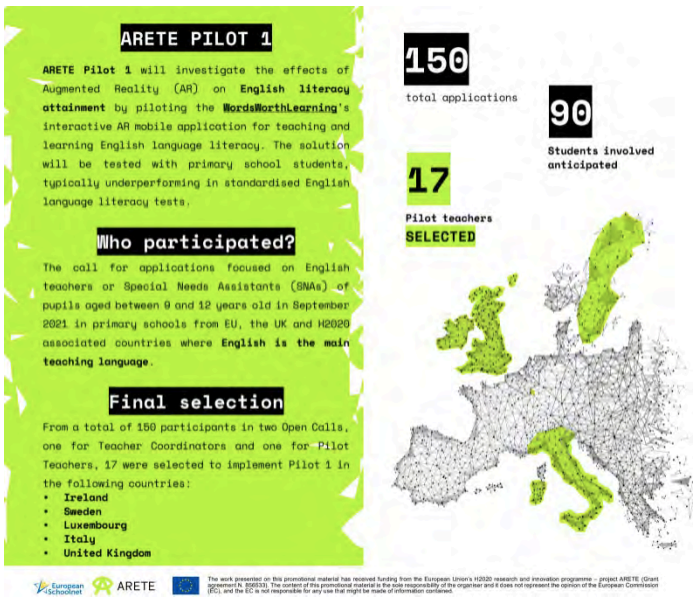

Figure 3.1 Pilot 1 recruitment (final numbers).

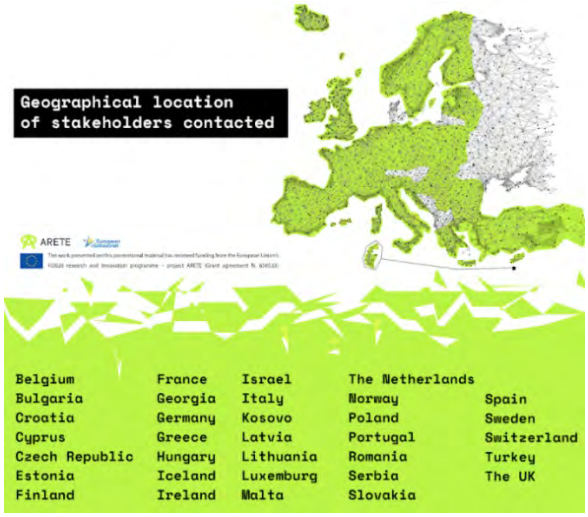

Figure 3.2 Stakeholders' engagement

3.3 Pilot 1: Design - Methodology

3.3.1 Pilot 1: Stakeholders' Training

The 1st ARETE pilot 1 teacher coordinators workshop took place on the 7th and 8th of July via Microsoft Teams. Two ARETE pilot 1 teacher coordinators, and the project partners involved in ARETE pilot 1 - i.e., EUN, WWL, UNW and ULEIC - participated in this workshop.

Teacher coordinators were introduced to the ARETE WordsWorthLearning program and the application which they will use within ARETE Pilot 1; the research part and instruments of the project were also explained. Two focus groups were also organized over the two days of the workshop. The first one concerned the pedagogical implications of AR application in education while the second one focused on the usability and user experience feedback of the AR educational application. Teacher coordinators' questions regarding the deployment of the pilot were also discussed.

The training material presented at the workshop (Annex A.4) will be included in the online ARETE training platform and is further discussed in D6.3.

3.3.2 Pilot 1: Intervention Strategy

Pilot 1 Intervention strategy is provided at Annex A.5.

3.3.3 Pilot 1: Intervention Assessment

Pilot 1 Intervention assessment is provided at Annex A.6.

3.3.4 Pilot 1: Evaluation Strategy

2.3.4.1 Pilot 1: Questionnaires/Surveys

Pilot 1 Questionnaires/Surveys are provided at Annex A.7.

Annex A.7.1: Teachers' Survey (intervention group)

Annex A.7.2: Teachers' Survey (control group)

ProfilED Case-History Form is provided online: https://wordsworthlearning.com/arete

At the login screen enter the Username: **AretePilot1** and Password: **AreteP1** to open the ProfilED Case-History Form (note case sensitive)

3.3.4.2 Pilot 1: Measurement Tools

Pilot 1 measurement tools are provided at Annex A.8.

3.3.5 Pilot 1: Pilot Coordination - Risk Management

(DoA - Table 3.2b) - Risks acceptability**

	Probability (P)		
Impact (I)	1 (Low)	2 (Medium)	3 (High)
1 (Low)	**Acceptable Risk**	**Acceptable Risk**	**Acceptable Risk**
2 (Medium)	**Unacceptable Risk**	**Unacceptable Risk**	**Unacceptable Risk**
3 (High)	**Unacceptable Risk**	**Unacceptable Risk**	**Unacceptable Risk**

Risk Description	WPs Involved	Proposed Risk Mitigation Measures
COVID-19 Impact on Pilot 1 teacher recruitment and interventions. Initial risk estimation P=2 and I=3	WP5 WP6	**Pilot 1:** P=3 and I=3. Alternative solution: Online delivery of Pilot 1, with intervention at home-school set up.

Insufficient assessment (pre and post) due to Covid-19 lockdown. Initial risk estimate P=3 and I=3	WP5 WP6	**Pilot 1:** P=3 and I=3. Pre and post assessment will take place online during the planned assessment periods in case of schools' lockdown. All evaluation measures can be conducted online in case of an online pilot delivery. This would have - no or only low impact on the ProfilEd Case History Forms and on teacher coordinator focus group and interviews, and - a medium impact on NARA II and Vernon tests and on the IMI (Intrinsic Motivation Inventory).

3.4 Pilot 1: Data Management Plan (DMP)

Pilot 1 is aligned with the ARETE Data Management Plan (DMP), which is a formal document and has been submitted initially under deliverable D2.3 (M6) and specifies how research data will be handled both during and after a research project. The DMP is updated in time with the periodic evaluation/assessment of the project. The consortium has defined the timetable for review at M18 – D2.9 (prior to Pilots' intervention at M21) and M36 – D2.10 (post evaluation of the results from the pilots' interventions).

The data workflow diagram for Pilot 1 (based on the Pilot 1 DPIA document - D2.9: Annex 2.1) shows with clarity provision of data sets, inclusion of new data sets, data providers, data controllers and data processors. The research data will be deposited to H2020 ARETE project data repository3 and ZENODO community4 and Argos5, provided from OpenAIRE6. Third parties can freely access, mine, exploit, reproduce and disseminate the data provided. Pilot 1 data workflow diagram is provided at D2.9.

4. Pilot 2: Requirements, Design and Data Management Plan

4.1 Pilot 2: Requirements

4.1.1 Pilot 2: Stakeholders' Requirements

There is an established set of inclusion criteria which stakeholders should meet in order to be involved in ARETE pilot 2. In the case of students, there are also predetermined exclusion criteria.

Teacher Selection Criteria:

- Be actively involved in teaching geometry (mathematics) or geography topics in primary education (with students in grade 4 or 5 of primary school as of September 2021).
- Good knowledge of English (understanding, writing, reading and listening), as teachers should feel comfortable to communicate in English in order to successfully carry out pilot instructions.
- Interest and/or experience in the use of technology in education: teachers will be required to demonstrate their interest and/or experience in the use of technology in education. Previous experience in collaborative local/national/international projects is desirable, but not a must for pilot teachers.

[3] https://arete.ucd.ie/

[4] https://zenodo.org/communities/augmented/

[5] https://argos.openaire.eu/

[6] https://argos.openaire.eu/

- Good digital skills: teachers should feel comfortable with using mobile applications in their teaching.
- Good Internet connection at school and at home both in terms of stability and available bandwidth as well as frequent access to technical infrastructure (i.e., tablets, mobile phones) since teachers need to be able to regularly connect online for their work. Good Internet connection is important for multi-user functionality of both Pilot 2 applications i.e., geography and geometry. They can work offline too but without an option for simultaneous multi-user interaction.
- Access to devices: pilot teachers and their students will have access to Android or iOS tablets/iPads/smartphones.
- Selected Pilot 2 teachers need to be engaged in the project between September 2021 and June 2022.

Teacher coordinators should meet some additional criteria:

- Teachers should have proven experience in organising and facilitating (teacher) communities in the framework of other regional/national/international projects.
- Proven experience in creating educational content, disseminating, sharing and providing training of resources, methodologies and or other educational activities to other teachers.
- Availability to participate in three face-to-face workshops and online meetings

Student Selection Criteria:

Inclusion Criteria:

- Primary school students, in grade 4 or 5 as of September 2021.
- Teachers and pupils in their class must have access to Android or iOS tablets/iPads/smartphones for implementing piloting activities.

Exclusion Criteria:

- Significant visual impairment e.g. on the blind register

Detailed description is located on the ARETE website:
https://www.areteproject.eu/t4media/ARETE-Pilot-2-Call-for-PT-briefing-doc.pdf
https://www.areteproject.eu/pilots/opencallpilots12/

4.1.2 Pilot 2: Consort Diagram

Pilot 2 Consort Diagram is provided at Annex B.1.

4.1.3 Pilot 2: Ethics requirements

4.1.3.1 Pilot 2: Information Sheets (Parents-Students-Teachers)

Pilot 2 Information Sheets for all stakeholders have been provided at D2.9 Annex 2.2 (M18).

4.1.3.2 Pilot 2: Consent Forms (Parents-Students-Teachers)

Pilot 2 Consent Forms for all stakeholders are provided at Annex B.2.

4.1.3.3 Pilot 2: Data Protection Impact Assessment (DPIA)

Pilot 2 DPIA has been provided at D2.9 (M18).

4.1.3.4 Pilot 2: Record of Processing Activities (RoPA)

Pilot 2 RoPA is provided at D2.9 (M18).

4.1.3.5 Pilot 2: Mobile app Privacy policy

Pilot 2 Mobile Privacy Policy is provided at Annex B.3.

4.2 Pilot 2: Recruitment and engagement with Stakeholders

The selection process of the stakeholders to be involved in Pilot 2 resulted in the recruitment of 166 teachers, with 9 teacher coordinators among them (Figure 4.1). To engage the highest number of

pilot teachers, a wide range of measures were undertaken to further disseminate and advertise the ARETE Pilot 2 Call (Figure 4.2).

At first, an intense dissemination campaign took place via social media. Then, the call was disseminated among 33 Ministries of Education via email, at meetings and events. Also industry partners, associations and other stakeholders usually involved in projects with schools within the EU and beyond were contacted and invited to disseminate the call for ARETE pilot 2. In addition, the network of European Schools was contacted and the Call was advertised across all its schools. Finally a snowball approach was employed as selected teachers were also invited to contact and disseminate the ARETE pilot 2 call within their school and among their colleagues

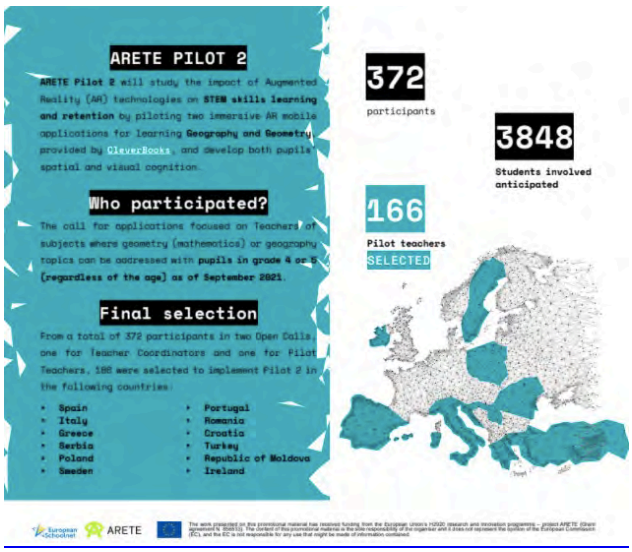

Figure 4.1 Pilot 2 recruitment (final numbers).

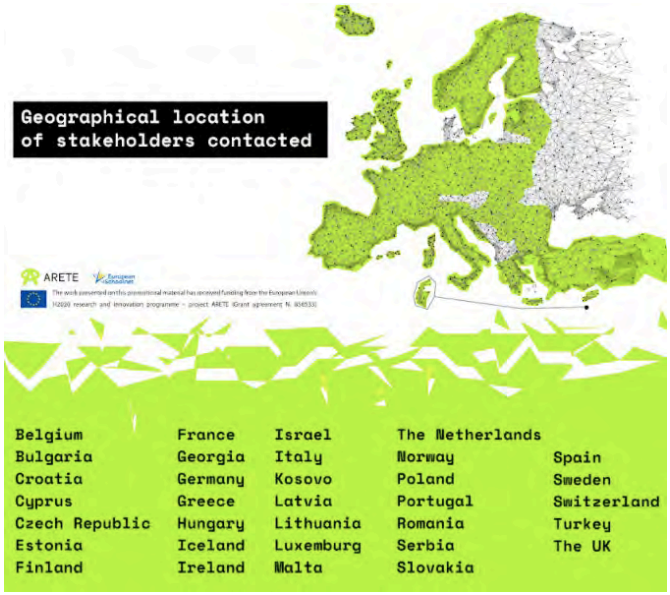

Figure 4.2 Stakeholders' engagement

4.3 Pilot 2: Design - Methodology

4.3.1 Pilot 2: Stakeholders' Training

The 1st ARETE pilot 2 teacher coordinators workshop took place on the 23rd and 24th of June 2021 via Microsoft Teams. Nine ARETE pilot 2 teacher coordinators, and project partners involved in ARETE pilot 1, i.e., EUN, CLB, UNW and ULEIC, participated in this workshop. Teacher coordinators were introduced to the ARETE CleverBooks Geometry and Geography applications, which they will use and implement within ARETE Pilot 2, as well as the research part of the project. Two focus groups were organized. The first one concerned the pedagogical implications of AR application in education, while the second one collected feedback on the usability and user experience of the AR educational applications. In addition, teacher coordinators worked on producing learning scenarios to integrate the use of CLB-AR applications into their teaching and shared ideas on this matter with other participants. Teacher coordinators' questions regarding the deployment of the pilot were also discussed.

The training material presented at the workshop (Annex B.4) is included in the online ARETE training platform and is further discussed in D6.3. Pilot 2 testing material is available in 11 native languages for this pilot. Annex B.4 provides the English versions as an example: A stands for the intervention group, B is for the control group. All of the other 10 language versions have been translated professionally according to scientific standards (i.e., translations done by native speakers with content expertise and following a 4 eyes-principle).

4.3.2 Pilot 2: Intervention Strategy

Pilot 2 Intervention strategy is provided at Annex B.5.

4.3.3 Pilot 2: Intervention Assessment

Pilot 2 Intervention assessment is provided at Annex B.6.

4.3.4 Pilot 2: Evaluation Strategy

3.3.4.1 Pilot 2: Questionnaires/Surveys

Pilot 2 Questionnaires/Surveys are provided at Annex B.7.

3.3.4.2 Pilot 2: Measurement Tools

Selected items from the TIMSS2015 study are used for the ARETE pilot 2 evaluation of student knowledge in Science and Mathematics.

There are 220 different versions of the test books, as there are:

- 5 different test books (3 mathematics test books and 2 science test books), each including different items
- 4 versions of all these 5 test books (1 teacher version and pre-test, post-test and retention test student versions)
- all of these 20 books available in 11 languages

For illustration purposes, the English version of all 5 test books in the student post-test version as well as one teacher test book will be included in Annex B.8.

4.3.5 Pilot 2: Pilot Coordination - Risk Management

Based on the risk analysis for Pilot 2, as described in Table 3.2b in DoA, the pandemic can have a high impact on the intervention phase. In any case as shown below, all evaluation measures can be conducted online or at home. The pilot manager and European Schoolnet will ensure to be in communication with the teachers coordinators to ensure continuity and keep the momentum of the project process.

(DoA - Table 3.2b) - Risks acceptability**

	Probability (P)		
Impact (I)	1 (Low)	2 (Medium)	3 (High)
1 (Low)	**Acceptable Risk**	**Acceptable Risk**	**Acceptable Risk**
2 (Medium)	**Unacceptable Risk**	**Unacceptable Risk**	**Unacceptable Risk**
3 (High)	**Unacceptable Risk**	**Unacceptable Risk**	**Unacceptable Risk**

Risk Description	WPs involved	Proposed risk-mitigation measures
Insufficient assessment (pre and post) due to COVID-19 lockdown. Initial risk estimation: P=3 and I=3	WP6	**Pilot 2: P=3 and I=1** All evaluation measures can be conducted online or at home in case of an online pilot delivery. This would have - no or only low impact on teacher coordinator focus groups (online pre & post), - medium impact on the IMI (Intrinsic Motivation Inventory; online), and - high impact on TIMSS2015. In the case of TIMSS2015, the survey would have to be filled in at home by students, hence a severe impact on the quality of data collected is to be expected in terms of validity, completion, and response rate. - ARETE apps can be used in the remote settings having the wifi connecting in place - printed materials are individual for students and teachers and will be distributed by EUN prior to the piloting stage which provides convenience for remote settings use in case of lockdown is in place again

4.4 Pilot 2: Data Management Plan (DMP)

Pilot 2 is aligned with the ARETE Data Management Plan (DMP), which is a formal document and has been submitted initially under deliverable D2.3 (M6) and specifies how research data will be handled both during and after a research project. The DMP is updated in time with the periodic evaluation/assessment of the project. The consortium has defined the timetable for review at M18 – D2.9 (prior to Pilots' intervention at M21) and M36 – D2.10 (post evaluation of the results from the pilots' interventions). The data workflow diagram for Pilot 2 (based on the Pilot 2 DPIA document) shows with clarity provision of data sets, inclusion of new data sets, data providers, data controllers and data processors. The research data will be deposited to H2020 ARETE project data repository[7] and ZENODO community[8] and Argos[9], provided from OpenAIRE[10]. Third parties can freely access, mine, exploit, reproduce and disseminate the data provided. Pilot 2 data workflow diagram is provided at D2.9.

[7] https://arete.ucd.ie/

[8] https://zenodo.org/communities/augmented/

[9] https://argos.openaire.eu/

[10] https://argos.openaire.eu/

5. Conclusions – Key lessons

Over the course of the 22 months of the project, WP6 partners put in place a comprehensive plan for the deployment of the ARETE pilots, fully aligned with the timeline foreseen in the description of work. The pilots' evaluation strategy and instruments are in place. Aspects related to ethics and data protection are also integrated and processes are established that will ensure a streamlined implementation that takes into consideration the protection of personal data from all pilot participants (including minors).

The road to getting the pilots operational for M23, has not been an easy one. Initial planning did not recognize the complexities of attracting stakeholders during a pandemic which made teachers reluctant to engage in additional activities. As a result, recruitment took longer than expected and resulted in securing 43% of the targeted quota of teachers for Pilot 1 and 98% for Pilot 2.

Attracting stakeholders for Pilot 1 proved to be particularly difficult and the result achieved is not as satisfying as the one obtained for Pilot 2. However, it must be noticed that Pilot 1 concerns only schools where the curriculum is taught in English, which are a minority across Europe and are mostly located in the United Kingdom. To this extent, the Brexit recently concluded discouraged British schools to engage in a EU funded project; in addition, the effects of the anti-EU communication campaign often present in UK media cannot be underestimated and topped the already difficult situation created by the Covid-19 pandemic. Finally, Pilot 1 technical requirements such as the need to have access to Android or iOS tables/iPads for each participating teacher and student - i.e. mobile phones and Chromebooks cannot be used - further limited the number of eligible schools.

The impact assessment carried out at the WP6 level allowed the consortium to envisage solutions to mitigate negative effects on the pilots' deployment. In particular, the employment of a 2-step approach for the recruitment of teachers proved to be a valuable solution to successfully incorporate early feedback from target groups and better plan the pilot implementation stage. This strategy allowed to fulfil the established quota of teachers operatives for Pilot 2 and sensibly increased the number of applicants for Pilot 1.

For future pilots, it is recommended to have a dedicated steering group with representatives from each EU participating country, governing the process to secure commitment and encourage local national advertisement of the pilots through the Ministries of Education. The design and employment of a more simple and easy to apply research approach, which would limit teachers' involvement and burden is also to be considered.

Apart from the difficulty with the recruitment phase, we have prepared all the necessary materials for the Pilots 1 & 2 to kick start in M23, the deployment of which will be reported at D6.4 (M42) and the evaluation at D6.5 (M42)

List of annexes

Annex A: Pilot 1

Annex A.1: Pilot 1 Consort Diagram

Annex A.2: Pilot 1 Consent Forms (Parents-Students-Teachers)

Annex A.3: Pilot 1 Mobile AR-App Privacy Policy

Annex A.4: Pilot 1 Training Material

Annex A.5: Pilot 1 Intervention Strategy

Annex A.6: Pilot 1 Intervention Assessment

Annex A.7: Pilot 1 Questionnaires/Surveys

- **Annex A.7.1: Teachers' Survey (intervention group)**
- **Annex A.7.2: Teachers' Survey (control group)**

Annex A.8: Pilot 1 Measurement Tools

Annex B: Pilot 2

Annex B.1: Pilot 2 Consort Diagram

Annex B.2: Pilot 2 Consent Forms (Parents-Students-Teachers)

Annex B.3: Pilot 2 Mobile AR-App Privacy Policy

Annex B.4: Pilot 2 Training Material

Annex B.5: Pilot 2 Intervention Strategy

Annex B.6: Pilot 2 Intervention Assessment

Annex B.7: Pilot 2 Questionnaires/Surveys

- **Annex B.7.1: Teachers' Survey (intervention group)**
- **Annex B.7.2: Teachers' Survey (control group)**

Annex B.8: Pilot 2 Measurement Tools

ARETE

CONSORT
TRANSPARENT REPORTING of TRIALS

ARETE Pilot 1 Recruitment & Enrollment

Assessed for Eligibility (n = ?)
- Teacher consent forms submitted (n_{teach} = ?)
- Student assent forms submitted (n_{stud} = ?)
- Parent consent forms submitted (n_{par} = ?)
- Parent 'ProfilEd' Control Group consent form submitted ($n_{par\ PROF}$ = ?)

Excluded (n_{par} = ?; n_{teach} = ?; n_{stud} = ?)
- Not meeting inclusion criteria (n_{par} = ?; n_{teach} = ?; n_{stud} = ?)
- Declined to participate (n_{par} = ?; n_{teach} = ?; n_{stud} = ?)
- Other reasons (n_{par} = ?; n_{teach} = ?; n_{stud} = ?)

Parents from 'ProfilEd' Control Group filled in Case History Control Form ($n_{par\ PROF}$ = 90)

Met inclusion criteria (n_{par} = ?; n_{teach} = ?; n_{stud} = ?)

Intervention | **Randomization (classwise)** | *Control*

Allocated to intervention group ($n_{stud\ ITV}$ = 45)

Allocated to control group ($n_{stud\ CTRL}$ = 45)

Pretesting

- Parents filled in Case History Form ($n_{par\ ITV}$ = ?)
- Teacher coordinators interviewed ($n_{teach\ ITV}$ = 2)
- Students completed NARA II: Form 1 ($n_{stud\ ITV}$ = ?)
- Students completed Vernon Graded Word Spelling Test ($n_{stud\ ITV}$ = ?)
- Teachers filled in pre survey ($n_{teach\ ITV}$ = 9)

- Parents filled in Case History Form ($n_{par\ CTRL}$ = ?)
- Students completed NARA II: Form 1 ($n_{stud\ CTRL}$ = ?)
- Students completed Vernon Graded Word Spelling Test ($n_{stud\ CTRL}$ = ?)
- Teachers filled in pre survey ($n_{teach\ CTRL}$ = 8)

Intervention

- Students received allocated intervention ($n_{stud\ ITV}$ = ?)
- Students did not receive allocated intervention ($n_{stud\ ITV}$ = ?) (give reasons)

- Students left control group ($n_{stud\ CTRL}$ = ?) (give reasons)

Posttesting

Reassessed ($n_{stud\ ITV}$ = ?)
- Students completed NARA II: Form 2 ($n_{stud\ ITV}$ = ?)
- Students completed Vernon Graded Word Spelling Test ($n_{stud\ ITV}$ = ?)
- Students completed IMI Survey ($n_{stud\ ITV}$ = ?)
- Teacher Coordinators interviewed ($n_{teach\ ITV}$ = 2)
- Teachers filled in post survey ($n_{teach\ ITV}$ = ?)
- Students lost to follow-up ($n_{stud\ ITV}$ = ?) (give reasons)
- Students discontinued intervention ($n_{stud\ ITV}$ = ?) (give reasons)

Reassessed ($n_{stud\ CTRL}$ = ?)
- Students completed NARA II: Form 2 ($n_{stud\ CTRL}$ = ?)
- Students completed Vernon Graded Word Spelling Test ($n_{stud\ CTRL}$ = ?)
- Students completed IMI Survey ($n_{stud\ CTRL}$ = ?)
- Teachers filled in post survey ($n_{teach\ CTRL}$ = ?)

Students lost to follow-up ($n_{stud\ CTRL}$ = ?) (give reasons)

Analysis

Analysed ($n_{stud\ ITV}$ = ?; $n_{teach\ ITV}$ = ?)
- Excluded from analysis ($n_{stud\ ITV}$ = ?; $n_{teach\ ITV}$ =?) (give reasons)

Analysed ($n_{stud\ CTRL}$ = ?)
- Excluded from analysis ($n_{stud\ CTRL}$ = ?; $n_{teach\ CTRL}$ = ?) (give reasons)

ARETE

Arete Project Pilot 1:

Using Augmented Reality to Facilitate Teaching English Literacy Skills

PARENT CONSENT FORM

PARENT / LEGAL GUARDIAN CONSENT TO PARTICIPATE

ARETE Pilot Project 1 Using Augmented Reality to Facilitate Teaching English Literacy Skills.

Note: All personal identifiable data collected in this form will remain in the possession of the school and **will not** be shared with any member of the ARETE project team. Please refer to the privacy section in the Information handout for further details.

- I have read and understood the parent/legal guardian information leaflet for the ARETE Pilot 1 study.
- I understand what the study is about and what my child's results will be used for.
- I have had the time to research and to consider whether to take part in the study.
- I understand that I will complete a pseudonymised ProfilEd Case History form regarding my child, but that no identifying information will appear on any research data from this pilot study and there will be no audio/video recordings for this study.
- I understand that my child will undergo a 1:1 pre and post pilot intervention standardised literacy assessments. The Neale Analysis of Reading ability (NARA II), which tests for reading accuracy, reading comprehension and reading rate and the Vernon Graded Word Spelling Test will be given before the project starts and again at the end to evaluate the child's performance over time.
- I am fully aware of the procedures involving my child and of possible risks and benefits associated with the study.
- I understand that my child's and my **participation is voluntary** (choice under free will) and that I am free to withdraw from the research study at any time without disadvantage and without giving any reason.

Therefore, **I agree to take part in this research** (please tick the box): ☐

I hereby consent to my child (name)_____ involvement in this ARETE Pilot 1 study and I give my permission for the use of pseudonymised data collected from my child and me and through the use of the WWL-AR app for the following purposes:

1. **Publications and conference presentations.**
2. **Future research (subject to ethical review).**
3. **Sharing of pseudonymised data with third parties for research purposes only.**

If in agreement please tick the box ☐

Name of parent/legal guardian (in block letters): _____

Email Address: _____ Mobile: _____

Signature(s):_____Date: _____

Please return this form to the school.

For more information on this project please visit http://www.areteproject.eu/.

ARETE

Arete Project Pilot 1:

Using Augmented Reality to Facilitate Teaching English Literacy Skills

STUDENT CONSENT FORM

STUDENT CONSENT TO PARTICIPATE

ARETE Pilot Project 1 Using Augmented Reality to Facilitate Teaching English Literacy Skills.

Note: All personal identifiable data collected in this form will remain in the possession of the school and **will not** be shared with any member of the ARETE project team. Please ask your parent or teacher to explain to you the privacy section in the Information handout.

- I have read with my parent(s)/legal guardian(s) and understood the information leaflet for the ARETE Pilot 1 study.
- I understand what the study is about and what my results will be used for.
- I have had the time to research and to consider whether to take part in the study.
- I understand that my personal information is not identifiable and will not appear on any research data from this pilot study and there are no audio/video recordings for this study.
- I am fully aware of the procedures associated with the study.
- I understand that my **participation is voluntary** (choice under free will) and that I am free to withdraw from the research study at any time without penalty and without giving any reason.

Therefore, **I agree to take part in this research** (please tick the box): ☐

I _____ agree to be involved in the ARETE Pilot 1 study and I give my permission for the use of **pseudonymised** data collected about me through my ProfilED form, my assessments and the use of the WWL-AR app for the following purposes:

1. **Publications and conference presentations to let people know about the project.**
2. **Future research (subject to ethical review to protect my information).**
3. **Sharing of my pseudonymised data for further research purposes only.**

If you agree to this please tick the box: ☐

Name of student (in block letters): _____

School: _____ Class: _____

Signature: _____ Date: _____

Please return this form to the school.

For more information on this project please visit http://www.areteproject.eu/.

ARETE

Arete Project Pilot 1:

Using Augmented Reality to Facilitate Teaching English Literacy Skills

TEACHER CONSENT FORM

TEACHER CONSENT FORM

ARETE Pilot Project 1 Using Augmented Reality to Facilitate Teaching English Literacy Skills.

Note: All personal identifiable data collected in this form will be collected by and remain in the possession of EUN and **will not** be shared with any other members of the ARETE project team. Please refer to the privacy section in the Information handout for further details.

- I have read and understood the information leaflet for the ARETE Pilot 1 study.
- I understand what the study is about and what my student's results will be used for.
- I have had the time to research and to consider whether to take part in the study.
- I understand that my student(s) and my personal information will not appear on any research data from this pilot study and there will be no audio/ video recordings for this study.
- I am aware of the procedures involving my student(s) participation and of possible risks and benefits associated with the study.
- I understand that my student's and my **participation is voluntary** (choice under free will) and that I am free to withdraw from the research study at any time without disadvantage and without giving any reason.

Therefore, **I agree to take part in this research** (please tick the box): ☐

I hereby give my permission for the use of **pseudonymised** data collected from my student(s) and me and through the use of the ARETE WWL AR app for the following purposes:

1. **Publications and conference presentations.**
2. **Future research (subject to ethical review).**
3. **Sharing of pseudonymised data with third parties for research purposes only.**

If in agreement please tick the box ☐

Name of Teacher (in block letters): _____

School: _____ **Class:** _____

Signature: _____ **Date:** _____

Please return this form to: Giuseppe Mossuti < giuseppe.mossuti@eun.org >

For more information on this project please visit http://www.areteproject.eu/.

ARETE PROJECT: PILOT 1 - APP PRIVACY POLICY

EU H2020 Research and Innovation Action programme - Grant Agreement No. 856533.

PRIVACY POLICY for PILOT 1 – AR-App

PERSONAL/RESEARCH INFORMATION for PILOT 1 App collected by ARETE Project.

1. Description

WordsWorth Learning Ltd, will provide access for each stakeholder that has volunteered to participate in this ARETE Project - Pilot 1 App to research whether the introduction of state-of-the-art Augmented Reality into the WordsWorthLearning programme will improve reading and spelling skills.

Your original personal data is reprocessed and pseudonymised before being made available and used to access the Pilot 1 App. This means you will not be identifiable, which is the responsibility of the DPO and Legal Team indicated in Section 3 below.

Your pseudonymised information will enable stakeholders, teachers and our research community, geographically spread across Europe (and beyond) to maintain a private space on the Internet where they can share research information, documents, participate in discussion fora, download software, subscribe to Joint Research Center (JRC) publications etc. Your data will be collected and further processed for the purposes detailed hereafter under point 2.
As the processing collects and further processes research data, Regulation (EC) 45/2001, of the European Parliament and of the Council of 18 December 2000 on the protection of individuals with regard to the processing of personal data by the Community institutions and bodies and on the free movement of such data, is applicable.

2. What personal/research information do we collect, what is the legal basis, for what purpose and through which technical means?

Identification Data:

The App does not collect personal data it uses pseudonymised data collected for research purposes only, for future App development. Each stakeholder accesses the App using a unique 6-digit ID and PW provided for the project. Registration and participation of data subjects are provided on a purely voluntary basis.

Legal Basis of processing:

The European Parliament and Council Decision of Horizon2020 - https://ec.europa.eu/programmes/horizon2020/en/official-documents

Purpose of processing:

The purpose of the processing of research data for the Arete Pilot 1 project is to provide secure access and information exchange, including management of: communications to

users, reports, distribution of reports, information sharing within research interest, groups, etc.

Technical Information:
The user data are collected through clicks and transmitted as xAPI statements via JSON files to a secure research data repository.

3. Who has access to your information and to whom is it disclosed?

Access to the research data is only granted through User-Id & Password to appointed users:

Pilot 1 Data Controller information is:

Processing the personal data:

- UNW: Dr. Uwe Klug (Chancellor of the University of Wuerzburg), uwe.klug@uni-wuerzburg.de;

Processing the pseudonymisation and creation of ID & PW of personal data:

- EUN: Marc Durando (Executive Director of European Schoolnet), marc.durando@eun.org;

Processing of digitalised pseudonymised data transfer:

- WWL: WordsWorth Learning Ltd.,(App Developer) 12 Priory Office Park, Blackrock, Dublin, A94 N2V3, Ireland. contact@wordsworthlearning.com

Pilot 1 Data Protection Officers information is:

- WWL: Rita Treacy, rita@wordsworthlearning.com;
- UNW: Stefan Wettengel (Deputy Data Protection Supervisor at the University of Wuerzburg), stefan.wettengel@uni-wuerzburg.de, +49 (0)931 31-82545;
- EUN: John Stringer (an inhouse consultant at EUN, a UK lawyer), john.stringer@eun.org;

Regular registered and approved Research Organisations by default have access to the pseudonymised research data produced in the App. No personal data is transmitted.

4. How do we protect and safeguard your information?

The collected research data is stored on the Arete Project servers as follows: https://learninglocker.vicomtech.org, which is physically located on Vicomtech premises (Mikeletegi Pasealekua 57, 20009 Donostia, Spain).

The server is installed on a Virtual Machine and is not accessible by other machines in the local network. All the traffic sent to the server is encrypted and only the users with administrative rights can access it.

5. How can you verify, modify or delete your information?

Registered users are able to update it or to cancel their registration or to request to unsubscribe from this specific project, more information can be found at the following link https://www.areteproject.eu/gdprpolicy

6. How long do we keep your data?

Your personal/research data will remain in the database for a period of 6 years after the end of the project.

7. Contact Information

Should you have any queries concerning the processing of your personal/research data, please address them to: https://www.areteproject.eu/gdprpolicy/

8. Recourse

We are committed to the protection of your privacy while you use our Mobile App.

By continuing to use our Mobile App, you acknowledge that you have had the chance to review and consider this Privacy Policy, and you acknowledge that you agree to it. This means that you also consent to the use of your information and the method of disclosure as described in this Privacy Policy. If you do not understand the Privacy Policy or do not agree to it, then you agree to immediately cease your use of our Mobile App.

1st ARETE Pilot 1

Teacher Coordinators workshop

Agenda

When?	Where?
7th and 8th of July 2021 from 15:30 till 19:00 CEST	The event will take place **online** via Microsoft Teams. Click here to connect to the session of 07/07 Click here to connect to the session of 08/07
Who will be there?	**Objectives?**
- WordsWorthLearning (Pilot 1) applications' representatives - ARETE Pilot 1 Teacher Coordinators - Research partners (UNW, ULEIC) - EUN coordinators and staff	- Introduction to pilot organisation and implementation activities - Introduction to the AR application used in ARETE Pilot 1 (incl. technical sessions) - Introduction and feedback on ARETE Training platform - Introduction to research and evaluation design - Overview of lesson plans related to ARETE Pilot 1

The ARETE project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 856533. Neither the European Commission (EC) nor any person acting on behalf of the Commission is responsible for how the following information is used. The views expressed in this document are the sole responsibility of the authors and do not necessarily reflect the views of the EC.

Day 1

Time*	Session type	Session	Session Leader
15:30 – 15:45	*Plenary*	Welcome and participants short introduction	EUN
15:45 – 16:45	***FG 1***	**Focus group 1 –** Pedagogical implications of AR application in education: – Pilot 1 teacher coordinators	UNW
16:45 – 17:00	*BREAK*	**Coffee break**	
17:00 – 18:00	***WSH 1***	**Workshop 1 – Introduction to the Augmented Reality application tested in ARETE Pilot 1:** – Pilot 1 teacher coordinators	WWL
18:00 – 18:45	***WSH 2***	**Workshop 2 – Introduction to research and evaluation design in ARETE Pilot 1:** – Pilot 1 teacher coordinators	WWL, UNW
18:45 – 19:00	*Plenary*	Wrap-up of the activities and end of the meeting	EUN

Day 2

Time*	Session type	Session	Session Leader
15:30 – 15:45	*Plenary*	Welcome and introduction to upcoming activities	EUN
15:45 – 16:30	***WSH 3***	**Workshop 3 –Training platform for Pilot operatives:** – Pilot 1 teacher coordinators	WWL
16:30 – 17:00	***WSH 4 (Part 1)***	**Workshop 4 (Part 1) – Introduction Augmented Reality (AR) into real classroom settings:** – WWL AR and classroom activities (Pilot 1 teacher coordinators)	WWL
17:00 – 17:15	*BREAK*	**Coffee break**	
17:15 – 17:45	***WSH 4 (Part 2)***	**Workshop 4 (Part 2) – Introduction Augmented Reality (AR) into real classroom settings:** – WWL AR and classroom activities (Pilot 1 teacher coordinators)	WWL
17:45 - 18:45	***FG 2***	**Focus group 2 –** Usability and User Experience Feedback of the AR Educational Application: – Pilot 1 teacher coordinators	ULEIC
18:45 - 19:00	*Plenary*	Closing words and next steps	EUN

All times expressed as CEST (Central European Summer Time)

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ARETE Pilot 1 · Intervention Strategy · *09/07/2021, UNW*

ARETE

2021: Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec

Recruitment
n_{teach} = 17;
n_{stud} = 90;
n_{par} = 90;
$n_{case\ hist\ CTRL}$ = 90

Parents, Teachers, Students complete informed intervention consent paper forms[1]

Teacher Coordinator Pre Interviews:
$n_{teach\ int}$ = 2

Classes randomized: allocated to interv. or ctrl. group by UNW
Students,teachers & parents assigned a pseudonymised ID[2]

Teacher Pre Surveys[7]:
$n_{teach\ svy}$ = 17

Teachers administer NARA II: Form 1 and Vernon Graded Word Spelling Test[4]
($n_{stud\ ITV}$ = 45; $n_{stud\ CTRL}$ = 45)

Intervention:
Teachers administer WWL-AR app on tablet/ phone:
15-20 minute sessions, 3-5 sessions per week for 2 academic terms[5]

Control group:
Teachers support students' literacy attainment without WWL-AR app

Parents complete Online ProfilED Case History form[3]
($n_{par\ ITV}$ = 45; $n_{par\ CTRL}$ = 45; $n_{case\ hist\ CTRL}$ = 90)

2022: Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec

Teachers re-administer NARA II: Form 2, Vernon Graded Word Spelling Test[4] and IMI Post Survey[2]
($n_{stud\ ITV}$ = 45; $n_{stud\ CTRL}$ = 45)

Teacher Post Surveys[7]:
$n_{teach\ svy}$ = 17

Teacher Coordinator Post Interviews[6]: $n_{teach\ int}$ = 2

2023: Jan, Feb, Mar, Apr

- Data analysis and reports / Journal articles
- Dissemination
- Collaborative reporting between all consortium parties concerned

[1] Students' and parents' forms remain at schools. Teachers' forms collected by EUN.
[2] Codes developed and assigned to teachers by UNW. Group codes for pseudonymisation transferred to WWL.
[3] Pseudonymised completed online forms sent directly to WWL and data plotted on SPSS. Completed forms kept in secure storage at WWL.
Once completed, SPSS ProfilED data sent to UNW to analyze.
[4] NARA II and Vernon Graded Word Spelling test scored by teachers on site and plotted on the front pages of the concerned forms. The anonymized test forms (paper/digital) are sent to UNW via EUN and set up in a data base. Once the analysis is over, the forms are sent to WWL to store for 6 years post project.
[5] During the intervention, pseudonymised technical data are collected by WWL. The data are anonymised and sent to UNW post intervention in a processible format (csv files) for analysis.
[6] Teacher Coordinator Interviews: to be organized at the 1st and 3rd teacher coordinators workshop. To be conducted, recorded, transcribed by UNW.
Pseudonymised recordings and anonymised transcriptions saved securely at UNW for 6 years post project.
[7] Teacher Surveys: Online surveys for intervention and control group teachers, pre and post intervention. Organized and analyzed by UNW. Anonymised results stored securely at UNW for 6 years post project.
[8] Student IMI Post Survey: Online survey for intervention and control group students, post intervention. Pseudonymised data sent to UNW to plot and anonymise on data base, storage at UNW – 6 years post project.

ARETE Pilot 1 · Assessment Strategy · *09/07/2021, UNW*

Research Question: How does AR impact on students' literacy attainment?

ARETE

ProfilED Case History form

Online Survey, filled in by parents

Sept-Oct 2021

$n_{par\ ITV} = 45$; $n_{par\ CTRL} = 45$;
$n_{case\ hist\ CTRL} = 90$

Instrument characteristics

The form works from a multi-disciplinary perspective to provide information relating to Speech & Language Therapy, Occupational Therapy, Psychology and Academic (School) performance. The data collected includes early and current history and identifies areas of strength and difficulty of clinical interest to these multi-disciplines to help with assessment & intervention recommendations. It takes approx. 20 min to complete.

Handling of Data

Anonymous completed online forms sent directly to WWL and data plotted on SPSS. Completed forms kept in secure storage at WWL. Once completed, anonymized SPSS ProfilED data sent to UNW to analyze.

Analysis (Oct 2021-Dec 2021)

Identification of variables that distinguish intervention and control group from the case history control group:
what variables are shared across groups so that they can be eliminated for the next stage of analysis? What variables are specific to students with literacy difficulties?

NARA II: Form 1 (pretest) and Form 2 (posttest); Vernon Graded Word Spelling Test, IMI Survey (post)

Paper tests, administered by teachers
Pre: Sept-Oct 2021; Post: Apr-Jun 2022
$n_{stud\ ITV} = 45$; $n_{stud\ CTRL} = 45$

Instrument characteristics

Neale Analysis allows for Pre and Post testing of reading ability for English language. It is a standardised test of English reading accuracy, reading comprehension and reading rate, providing standard scores and reading age equivalents for students up to 12:11 years. Testing takes approx. 20 min for one teacher and one student.
Vernon Graded Spelling Test is a standardised test designed to assess spelling attainment and progress from age range 5 to 18+ years. Testing takes 5-20 minutes and is realized by a teacher and either one student or a group of students.
The Intrinsic Motivation Inventory (IMI) is a multidimensional tool that allows to assess the students' experience during the intervention phase through a Likert scale.
The survey will take approx. 5-10 minutes.

Handling of Data

Pseudonymized test forms (paper) to be sent to UNW initially to plot and anonymise baseline data (pre) and intervention scores data (post) on data base, then sent back to WWL for storage – 6 years post project.

Analysis (Oct 2021-Apr 2023)

- Comparison of pre and post results
- Comparison of intervention and control group
- Identification of profile variables (decided upon from previous ProfilEd Case History Form analysis) that contribute to or determine a positive response to WWL-AR; evaluation of profile variables that indicate suitability/ unsuitability of AR use

Teacher Coordinator Interviews

Face to face interviews
Organized at 1st & 2nd teacher coordinators' workshop by EUN / Administered by UNW

Pre: June 2021; Post: Mar 2022

$n_{teach\ ITV} = 2$

Instrument characteristics

Qualitative interview guideline developed based on relevant literature, to clarify the pedagogical implications of AR application in educational settings. The interviews will take approx. 1 hour.

Handling of Data

Interviews conducted, audio-recorded and transcribed by UNW. Data accessed by UNW only.
Pseudonymized recordings and anonymized transcriptions saved securely at UNW for 6 years post project.

Analysis (Jun 2021-Apr 2023)

- Qualitative content analysis of anonymized transcripts
- Conclusions on the implications of AR on teaching and learning processes in school
- Identification of teachers' experiences and evaluation of the intervention, of factors that hinder or facilitate a successful implementation, and of the perceived impact of the AR-based intervention on the students

Teacher Surveys

Online surveys
Organized and administered by UNW

Pre: Sept-Oct 2021; Post: May-Jun 2022

$n_{teach\ ITV} = 9$; $n_{teach\ CTRL} = 8$

Instrument characteristics

Subjective surveys, developed based on relevant literature, to identify intervention and control group settings and pedagogical implications of AR applications in education. The surveys take approx. 10 min (pre) / 30 min (post) to complete.

Handling of Data

Pseudonymised surveys developed, administered, anonymised and analysed by UNW. Data accessed by UNW only. Data saved securely at UNW for 6 years post project.

Analysis (Sep 2021-Apr 2023)

- Descriptive statistics, comparison of intervention and control group results
- Conclusions on the implications of AR on teaching and learning processes in school
- Identification of intervention and control group settings, of teachers' experiences and evaluation of the intervention, of factors that hinder or facilitate a successful implementation, and of the perceived impact of the AR-based intervention on the students

Collection of technical data

Collection of research data will be organized and administered by WWL. Currently, all app data will be stored on the client device. Additional features will provide research data collection. The data will be anonymized and stored in the Arete Project repository.

Instrument characteristics

Data will include:

- Teacher dashboard access to student progress will be collected throughout the app
- Speech recognition App (COPPA & GDPR compliant)
- xAPI research data will be extracted and transferred.

Handling of Data

- Pseudonymised data will be collected from Events Logs (clicks) and stored as anonymized Json files.
- The data will be extracted by xAPI to the project Learning Locker and used for research purposes and teacher dashboard.

Analysis (Jul 2022-Apr 2023)

Future statistical data for analysis will include e.g. Tracking:

- Speed of progress through the app
- Scores: for games, awards, questionnaires
- Attempts at reading & spelling exercises
- No. of references to Vowel & Consonant charts

Data analysis and reports
Journal articles
Dissemination
Collaborative reporting between all consortium parties concerned

Project ARETE • Pilot 1 • Evaluation Survey for Teachers · **Intervention** Group

Survey Items: PRETEST

Introduction

Dear teachers,

Thank you for participating in the ARETE project. ARETE (https://www.areteproject.eu) is an EU-funded project, aiming to develop and evaluate the effectiveness of an interactive Augmented Reality (AR) content toolkit. This will give students and teachers access to innovative AR content to enhance their learning and teaching.

The following survey is part of an ARETE pilot study which will be evaluated to assess the success and impact of Augmented Reality in education. It will take you about 10 minutes to complete.

Your answers in the following questionnaire are a central resource for this evaluation and of great value for this project. There are no right or wrong answers. **Please fill in all questions honestly and completely** to ensure a comprehensive and significant evaluation. Please note that your participation is voluntary.

The questionnaire is entirely anonymous. We assure you that your data will be treated in the strictest confidence and in accordance with General Data Protection Regulation (GDPR) <https://www.ucd.ie/gdpr/about/>. The data will only be viewed by personnel working on this project, will not be forwarded to third parties and will be used solely for research purposes.

If you have questions regarding this survey or the evaluation process, please contact a member of the evaluation team: Jennifer.tiede@uni-wuerzburg.de

Please confirm that you have read the information above and that you give us your consent to use your anonymous responses for our research work by checking the box:	☐ **I agree**

Thank you!

Area 1: Demographic Data

1. Please enter your unique identification code here: . _____

2. What is your gender? *(select one answer)*
   - □ Female
   - □ Male
   - □ Other / prefer not to say

3. What is your age? _____ [numerical input]

4. What is your country of residence? *(select one answer)*
   - □ Ireland
   - □ UK
   - □ Malta
   - □ Cyprus
   - □ Other: please specify _____

5. How many years of teaching experience do you have? *(select one answer)*
   - □ < 5 years
   - □ 5-10 years
   - □ > 10 years

Area 2: Teachers' Digital Pedagogical Competence and Previous Experience with AR

6. How do you rate your level of expertise in using digital media in teaching and learning? *(select one answer)*
   - □ Very good
   - □ Good
   - □ Acceptable
   - □ Poor
   - □ Very poor

7. Have you heard or read about Augmented Reality? *(select one answer)*
   - □ Yes, a lot
   - □ Yes, a little
   - □ No
   - □ I don't know

8. Have you ever used an Augmented Reality app in your leisure time? *(select one answer)*
   - □ Yes, often
   - □ Yes, sometimes
   - □ No
   - □ I don't know

9. Have you ever used an Augmented Reality app for teaching and learning? *(select one answer)*
   - □ Yes, often
   - □ Yes, sometimes
   - □ No
   - □ I don't know

Area 3: Teachers' Attitudes

10. Apps which include Augmented Reality may have different qualities for teaching and learning. To what extent do you agree with the following statements: *(select one answer per row)*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
They are fun for the students.	□	□	□	□	□
They are hands-on for the students.	□	□	□	□	□
They are motivating for the students.	□	□	□	□	□
They increase the students' classroom engagement.	□	□	□	□	□
They promote cognitive learning.	□	□	□	□	□
They promote collaborative learning.	□	□	□	□	□
They help increase content knowledge acquisition.	□	□	□	□	□
They can be used as rewards when students do well in class.	□	□	□	□	□
They can be used to promote learning objectives that meet curriculum requirements.	□	□	□	□	□
They can be used as supplemental learning materials.	□	□	□	□	□
They bridge the gap between what students do at home and at school.	□	□	□	□	□
They improve student attitudes toward the content.	□	□	□	□	□
They promote personalized learning.	□	□	□	□	□
They can promote learning in STEM (science, technology, engineering, mathematics).	□	□	□	□	□
They can promote literacy skills.	□	□	□	□	□
They are easy to set up to facilitate classroom teaching and learning.	□	□	□	□	□
They bring me into a better position among classroom teachers who are interested in using digital technologies for teaching.	□	□	□	□	□
They provide me with another platform to engage my students in learning.	□	□	□	□	□
Using them helps me relate to my students.	□	□	□	□	□
I enjoy incorporating them into teaching.	□	□	□	□	□
Nowadays students are attuned to learning with Augmented Reality.	□	□	□	□	□

11. Teachers have individual attitudes towards apps which include Augmented Reality. To what extent do you agree with the following statements: *(select one answer per row)*

	Strongly agree	Agree	Some-what Agree	Neither agree nor disagree	Some-what Disagree	Disagree	Strongly disagree
It's a good idea to use AR apps.	☐	☐	☐	☐	☐	☐	☐
Using AR apps can improve my teaching performance.	☐	☐	☐	☐	☐	☐	☐
Using AR apps is easy for me.	☐	☐	☐	☐	☐	☐	☐
I predict I would use AR apps in the future.	☐	☐	☐	☐	☐	☐	☐
People who influence me think that I should use AR apps.	☐	☐	☐	☐	☐	☐	☐
I hesitate to use AR apps for fear of making mistakes I cannot correct.	☐	☐	☐	☐	☐	☐	☐
I find it easy to get AR apps to do what I want it to do.	☐	☐	☐	☐	☐	☐	☐
I find AR apps to be useful to me.	☐	☐	☐	☐	☐	☐	☐
I feel apprehensive about using AR apps.	☐	☐	☐	☐	☐	☐	☐
I like using AR apps.	☐	☐	☐	☐	☐	☐	☐
I plan to use AR apps in the future.	☐	☐	☐	☐	☐	☐	☐
People important to me support my use of AR apps.	☐	☐	☐	☐	☐	☐	☐

Thank you for participating in the ARETE project.

This research has been supported by the European Union's Horizon 2020 research and innovation program under grant agreement No 856533, project ARETE.

Survey Items: POSTTEST

Introduction

Dear teachers,

Thank you for participating in the ARETE project. ARETE (https://www.areteproject.eu) is an EU-funded project, aiming to develop and evaluate the effectiveness of an interactive Augmented Reality (AR) content toolkit. This will give students and teachers access to innovative AR content to enhance their learning and teaching.

The following survey is part of an ARETE pilot study which will be evaluated to assess the success and impact of Augmented Reality in education. It will take you about 25 minutes to complete.

Your answers in the following questionnaire are a central resource for this evaluation and of great value for this project. There are no right or wrong answers. **Please fill in all questions honestly and completely** to ensure a comprehensive and significant evaluation. Please note that your participation is voluntary.

The questionnaire is entirely anonymous. We assure you that your data will be treated in the strictest confidence and in accordance with General Data Protection Regulation (GDPR) <https://www.ucd.ie/gdpr/about/>. The data will only be viewed by personnel working on this project, will not be forwarded to third parties and will be used solely for research purposes.

If you have questions regarding this survey or the evaluation process, please contact a member of the evaluation team: Jennifer.tiede@uni-wuerzburg.de

Please confirm that you have read the information above and that you give us your consent to use your anonymous responses for our research work by checking the box:	☐ **I agree**

Thank you!

Area 1: Demographic Data

1. Please enter your unique identification code here: _____

2. What is your gender? *(select one answer)*
   - □ Female
   - □ Male
   - □ Other / prefer not to say

3. What is your age? _____ [numerical input]

4. What is your country of residence? *(select one answer)*
   - □ Ireland
   - □ UK
   - □ Malta
   - □ Cyprus
   - □ Other: please specify _____

5. How many years of teaching experience do you have? *(select one answer)*
   - □ < 5 years
   - □ 5-10 years
   - □ > 10 years

Area 2: Teachers' Digital Pedagogical Competence and Previous Experience with AR

6. How do you rate your level of expertise in using digital media in teaching and learning? *(select one answer)*
   - □ Very good
   - □ Good
   - □ Acceptable
   - □ Poor
   - □ Very poor

7. Have you heard or read about Augmented Reality before this project? *(select one answer)*
   - □ Yes, a lot
   - □ Yes, a little
   - □ No
   - □ I don't know

8. Have you ever used an Augmented Reality app in your leisure time before this project? *(select one answer)*
   - □ Yes, often
   - □ Yes, sometimes
   - □ No
   - □ I don't know

9. Have you ever used an Augmented Reality app for teaching and learning before this project? *(select one answer)*
   - □ Yes, often
   - □ Yes, sometimes
   - □ No
   - □ I don't know

Area 3: Teachers' Attitudes

10. Apps which include Augmented Reality may have different qualities for teaching and learning. To what extent do you agree with the following statements: *(select one answer per row)*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
They are fun for the students.	□	□	□	□	□
They are hands-on for the students.	□	□	□	□	□
They are motivating for the students.	□	□	□	□	□
They increase the students' classroom engagement.	□	□	□	□	□
They promote cognitive learning.	□	□	□	□	□
They promote collaborative learning.	□	□	□	□	□
They help increase content knowledge acquisition.	□	□	□	□	□
They can be used as rewards when students do well in class.	□	□	□	□	□
They can be used to promote learning objectives that meet curriculum requirements.	□	□	□	□	□
They can be used as supplemental learning materials.	□	□	□	□	□
They bridge the gap between what students do at home and at school.	□	□	□	□	□
They improve student attitudes toward the content.	□	□	□	□	□
They promote personalized learning.	□	□	□	□	□
They can promote learning in STEM (science, technology, engineering, mathematics).	□	□	□	□	□
They can promote literacy skills.	□	□	□	□	□
They are easy to set up to facilitate classroom teaching and learning.	□	□	□	□	□
They bring me into a better position among classroom teachers who are interested in using digital technologies for teaching.	□	□	□	□	□
They provide me with another platform to engage my students in learning.	□	□	□	□	□
Using them helps me relate to my students.	□	□	□	□	□
I enjoy incorporating them into teaching.	□	□	□	□	□
Nowadays students are attuned to learning with Augmented Reality.	□	□	□	□	□

11. Teachers have individual attitudes towards apps which include Augmented Reality. To what extent do you agree with the following statements: *(select one answer per row)*

	Strongly agree	Agree	Some-what Agree	Neither agree nor disagree	Some-what Disagree	Disagree	Strongly disagree
It's a good idea to use AR apps.	☐	☐	☐	☐	☐	☐	☐
Using AR apps can improve my teaching performance.	☐	☐	☐	☐	☐	☐	☐
Using AR apps is easy for me.	☐	☐	☐	☐	☐	☐	☐
I predict I would use AR apps in the future.	☐	☐	☐	☐	☐	☐	☐
People who influence me think that I should use AR apps.	☐	☐	☐	☐	☐	☐	☐
I hesitate to use AR apps for fear of making mistakes I cannot correct.	☐	☐	☐	☐	☐	☐	☐
I find it easy to get AR apps to do what I want it to do.	☐	☐	☐	☐	☐	☐	☐
I find AR apps to be useful to me.	☐	☐	☐	☐	☐	☐	☐
I feel apprehensive about using AR apps.	☐	☐	☐	☐	☐	☐	☐
I like using AR apps.	☐	☐	☐	☐	☐	☐	☐
I plan to use AR apps in the future.	☐	☐	☐	☐	☐	☐	☐
People important to me support my use of AR apps.	☐	☐	☐	☐	☐	☐	☐

Area 4: Teaching and Learning Processes

For the following questions, please refer to the past intervention where you applied the ARETE Augmented Reality app for advancing your students' literacy attainment.

12. How many of your students took part in this intervention? _____ [numerical input]

13. Which methodology did you apply to advance your students' literacy attainment during the intervention, in addition to using the ARETE Augmented Reality app? *(tick all that apply)*
    - □ No additional method, only the ARETE Augmented Reality app
    - □ Working with random or self-developed worksheets
    - □ Working with worksheets from a program: which one(s)? _____
    - □ Working with an app or online program: which one(s)? _____
    - □ Working with a book / a paper-based literacy program: which one(s)? _____
    - □ Other: please specify _____

14. On average, how often did your intervention with the ARETE AR app take place? *(select one answer)*
    - □ Less often than once a week
    - □ Once or twice a week
    - □ Three or four times a week
    - □ On a daily basis

15. On average, how much time per session did you spend on the ARETE AR app intervention? *(select one answer)*
    - □ < 10 minutes per session
    - □ 10-15 minutes per session
    - □ 15-30 minutes per session
    - □ > 30 minutes per session

16. Did you teach the intervention / English literacy teaching remotely (online via videoconferencing or similar) or in a face to face-setting? *(select one answer)*
    - □ Remotely online
    - □ Face to face
    - □ Both: sometimes online, sometimes face to face

17. Did you or will you administer the pretest and posttest (NARA II and Vernon Graded Word Spelling Test) remotely online or in a face to face-setting? *(select one answer per row)*

	Remotely online	**Face to face**	**Haven't done yet and won't do anymore***
Pretest	□	□	□
Posttest	□	□	□

** if any of these is ticked, proceed with the following information:*

Please reconsider if you can arrange the missing test. Your completion of all three tests is of key importance for our research. Thank you! [Click "I understood" and proceed with item 18]

18. In which kinds of social settings did the participating students work in the intervention in your class? *(tick all that apply)*

- □ Individually
- □ In pairs with a peer student
- □ In pairs with a teacher
- □ In small groups with peer students
- □ In small groups with a teacher
- □ With the whole class

19. Where did your students use the app? *(select one answer)*
    - □ Students used the app in school lessons only
    - □ Students used the app at school and at home
    - □ Students used the app at home only

20. Which cognitive processes did you aim to address in the AR unit? *(tick all that apply)*
    - □ Remembering
      (recalling knowledge from memory)
    - □ Understanding
      (constructing meaning; e.g., summarizing, comparing, explaining)
    - □ Applying
      (using a procedure learned, through executing or implementing)
    - □ Analyzing
      (breaking materials or concepts into parts, determining how the parts relate to one another or how they relate to an overall structure or purpose)
    - □ Evaluating
      (making judgments based on criteria and standards through checking and critiquing)
    - □ Creating
      (putting parts together in a new way, or synthesizing parts into something new and different)

21. Please list all media you used in the AR-enhanced unit, i.e., the devices used for the ARETE app and all other media used in the intervention lessons: *(tick all that apply)*
    - □ Smartphones
    - □ Tablet PCs
    - □ Augmented Reality
    - □ Virtual Reality
    - □ Personal computers/ laptops
    - □ TV
    - □ Audio equipment
    - □ Interactive Whiteboard
    - □ Overhead projector and slides
    - □ Blackboard
    - □ E-book readers
    - □ Books/ printed texts
    - □ Printed work sheets
    - □ Other, please summarize briefly: _____

Area 5: Evaluation of Experiences with the App-based Intervention

22. How would you rate your overall experience with the AR app in your classroom on a scale from 1 (poor) to 5 (excellent)? *(select one answer)*
    - □ 1 (poor)
    - □ 2
    - □ 3
    - □ 4
    - □ 5 (excellent)

23. To what extent do you agree with the following statements? *(select one answer per row)*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
My students enjoyed the app-based intervention.	□	□	□	□	□
My students learned a lot from the app-based intervention.	□	□	□	□	□
My students learned more from the AR-based teaching approach than they would have learned from traditional teaching approaches.	□	□	□	□	□
The app-based intervention supported students' collaboration.	□	□	□	□	□
I enjoyed teaching the app-based intervention.	□	□	□	□	□
I would recommend using AR in class to a colleague.	□	□	□	□	□
I would use other AR-based apps in my teaching again.	□	□	□	□	□
The app contents were relevant for my context.	□	□	□	□	□
It was easy to integrate the app into my teaching.	□	□	□	□	□
It was easy for me to operate the app (technically).	□	□	□	□	□

24. Which problems or drawbacks did you encounter with the intervention? *(tick all that apply)*
    - □ There were no problems or drawbacks
    - □ The app contents were not relevant for my teaching
    - □ There was no added value for me in using an AR app, compared to traditional teaching & learning approaches
    - □ I was not sure how to integrate the app into my teaching
    - □ Lack of pedagogical/didactical support
    - □ I am generally unfamiliar with technology
    - □ I don't like changing my usual teaching habits
    - □ I did not have enough time to work with the app properly
    - □ Using the app cost too much time
    - □ My students did not like the app

- □ Problematic student behavior (e.g., trial & error, taking things not seriously, distraction, etc.)
- □ Poor user experience in the app (e.g., the app was not intuitive, it was difficult to make the app do what I wanted, etc.)
- □ Technical issues with the app, AR-related (e.g., poor marker detection)
- □ Technical issues with the app, not AR-related (e.g., long processing times, crashes)
- □ Technical issues with devices
- □ Lack of necessary technical equipment
- □ Lack of technical support
- □ Other: [please specify]

Area 6: Student Motivation & Classroom Engagement

25. To what extent do you agree with the following statements? *(select one answer per row)*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
The intervention had a positive impact on my students' motivation.	☐	☐	☐	☐	☐
My students found the interface design of the intervention eye-catching.	☐	☐	☐	☐	☐
My students really enjoyed learning with the intervention.	☐	☐	☐	☐	☐
My students enjoyed the intervention so much that they wanted to know more about the topic.	☐	☐	☐	☐	☐
My students found the contents of the intervention useful to themselves.	☐	☐	☐	☐	☐
It was clear for my students how the content of the intervention was related to things they already knew.	☐	☐	☐	☐	☐
It was difficult for my students to discover the digital information associated with the real image.	☐	☐	☐	☐	☐
My students could not really understand quite a bit of the material in the intervention.	☐	☐	☐	☐	☐
My students learned some things that were surprising or unexpected with the intervention.	☐	☐	☐	☐	☐

26. To what extent do you agree with the following statements? *(select one answer per row)*

When participating in the intervention, …

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
… my students showed high on-task attention and concentration	☐	☐	☐	☐	☐
… my students showed frequent and strong positive emotions (such as joy and curiosity)	☐	☐	☐	☐	☐
… my students used sophisticated learning strategies	☐	☐	☐	☐	☐
… my students asked questions about what they are learning	☐	☐	☐	☐	☐
… my students showed high persistence, especially on difficult tasks	☐	☐	☐	☐	☐
… my students rarely showed negative emotions (such as anger, boredom and discouragement)	☐	☐	☐	☐	☐
… my students were planful and strategic learners	☐	☐	☐	☐	☐
… my students expressed their interest	☐	☐	☐	☐	☐

Thank you for participating in the ARETE project.

This research has been supported by the European Union's Horizon 2020 research and innovation program under grant agreement No 856533, project ARETE.

Project ARETE • Pilot 1 • Evaluation Survey for Teachers · **Control** Group

Survey Items: PRETEST

Introduction

Dear teachers,

Thank you for participating in the ARETE project. ARETE (https://www.areteproject.eu) is an EU-funded project, aiming to develop and evaluate the effectiveness of an interactive Augmented Reality (AR) content toolkit. This will give students and teachers access to innovative AR content to enhance their learning and teaching.

The following survey is part of an ARETE pilot study which will be evaluated to assess the success and impact of Augmented Reality in education. It will take you about 10 minutes to complete.

Your answers in the following questionnaire are a central resource for this evaluation and of great value for this project. There are no right or wrong answers. **Please fill in all questions honestly and completely** to ensure a comprehensive and significant evaluation. Please note that your participation is voluntary.

The questionnaire is entirely anonymous. We assure you that your data will be treated in the strictest confidence and in accordance with General Data Protection Regulation (GDPR) <https://www.ucd.ie/gdpr/about/>. The data will only be viewed by personnel working on this project, will not be forwarded to third parties and will be used solely for research purposes.

If you have questions regarding this survey or the evaluation process, please contact a member of the evaluation team: Jennifer.tiede@uni-wuerzburg.de

Please confirm that you have read the information above and that you give us your consent to use your anonymous responses for our research work by checking the box:	☐ **I agree**

Thank you!

Area 1: Demographic Data

1. Please enter your unique identification code here: . _____

2. What is your gender? *(select one answer)*
   - □ Female
   - □ Male
   - □ Other / prefer not to say

3. What is your age? _____ [numerical input]

4. What is your country of residence? *(select one answer)*
   - □ Ireland
   - □ UK
   - □ Malta
   - □ Cyprus
   - □ Other: please specify _____

5. How many years of teaching experience do you have? *(select one answer)*
   - □ < 5 years
   - □ 5-10 years
   - □ > 10 years

Area 2: Teachers' Digital Pedagogical Competence and Previous Experience with AR

6. How do you rate your level of expertise in using digital media in teaching and learning? *(select one answer)*
   - □ Very good
   - □ Good
   - □ Acceptable
   - □ Poor
   - □ Very poor

7. Have you heard or read about Augmented Reality? *(select one answer)*
   - □ Yes, a lot
   - □ Yes, a little
   - □ No
   - □ I don't know

8. Have you ever used an Augmented Reality app in your leisure time? *(select one answer)*
   - □ Yes, often
   - □ Yes, sometimes
   - □ No
   - □ I don't know

9. Have you ever used an Augmented Reality app for teaching and learning? *(select one answer)*
   - □ Yes, often
   - □ Yes, sometimes
   - □ No
   - □ I don't know

Area 3: Teachers' Attitudes

10. Apps which include Augmented Reality may have different qualities for teaching and learning. To what extent do you agree with the following statements: *(select one answer per row)*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
They are fun for the students.	□	□	□	□	□
They are hands-on for the students.	□	□	□	□	□
They are motivating for the students.	□	□	□	□	□
They increase the students' classroom engagement.	□	□	□	□	□
They promote cognitive learning.	□	□	□	□	□
They promote collaborative learning.	□	□	□	□	□
They help increase content knowledge acquisition.	□	□	□	□	□
They can be used as rewards when students do well in class.	□	□	□	□	□
They can be used to promote learning objectives that meet curriculum requirements.	□	□	□	□	□
They can be used as supplemental learning materials.	□	□	□	□	□
They bridge the gap between what students do at home and at school.	□	□	□	□	□
They improve student attitudes toward the content.	□	□	□	□	□
They promote personalized learning.	□	□	□	□	□
They can promote learning in STEM (science, technology, engineering, mathematics).	□	□	□	□	□
They can promote literacy skills.	□	□	□	□	□
They are easy to set up to facilitate classroom teaching and learning.	□	□	□	□	□
They bring me into a better position among classroom teachers who are interested in using digital technologies for teaching.	□	□	□	□	□
They provide me with another platform to engage my students in learning.	□	□	□	□	□
Using them helps me relate to my students.	□	□	□	□	□
I enjoy incorporating them into teaching.	□	□	□	□	□
Nowadays students are attuned to learning with Augmented Reality.	□	□	□	□	□

11. Teachers have individual attitudes towards apps which include Augmented Reality. To what extent do you agree with the following statements: *(select one answer per row)*

	Strongly agree	Agree	Some-what Agree	Neither agree nor disagree	Some-what Disagree	Disagree	Strongly disagree
It's a good idea to use AR apps.	☐	☐	☐	☐	☐	☐	☐
Using AR apps can improve my teaching performance.	☐	☐	☐	☐	☐	☐	☐
Using AR apps is easy for me.	☐	☐	☐	☐	☐	☐	☐
I predict I would use AR apps in the future.	☐	☐	☐	☐	☐	☐	☐
People who influence me think that I should use AR apps.	☐	☐	☐	☐	☐	☐	☐
I hesitate to use AR apps for fear of making mistakes I cannot correct.	☐	☐	☐	☐	☐	☐	☐
I find it easy to get AR apps to do what I want it to do.	☐	☐	☐	☐	☐	☐	☐
I find AR apps to be useful to me.	☐	☐	☐	☐	☐	☐	☐
I feel apprehensive about using AR apps.	☐	☐	☐	☐	☐	☐	☐
I like using AR apps.	☐	☐	☐	☐	☐	☐	☐
I plan to use AR apps in the future.	☐	☐	☐	☐	☐	☐	☐
People important to me support my use of AR apps.	☐	☐	☐	☐	☐	☐	☐

Thank you for participating in the ARETE project.

This research has been supported by the European Union's Horizon 2020 research and innovation program under grant agreement No 856533, project ARETE.

Survey Items: POSTTEST

Introduction

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Thank you!

Area 1: Demographic Data

1. Please enter your unique identification code here: _____

2. What is your gender? *(select one answer)*
   - □ Female
   - □ Male
   - □ Other / prefer not to say

3. What is your age? _____ [numerical input]

4. What is your country of residence? *(select one answer)*
   - □ Ireland
   - □ UK
   - □ Malta
   - □ Cyprus
   - □ Other: please specify _____

5. How many years of teaching experience do you have? *(select one answer)*
   - □ < 5 years
   - □ 5-10 years
   - □ > 10 years

Area 2: Teachers' Digital Pedagogical Competence and Previous Experience with AR

6. How do you rate your level of expertise in using digital media in teaching and learning? *(select one answer)*
   - □ Very good
   - □ Good
   - □ Acceptable
   - □ Poor
   - □ Very poor

7. Have you ever heard or read about Augmented Reality? *(select one answer)*
   - □ Yes, a lot
   - □ Yes, a little
   - □ No
   - □ I don't know

8. Have you ever used an Augmented Reality app in your leisure time? *(select one answer)*
   - □ Yes, often
   - □ Yes, sometimes
   - □ No
   - □ I don't know

9. Have you ever used an Augmented Reality app for teaching and learning? *(select one answer)*
   - □ Yes, often
   - □ Yes, sometimes
   - □ No
   - □ I don't know

Area 3: Teachers' Attitudes

10. Apps which include Augmented Reality may have different qualities for teaching and learning. To what extent do you agree with the following statements: *(select one answer per row)*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
They are fun for the students.	□	□	□	□	□
They are hands-on for the students.	□	□	□	□	□
They are motivating for the students.	□	□	□	□	□
They increase the students' classroom engagement.	□	□	□	□	□
They promote cognitive learning.	□	□	□	□	□
They promote collaborative learning.	□	□	□	□	□
They help increase content knowledge acquisition.	□	□	□	□	□
They can be used as rewards when students do well in class.	□	□	□	□	□
They can be used to promote learning objectives that meet curriculum requirements.	□	□	□	□	□
They can be used as supplemental learning materials.	□	□	□	□	□
They bridge the gap between what students do at home and at school.	□	□	□	□	□
They improve student attitudes toward the content.	□	□	□	□	□
They promote personalized learning.	□	□	□	□	□
They can promote learning in STEM (science, technology, engineering, mathematics).	□	□	□	□	□
They can promote literacy skills.	□	□	□	□	□
They are easy to set up to facilitate classroom teaching and learning.	□	□	□	□	□
They bring me into a better position among classroom teachers who are interested in using digital technologies for teaching.	□	□	□	□	□
They provide me with another platform to engage my students in learning.	□	□	□	□	□
Using them helps me relate to my students.	□	□	□	□	□
I enjoy incorporating them into teaching.	□	□	□	□	□
Nowadays students are attuned to learning with Augmented Reality.	□	□	□	□	□

11. Teachers have individual attitudes towards apps which include Augmented Reality. To what extent do you agree with the following statements: *(select one answer per row)*

	Strongly agree	Agree	Some-wh at Agree	Neither agree nor disagree	Some-wh at Disagree	Disagree	Strongly disagree
It's a good idea to use AR apps.	□	□	□	□	□	□	□
Using AR apps can improve my teaching performance.	□	□	□	□	□	□	□
Using AR apps is easy for me.	□	□	□	□	□	□	□
I predict I would use AR apps in the future.	□	□	□	□	□	□	□
People who influence me think that I should use AR apps.	□	□	□	□	□	□	□
I hesitate to use AR apps for fear of making mistakes I cannot correct.	□	□	□	□	□	□	□
I find it easy to get AR apps to do what I want it to do.	□	□	□	□	□	□	□
I find AR apps to be useful to me.	□	□	□	□	□	□	□
I feel apprehensive about using AR apps.	□	□	□	□	□	□	□
I like using AR apps.	□	□	□	□	□	□	□
I plan to use AR apps in the future.	□	□	□	□	□	□	□
People important to me support my use of AR apps.	□	□	□	□	□	□	□

Area 4: Teaching and Learning Processes

For the following questions, please refer to your recent remedial literacy intervention for the students with reading and spelling difficulties participating in this study, or the regular curricular English literacy teaching these students received.

12. How many of your students took part in this intervention / English literacy teaching?
    _____ [numerical input]

13. Which methodology did you apply to advance your students' literacy attainment during the intervention / English literacy teaching? *(tick all that apply)*
    - □ No particular intervention or support, just the regular classes *[if selected, skip items 13 & 14 and proceed with item 15]*
    - □ Working with random or self-developed worksheets
    - □ Working with worksheets from a program: which one(s)? _____
    - □ Working with an app or online program: which one(s)? _____
    - □ Working with a book / a paper-based literacy program: which one(s)? _____
    - □ Other: please specify _____

14. On average, how often did your intervention / English literacy teaching take place? *(select one answer)*
    - □ Less often than once a week
    - □ Once or twice a week
    - □ Three or four times a week
    - □ On a daily basis

15. On average, how much time per session did you spend on the intervention / English literacy teaching? *(select one answer)*
    - □ < 10 minutes per session
    - □ 10-15 minutes per session
    - □ 15-30 minutes per session
    - □ > 30 minutes per session

16. Did you teach the intervention / English literacy teaching remotely (online via videoconferencing or similar) or in a face to face-setting? *(select one answer)*
    - □ Remotely online
    - □ Face to face
    - □ Both: sometimes online, sometimes face to face

17. Did you or will you administer the pretest and posttest (NARA II and Vernon Graded Word Spelling Test) remotely online or in a face to face-setting? *(select one answer per row)*

	Remotely online	**Face to face**	**Haven't done yet and won't do anymore***
Pretest	□	□	□
Posttest	□	□	□

** if any of these is ticked, proceed with the following information:*

Please reconsider if you can arrange the missing test. Your completion of all three tests is of key importance for our research. Thank you! [Click "I understood" and proceed with item 18]

18. In which kinds of social settings did the participating students work in the intervention / English literacy teaching in your class? *(tick all that apply)*
    - □ Individually
    - □ In pairs with a peer student
    - □ In pairs with a teacher
    - □ In small groups with peer students
    - □ In small groups with a teacher
    - □ With the whole class

19. Which cognitive processes did you aim to address in the intervention / English literacy teaching? *(tick all that apply)*
    - □ Remembering
      (recalling knowledge from memory)
    - □ Understanding
      (constructing meaning; e.g., summarizing, comparing, explaining)
    - □ Applying
      (using a procedure learned, through executing or implementing)
    - □ Analyzing
      (breaking materials or concepts into parts, determining how the parts relate to one another or how they relate to an overall structure or purpose)
    - □ Evaluating
      (making judgments based on criteria and standards through checking and critiquing)
    - □ Creating
      (putting parts together in a new way, or synthesizing parts into something new and different)

20. Please list all media you used in the intervention / English literacy teaching: *(tick all that apply)*
    - □ Smartphones
    - □ Tablet PCs
    - □ Augmented Reality
    - □ Virtual Reality
    - □ Personal computers/ laptops
    - □ TV
    - □ Audio equipment
    - □ Interactive Whiteboard
    - □ Overhead projector and slides
    - □ Blackboard
    - □ E-book readers
    - □ Books/ printed texts
    - □ Printed work sheets

    - □ Other, please summarize briefly: _____

Area 5: Evaluation of Experiences with the Intervention Provided

For the following questions, please continue to refer to your recent remedial literacy intervention for the students with reading and spelling difficulties participating in this study, or the regular curricular English literacy teaching these students received.

21. To what extent do you agree with the following statements? *(select one answer per row)*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
My students enjoyed the intervention / English literacy teaching.	□	□	□	□	□
My students learned a lot from the intervention / English literacy teaching.	□	□	□	□	□
The intervention / English literacy teaching supported students' collaboration.	□	□	□	□	□
I enjoyed teaching the intervention / English literacy teaching.	□	□	□	□	□
The intervention / English literacy teaching was relevant for my context.	□	□	□	□	□
It was easy to integrate the intervention / English literacy teaching into my teaching.	□	□	□	□	□

22. Which problems or drawbacks did you encounter with the intervention / English literacy teaching ? *(tick all that apply)*
    - □ There were no problems or drawbacks
    - □ I was not sure how to integrate the intervention / English literacy teaching into my teaching
    - □ Lack of pedagogical/didactical support
    - □ I am generally unfamiliar with technology
    - □ I don't like changing my usual teaching habits
    - □ I did not have enough time to work with the intervention / English literacy teaching properly
    - □ The intervention / English literacy teaching cost too much time
    - □ My students did not like the intervention / English literacy teaching
    - □ Problematic student behavior (e.g., trial & error, taking things not seriously, distraction, etc.)
    - □ Technical issues, e.g., with devices
    - □ Lack of necessary technical equipment
    - □ Lack of technical support
    - □ Other: [please specify]

Area 6: Student Motivation & Classroom Engagement

23. To what extent do you agree with the following statements? *(select one answer per row)*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
The intervention / English literacy teaching had a positive impact on my students' motivation.	☐	☐	☐	☐	☐
My students found the design of the intervention / English literacy teaching eye-catching.	☐	☐	☐	☐	☐
My students really enjoyed learning with the intervention / English literacy teaching.	☐	☐	☐	☐	☐
My students enjoyed the intervention / English literacy teaching so much that they wanted to know more about the topic.	☐	☐	☐	☐	☐
My students found the contents of the intervention / English literacy teaching useful to themselves.	☐	☐	☐	☐	☐
It was clear for my students how the content of the intervention / English literacy teaching was related to things they already knew.	☐	☐	☐	☐	☐
My students could not really understand quite a bit of the intervention / English literacy teaching.	☐	☐	☐	☐	☐
My students learned some things that were surprising or unexpected with the intervention / English literacy teaching.	☐	☐	☐	☐	☐

24. To what extent do you agree with the following statements? *(select one answer per row)*

When participating in the intervention / English literacy teaching, …

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
… my students showed high on-task attention and concentration	☐	☐	☐	☐	☐
… my students showed frequent and strong positive emotions (such as joy and curiosity)	☐	☐	☐	☐	☐
… my students used sophisticated learning strategies	☐	☐	☐	☐	☐
… my students asked questions about what they are learning	☐	☐	☐	☐	☐
… my students showed high persistence, especially on difficult tasks	☐	☐	☐	☐	☐
… my students rarely showed negative emotions (such as anger, boredom and discouragement)	☐	☐	☐	☐	☐
… my students were planful and strategic learners	☐	☐	☐	☐	☐
… my students expressed their interest	☐	☐	☐	☐	☐

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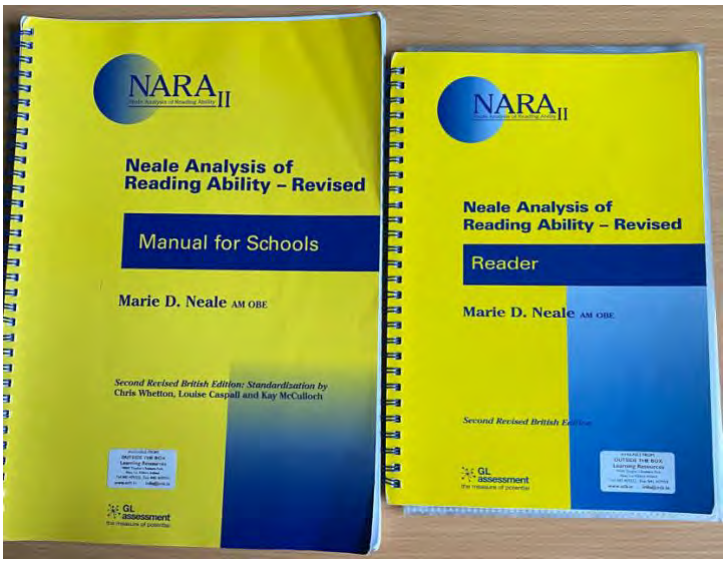


Neale Analysis of Reading Ability: Manual. Third Edition.

Neale, Marie D.

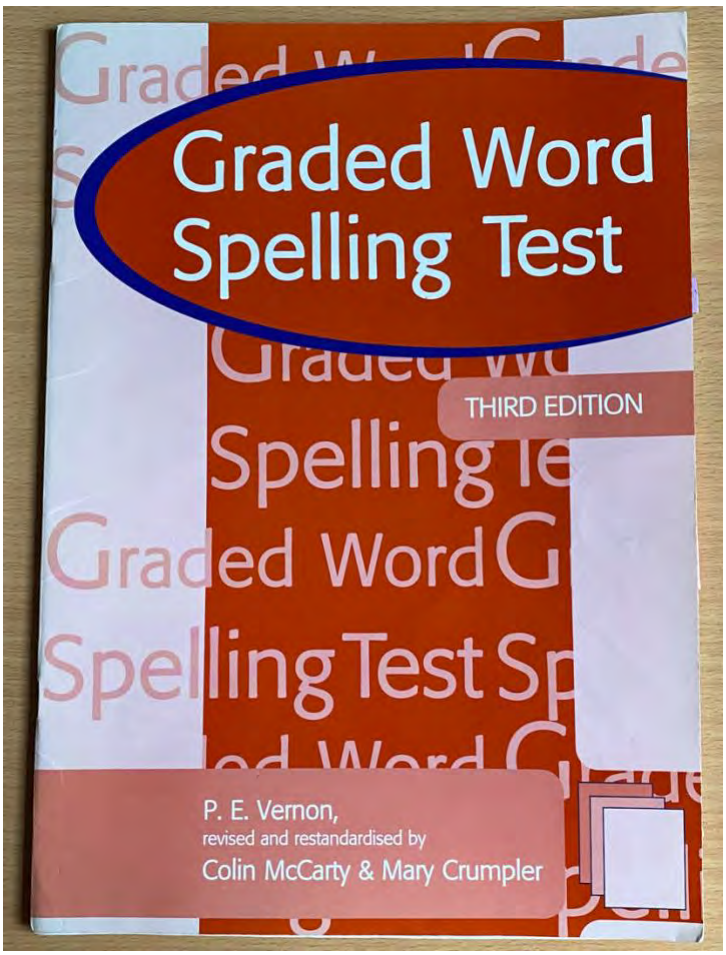
Following the style of the 1958 original, this third edition of the Neale Analysis of Reading Ability is both a standardized attainment test and a diagnostic test for readers of all ages and thus can be used to assess reading progress objectively as well as to obtain structured diagnostic observations of an individual's reading behaviour. It contains information concerning the development, description, administration, and scoring of the test, tables of norms, guidance for interpreting the test data, and research studies illustrating how the Neale Analysis has been used. Main changes in the third edition include revised and enhanced format and design to enhance legibility; new parallel passages; redesigned individual records; a new chapter presenting case studies illustrating the application of results; and word lists for "quick" assessment of accuracy or word recognition skills. Chapters in the book are: (1) Introduction; (2) Introducing the 3rd Edition of the Neale Analysis of Reading Ability; (3) Guidelines for Administering the Neale Analysis; (4) Scoring the Neale Analysis; (5) Interpreting and Using Standardised Scores; (6) The Diagnostic Tutor; (7) Supplementary Diagnostic Tests; (8) Beyond Testing: Case Studies using the Neale; and (9) Development of the 3rd Edition of the Neale. Contains 134 references, 17 figures and 14 tables of data; appendixes contain an 116-item glossary, a list of participating schools, and 4 separate individual scoring sheets. (RS)

Descriptors: Case Studies, Elementary Secondary Education, Foreign Countries, Reading Ability, Reading Achievement, Reading Diagnosis, Reading Skills, Reading Tests, Scoring, Standardized Tests, Test Manuals, Testing

ACER Press, Australian Council for Educational Research Limited, 19 Prospect Hill Road, Camberwell, Melbourne, Victoria 3124, Australia.

NOTE: **The Neale Analysis of Reading Ability – Revised Edition**
This edition consists of a set of 6 graded passages for testing the rate, accuracy and comprehension of oral reading in students from 6 years to 12:11 years. It provides reading ages, percentile rankings and standardised scores for two parallel sets of graded passages.

6.1 Vernon - Graded Word Spelling Test



Spelling is a key skill in the National Curriculum for English and an important 'basic skill'. Vernon's **Graded Word Spelling Test (3rd Edition)** is a widely used, standardised test designed to assess spelling attainment and progress from age 5 to 18+ years. It is designed for use throughout the years of compulsory schooling, and extends to the level of spelling reached by well-educated adults.

This revised edition provides new norms which are reliable and fully up to date: the target words, graded in order of current difficulty, are unchanged.

It measures the spelling ability of children and adults and it consists of a total of 80 words, graded in order of difficulty. Age appropriate words are dictated, each in the

context of a sentence, the student writes the target word only and many of these sentences have been re-cast to be more relevant to functional literacy today.

ARETE

CONSORT
TRANSPARENT REPORTING of TRIALS

ARETE Pilot 2 Enrollment

Assessed for Eligibility (n= 372)
- Teacher applications (n= 372)
- Student applications (n= 7048)

Excluded (n_{stud} = 3200; n_{teach} = 206)
- Not meeting inclusion criteria (n_{stud} = 1838; n_{teach} = 80)
- Declined to participate (n_{stud} = 44; n_{teach} = 2)
- Other reasons (n_{stud} = 1318; n_{teach} = 124)

Assessed (n_{stud} = 3848; n_{teach} = 166)
- Met inclusion criteria (n_{stud} = 3848; n_{teach} = 166)
- Declined to participate further (n_{stud} = ?; n_{teach} = ?) (give reasons)

Allocation Science / Maths
- Science Sample ($n_{stud\ SCI}$ = 1900; $n_{teach\ SCI}$ = 82)
- Maths Sample ($n_{stud\ MAT}$ = 1948; $n_{teach\ MAT}$ = 84)

Intervention — **Randomization (classwise)** — *Control*

Science	Maths
Allocated to science interv. group ($n_{stud\ SCI\ ITV}$ = 950; $n_{teach\ SCI\ ITV}$ = 41)	Allocated to maths interv. group ($n_{stud\ MAT\ ITV}$ = 974; $n_{teach\ MAT\ ITV}$ = 42)

Science	Maths
Allocated to science control group ($n_{stud\ SCI\ CTRL}$ = 950; $n_{teach\ SCI\ CTRL}$ = 41)	Allocated to maths control group ($n_{stud\ MAT\ CTRL}$ = 974; $n_{teach\ MAT\ CTRL}$ = 42)

Pretesting

Science	Maths
Filled in TIMSS pretest ($n_{stud\ SCI\ ITV}$ = ?)	Filled in TIMSS pretest ($n_{stud\ MAT\ ITV}$ = ?)
Filled in pre survey ($n_{TEACH\ SCI\ ITV}$ = ?)	Filled in pre survey ($n_{TEACH\ MAT\ ITV}$ = ?)
Participated in focus group ($n_{TEACH\ SCI\ ITV}$ = 5)	Participated in focus group ($n_{TEACH\ MAT\ ITV}$ = 3)

Science	Maths
Filled in TIMSS pretest ($n_{stud\ SCI\ CTRL}$ = ?)	Filled in TIMSS pretest ($n_{stud\ MAT\ CTRL}$ = ?)
Filled in pre survey ($n_{TEACH\ SCI\ CTRL}$ = ?)	Filled in pre survey ($n_{TEACH\ MAT\ CTRL}$ = ?)

Intervention

Science	Maths
Received allocated interv. ($n_{stud\ SCI\ ITV}$ = ?; $n_{teach\ SCI\ ITV}$ = ?)	Received allocated interv. ($n_{stud\ MAT\ ITV}$ = ?; $n_{teach\ MAT\ ITV}$ = ?)
Did not receive allocated interv. ($n_{stud\ SCI\ ITV}$ = ?; $n_{teach\ SCI\ ITV}$ = ?) (give reasons)	Did not receive allocated interv. ($n_{stud\ MAT\ ITV}$ = ?; $n_{teach\ MAT\ ITV}$ = ?) (give reasons)

Science	Maths
Left science control group ($n_{stud\ SCI\ CTRL}$ = ?; $n_{teach\ SCI\ CTRL}$ = ?) (give reasons)	Left maths control group ($n_{stud\ MAT\ CTRL}$ = ?; $n_{teach\ MAT\ CTRL}$ = ?) (give reasons)

Posttesting

Science	Maths
Filled in TIMSS posttest ($n_{stud\ SCI\ ITV}$ = ?)	Filled in TIMSS posttest ($n_{stud\ MAT\ ITV}$ = ?)
Filled in IMI post survey ($n_{stud\ SCI\ ITV}$ = ?)	Filled in IMI post survey ($n_{stud\ MAT\ ITV}$ = ?)
Filled in post survey ($n_{TEACH\ SCI\ ITV}$ = ?)	Filled in post survey ($n_{TEACH\ MAT\ ITV}$ = ?)
Participated in focus group ($n_{TEACH\ SCI\ ITV}$ = ?)	Participated in focus group ($n_{TEACH\ MAT\ ITV}$ = ?)
Lost to posttesting ($n_{stud\ SCI\ ITV}$ = ?; $n_{teach\ SCI\ ITV}$ = ?) (give reasons)	Lost to posttesting ($n_{stud\ MAT\ ITV}$ = ?; $n_{teach\ MAT\ ITV}$ = ?) (give reasons)
Discontinued intervention ($n_{stud\ SCI\ ITV}$ = ?; $n_{teach\ SCI\ ITV}$ = ?) (give reasons)	Discontinued intervention ($n_{stud\ MAT\ ITV}$ = ?; $n_{teach\ MAT\ ITV}$ = ?) (give reasons)

Science	Maths
Filled in TIMSS posttest ($n_{stud\ SCI\ CTRL}$ = ?)	Filled in TIMSS posttest ($n_{stud\ MAT\ CTRL}$ = ?)
Filled in IMI post survey ($n_{stud\ SCI\ CTRL}$ = ?)	Filled IMI post survey ($n_{stud\ MAT\ CTRL}$ = ?)
Filled in post survey ($n_{TEACH\ SCI\ CTRL}$ = ?)	Filled in post survey ($n_{TEACH\ MAT\ CTRL}$ = ?)
Lost to posttesting ($n_{stud\ SCI\ CTRL}$ = ?; $n_{teach\ SCI\ CTRL}$ = ?) (give reasons)	Lost to posttesting ($n_{stud\ MAT\ CTRL}$ = ?; $n_{teach\ MAT\ CTRL}$ = ?) (give reasons)

Retention Follow-Up

Science	Maths
Filled in TIMSS retention posttest ($n_{stud\ SCI\ ITV}$ = ?)	Filled in TIMSS retention posttest ($n_{stud\ MAT\ ITV}$ = ?)
Lost to retention posttesting ($n_{stud\ SCI\ ITV}$ = ?; $n_{teach\ SCI\ ITV}$ = ?) (give reasons)	Lost to retention posttesting ($n_{stud\ MAT\ ITV}$ = ?; $n_{teach\ MAT\ ITV}$ = ?) (give reasons)

Science	Maths
Filled in TIMSS retention posttest ($n_{stud\ SCI\ CTRL}$ = ?)	Filled in TIMSS retention posttest ($n_{stud\ MAT\ CTRL}$ = ?)
Lost to retention posttesting ($n_{stud\ SCI\ CTRL}$ = ?; $n_{teach\ SCI\ CTRL}$ = ?) (give reasons)	Lost to retention posttesting ($n_{stud\ MAT\ CTRL}$ = ?; $n_{teach\ MAT\ CTRL}$ = ?) (give reasons)

Analysis

Analysed ($n_{stud\ SCI\ ITV}$ = ?; $n_{teach\ SCI\ ITV}$ = ?; $n_{stud\ MAT\ ITV}$ = ?; $n_{teach\ MAT\ ITV}$ = ?)
- Excluded from analysis ($n_{stud\ SCI\ ITV}$ = ?; $n_{teach\ SCI\ ITV}$ = ?; $n_{stud\ MAT\ ITV}$ = ?; $n_{teach\ MAT\ ITV}$ = ?) (give reasons)

Analysed ($n_{stud\ SCI\ CTRL}$ =?; $n_{teach\ SCI\ CTRL}$ = ?; $n_{stud\ MAT\ CTRL}$ =?; $n_{teach\ MAT\ CTRL}$ =?)
- Excluded from analysis ($n_{stud\ SCI\ CTRL}$ = ?; $n_{teach\ SCI\ CTRL}$ = ?; $n_{stud\ MAT\ CTRL}$ = ?; $n_{teach\ MAT\ CTRL}$ = ?) (give reasons)

We welcome any questions you may have about this project

For more information on this project please visit www.areteproject.eu or email arete@ucd.ie

ARETE

ARETE

PARENT/LEGAL GUARDIAN CONSENT TO PARTICIPATE WITH CONDITIONS

Pilot project for developing the use of new Augmented Reality technology in education for multiuser STEM learning

Pilot project for developing the use of new Augmented Reality technology in education for STEM

I hereby consent to my child (name) _____

learning

- I have read and understood the parent/legal guardian information leaflet for ARETE pilot study
- I understand what the study is about and what my child's results will be used for.
- I have had the time to research and consider whether to take part in the study.
- I understand that my child's and my personal information will not appear on any research data from this pilot study and there will be no audio/ video recordings for this study.
- I understand that my child will undergo a FREE pre and post project assessment with the data collected at class level and fully anonymized.
- I am fully aware of all of the procedures involving my child and of any risks and benefits associated with the study.
- I understand that my child's and my participation is voluntary (it is my choice under free will) and that I am free to withdraw from the research study at any time without disadvantage and without giving any reason.

Therefore, **I agree to take part in this research** (please tick the box):

☐

involvement in this pilot study and I give my permission for the use of de-identified data collected from my child and me and through the use of ARETE mobile app for the following purpose (please tick the relevant box or boxes you are agreeing to):

☐ Publications and conference presentations
Future research (subject to ethical review)
Sharing of data with third parties within ARETE project for research purposes only.

Name of parent(s)/legal guardian(s) (in block letters):

Home Address:

Signature(s):

Date:

Please return this form to: your teacher/project coordinator at the school level.

For more information on this project please visit http://www.areteproject.eu/ or if you have questions about the study, please email arete@ucd.ie.

We welcome any questions you may have about this project

For more information on this project please visit www.areteproject.eu or email arete@ucd.ie

STUDENT CONSENT
TO PARTICIPATE WITH CONDITIONS

Pilot project for developing the use of new Augmented Reality technology in education for multiuser STEM learning

Pilot project for developing the use of new Augmented I _____(name)

Reality technology in education for STEM learning

• I have read with my parent/legal guardian and understood the information leaflet for ARETE pilot study
• I understand what the study is about and what my results of test and using apps will be used for.
• I have had the time to research and consider whether to take part in the study
• I understand that my personal information will not appear on any research data from this pilot study and there will be no audio/ video recordings for this study.
• I understand that I will undergo a FREE pre and post project assessment with the data collected at class level and fully anonymized.
• I am fully aware of all of the procedures involving me and of any risks and benefits associated with the study.
• I understand that my participation is voluntary (it is my choice under free will) and that I am free to withdraw from the research study at any time without disadvantage and without giving any reason.

Therefore, **I agree to take part in this research** (please tick the box):
☐

Agree to be involved in this pilot study and I give my permission for the use of de-identified data collected from me and through the use of ARETE mobile app for the following purpose (please tick the relevant box or boxes you are agreeing to):

☐ Publications and conference presentations
Future research (subject to ethical review)
Sharing of data with third parties within ARETE project for research purposes only

Your name (in block letters):

Name of teacher (in block letters):

School name and address:

Signature:

Date:

Please return this form to: your teacher/project coordinator at the school level.

For more information on this project please visit http://www.areteproject.eu/ or if you have questions about the study, please email arete@ucd.ie.

We welcome any questions you may have about this project

For more information on this project please visit www.areteproject.eu or email arete@ucd.ie

ARETE

TEACHER CONSENT
TO PARTICIPATE WITH CONDITIONS

Pilot project for developing the use of new Augmented Reality technology in education for multiuser STEM learning

Pilot project for developing the use of new Augmented Reality technology in education for STEM learning

• I have read and understood the teacher information leaflet for ARETE pilot study
• I understand what the study is about and what my results will be used for.
• I have had the time to research and consider whether to take part in the study.
• I understand that my students' and my personal information will not appear on any research data from this pilot study and there will be no audio/ video recordings for this study.
• I understand that my child will undergo a FREE pre and post project assessment with the data collected at class level and fully anonymized.
• I am fully aware of all of the procedures involving my students and of any risks and benefits associated with the study.
• I understand that my participation is voluntary (it is my choice under free will) and that I am free to withdraw from the research study at any time without disadvantage and without giving any reason.

Therefore, **I agree to take part in this research** (please tick the box):

☐

I hereby provide my consent (name)

_____

for involvement in this pilot study and I give my permission for the use of de-identified data collected from me and through the use of ARETE mobile app for the following purpose (please tick the relevant box or boxes you are agreeing to):

☐ Publications and conference presentations
Future research (subject to ethical review)
Sharing of data with third parties within ARETE project for research purposes only

EUN will collect the consent forms from the teachers participating in the ARETE research

Your Name (in block letters):

School name and address:

Signature:

Date:

Please return this form to: Giuseppe Mossuti (giuseppe.mossuti@eun.org)

For more information on this project please visit http://www.areteproject.eu/ or if you have questions about the study, please email arete@ucd.ie.

Privacy Policy For Mobile Application

Effective Date: 06/01/2021

Applicable To The Following Mobile Application:

ARETE Geometry and ARETE Geography Pilot 2 of the ARETE project

Article 1 - DEFINITIONS:

a) APPLICABLE MOBILE APPLICATION (ARETE Geometry and ARETE Geography Pilot 2 of the ARETE project): This Privacy Policy will refer to and be applicable to the Mobile App listed above, which shall hereinafter be referred to as "Mobile App."

b) EFFECTIVE DATE: "Effective Date" means the date this Privacy Policy comes into force and effect.

c) PARTIES: The parties to this privacy policy are the following data controller: UNW ("Data Controller") and you, as the user of this Mobile App. Hereinafter, the parties will individually be referred to as "Party" and collectively as "Parties."

d) DATA CONTROLLER: Data Controller is the Party responsible for the collection of information described herein. Data Controller shall be referred to either by Data Controller's name or "Data Controller."

e) OPERATOR: Operator is the publisher, owner, and operator of the Mobile App and is the Party responsible for the collection of information described herein, along with Data Controller. Operator shall be referred to either by Operator's name or "Operator." If Operator or Operator's property shall be referred to through first-person pronouns, it shall be through the use of the following: us, we, our, ours, etc.

f) YOU: Should you agree to this Privacy Policy and continue your use of the Mobile App, you will be referred to herein as either you, the user, or if any second-person pronouns are required and applicable, such pronouns as 'your", "yours", etc.

g) SERVICES: "Services" means any services that we make available for sale on the Mobile App.

h) PERSONAL DATA: "Personal DATA" means personal data and information that we obtain from you in connection with your use of the Mobile App that is capable of identifying you in any manner.

Article 2 - GENERAL INFORMATION:

This privacy policy (hereinafter "Privacy Policy") describes how we collect and use the Personal Data that we receive about you, as well as your rights in relation to that Personal Data, when you visit our Mobile App or use our Services.

This Privacy Policy does not cover any information that we may receive about you through sources other than the use of our Mobile App. The Mobile App may link out to other websites or mobile applications, but this Privacy Policy does not and will not apply to any of those linked websites or applications.

We are committed to the protection of your privacy while you use our Mobile App.

By continuing to use our Mobile App, you acknowledge that you have had the chance to review and consider this Privacy Policy, and you acknowledge that you agree to it. This means that you also consent to the use of your information and the method of disclosure as described in this Privacy Policy. If you do not understand the Privacy Policy or do not agree to it, then you agree to immediately cease your use of our Mobile App.

Article 3 -CONTACT AND DATA PROTECTION OFFICER:

The Pilot manager for ARETE Geometry and ARETE Geography Pilot 2 of the ARETE project is Darya Yegorina, cleverbooksireland@gmail.com.

The Data Protection Officers for ARETE Geometry and ARETE Geography Pilot 2 are:

CLB: Inna Armstrong, dpo@cleverbooks.eu;

UNW: Stefan Wettengel (Deputy Data Protection Supervisor at the University of Wuerzburg), stefan.wettengel@uni-wuerzburg.de, +49 (0)931 31-82545;

EUN: John Stringer (an inhouse consultant at EUN, a UK lawyer), john.stringer@eun.org;

Article 4 - LOCATION:

The location where the data processing activities take place is as follows:

The data is stored on the server https://learninglocker.vicomtech.org. The server is using AWS infrastructure and is physically located in Frankfurt, Germany. All the traffic sent to the server is encrypted and only the users with administrative rights can access it. Once Pilot 2 is over, the data collected will be removed from

AWS and safely stored on a server on Vicomtech's premises, located in San Sebastian, Spain.

Article 5 - MODIFICATIONS AND REVISIONS:

We reserve the right to modify, revise, or otherwise amend this Privacy Policy at any time and in any manner. If we do so, however, we will notify you and obtain your consent to the change in processing. Unless we specifically obtain your consent, any changes to the Privacy Policy will only impact the information collected on or after the date of the change. It is also your responsibility to periodically check this page for any such modification, revision or amendment.

Article 6 - THE PERSONAL DATA WE RECEIVE FROM YOU:

Depending on how you use our Mobile App, you will be subject to different types of Personal Data collected and different manners of collection:

a) Unregistered users: If you are a passive user of the Mobile App and do not register for any purchases or other service, you may still be subject to certain passive data collection ("Passive Data Collection"). Such Passive Data Collection may include through cookies, as described below, IP address information, and certain browser data, such as history and/or session information.

b) All users: The Passive Data Collection that applies to Unregistered users shall also apply to all other users and/or visitors of our Mobile App.

However, we only share your Personal Data with a trusted related entity if that entity agrees to our privacy standards as set out in this Privacy Policy and to treat your Personal Data in the same manner that we do.

Article 7 - THE PERSONAL DATA WE RECEIVE AUTOMATICALLY:

Cookies: We may collect information from you through automatic tracking systems (such as information about your browsing preferences) as well as through information that you volunteer to us (such as information that you provide during a registration process or at other times while using the Mobile App, as described above).

For example, we use cookies to make your browsing experience easier and more intuitive: cookies are small strings of text used to store some information that may concern the user, his or her preferences or the device they are using to access the internet (such as a computer, tablet, or mobile phone). Cookies are mainly used to adapt the operation of the site to your expectations, offering a more personalized browsing experience and memorizing the choices you made previously.

A cookie consists of a reduced set of data transferred to your browser from a web server and it can only be read by the server that made the transfer. This is not executable code and does not transmit viruses.

Cookies do not record or store any Personal Data. If you want, you can prevent the use of cookies, but then you may not be able to use our Mobile App as we intend. To proceed without changing the options related to cookies, simply continue to use our Mobile App.

Technical cookies: Technical cookies, which can also sometimes be called HTML cookies, are used for navigation and to facilitate your access to and use of the site. They are necessary for the transmission of communications on the network or to supply services requested by you. The use of technical cookies allows the safe and efficient use of the site.

You can manage or request the general deactivation or cancelation of cookies through your browser. If you do this though, please be advised this action might slow down or prevent access to some parts of the site.

Cookies may also be retransmitted by an analytics or statistics provider to collect aggregated information on the number of users and how they visit the Mobile App. These are also considered technical cookies when they operate as described.

Temporary session cookies are deleted automatically at the end of the browsing session - these are mostly used to identify you and ensure that you don't have to log in each time - whereas permanent cookies remain active longer than just one particular session.

Third-party cookies: We may also utilize third-party cookies, which are cookies sent by a third-party to your computer. Permanent cookies are often third-party cookies. The majority of third-party cookies consist of tracking cookies used to identify online behavior, understand interests and then customize advertising for users.

Third-party analytical cookies may also be installed. They are sent from the domains of the aforementioned third parties external to the site. Third-party analytical cookies are used to detect information on user behavior on our Mobile App. This place anonymously, in order to monitor the performance and improve the usability of the site. Third-party profiling cookies are used to create profiles relating to users, in order to propose advertising in line with the choices expressed by the users themselves.

Profiling cookies: We may also use profiling cookies, which are those that create profiles related to the user and are used in order to send advertising to the user's browser.

When these types of cookies are used, we will receive your explicit consent.

Support in configuring your browser: You can manage cookies through the settings of your browser on your device. However, deleting cookies from your browser may remove the preferences you have set for this Mobile App.

For further information and support, you can also visit the specific help page of the web browser you are using:

- Internet Explorer: http://windows.microsoft.com/en-us/windows-vista/block-or-allow-cookies

- Firefox: https://support.mozilla.org/en-us/kb/enable-and-disable-cookies-website-preferences

- Safari: http://www.apple.com/legal/privacy/

- Chrome: https://support.google.com/accounts/answer/61416?hl=en

- Opera: http://www.opera.com/help/tutorials/security/cookies/

- Google Play: https://policies.google.com/privacy?hl=en-US

- iTunes: https://www.apple.com/ie/legal/privacy/en-ww/

Log Data: Like all websites and mobile applications, this Mobile App also makes use of log files that store automatic information collected during user visits. The different types of log data could be as follows:

- internet protocol (IP) address;

- type of browser and device parameters used to connect to the Mobile App;

- name of the Internet Service Provider (ISP);

- date and time of visit;

- web page of origin of the user (referral) and exit;

- possibly the number of clicks.

The aforementioned information is processed in an automated form and collected in an exclusively aggregated manner in order to verify the correct functioning of the site, and for security reasons. This information will be processed according to the legitimate interests of the Data Controller.

For security purposes (spam filters, firewalls, virus detection), the automatically recorded data may also possibly include Personal Data such as IP address, which could be used, in accordance with applicable laws, in order to block attempts at damage to the Mobile App or damage to other users, or in the case of harmful activities or crime. Such data are never used for the identification or profiling of the user, but only for the protection of the Mobile App and our users. Such information will be treated according to the legitimate interests of the Data Controller.

Article 8 - THIRD PARTIES:

We may utilize third-party service providers ("Third-Party Service Providers"), from time to time or all the time, to help us with our Mobile App, and to help serve you.

We may use Third-Party Service Providers to assist with information storage (see Article 4 for detailed information).

We may provide some of your Personal Data to Third-Party Service Providers in order to help us track usage data, such as referral websites, dates and times of page requests, etc. We use this information to understand patterns of usage of, and to improve, the Mobile App.

We may use Third-Party Service Providers to host the Mobile App. In this instance, the Third-Party Service Provider will have access to your Personal Data.

We only share your Personal Data with a Third-Party Service Provider if that provider agrees to our privacy standards as set out in this Privacy Policy.

Your Personal Data will not be sold or otherwise transferred to other third parties without your approval.

Notwithstanding the other provisions of this Privacy Policy, we may provide your Personal Data to a third party or to third parties in order to protect the rights, property or safety, of us, our customers or third parties, or as otherwise required by law.

We will not knowingly share your Personal Data with any third parties other than in accordance with this Privacy Policy.

If your Personal Data might be provided to a third party in a manner that is other than as explained in this Privacy Policy, you will be notified. You will also have the opportunity to request that we not share that information.

In general, you may request that we do not share your Personal Data with third parties. Please contact us via email, if so. Please be advised that you may lose access to certain services that we rely on third-party providers for.

Article 9 - HOW PERSONAL DATA IS STORED:

We use secure physical and digital systems to store your Personal Data when appropriate. We ensure that your Personal Data is protected against unauthorized access, disclosure, or destruction.

Please note, however, that no system involving the transmission of information via the internet, or the electronic storage of data, is completely secure. However, we take the protection and storage of your Personal Data very seriously. We take all reasonable steps to protect your Personal Data.

Personal Data is stored throughout your relationship with us. We delete your Personal Data upon request for cancelation of your account or other general request for the deletion of data.

In the event of a breach of your Personal Data, you will be notified in a reasonable time frame, but in no event later than two weeks, and we will follow all applicable laws regarding such breach.

Article 10 - PURPOSES OF PROCESSING OF PERSONAL DATA:

We primarily use your Personal Data to help us provide a better experience for you on our Mobile App and to provide you the services and/or information you may have requested, such as use of our Mobile App.

Information that does not identify you personally, but that may assist in providing us broad overviews of our customer base, will be used for market research or marketing efforts. Such information may include, but is not limited to, interests based on your cookies.

Personal Data that may be considering identifying may be used for the following:

a) Improving your personal user experience

b) ARETE anonymous research data collection

Article 11 - DISCLOSURE OF PERSONAL DATA:

Although our policy is to maintain the privacy of your Personal Data as described herein, we may disclose your Personal Data if we believe that it is reasonable to do so in certain cases, in our sole and exclusive discretion. Such cases may include, but are not limited to:

a) To satisfy any local, state, or EU laws or regulations

b) To respond to requests, such discovery, criminal, civil, or administrative process, subpoenas, court orders, or writs from law enforcement or other governmental or legal bodies

c) To bring legal action against a user who has violated the law or violated the terms of use of our Mobile App

d) As may be necessary for the operation of our Mobile App

e) To generally cooperate with any lawful investigation about our users

f) If we suspect any fraudulent activity on our Mobile App or if we have noticed any activity which may violate our terms or other applicable rules

Article 12 - CHILD ACCESS:

We may collect information from children, as well as allow and encourage children to visit our Mobile App.

The information we collect from children is as follows:

- number of clicks within app
- time spent in the app

We do not allow children to make their Personal Data publicly available.

Information collected from children in accordance with this clause is collected to help us enhance all user experiences and to improve our Mobile App.

It is also collected for the specific purpose of the following:

Data collection characteristics

During the intervention, the CLB apps will collect anonymous user data on time spent in the apps and numbers of clicks.

Handling of Data

The technical data will be collected anonymously in the CLB apps, transferred via xAPI to Learning Locker and shared with UNW. After transfer, it will be stored by UNW securely for 6 years post project.

Analysis (Jul 2022-Apr 2023)

• Descriptive statistics

• Identification of references between cumulated app data and post-testing / retention results

We do not require children to disclose any further information than is reasonably necessary to interact with our Mobile App.

Parents or guardians of minor children may review the Personal Data of their child and have it deleted at their request. They may also agree to collection and use of information, without consenting to disclosure to any other party. They may also refuse to permit any further collection or use of such information by sending us an email at arete@ucd.ie.

Otherwise, information collected from children in accordance with this clause is collected, used and if applicable, disclosed, in accordance with the general provisions of this Privacy Policy.

Article 13 - MODIFYING, DELETING, AND ACCESSING YOUR INFORMATION:

If you wish to modify or delete any information we may have about you, or you wish to simply access any information we have about you, you may reach out to us at the following email address: arete@ucd.ie.

Article 14 - ACCEPTANCE OF RISK:

By continuing to our Mobile App in any manner, use the Product, you manifest your continuing asset to this Privacy Policy. You further acknowledge, agree and accept that no transmission of information or data via the internet is not always completely secure, no matter what steps are taken. You acknowledge, agree and accept that we do not guarantee or warrant the security of any information that you provide to us, and that you transmit such information at your own risk.

Article 15 - YOUR RIGHTS:

You have many rights in relation to your Personal Data. Specifically, your rights are as follows:

- the right to be informed about the processing of your Personal Dat

- the right to have access to your Personal Data

- the right to update and/or correct your Personal Data

- the right to portability of your Personal Data

- the right to oppose or limit the processing of your Personal Data

- the right to request that we stop processing and delete your Personal Data

- the right to block any Personal Data processing in violation of any applicable law

- the right to launch a complaint with the Federal Trade Commission (FTC) in the United States or applicable data protection authority in another jurisdiction

Such rights can all be exercised by contacting us at the relevant contact information listed in this Privacy Policy.

Article 16 - CONTACT INFORMATION:

If you have any questions about this Privacy Policy or the way we collect information from you, or if you would like to launch a complaint about anything related to this Privacy Policy, you may contact any of the following DPOs:

CLB: Inna Armstrong, dpo@cleverbooks.eu;

UNW: Stefan Wettengel (Deputy Data Protection Supervisor at the University of Wuerzburg), stefan.wettengel@uni-wuerzburg.de, +49 (0)931 31-82545;

EUN: John Stringer (an inhouse consultant at EUN, a UK lawyer), john.stringer@eun.org;

ARETE Testing Information for Teachers

Dear teacher,

thank you for your participation in our ARETE pilot study.

Documents and References for your ARETE Testing

In addition to the student test books, you have been provided with four documents:

1) Testing information,
2) Test administration manual,
3) Test book – teachers version –, and
4) Student ID code list.

This document you are reading now is the testing information (1). It serves to inform you about the testing procedure and all related questions.

The test administration manual (2) is the document that you will need to read out during the test administration.

The test book – teachers version – (3) contains the questions your students will answer as well as the correct answers. As all teachers materials, this test book is **for your reference only** and **not to be shared with your students**.

The student ID code list (4) contains the student codes that you will need to assign to your students locally.

Please read through all materials provided carefully before the testing and ask your national coordinator in case you have any questions.

Overall timeline for assessment activities and intervention

You can start your work with the ARETE Augmented Reality app any time between September and October, 2021.

Step	When?	Activity	Deadline
1 Pretesting: Before the intervention starts	September / October 2021	The **first thing** to do is administering the STUDENT PRETEST, following the instructions below. Once you are done with the pretest, please grade selected items and send all scans via email (see below for further information).	Scans should be sent in **until November 12, 2021**.
		Also, please fill in the TEACHERS' ONLINE SURVEY PRETEST: https://www.surveymonkey.de/r/ARETE-Pre-EN-A	The teachers' online questionnaire pretest should also be filled in **before the intervention starts**, i.e., **in September or October, 2021**.
2 Intervention	September 2021 – March 2022	As soon as STUDENT PRETEST and TEACHERS' ONLINE SURVEY PRETEST are completed, you can start with the intervention and use the app in your class as long and as often as you consider appropriate.	The latest point in time to finish the intervention is **end of March, 2022**.
3 Posttesting: After the intervention is finished	September 2021 – March 2022	Once you are finished, please administer the STUDENT POSTTEST **directly**. Please grade selected items and send all scans via email (see below for further information).	Again, please send all scans via mail directly until **April 15, 2022,** at the latest.
		Also, please fill in the TEACHERS' ONLINE SURVEY POSTTEST: https://www.surveymonkey.de/r/ARETE-Post-EN-A	Please fill in the teachers' survey posttest until **April 15, 2022,** at the latest.
4 Retention test	Exactly 6 weeks after the posttest	Please administer the STUDENT RETENTION TEST **exactly 6 weeks** after the posttest, i.e., until mid-May at the latest. It is important that there are exactly six weeks between posttesting and retention testing.	We are looking forward to receiving your retention test scans **until May 31, 2022**.

Test Items

The items your students will answer are taken from the TIMSS2015 study (Trends In International Mathematics And Science Study[1]). They are used in ARETE by courtesy of IEA (International Association for the Evaluation of Educational Achievement). The items have been validated internationally to measure students' knowledge and skills in mathematics and science in their respective age group.

During the ARETE pilot, your students will answer the same items three times: **once before the intervention (pretesting), once directly following the intervention (posttesting), and a third time 6 weeks after the intervention (retention test)**. This allows us to learn more about the effects the intervention has on your students' knowledge in the areas of interest.

There is also a scale for student motivation included in the posttest. These items are taken from the IMI (Intrinsic Motivation Scale[2]). IMI is a well-established and validated instrument that will help us understand your students' motivation during the intervention.

Student Identification Codes

It is of vital importance for the scientific evaluation that you keep track of the student identification codes carefully. To ensure anonymization and in compliance with GDPR, the ARETE team will not have access to any identifying student information such as names etc.

You have been provided with a list of identification codes for your students who take part in this study. **Please assign each student a code and store this information securely** and only for yourself. The ARETE team will not ask you for student names or related confidential information.

It is very important that you **ensure that your students write down the correct code on the first page of their test books**. Without these codes, we will not be able to link the students' pretest, posttest and retention data correctly.

[1] http://timss2015.org/

[2] https://selfdeterminationtheory.org/intrinsic-motivation-inventory/

Test administration timetable: PRETEST

Step	Time	Duration	Procedure
1	0:00 – 0:10	10 min	Welcome students Introduction and explanation Distribute tests Students fill in student ID codes with teacher's help and supervision
2	**0:10 – 0:30**	**20 min**	**Context questionnaire**
3	0:30 – 0:40	10 min	Break (eat, drink, move)
4	**0:40 – 0:58**	**18 min**	**Maths / Science items**
5	0:58 – 1:00	2 min	Ending Collecting tests
		60 min	**Total testing duration**
		38 min	**Working time**

Test administration timetable: POSTTEST

Step	Time	Duration	Procedure
1	0:00 – 0:10	10 min	Welcome students Introduction and explanation Distribute tests Students fill in student ID codes with teacher's help and supervision
2	**0:10 – 0:30**	**20 min**	**Context questionnaire**
3	0:30 – 0:40	10 min	Break (eat, drink, move)
4	**0:40 – 0:58**	**18 min**	**Maths / Science items**
5	0:58 – 1:08	10 min	Break (eat, drink, move) (in posttest)
6	**1:08 – 1:18**	**10 min**	**Motivational scale (in posttest)**
7	1:18 – 1:20	2 min	Ending Collecting tests
		80 min	**Total testing duration**
		48 min	**Working time**

Test administration timetable: RETENTION TEST

Step	Time	Duration	Procedure
1	0:00 – 0:10	10 min	Welcome students Introduction and explanation Distribute tests Students fill in student ID codes with teacher's help and supervision
2	**0:10 – 0:30**	**20 min**	**Context questionnaire**
3	0:30 – 0:40	10 min	Break (eat, drink, move)
4	**0:40 – 0:58**	**18 min**	**Maths / Science items**
5	0:58 – 1:00	2 min	Ending Collecting tests
		60 min	**Total testing duration**
		38 min	**Working time**

Please adhere to this timeline strictly to make testing results comparable. You may adjust the timing of introduction (step 1), breaks (steps 3 and 5) and ending (step 7) to suit your local context, but it is **absolutely necessary to have the testing phases (steps 2, 4 and 6) last exactly as long as stated in the table**.

Please use a stop watch or similar to control the duration of the testing phases.

Test administration manual

During the testing, please have a print copy of the test administration manual (2) with you. It is necessary to read out everything **written in bold** word by word. Instructions *written in Italics* are for your instruction and not to be read out.

Reading out the texts written in bold may seem a bit odd and formal to you. Still, **it is absolutely necessary that you stick to the text word by word**. The ARETE testing is conducted in numerous countries with thousands of students, and reading out the instructions word by word is crucial for standardizing the test setting and ensuring sound comparability between the data collected.

After the testing

- **Grading**

Please collect all student test books after the testing, either directly (face to face-setting) or as soon as possible within a 2-week frame after the testing (in case of online administration).

While most of the test items are multiple choice, a couple of items require open input from your students (i.e., a free text). **Please grade only these items** by assigning the correct points clearly.

You can simply write the points achieved near the item.

You will find the right solution and hints for grading in the manual. The instructions are unambiguous.

The items you will need to grade are marked clearly in your test book – teachers version (3). It is also possible that there are no items for you to grade in your test book. **It is not necessary to grade any other item**, apart from the ones that are marked.

- **Scanning**

Once you are done with grading, please scan each test book and kindly send the scans to Giuseppe Mossuti giuseppe.mossuti@eun.org and Elisavet Vlachou elisavet.vlachou@eun.org. Please ensure that all scans are legible and in the right order.

It is important that you **keep all test books** for later reference! Do not throw anything away.

Important: please do not discuss items or correct answers with your students after the testing, because your students will need to answer these items again in posttest and retention test.

Online delivery

Due to COVID19, you might need to teach the intervention fully online. In this case, please go ahead with the assessment as described nonetheless. You will need to organize a way to distribute the test books to your students, and to collect them afterwards. **It is necessary that your students work with a paper copy**. The test must not be filled in digitally.

Please try your best to achieve conditions comparable to a face to face-setting. Students will need to fill in the tests while you are with them online in a video conferencing setting. This way, you can read out instructions and control timing and cheating as you would do in classroom.

Thank you for your cooperation!

ARETE Testing Information for Teachers

Dear teacher,

thank you for your participation in our ARETE pilot study.

Documents and References for your ARETE Testing

In addition to the student test books, you have been provided with four documents:

1) Testing information,
2) Test administration manual,
3) Test book – teachers version –, and
4) Student ID code list.

This document you are reading now is the testing information (1). It serves to inform you about the testing procedure and all related questions.

The test administration manual (2) is the document that you will need to read out during the test administration.

The test book – teachers version – (3) contains the questions your students will answer as well as the correct answers. As all teachers materials, this test book is **for your reference only** and **not to be shared with your students**.

The student ID code list (4) contains the student codes that you will need to assign to your students locally.

Please read through all materials provided carefully before the testing and ask your national coordinator in case you have any questions.

Overall timeline for assessment activities and intervention

You can start your work with the ARETE Augmented Reality app any time between September and October, 2021.

Step	When?	Activity	Deadline
1 Pretesting: Before the intervention starts	September / October 2021	The **first thing** to do is administering the STUDENT PRETEST, following the instructions below. Once you are done with the pretest, please grade selected items and send all scans via email (see below for further information).	Scans should be sent in **until November 12, 2021**.
		Also, please fill in the TEACHERS' ONLINE SURVEY PRETEST: https://www.surveymonkey.de/r/ARETE-Pre-EN-B	The teachers' online questionnaire pretest should also be filled in **before the intervention starts**, i.e., **in September or October, 2021**.
2 Intervention	September 2021 – March 2022	As soon as STUDENT PRETEST and TEACHERS' ONLINE SURVEY PRETEST are completed, you can start with the intervention and use the app in your class as long and as often as you consider appropriate.	The latest point in time to finish the intervention is **end of March, 2022**.
3 Posttesting: After the intervention is finished	September 2021 – March 2022	Once you are finished, please administer the STUDENT POSTTEST **directly**. Please grade selected items and send all scans via email (see below for further information).	Again, please send all scans via mail directly until **April 15, 2022,** at the latest.
		Also, please fill in the TEACHERS' ONLINE SURVEY POSTTEST: https://www.surveymonkey.de/r/ARETE-Post-EN-B	Please fill in the teachers' survey posttest until **April 15, 2022,** at the latest.
4 Retention test	Exactly 6 weeks after the posttest	Please administer the STUDENT RETENTION TEST **exactly 6 weeks** after the posttest, i.e., until mid-May at the latest. It is important that there are exactly six weeks between posttesting and retention testing.	We are looking forward to receiving your retention test scans **until May 31, 2022**.

Test Items

The items your students will answer are taken from the TIMSS2015 study (Trends In International Mathematics And Science Study[1]). They are used in ARETE by courtesy of IEA (International Association for the Evaluation of Educational Achievement). The items have been validated internationally to measure students' knowledge and skills in mathematics and science in their respective age group.

During the ARETE pilot, your students will answer the same items three times: **once before the intervention (pretesting), once directly following the intervention (posttesting), and a third time 6 weeks after the intervention (retention test)**. This allows us to learn more about the effects the intervention has on your students' knowledge in the areas of interest.

There is also a scale for student motivation included in the posttest. These items are taken from the IMI (Intrinsic Motivation Scale[2]). IMI is a well-established and validated instrument that will help us understand your students' motivation during the intervention.

Student Identification Codes

It is of vital importance for the scientific evaluation that you keep track of the student identification codes carefully. To ensure anonymization and in compliance with GDPR, the ARETE team will not have access to any identifying student information such as names etc.

You have been provided with a list of identification codes for your students who take part in this study. **Please assign each student a code and store this information securely** and only for yourself. The ARETE team will not ask you for student names or related confidential information.

It is very important that you **ensure that your students write down the correct code on the first page of their test books**. Without these codes, we will not be able to link the students' pretest, posttest and retention data correctly.

[1] http://timss2015.org/

[2] https://selfdeterminationtheory.org/intrinsic-motivation-inventory/

Test administration timetable: PRETEST

Step	Time	Duration	Procedure
1	0:00 – 0:10	10 min	Welcome students Introduction and explanation Distribute tests Students fill in student ID codes with teacher's help and supervision
2	**0:10 – 0:30**	**20 min**	**Context questionnaire**
3	0:30 – 0:40	10 min	Break (eat, drink, move)
4	**0:40 – 0:58**	**18 min**	**Maths / Science items**
5	0:58 – 1:00	2 min	Ending Collecting tests
		60 min	**Total testing duration**
		38 min	**Working time**

Test administration timetable: POSTTEST

Step	Time	Duration	Procedure
1	0:00 – 0:10	10 min	Welcome students Introduction and explanation Distribute tests Students fill in student ID codes with teacher's help and supervision
2	**0:10 – 0:30**	**20 min**	**Context questionnaire**
3	0:30 – 0:40	10 min	Break (eat, drink, move)
4	**0:40 – 0:58**	**18 min**	**Maths / Science items**
5	0:58 – 1:08	10 min	Break (eat, drink, move) (in posttest)
6	**1:08 – 1:18**	**10 min**	**Motivational scale (in posttest)**
7	1:18 – 1:20	2 min	Ending Collecting tests
		80 min	**Total testing duration**
		48 min	**Working time**

Test administration timetable: RETENTION TEST

Step	Time	Duration	Procedure
1	0:00 – 0:10	10 min	Welcome students Introduction and explanation Distribute tests Students fill in student ID codes with teacher's help and supervision
2	**0:10 – 0:30**	**20 min**	**Context questionnaire**
3	0:30 – 0:40	10 min	Break (eat, drink, move)
4	**0:40 – 0:58**	**18 min**	**Maths / Science items**
5	0:58 – 1:00	2 min	Ending Collecting tests
		60 min	**Total testing duration**
		38 min	**Working time**

Please adhere to this timeline strictly to make testing results comparable. You may adjust the timing of introduction (step 1), breaks (steps 3 and 5) and ending (step 7) to suit your local context, but it is **absolutely necessary to have the testing phases (steps 2, 4 and 6) last exactly as long as stated in the table**.

Please use a stop watch or similar to control the duration of the testing phases.

Test administration manual

During the testing, please have a print copy of the test administration manual (2) with you. It is necessary to read out everything **written in bold** word by word. Instructions *written in Italics* are for your instruction and not to be read out.

Reading out the texts written in bold may seem a bit odd and formal to you. Still, **it is absolutely necessary that you stick to the text word by word**. The ARETE testing is conducted in numerous countries with thousands of students, and reading out the instructions word by word is crucial for standardizing the test setting and ensuring sound comparability between the data collected.

After the testing

- **Grading**

Please collect all student test books after the testing, either directly (face to face-setting) or as soon as possible within a 2-week frame after the testing (in case of online administration).

While most of the test items are multiple choice, a couple of items require open input from your students (i.e., a free text). **Please grade only these items** by assigning the correct points clearly.

You can simply write the points achieved near the item.

You will find the right solution and hints for grading in the manual. The instructions are unambiguous.

The items you will need to grade are marked clearly in your test book – teachers version (3). It is also possible that there are no items for you to grade in your test book. **It is not necessary to grade any other item**, apart from the ones that are marked.

- **Scanning**

Once you are done with grading, please scan each test book and kindly send the scans to Giuseppe Mossuti giuseppe.mossuti@eun.org and Elisavet Vlachou elisavet.vlachou@eun.org. Please ensure that all scans are legible and in the right order.

It is important that you **keep all test books** for later reference! Do not throw anything away.

Important: please do not discuss items or correct answers with your students after the testing, because your students will need to answer these items again in posttest and retention test.

Online delivery

Due to COVID19, you might need to teach the intervention fully online. In this case, please go ahead with the assessment as described nonetheless. You will need to organize a way to distribute the test books to your students, and to collect them afterwards. **It is necessary that your students work with a paper copy**. The test must not be filled in digitally.

Please try your best to achieve conditions comparable to a face to face-setting. Students will need to fill in the tests while you are with them online in a video conferencing setting. This way, you can read out instructions and control timing and cheating as you would do in classroom.

Thank you for your cooperation!

ARETE Testing Administration manual for Teachers

How to Use this Manual

This manual will guide you through the ARETE tests and inform you what to read out to your class during the testing.

Please read out all passages **printed in bold and in boxes**. *Please read out everything word by word to ensure equal conditions and testing procedures in every country.*

Instructions for you are printed in italics. These must not be read out aloud.

Before the Testing

- *Prepare your student ID codes: you received a list with codes. Write one of your students' names behind every code.*
- *In a face to face-setting: Provide every student with a copy of the test book directly before the testing. Take care that there is enough space for every student.*
- *In an online videoconferencing setting: Organize in advance that every student has a print copy of the test book. It is absolutely necessary that each student works with an own print copy.*

Test Administration: PRETEST (before the intervention begins)

Welcome your students and explain to them that you will need to read out instructions word-for-word because the testing has to be the same for every class.

Then, start reading out word-for-word:

You are here to participate in a test for a European pilot study that researches the use of Augmented Reality for teaching and learning contexts. Students from all over Europe participate in this study.
You will take this test three times: once at the beginning of the school year, a second time a couple of weeks later and a third time another six weeks later.

The test will take approximately 60 minutes. It includes questions on Maths or Science and some questions about yourself.

The test will not be graded or have any impact on your grade. The researchers working on the results will not know your name or be able to link your results to you as a person.

Your participation is voluntary, but please give your best and answer every question.

Please read through every question carefully before answering. There is only one correct answer per question.

Please fill in the box you consider correct by ticking it.

Introduction

10 minutes

Illustrate this on the blackboard: ☒

If you need to correct your input, please blacken the incorrect box completely.

Illustrate this on the blackboard: ■

You will find your test book at your table. At first, please write your student ID code on the front page.

You assigned every student a code in advance. Now tell each student their code and control that they write it on the front page correctly. Proceed only after you have controlled every front page.

Now we can start with the first questions. They are about yourself.

Please answer honestly, there are no right or wrong answers here. It is all about your personal opinion.

Please stop when there is a stop sign.

Are there any questions?

Block 1:

Context Questions

20 minutes

Please answer your students' questions, if they are process-related.

You may start now.

Start your stop watch (or similar). The time for this block is 20 minutes.

During the testing, please make sure that your students do not talk, use electronic devices or cheat. If students are done with the questions, take care that they stay quiet.

Other than that, you should take an observing role only and not interfere at all.

Go on after 20 minutes:

Now, we will have a [ten-minute] break. You may stand up and move, eat and drink if you like. Please do not talk about the test.

Break 1

10 minutes

Start your stop watch (or similar). The time for the break scheduled is 10 minutes, but you can adjust it to suit your local needs if you like.

Block 2:

Maths / Science Questions

18 minutes

Now we will go on with the next questions. They are about your knowledge in Maths or Science.

I am not allowed to help you, so please fill in everything as you think best.

There is only one correct answer per question.

Are there any questions?

Please answer your students' questions, if they are process-related.

You may start now.

Start your stop watch (or similar). The time for this block is exactly 18 minutes.
You are not allowed to help your students. If they have a content-related question, please tell them to fill in as they think best.

During the testing, please make sure that your students do not talk, use electronic devices or cheat. If students are done with the questions, take care that they stay quiet.

Other than that, you should take an observing role only and not interfere at all.

After 18 minutes, go on:

Ending

2 minutes

Please stop now.

You are done with the test. Thank you very much for your participation.

In case of face to face-administration: collect all test books directly.

In case of an online administration: inform your students how and when you will collect the test books.

Test Administration: POSTTEST (directly after the intervention is completed)

Welcome your students and explain to them that you will need to read out instructions word-for-word because the testing has to be the same for every class.

Then, start reading out word-for-word:

You are here to participate in a test for a European pilot study that researches the use of Augmented Reality for teaching and learning contexts. Students from all over Europe participate in this study.
You will take this test three times: once at the beginning of the school year, a second time a couple of weeks later and a third time another six weeks later.

The test will take approximately 80 minutes. It includes questions on Maths or Science and some questions about yourself and your motivation.

The test will not be graded or have any impact on your grade. The researchers working on the results will not know your name or be able to link your results to you as a person.

Your participation is voluntary, but please give your best and answer every question.

Please read through every question carefully before answering. There is only one correct answer per question.

Please fill in the box you consider correct by ticking it.

Introduction

10 minutes

Illustrate this on the blackboard: ☒

If you need to correct your input, please blacken the incorrect box completely.

Illustrate this on the blackboard: ■

You will find your test book at your table. At first, please write your student ID code on the front page.

You assigned every student a code in advance. Now tell each student their code and control that they write it on the front page correctly. Proceed only after you have controlled every front page.

Now we can start with the first questions. They are about yourself.

Please answer honestly, there are no right or wrong answers here. It is all about your personal opinion.

Please stop when there is a stop sign.

Are there any questions?

Block 1:

Context Questions

20 minutes

Please answer your students' questions, if they are process-related.

You may start now.

Start your stop watch (or similar). The time for this block is 20 minutes.

During the testing, please make sure that your students do not talk, use electronic devices or cheat. If students are done with the questions, take care that they stay quiet.

Other than that, you should take an observing role only and not interfere at all.

Go on after 20 minutes:

Now, we will have a [ten-minute] break. You may stand up and move, eat and drink if you like. Please do not talk about the test.

Break 1

10 minutes

Start your stop watch (or similar). The time for the break scheduled is 10 minutes, but you can adjust it to suit your local needs if you like.

Block 2:

Maths / Science Questions

18 minutes

Now we will go on with the next questions. They are about your knowledge in Maths or Science.

I am not allowed to help you, so please fill in everything as you think best.

There is only one correct answer per question.

Please stop when there is a stop sign.

Are there any questions?

Please answer your students' questions, if they are process-related.

You may start now.

Start your stop watch (or similar). The time for this block is exactly 18 minutes.
You are not allowed to help your students. If they have a content-related question, please tell them to fill in as they think best.

During the testing, please make sure that your students do not talk, use electronic devices or cheat. If students are done with the questions, take care that they stay quiet.

Other than that, you should take an observing role only and not interfere at all.

Go on after 18 minutes:

Break 2

10 minutes

Please stop now.

We will have another [ten-minute] break now. You may stand up and move, eat and drink if you like. Please do not talk about the test.

Start your stop watch (or similar). The time for the break scheduled is 10 minutes, but you can adjust it to suit your local needs if you like.

Block 3:

Motivation

10 minutes

The last questions are about your motivation in relation to…

… the learning activities with the Augmented Reality app. This is the app we have been working with over the last lessons. [intervention group]

… the learning activities we did over the last lessons. [control group]

Please answer honestly, there are no right or wrong answers here. It is all about your personal opinion.

Are there any questions?

Please answer your students' questions, if they are process-related.

You may start now.

Start your stop watch (or similar). The time for this block is 10 minutes.

During the testing, please make sure that your students do not talk, use electronic devices or cheat. If students are done with the questions, take care that they stay quiet.

Other than that, you should take an observing role only and not interfere at all.

After 10 minutes, go on:

Please stop now.

You are done with the test. Thank you very much for your participation.

Ending

2 minutes

In case of face to face-administration: collect all test books directly.

In case of an online administration: inform your students how and when you will collect the test books.

Test Administration: RETENTION TEST (6 weeks after ending the intervention)

Welcome your students and explain to them that you will need to read out instructions word-for-word because the testing has to be the same for every class.

Then, start reading out word-for-word:

You are here to participate in a test for a European pilot study that researches the use of Augmented Reality for teaching and learning contexts. Students from all over Europe participate in this study.
You will take this test three times: once at the beginning of the school year, a second time a couple of weeks later and a third time another six weeks later.

The test will take approximately 60 minutes. It includes questions on Maths or Science and some questions about yourself.

The test will not be graded or have any impact on your grade. The researchers working on the results will not know your name or be able to link your results to you as a person.

Your participation is voluntary, but please give your best and answer every question.

Please read through every question carefully before answering. There is only one correct answer per question.

Please fill in the box you consider correct by ticking it.

Introduction

10 minutes

Illustrate this on the blackboard: ☒

If you need to correct your input, please blacken the incorrect box completely.

Illustrate this on the blackboard: ■

You will find your test book at your table. At first, please write your student ID code on the front page.

You assigned every student a code in advance. Now tell each student their code and control that they write it on the front page correctly. Proceed only after you have controlled every front page.

Now we can start with the first questions. They are about yourself.

Please answer honestly, there are no right or wrong answers here. It is all about your personal opinion.

Please stop when there is a stop sign.

Are there any questions?

Block 1:

Context Questions

20 minutes

Please answer your students' questions, if they are process-related.

You may start now.

Start your stop watch (or similar). The time for this block is 20 minutes.

During the testing, please make sure that your students do not talk, use electronic devices or cheat. If students are done with the questions, take care that they stay quiet.

Other than that, you should take an observing role only and not interfere at all.

Go on after 20 minutes:

Now, we will have a [ten-minute] break. You may stand up and move, eat and drink if you like. Please do not talk about the test.

Break 1

10 minutes

Start your stop watch (or similar). The time for the break scheduled is 10 minutes, but you can adjust it to suit your local needs if you like.

Block 2:

Maths / Science Questions

18 minutes

Now we will go on with the next questions. They are about your knowledge in Maths or Science.

I am not allowed to help you, so please fill in everything as you think best.

There is only one correct answer per question.

Are there any questions?

Please answer your students' questions, if they are process-related.

You may start now.

Start your stop watch (or similar). The time for this block is exactly 18 minutes.
You are not allowed to help your students. If they have a content-related question, please tell them to fill in as they think best.

During the testing, please make sure that your students do not talk, use electronic devices or cheat. If students are done with the questions, take care that they stay quiet.

Other than that, you should take an observing role only and not interfere at all.

After 18 minutes, go on:

Ending

2 minutes

Please stop now.

You are done with the test. Thank you very much for your participation.

In case of face to face-administration: collect all test books directly.

In case of an online administration: inform your students how and when you will collect the test books.

ARETE Pilot 2 · Intervention Strategy · *05/07/2021, UNW*

ARETE

2021: Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec

Recruitment
n_{teach} = 166;
n_{stud} = 3848

Parents, Teachers, Students complete informed intervention consent paper forms[1]

Teacher Coordinator Pre Focus Groups[4]:
$n_{teach\ ITV}$ = 8

Classes randomized / allocated to interv. or ctrl. group by UNW (pairwise; science and maths sample)
Students and teachers assigned a pseudonymized ID by UNW

Teacher Pre Surveys[5]:
$n_{teach\ ITV}$ = 83;
$n_{teach\ CTRL}$ = 83

Students fill in TIMSS Pretest[2]
$n_{stud\ SCI\ ITV}$ = 950; $n_{stud\ MAT\ ITV}$ = 974;
$n_{stud\ SCI\ CTRL}$ = 950; $n_{stud\ MAT\ CTRL}$ = 974

Intervention:
Teachers administer CLB-AR app on tablet / laptop[3]

Control group:
Teachers teach geometry / geography contents without app

2022: Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec

Teacher Coordinators Post Focus Groups[4]: $n_{teach\ ITV}$ = 9

Teacher Post Survey[5]:
$n_{teach\ ITV}$ = 83;
$n_{teach\ CTRL}$ = 83

Students fill in TIMSS Posttest[2] and IMI Post Survey[6]
$n_{stud\ SCI\ ITV}$ = 950; $n_{stud\ MAT\ ITV}$ = 974;
$n_{stud\ SCI\ CTRL}$ = 950; $n_{stud\ MAT\ CTRL}$ = 974

Students fill in TIMSS Retention test[2]
$n_{stud\ SCI\ ITV}$ = 950; $n_{stud\ MAT\ ITV}$ = 974;
$n_{stud\ SCI\ CTRL}$ = 950; $n_{stud\ MAT\ CTRL}$ = 974

2023: Jan, Feb, Mar, Apr

- Data analysis and reports / Journal articles
- Dissemination
- Collaborative reporting between all consortium parties concerned

[1] Students' and parents' forms remain at schools.
Teachers' forms collected by EUN.

[2] Pseudonymised paper tests filled in by students. Teachers send scans to EUN. EUN shares scans with UNW for grading, digitalisation, anonymisation and storage.

[3] During the intervention, anonymized technical data are collected by CLB. The data are sent to UNW post intervention in a processible format for analysis.

[4] Teacher Coordinator Interviews: to be organized at the 1st and 3rd teacher coordinators workshops.
To be conducted, recorded, transcribed by UNW.
Pseudonymised recordings and anonymized transcriptions saved securely at UNW for 6 years post project.

[5] Teacher Surveys: Pseudonymised online surveys for intervention and control group teachers. Organized and analysed by UNW. Results are accumulated and anonymized and subsequently stored securely at UNW for 6 years post project.

[6] Student IMI Post Survey: Paper survey for intervention and control group students to be administered post intervention. Pseudonymized forms / scans sent to UNW to analyse.

ARETE Pilot 2 · Assessment Strategy · *05/07/2021, UNW*

Research Question: How does AR impact on students' STEM learning and retention?

ARETE

TIMSS 2015 – Selected items; IMI Post-Survey - Selected items

Paper test, filled in by students

Pre: Sep-Oct 2021; Post: Mar-Apr 2022;
Retention: May-Jun 2022

$n_{stud\ SCI\ ITV}$ = 950; $n_{stud\ MAT\ ITV}$ = 974;
$n_{stud\ SCI\ CTRL}$ = 950; $n_{stud\ MAT\ CTRL}$ = 974

Instrument characteristics

The TIMSS 2015 inventory is an established international standardised knowledge testing instrument. It is available upon authorisation in all pilot languages and includes items for 4th and 8th grade in mathematics and science. A selection of 4th grade items will be used for the ARETE study. Additionally, selected items from the TIMSS context questionnaire will be included to cover basic pseudonymised demographic data. The testing will take approx. 45 min (incl. break).
The Intrinsic Motivation Inventory (IMI) is a multidimensional tool that allows to assess the students' experience during the intervention phase through a Likert scale. The survey will take approx. 5-10 minutes (an additional break may be required).

Handling of Data

Pseudonymised paper tests filled in by students. Teachers send scans to EUN who forward to UNW for grading, digitalisation, anonymisation and storage (6 years post project).

Analysis (Sep 2021-Apr 2023)

- Descriptive statistics, comparison of intervention and control group results
- Comparison pre – post – retention
- Development of subsamples
- Hypothesis testing, group performance etc.

Teacher Coordinator Focus Groups

Online / face to face focus groups
Organised at 1st and 3rd teacher coordinators' workshops by EUN / Administered by UNW

Pre: Jun 2021; Post: Mar 2022

$n_{teach\ ITV}$ = 9

Instrument characteristics

Qualitative interview guideline developed based on relevant literature, to clarify the pedagogical implications of AR application in educational settings. Focus groups will take approx. 2 hrs.

Handling of Data

Interviews conducted, audio-recorded and transcribed by UNW. Data accessed by UNW only.
Pseudonymised recordings and anonymised transcriptions saved securely at UNW for 6 years post project.

Analysis (Jun 2022-Apr 2023)

- Qualitative content analysis of anonymised transcripts
- Conclusions on the implications of AR on teaching and learning processes in school
- Identification of teachers' experiences and evaluation of the intervention, of factors that hinder or facilitate a successful implementation, and of the perceived impact of the AR-based intervention on the students

Teacher Surveys

Online surveys
Organised and administered by UNW

Pre: Sep-Oct 2021; Post: Mar-Apr 2022

$n_{teach\ ITV}$ = 83; $n_{teach\ CTRL}$ = 83

Instrument characteristics

Subjective surveys, developed based on relevant literature, to identify intervention and control group settings and pedagogical implications of AR applications in education. The surveys will take approx. 10 min (pre) / 30 min (post) to complete.

Handling of Data

Pseudonymised surveys developed, administered, anonymised and analysed by UNW. Realised with SurveyMonkey. Data are password-protected and accessed by UNW only. Pseudonymised data saved securely at UNW for 6 years post project.

Analysis (Sep 2021-Apr 2023)

- Descriptive statistics, comparison of intervention and control group results
- Conclusions on the implications of AR on teaching and learning processes in school
- Identification of intervention and control group settings, of teachers' experiences and evaluation of the intervention, of factors that hinder or facilitate a successful implementation, and of the perceived impact of the AR-based intervention on the students

Collection of technical data

Organised and administered by CLB

Sep 2021-Mar 2022

$n_{stud\ SCI\ ITV}$ = 1,924;
$n_{stud\ MAT\ ITV}$ = 1,924

Data collection characteristics

During the intervention, the CLB apps will collect anonymous user data on time spent in the apps and numbers of clicks.

Handling of Data

The technical data will be collected anonymously in the CLB apps, secured on the local, password-protected CLB server and shared with UNW as Excel files. After transfer, it will be deleted from the CLB server and stored by UNW securely for 6 years post project.

Analysis (Jul 2022-Apr 2023)

- Descriptive statistics
- Identification of references between cumulated app data and post-testing / retention results

⇩ ⇩ ⇩ ⇩

Data analysis and reports
Journal articles
Dissemination
Collaborative reporting between all consortium parties concerned

Project ARETE • Pilot 2 • Evaluation Survey for Teachers · **Intervention** Group

Survey Items: PRETEST

Introduction

Dear teachers,

Thank you for participating in the ARETE project. ARETE (https://www.areteproject.eu) is an EU-funded project, aiming to develop and evaluate the effectiveness of an interactive Augmented Reality (AR) content toolkit. This will give students and teachers access to innovative AR content to enhance their learning and teaching.

The following survey is part of an ARETE pilot study which will be evaluated to assess the success and impact of Augmented Reality in education. It will take you about 10 minutes to complete.

Your answers in the following questionnaire are a central resource for this evaluation and of great value for this project. There are no right or wrong answers. **Please fill in all questions honestly and completely** to ensure a comprehensive and significant evaluation. Please note that your participation is voluntary.

The questionnaire is entirely anonymous. We assure you that your data will be treated in the strictest confidence and in accordance with General Data Protection Regulation (GDPR) <https://www.ucd.ie/gdpr/about/>. The data will only be viewed by personnel working on this project, will not be forwarded to third parties and will be used solely for research purposes.

If you have questions regarding this survey or the evaluation process, please contact a member of the evaluation team: Jennifer.tiede@uni-wuerzburg.de

Please confirm that you have read the information above and that you give us your consent to use your anonymous responses for our research work by checking the box:	☐ **I agree**

Thank you!

Area 1: Demographic Data

1. Please enter your unique identification code here: _____

2. What is your gender? *(select one answer)*
   - ☐ Female
   - ☐ Male
   - ☐ Other / prefer not to say

3. What is your age? _____ [numerical input]

4. What is your country of residence? *(select one answer)*
   - ☐ Ireland
   - ☐ Romania
   - ☐ Spain
   - ☐ Portugal
   - ☐ Italy
   - ☐ Greece
   - ☐ Poland
   - ☐ Serbia
   - ☐ Croatia
   - ☐ Turkey
   - ☐ Sweden
   - ☐ Other: please specify _____

5. How many years of teaching experience do you have? *(select one answer)*
   - ☐ < 5 years
   - ☐ 5-10 years
   - ☐ > 10 years

Area 2: Teachers' Digital Pedagogical Competence and Previous Experience with AR

6. How do you rate your level of expertise in using digital media in teaching and learning? *(select one answer)*
   - ☐ Very good
   - ☐ Good
   - ☐ Acceptable
   - ☐ Poor
   - ☐ Very poor

7. Have you heard or read about Augmented Reality? *(select one answer)*
   - ☐ Yes, a lot
   - ☐ Yes, a little
   - ☐ No
   - ☐ I don't know

8. Have you ever used an Augmented Reality app in your leisure time? *(select one answer)*
   - ☐ Yes, often
   - ☐ Yes, sometimes
   - ☐ No
   - ☐ I don't know

9. Have you ever used an Augmented Reality app for teaching and learning? *(select one answer)*
   - ☐ Yes, often
   - ☐ Yes, sometimes
   - ☐ No
   - ☐ I don't know

Area 3: Teachers' Attitudes

10. Apps which include Augmented Reality may have different qualities for teaching and learning. To what extent do you agree with the following statements: *(select one answer per row)*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
They are fun for the students.	☐	☐	☐	☐	☐
They are hands-on for the students.	☐	☐	☐	☐	☐
They are motivating for the students.	☐	☐	☐	☐	☐
They increase the students' classroom engagement.	☐	☐	☐	☐	☐
They promote cognitive learning.	☐	☐	☐	☐	☐
They promote collaborative learning.	☐	☐	☐	☐	☐
They help increase content knowledge acquisition.	☐	☐	☐	☐	☐
They can be used as rewards when students do well in class.	☐	☐	☐	☐	☐
They can be used to promote learning objectives that meet curriculum requirements.	☐	☐	☐	☐	☐
They can be used as supplemental learning materials.	☐	☐	☐	☐	☐
They bridge the gap between what students do at home and at school.	☐	☐	☐	☐	☐
They improve student attitudes toward the content.	☐	☐	☐	☐	☐
They promote personalized learning.	☐	☐	☐	☐	☐
They can promote learning in STEM (science, technology, engineering, mathematics).	☐	☐	☐	☐	☐
They can promote literacy skills.	☐	☐	☐	☐	☐
They are easy to set up to facilitate classroom teaching and learning.	☐	☐	☐	☐	☐
They bring me into a better position among classroom teachers who are interested in using digital technologies for teaching.	☐	☐	☐	☐	☐
They provide me with another platform to engage my students in learning.	☐	☐	☐	☐	☐
Using them helps me relate to my students.	☐	☐	☐	☐	☐
I enjoy incorporating them into teaching.	☐	☐	☐	☐	☐
Nowadays students are attuned to learning with Augmented Reality.	☐	☐	☐	☐	☐

11. Teachers have individual attitudes towards apps which include Augmented Reality. To what extent do you agree with the following statements: *(select one answer per row)*

	Strongly agree	Agree	Some-what Agree	Neither agree nor disagree	Some-what Disagree	Disagree	Strongly disagree
It's a good idea to use AR apps.	☐	☐	☐	☐	☐	☐	☐
Using AR apps can improve my teaching performance.	☐	☐	☐	☐	☐	☐	☐
Using AR apps is easy for me.	☐	☐	☐	☐	☐	☐	☐
I predict I would use AR apps in the future.	☐	☐	☐	☐	☐	☐	☐
People who influence me think that I should use AR apps.	☐	☐	☐	☐	☐	☐	☐
I hesitate to use AR apps for fear of making mistakes I cannot correct.	☐	☐	☐	☐	☐	☐	☐
I find it easy to get AR apps to do what I want it to do.	☐	☐	☐	☐	☐	☐	☐
I find AR apps to be useful to me.	☐	☐	☐	☐	☐	☐	☐
I feel apprehensive about using AR apps.	☐	☐	☐	☐	☐	☐	☐
I like using AR apps.	☐	☐	☐	☐	☐	☐	☐
I plan to use AR apps in the future.	☐	☐	☐	☐	☐	☐	☐
People important to me support my use of AR apps.	☐	☐	☐	☐	☐	☐	☐

Thank you for participating in the ARETE project.

This research has been supported by the European Union's Horizon 2020 research and innovation program under grant agreement No 856533, project ARETE.

Survey Items: POSTTEST

Introduction

Dear teachers,

Thank you for participating in the ARETE project. ARETE (https://www.areteproject.eu) is an EU-funded project, aiming to develop and evaluate the effectiveness of an interactive Augmented Reality (AR) content toolkit. This will give students and teachers access to innovative AR content to enhance their learning and teaching.

The following survey is part of an ARETE pilot study which will be evaluated to assess the success and impact of Augmented Reality in education. It will take you about 25 minutes to complete.

Your answers in the following questionnaire are a central resource for this evaluation and of great value for this project. There are no right or wrong answers. **Please fill in all questions honestly and completely** to ensure a comprehensive and significant evaluation. Please note that your participation is voluntary.

The questionnaire is entirely anonymous. We assure you that your data will be treated in the strictest confidence and in accordance with General Data Protection Regulation (GDPR) <https://www.ucd.ie/gdpr/about/>. The data will only be viewed by personnel working on this project, will not be forwarded to third parties and will be used solely for research purposes.

If you have questions regarding this survey or the evaluation process, please contact a member of the evaluation team: Jennifer.tiede@uni-wuerzburg.de

Please confirm that you have read the information above and that you give us your consent to use your anonymous responses for our research work by checking the box:	☐ **I agree**

Thank you!

Area 1: Demographic Data

1. Please enter your unique identification code here: _____

2. What is your gender? *(select one answer)*
   - ☐ Female
   - ☐ Male
   - ☐ Other / prefer not to say

3. What is your age? _____ [numerical input]

4. What is your country of residence? *(select one answer)*
   - ☐ Ireland
   - ☐ Romania
   - ☐ Spain
   - ☐ Portugal
   - ☐ Italy
   - ☐ Greece
   - ☐ Poland
   - ☐ Serbia
   - ☐ Croatia
   - ☐ Turkey
   - ☐ Sweden
   - ☐ Other: please specify _____

5. How many years of teaching experience do you have? *(select one answer)*
   - ☐ < 5 years
   - ☐ 5-10 years
   - ☐ > 10 years

Area 2: Teachers' Digital Pedagogical Competence and Previous Experience with AR

6. How do you rate your level of expertise in using digital media in teaching and learning? *(select one answer)*
   - ☐ Very good
   - ☐ Good
   - ☐ Acceptable
   - ☐ Poor
   - ☐ Very poor

7. Have you heard or read about Augmented Reality before this project? *(select one answer)*
   - ☐ Yes, a lot
   - ☐ Yes, a little
   - ☐ No
   - ☐ I don't know

8. Have you ever used an Augmented Reality app in your leisure time before this project? *(select one answer)*
   - ☐ Yes, often
   - ☐ Yes, sometimes
   - ☐ No
   - ☐ I don't know

9. Have you ever used an Augmented Reality app for teaching and learning before this project? *(select one answer)*
   - ☐ Yes, often
   - ☐ Yes, sometimes
   - ☐ No
   - ☐ I don't know

Area 3: Teachers' Attitudes

10. Apps which include Augmented Reality may have different qualities for teaching and learning. To what extent do you agree with the following statements: *(select one answer per row)*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
They are fun for the students.	☐	☐	☐	☐	☐
They are hands-on for the students.	☐	☐	☐	☐	☐
They are motivating for the students.	☐	☐	☐	☐	☐
They increase the students' classroom engagement.	☐	☐	☐	☐	☐
They promote cognitive learning.	☐	☐	☐	☐	☐
They promote collaborative learning.	☐	☐	☐	☐	☐
They help increase content knowledge acquisition.	☐	☐	☐	☐	☐
They can be used as rewards when students do well in class.	☐	☐	☐	☐	☐
They can be used to promote learning objectives that meet curriculum requirements.	☐	☐	☐	☐	☐
They can be used as supplemental learning materials.	☐	☐	☐	☐	☐
They bridge the gap between what students do at home and at school.	☐	☐	☐	☐	☐
They improve student attitudes toward the content.	☐	☐	☐	☐	☐
They promote personalized learning.	☐	☐	☐	☐	☐
They can promote learning in STEM (science, technology, engineering, mathematics).	☐	☐	☐	☐	☐
They can promote literacy skills.	☐	☐	☐	☐	☐
They are easy to set up to facilitate classroom teaching and learning.	☐	☐	☐	☐	☐
They bring me into a better position among classroom teachers who are interested in using digital technologies for teaching.	☐	☐	☐	☐	☐
They provide me with another platform to engage my students in learning.	☐	☐	☐	☐	☐
Using them helps me relate to my students.	☐	☐	☐	☐	☐
I enjoy incorporating them into teaching.	☐	☐	☐	☐	☐
Nowadays students are attuned to learning with Augmented Reality.	☐	☐	☐	☐	☐

11. Teachers have individual attitudes towards apps which include Augmented Reality.
To what extent do you agree with the following statements: *(select one answer per row)*

	Strongly agree	Agree	Some-what Agree	Neither agree nor disagree	Some-what Disagree	Disagree	Strongly disagree
It's a good idea to use AR apps.	☐	☐	☐	☐	☐	☐	☐
Using AR apps can improve my teaching performance.	☐	☐	☐	☐	☐	☐	☐
Using AR apps is easy for me.	☐	☐	☐	☐	☐	☐	☐
I predict I would use AR apps in the future.	☐	☐	☐	☐	☐	☐	☐
People who influence me think that I should use AR apps.	☐	☐	☐	☐	☐	☐	☐
I hesitate to use AR apps for fear of making mistakes I cannot correct.	☐	☐	☐	☐	☐	☐	☐
I find it easy to get AR apps to do what I want it to do.	☐	☐	☐	☐	☐	☐	☐
I find AR apps to be useful to me.	☐	☐	☐	☐	☐	☐	☐
I feel apprehensive about using AR apps.	☐	☐	☐	☐	☐	☐	☐
I like using AR apps.	☐	☐	☐	☐	☐	☐	☐
I plan to use AR apps in the future.	☐	☐	☐	☐	☐	☐	☐
People important to me support my use of AR apps.	☐	☐	☐	☐	☐	☐	☐

Area 4: Teaching and Learning Processes

For the following questions, please refer to the past teaching and learning unit where you applied the ARETE Augmented Reality app.

12. How many of your students took part in this teaching and learning unit? ✍ _____ [numerical input]

13. How many lessons did the AR-supported unit take? ✍ _____ [numerical input]

14. Where did your students use the AR app? *(select one answer)*
    - ☐ Students used the app in school lessons only
    - ☐ Students used the app at school and at home
    - ☐ Students used the app at home only

15. Did you teach the AR-supported unit remotely (online via videoconferencing or similar) or in a face to face-setting? *(select one answer)*
    - ☐ Remotely online
    - ☐ Face to face
    - ☐ Both: sometimes online, sometimes face to face

16. Did you or will you administer the student pretest, posttest and retention test remotely online or in a face to face-setting? If you haven't done one test yet but are going to, please select the setting you will probably use. *(select one answer per row)*

	Remotely online	**Face to face**	**Haven't done yet and won't do anymore***
Pretest	☐	☐	☐
Posttest	☐	☐	☐
Retention test	☐	☐	☐

** if any of these is ticked, proceed with the following information:*

Please reconsider if you can arrange the missing test. Your completion of all three tests is of key importance for our research. Thank you! [Click "I understood" and proceed with item 15]

17. In which kinds of social settings did your students work in the AR-supported unit in your class? *(tick all that apply)*
    - ☐ Individually
    - ☐ In pairs
    - ☐ In small groups
    - ☐ With the whole class

18. Which contents did you cover in the AR-supported unit?

    a Science:
    - ☐ Earth in the Solar System
    - ☐ Earth's Processes and History
    - ☐ Earth's Structure, Physical Characteristics, and Resources
    - ☐ Ecosystems

- ☐ Organisms, Environment, and their Interactions

b Maths:

- ☐ Two-dimensional shapes
- ☐ Three-dimensional shapes
- ☐ Reading, interpreting and representing data displayed

19. Which cognitive processes did you aim to address in the AR-supported unit? *(tick all that apply)*
    - ☐ Remembering
      (recalling knowledge from memory)
    - ☐ Understanding
      (constructing meaning; e.g., summarizing, comparing, explaining)
    - ☐ Applying
      (using a procedure learned, through executing or implementing)
    - ☐ Analyzing
      (breaking materials or concepts into parts, determining how the parts relate to one another or how they relate to an overall structure or purpose)
    - ☐ Evaluating
      (making judgments based on criteria and standards through checking and critiquing)
    - ☐ Creating
      (putting parts together in a new way, or synthesizing parts into something new and different)

20. Please list all media you used in the AR-enhanced unit, i.e., the devices used for the ARETE app and all other media used in the intervention lessons: *(tick all that apply)*
    - ☐ Smartphones
    - ☐ Tablet PCs
    - ☐ Augmented Reality (other than the ARETE app)
    - ☐ Virtual Reality
    - ☐ Personal computers/ laptops
    - ☐ TV
    - ☐ Audio equipment
    - ☐ Interactive Whiteboard
    - ☐ Overhead projector and slides
    - ☐ Blackboard
    - ☐ E-book readers
    - ☐ Books/ printed texts
    - ☐ Printed work sheets
    - ☐ Other, please summarize briefly: ✍ _____

21. In which parts of the lessons did you use the AR app? *(tick all that apply)*
    - ☐ In my opening part of a lesson
    - ☐ In my explanation of contents
    - ☐ In my introduction of tasks
    - ☐ In the students' working phase / when they practiced
    - ☐ In the solution, presentation and discussion of results
    - ☐ Other, please summarize briefly: ✍ _____

22. What were the main objectives of the AR app use in your class? *(tick all that apply)*
    - ☐ To provide new information/content
    - ☐ To practice contents already learned
    - ☐ To trigger and support learning processes
    - ☐ To provide a tool for knowledge acquisition
    - ☐ To provide a tool for communication

- ☐ To provide a tool for collaboration
- ☐ To give students a break activity
- ☐ To conduct assessments

Area 5: Evaluation of Experiences with the App

23. How would you rate your overall experience with the AR app in your classroom on a scale from 1 (poor) to 5 (excellent)? *(select one answer)*
    - ☐ 1 (poor)
    - ☐ 2
    - ☐ 3
    - ☐ 4
    - ☐ 5 (excellent)

24. To what extent do you agree with the following statements? *(select one answer per row)*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
My students enjoyed using the app.	☐	☐	☐	☐	☐
My students learned a lot using the app.	☐	☐	☐	☐	☐
My students learned more from the AR-based teaching approach than they would have learned from traditional teaching approaches.	☐	☐	☐	☐	☐
The app supported students' collaboration.	☐	☐	☐	☐	☐
I enjoyed working with the app.	☐	☐	☐	☐	☐
I would recommend using AR in class to a colleague.	☐	☐	☐	☐	☐
I would use other AR-based apps in my teaching again.	☐	☐	☐	☐	☐
The app contents were relevant for my context.	☐	☐	☐	☐	☐
It was easy to integrate the app into my teaching.	☐	☐	☐	☐	☐
It was easy for me to operate the app (technically).	☐	☐	☐	☐	☐

25. Which problems or drawbacks did you encounter? *(tick all that apply)*
    - ☐ There were no problems or drawbacks
    - ☐ The app contents were not relevant for my teaching
    - ☐ There was no added value for me in using an AR app, compared to traditional teaching & learning approaches

- ☐ I was not sure how to integrate the app into my teaching
- ☐ Lack of pedagogical/didactical support
- ☐ I am generally unfamiliar with technology
- ☐ I don't like changing my usual teaching habits
- ☐ I did not have enough time to work with the app properly
- ☐ Using the app cost too much time
- ☐ My students did not like the app
- ☐ Problematic student behavior (e.g., trial & error, taking things not seriously, distraction, etc.)
- ☐ Poor user experience in the app (e.g., the app was not intuitive, it was difficult to make the app do what I wanted, etc.)
- ☐ Technical issues with the app, AR-related (e.g., poor marker detection)
- ☐ Technical issues with the app, not AR-related (e.g., long processing times, crashes)
- ☐ Technical issues with devices
- ☐ Lack of necessary technical equipment
- ☐ Lack of technical support
- ☐ Other: [please specify]

Area 6: Student Motivation & Classroom Engagement

26. To what extent do you agree with the following statements? *(select one answer per row)*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
The app had a positive impact on my students' motivation.	☐	☐	☐	☐	☐
My students found the interface design of the app eye-catching.	☐	☐	☐	☐	☐
My students really enjoyed learning with the app.	☐	☐	☐	☐	☐
My students enjoyed the app so much that they wanted to know more about the topic.	☐	☐	☐	☐	☐
My students found the contents of the app useful to themselves.	☐	☐	☐	☐	☐
It was clear for my students how the content of the app was related to things they already knew.	☐	☐	☐	☐	☐
It was difficult for my students to discover the digital information associated with the real image.	☐	☐	☐	☐	☐
My students could not really understand quite a bit of the material in the app.	☐	☐	☐	☐	☐
My students learned some things that were surprising or unexpected with the app.	☐	☐	☐	☐	☐

27. To what extent do you agree with the following statements? *(select one answer per row)*

When working with the AR app in the classroom, …

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
… my students showed high on-task attention and concentration	☐	☐	☐	☐	☐
… my students showed frequent and strong positive emotions (such as joy and curiosity)	☐	☐	☐	☐	☐
… my students used sophisticated learning strategies	☐	☐	☐	☐	☐
… my students asked questions about what they are learning	☐	☐	☐	☐	☐
… my students showed high persistence, especially on difficult tasks	☐	☐	☐	☐	☐
… my students rarely showed negative emotions (such as anger, boredom and discouragement)	☐	☐	☐	☐	☐
… my students were planful and strategic learners	☐	☐	☐	☐	☐
… my students expressed their interest	☐	☐	☐	☐	☐

Thank you for participating in the ARETE project.

This research has been supported by the European Union's Horizon 2020 research and innovation program under grant agreement No 856533, project ARETE.

Project ARETE • Pilot 2 • Evaluation Survey for Teachers · **Control** Group

Survey Items: PRETEST

Introduction

Dear teachers,

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The following survey is part of an ARETE pilot study which will be evaluated to assess the success and impact of Augmented Reality in education. It will take you about 10 minutes to complete.

Your answers in the following questionnaire are a central resource for this evaluation and of great value for this project. There are no right or wrong answers. **Please fill in all questions honestly and completely** to ensure a comprehensive and significant evaluation. Please note that your participation is voluntary.

The questionnaire is entirely anonymous. We assure you that your data will be treated in the strictest confidence and in accordance with General Data Protection Regulation (GDPR) <https://www.ucd.ie/gdpr/about/>. The data will only be viewed by personnel working on this project, will not be forwarded to third parties and will be used solely for research purposes.

If you have questions regarding this survey or the evaluation process, please contact a member of the evaluation team: Jennifer.tiede@uni-wuerzburg.de

Please confirm that you have read the information above and that you give us your consent to use your anonymous responses for our research work by checking the box:	☐ **I agree**

Thank you!

Area 1: Demographic Data

1. Please enter your unique identification code here: _____

2. What is your gender? *(select one answer)*
   - ☐ Female
   - ☐ Male
   - ☐ Other / prefer not to say

3. What is your age? _____ [numerical input]

4. What is your country of residence? *(select one answer)*
   - ☐ Ireland
   - ☐ Romania
   - ☐ Spain
   - ☐ Portugal
   - ☐ Italy
   - ☐ Greece
   - ☐ Poland
   - ☐ Serbia
   - ☐ Croatia
   - ☐ Turkey
   - ☐ Sweden
   - ☐ Other: please specify _____

5. How many years of teaching experience do you have? *(select one answer)*
   - ☐ < 5 years
   - ☐ 5-10 years
   - ☐ > 10 years

Area 2: Teachers' Digital Pedagogical Competence and Previous Experience with AR

6. How do you rate your level of expertise in using digital media in teaching and learning? *(select one answer)*
   - ☐ Very good
   - ☐ Good
   - ☐ Acceptable
   - ☐ Poor
   - ☐ Very poor

7. Have you heard or read about Augmented Reality? *(select one answer)*
   - ☐ Yes, a lot
   - ☐ Yes, a little
   - ☐ No
   - ☐ I don't know

8. Have you ever used an Augmented Reality app in your leisure time? *(select one answer)*
   - ☐ Yes, often
   - ☐ Yes, sometimes
   - ☐ No
   - ☐ I don't know

9. Have you ever used an Augmented Reality app for teaching and learning? *(select one answer)*
   - ☐ Yes, often
   - ☐ Yes, sometimes
   - ☐ No
   - ☐ I don't know

Area 3: Teachers' Attitudes

10. Apps which include Augmented Reality may have different qualities for teaching and learning. To what extent do you agree with the following statements: *(select one answer per row)*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
They are fun for the students.	☐	☐	☐	☐	☐
They are hands-on for the students.	☐	☐	☐	☐	☐
They are motivating for the students.	☐	☐	☐	☐	☐
They increase the students' classroom engagement.	☐	☐	☐	☐	☐
They promote cognitive learning.	☐	☐	☐	☐	☐
They promote collaborative learning.	☐	☐	☐	☐	☐
They help increase content knowledge acquisition.	☐	☐	☐	☐	☐
They can be used as rewards when students do well in class.	☐	☐	☐	☐	☐
They can be used to promote learning objectives that meet curriculum requirements.	☐	☐	☐	☐	☐
They can be used as supplemental learning materials.	☐	☐	☐	☐	☐
They bridge the gap between what students do at home and at school.	☐	☐	☐	☐	☐
They improve student attitudes toward the content.	☐	☐	☐	☐	☐
They promote personalized learning.	☐	☐	☐	☐	☐
They can promote learning in STEM (science, technology, engineering, mathematics).	☐	☐	☐	☐	☐
They can promote literacy skills.	☐	☐	☐	☐	☐
They are easy to set up to facilitate classroom teaching and learning.	☐	☐	☐	☐	☐
They bring me into a better position among classroom teachers who are interested in using digital technologies for teaching.	☐	☐	☐	☐	☐
They provide me with another platform to engage my students in learning.	☐	☐	☐	☐	☐
Using them helps me relate to my students.	☐	☐	☐	☐	☐
I enjoy incorporating them into teaching.	☐	☐	☐	☐	☐
Nowadays students are attuned to learning with Augmented Reality.	☐	☐	☐	☐	☐

11. Teachers have individual attitudes towards apps which include Augmented Reality.
To what extent do you agree with the following statements: *(select one answer per row)*

	Strongly agree	Agree	Some-what Agree	Neither agree nor disagree	Some-what Disagree	Disagree	Strongly disagree
It's a good idea to use AR apps.	☐	☐	☐	☐	☐	☐	☐
Using AR apps can improve my teaching performance.	☐	☐	☐	☐	☐	☐	☐
Using AR apps is easy for me.	☐	☐	☐	☐	☐	☐	☐
I predict I would use AR apps in the future.	☐	☐	☐	☐	☐	☐	☐
People who influence me think that I should use AR apps.	☐	☐	☐	☐	☐	☐	☐
I hesitate to use AR apps for fear of making mistakes I cannot correct.	☐	☐	☐	☐	☐	☐	☐
I find it easy to get AR apps to do what I want it to do.	☐	☐	☐	☐	☐	☐	☐
I find AR apps to be useful to me.	☐	☐	☐	☐	☐	☐	☐
I feel apprehensive about using AR apps.	☐	☐	☐	☐	☐	☐	☐
I like using AR apps.	☐	☐	☐	☐	☐	☐	☐
I plan to use AR apps in the future.	☐	☐	☐	☐	☐	☐	☐
People important to me support my use of AR apps.	☐	☐	☐	☐	☐	☐	☐

Thank you for participating in the ARETE project.

This research has been supported by the European Union's Horizon 2020 research and innovation program under grant agreement No 856533, project ARETE.

Survey Items: POSTTEST

Introduction

Dear teachers,

Thank you for participating in the ARETE project. ARETE (https://www.areteproject.eu) is an EU-funded project, aiming to develop and evaluate the effectiveness of an interactive Augmented Reality (AR) content toolkit. This will give students and teachers access to innovative AR content to enhance their learning and teaching.

The following survey is part of an ARETE pilot study which will be evaluated to assess the success and impact of Augmented Reality in education. It will take you about 20 minutes to complete.

Your answers in the following questionnaire are a central resource for this evaluation and of great value for this project. There are no right or wrong answers. **Please fill in all questions honestly and completely** to ensure a comprehensive and significant evaluation. Please note that your participation is voluntary.

The questionnaire is entirely anonymous. We assure you that your data will be treated in the strictest confidence and in accordance with General Data Protection Regulation (GDPR) <https://www.ucd.ie/gdpr/about/>. The data will only be viewed by personnel working on this project, will not be forwarded to third parties and will be used solely for research purposes.

If you have questions regarding this survey or the evaluation process, please contact a member of the evaluation team: Jennifer.tiede@uni-wuerzburg.de

Please confirm that you have read the information above and that you give us your consent to use your anonymous responses for our research work by checking the box:	☐ **I agree**

Thank you!

Area 1: Demographic Data

1. Please enter your unique identification code here: _____

2. What is your gender? *(select one answer)*
   - ☐ Female
   - ☐ Male
   - ☐ Other / prefer not to say

3. What is your age? _____ [numerical input]

4. What is your country of residence? *(select one answer)*
   - ☐ Ireland
   - ☐ Romania
   - ☐ Spain
   - ☐ Portugal
   - ☐ Italy
   - ☐ Greece
   - ☐ Poland
   - ☐ Serbia
   - ☐ Croatia
   - ☐ Turkey
   - ☐ Sweden
   - ☐ Other: please specify _____

5. How many years of teaching experience do you have? *(select one answer)*
   - ☐ < 5 years
   - ☐ 5-10 years
   - ☐ > 10 years

Area 2: Teachers' Digital Pedagogical Competence and Previous Experience with AR

6. How do you rate your level of expertise in using digital media in teaching and learning? *(select one answer)*
   - ☐ Very good
   - ☐ Good
   - ☐ Acceptable
   - ☐ Poor
   - ☐ Very poor

7. Have you ever heard or read about Augmented Reality? *(select one answer)*
   - ☐ Yes, a lot
   - ☐ Yes, a little
   - ☐ No
   - ☐ I don't know

8. Have you ever used an Augmented Reality app in your leisure time? *(select one answer)*
   - ☐ Yes, often
   - ☐ Yes, sometimes
   - ☐ No
   - ☐ I don't know

9. Have you ever used an Augmented Reality app for teaching and learning? *(select one answer)*
   - ☐ Yes, often
   - ☐ Yes, sometimes
   - ☐ No
   - ☐ I don't know

Area 3: Teachers' Attitudes

10. Apps which include Augmented Reality may have different qualities for teaching and learning. To what extent do you agree with the following statements: *(select one answer per row)*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
They are fun for the students.	☐	☐	☐	☐	☐
They are hands-on for the students.	☐	☐	☐	☐	☐
They are motivating for the students.	☐	☐	☐	☐	☐
They increase the students' classroom engagement.	☐	☐	☐	☐	☐
They promote cognitive learning.	☐	☐	☐	☐	☐
They promote collaborative learning.	☐	☐	☐	☐	☐
They help increase content knowledge acquisition.	☐	☐	☐	☐	☐
They can be used as rewards when students do well in class.	☐	☐	☐	☐	☐
They can be used to promote learning objectives that meet curriculum requirements.	☐	☐	☐	☐	☐
They can be used as supplemental learning materials.	☐	☐	☐	☐	☐
They bridge the gap between what students do at home and at school.	☐	☐	☐	☐	☐
They improve student attitudes toward the content.	☐	☐	☐	☐	☐
They promote personalized learning.	☐	☐	☐	☐	☐
They can promote learning in STEM (science, technology, engineering, mathematics).	☐	☐	☐	☐	☐
They can promote literacy skills.	☐	☐	☐	☐	☐
They are easy to set up to facilitate classroom teaching and learning.	☐	☐	☐	☐	☐
They bring me into a better position among classroom teachers who are interested in using digital technologies for teaching.	☐	☐	☐	☐	☐
They provide me with another platform to engage my students in learning.	☐	☐	☐	☐	☐
Using them helps me relate to my students.	☐	☐	☐	☐	☐
I enjoy incorporating them into teaching.	☐	☐	☐	☐	☐
Nowadays students are attuned to learning with Augmented Reality.	☐	☐	☐	☐	☐

11. Teachers have individual attitudes towards apps which include Augmented Reality.
To what extent do you agree with the following statements: *(select one answer per row)*

	Strongly agree	Agree	Some-what Agree	Neither agree nor disagree	Some-what Disagree	Disagree	Strongly disagree
It's a good idea to use AR apps.	☐	☐	☐	☐	☐	☐	☐
Using AR apps can improve my teaching performance.	☐	☐	☐	☐	☐	☐	☐
Using AR apps is easy for me.	☐	☐	☐	☐	☐	☐	☐
I predict I would use AR apps in the future.	☐	☐	☐	☐	☐	☐	☐
People who influence me think that I should use AR apps.	☐	☐	☐	☐	☐	☐	☐
I hesitate to use AR apps for fear of making mistakes I cannot correct.	☐	☐	☐	☐	☐	☐	☐
I find it easy to get AR apps to do what I want it to do.	☐	☐	☐	☐	☐	☐	☐
I find AR apps to be useful to me.	☐	☐	☐	☐	☐	☐	☐
I feel apprehensive about using AR apps.	☐	☐	☐	☐	☐	☐	☐
I like using AR apps.	☐	☐	☐	☐	☐	☐	☐
I plan to use AR apps in the future.	☐	☐	☐	☐	☐	☐	☐
People important to me support my use of AR apps.	☐	☐	☐	☐	☐	☐	☐

Area 4: Teaching and Learning Processes

For the following questions, please refer to the past teaching and learning unit which followed the ARETE pretesting on science / maths knowledge and covered the contents defined as relevant for the ARETE study in your enrolment.

12. How many of your students took part in this teaching and learning unit? ✍ _____ [numerical input]

13. How many lessons did the past unit take? ✍ _____ [numerical input]

14. Did you teach the past unit remotely (online via videoconferencing or similar) or in a face to face-setting? *(select one answer)*

    - ☐ Remotely online
    - ☐ Face to face
    - ☐ Both: sometimes online, sometimes face to face

15. Did you or will you administer the student pretest, posttest and retention test remotely online or in a face to face-setting? If you haven't done one test yet but are going to, please select the setting you will probably use. *(select one answer per row)*

	Remotely online	**Face to face**	**Haven't done yet and won't do anymore***
Pretest	☐	☐	☐
Posttest	☐	☐	☐
Retention test	☐	☐	☐

** if any of these is ticked, proceed with the following information:*

Please reconsider if you can arrange the missing test. Your completion of all three tests is of key importance for our research. Thank you! [Click "I understood" and proceed with item 15]

16. In which kinds of social settings did your students work in the past unit in your class? *(tick all that apply)*
    - ☐ Individually
    - ☐ In pairs
    - ☐ In small groups
    - ☐ With the whole class

17. Which contents did you cover in the past unit? *(tick all that apply)*

    a Science:
    - ☐ Earth in the Solar System
    - ☐ Earth's Processes and History
    - ☐ Earth's Structure, Physical Characteristics, and Resources
    - ☐ Ecosystems
    - ☐ Organisms, Environment, and their Interactions

    b Maths:
    - ☐ Two-dimensional shapes
    - ☐ Three-dimensional shapes
    - ☐ Reading, interpreting and representing data displayed

18. Which cognitive processes did you aim to address in the past unit? *(tick all that apply)*
    - ☐ Remembering
      (recalling knowledge from memory)
    - ☐ Understanding
      (constructing meaning; e.g., summarizing, comparing, explaining)
    - ☐ Applying
      (using a procedure learned, through executing or implementing)
    - ☐ Analyzing
      (breaking materials or concepts into parts, determining how the parts relate to one another or how they relate to an overall structure or purpose)
    - ☐ Evaluating
      (making judgments based on criteria and standards through checking and critiquing)
    - ☐ Creating
      (putting parts together in a new way, or synthesizing parts into something new and different)

19. Please list all media you used in the past unit: *(tick all that apply)*
    - ☐ Smartphones
    - ☐ Tablet PCs
    - ☐ Augmented Reality
    - ☐ Virtual Reality
    - ☐ Personal computers/ laptops
    - ☐ TV
    - ☐ Audio equipment
    - ☐ Interactive Whiteboard
    - ☐ Overhead projector and slides
    - ☐ Blackboard
    - ☐ E-book readers
    - ☐ Books/ printed texts
    - ☐ Printed work sheets
    - ☐ Other, please summarize briefly: ✍ _____

20. Which medium was the one medium you used primarily to display / illustrate the contents of the unit? (e.g., a book, worksheets, a specific app, blackboard, etc.)

    Please name one medium only: ✍ _____

21. In which parts of the lessons did you use your primary medium? *(tick all that apply)*
    - ☐ In my opening part of a lesson
    - ☐ In my explanation of contents
    - ☐ In my introduction of tasks
    - ☐ In the students' working phase / when they practiced
    - ☐ In the solution, presentation and discussion of results
    - ☐ Other, please summarize briefly: ✍ _____

22. What were the main objectives of the primary medium use in your class? *(tick all that apply)*
    - ☐ To provide new information/content
    - ☐ To practice contents already learned
    - ☐ To trigger and support learning processes
    - ☐ To provide a tool for knowledge acquisition
    - ☐ To provide a tool for communication
    - ☐ To provide a tool for collaboration

- ☐ To give students a break activity
- ☐ To conduct assessments

Area 5: Evaluation of Experiences with the Own Materials Provided

For the following questions, please refer to the one medium you used primarily to display / illustrate the contents of the unit.

23. To what extent do you agree with the following statements? *(select one answer per row)*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
My students enjoyed using the medium I provided.	☐	☐	☐	☐	☐
My students learned a lot using the medium I provided.	☐	☐	☐	☐	☐
The medium I provided supported students' collaboration.	☐	☐	☐	☐	☐
I enjoyed working with the medium I provided.	☐	☐	☐	☐	☐
The medium I provided was relevant for my context.	☐	☐	☐	☐	☐
It was easy to integrate the medium I provided into my teaching.	☐	☐	☐	☐	☐

24. Which problems or drawbacks did you encounter? *(tick all that apply)*
- ☐ There were no problems or drawbacks
- ☐ The contents were not relevant for my teaching
- ☐ I was not sure how to integrate the medium into my teaching
- ☐ Lack of pedagogical/didactical support
- ☐ I am generally unfamiliar with technology
- ☐ I don't like changing my usual teaching habits
- ☐ I did not have enough time to work with the medium properly
- ☐ Using the medium cost too much time
- ☐ My students did not like the medium
- ☐ Problematic student behavior (e.g., trial & error, taking things not seriously, distraction, etc.)
- ☐ Technical issues, e.g., with devices
- ☐ Lack of necessary technical equipment
- ☐ Lack of technical support
- ☐ Other: [please specify]

Area 6: Student Motivation & Classroom Engagement

25. To what extent do you agree with the following statements? *(select one answer per row)*

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
The medium I provided had a positive impact on my students' motivation.	☐	☐	☐	☐	☐
My students found the design of the medium I provided eye-catching.	☐	☐	☐	☐	☐
My students really enjoyed learning with the medium I provided.	☐	☐	☐	☐	☐
My students enjoyed the medium I provided so much that they wanted to know more about the topic.	☐	☐	☐	☐	☐
My students found the contents of the medium I provided useful to themselves.	☐	☐	☐	☐	☐
It was clear for my students how the content of the medium I provided was related to things they already knew.	☐	☐	☐	☐	☐
My students could not really understand quite a bit of the medium I provided.	☐	☐	☐	☐	☐
My students learned some things that were surprising or unexpected with the medium I provided.	☐	☐	☐	☐	☐

26. To what extent do you agree with the following statements? *(select one answer per row)*

When working with the medium in the classroom, …

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
… my students showed high on-task attention and concentration	☐	☐	☐	☐	☐
… my students showed frequent and strong positive emotions (such as joy and curiosity)	☐	☐	☐	☐	☐
… my students used sophisticated learning strategies	☐	☐	☐	☐	☐
… my students asked questions about what they are learning	☐	☐	☐	☐	☐
… my students showed high persistence, especially on difficult tasks	☐	☐	☐	☐	☐
… my students rarely showed negative emotions (such as anger, boredom and discouragement)	☐	☐	☐	☐	☐
… my students were planful and strategic learners	☐	☐	☐	☐	☐
… my students expressed their interest	☐	☐	☐	☐	☐

Thank you for participating in the ARETE project.

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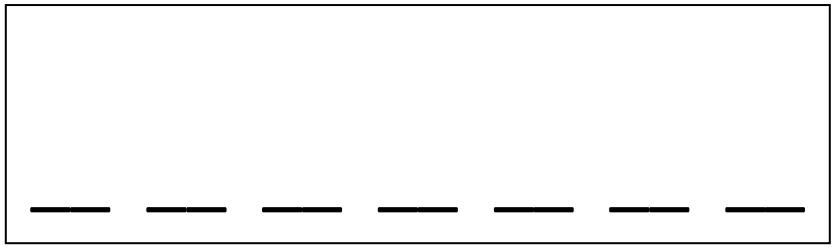
Please enter your **7-digit student ID code** here:



①

Context Questions

Are you a girl or a boy? CG1

(Fill one circle only.)

- ○ Girl
- ○ Boy
- ○ Other/ don't want to say

When were you born? CG2 a+b

(Fill the circles next to the month and year you were born.)

a) Month

- ○ January
- ○ February
- ○ March
- ○ April
- ○ May
- ○ June
- ○ July
- ○ August
- ○ September
- ○ October
- ○ November
- ○ December

b) Year

- ○ 2008
- ○ 2009
- ○ 2010
- ○ 2011
- ○ 2012
- ○ 2013
- ○ Other

How often do you speak English at home? CG3

(Fill one circle only.)

- ○ I always speak English at home
- ○ I almost always speak English at home
- ○ I sometimes speak English and sometimes speak another language at home
- ○ I never speak English at home

Do you have any of these things at your home? CG4 a-g

(Fill one circle for each line.)

		Yes ↓	**No** ↓
a)	A computer or tablet of your own	○	○
b)	A computer or tablet that is shared with other people at home	○	○
c)	Study desk/table for your use	○	○
d)	Your own room	○	○
e)	Internet connection	○	○
f)	Your own mobile phone	○	○
g)	A gaming system (e.g., PlayStation®, Wii®, Xbox®)	○	○

Was your mother (or stepmother, female guardian or first parent) born in Ireland? CG5

(Fill one circle only.)

- ○ Yes
- ○ No
- ○ I don't know

Was your father (or stepfather, male guardian or second parent) born in Ireland? CG6

(Fill one circle only.)

- ○ Yes
- ○ No
- ○ I don't know

Were you born in Ireland? CG7

(Fill one circle only.)

- ○ Yes
- ○ No

How often do you use a computer or tablet in each of these places for schoolwork (including classroom tasks, homework, studying outside of class)? CG8 a-c

(Fill one circle for each line.)

		Every day or almost every day ↓	Once or twice a week ↓	Once or twice a month ↓	Never or almost never ↓
a)	At home	○	○	○	○
b)	At school	○	○	○	○
c)	Some other place	○	○	○	○

How much do you agree with these statements about learning mathematics? CM1

(Fill one circle for each line.)

		Agree a lot ↓	Agree a little ↓	Disagree a little ↓	Disagree a lot ↓
a)	I enjoy learning mathematics	○	○	○	○
b)	I wish I did not have to study mathematics	○	○	○	○
c)	Mathematics is boring	○	○	○	○
d)	I learn many interesting things in mathematics	○	○	○	○
e)	I like mathematics	○	○	○	○
f)	I like any schoolwork that involves numbers	○	○	○	○
g)	I like to solve mathematics problems	○	○	○	○
h)	I look forward to mathematics lessons	○	○	○	○
i)	Mathematics is one of my favorite subjects	○	○	○	○

How much do you agree with these statements about your <u>mathematics lessons</u>? CM2

(Fill one circle for each line.)

		Agree a lot ↓	**Agree a little** ↓	**Disagree a little** ↓	**Disagree a lot** ↓
a)	I know what my teacher expects me to do	○	○	○	○
b)	My teacher is easy to understand	○	○	○	○
c)	I am interested in what my teacher says	○	○	○	○
d)	My teacher gives me interesting things to do	○	○	○	○
e)	My teacher has clear answers to my questions	○	○	○	○
f)	My teacher is good at explaining mathematics	○	○	○	○
g)	My teacher lets me show what I have learned	○	○	○	○
h)	My teacher does a variety of things to help us learn	○	○	○	○
i)	My teacher tells me how to do better when I make a mistake	○	○	○	○
j)	My teacher listens to what I have to say	○	○	○	○

How much do you agree with these statements about <u>mathematics</u>? CM3

(Fill one circle for each line.)

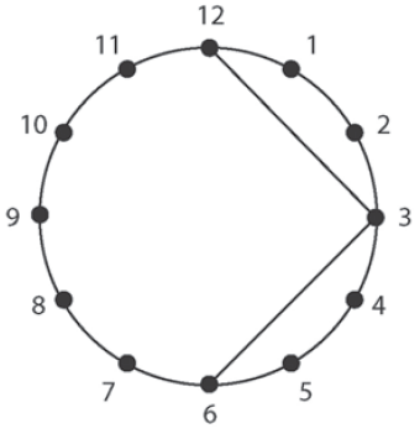
		Agree a lot ↓	**Agree a little** ↓	**Disagree a little** ↓	**Disagree a lot** ↓
a)	I usually do well in mathematics	○	○	○	○
b)	Mathematics is harder for me than for many of my classmates	○	○	○	○
c)	I am just not good at mathematics	○	○	○	○
d)	I learn things quickly in mathematics	○	○	○	○
e)	Mathematics makes me nervous	○	○	○	○
f)	I am good at working out difficult mathematics problems	○	○	○	○
g)	My teacher tells me I am good at mathematics	○	○	○	○
h)	Mathematics is harder for me than any other subject	○	○	○	○
i)	Mathematics makes me confused	○	○	○	○

②

Mathematics

Test Book: **M1** | Item ID: **M1_01A**

A. Matt started to draw a shape inside this circle. He connected the points with lines from 12 to 3 and from 3 to 6.



Finish the shape by connecting 6 to 9 and 9 to 12.

What shape is made?

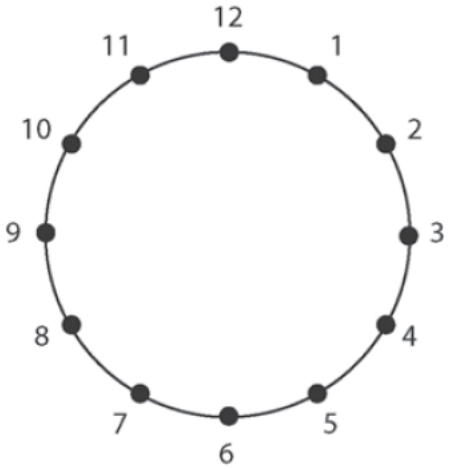
☐$_A$ circle

☐$_B$ pentagon

☐$_C$ square

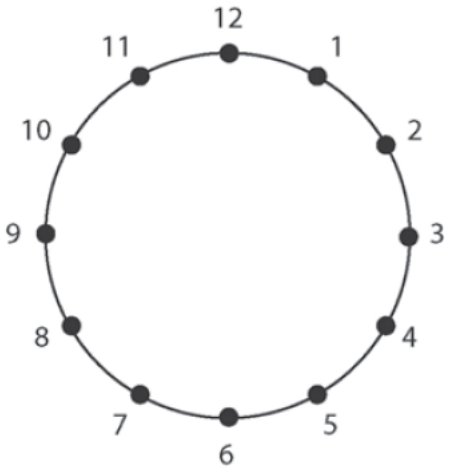
☐$_D$ triangle

B. In the circle, draw a triangle with all sides the same length.

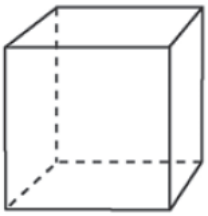


What points did you connect? _____

C. In the circle, draw a 6-sided figure with all the sides the same length.



Test Book: **M1** | Item ID: **M1_02**



The diagram above shows a cube. How many edges does it have?

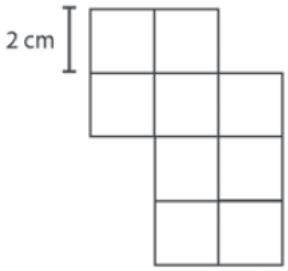
☐A 9

☐B 10

☐C 11

☐D 12

Test Book: **M1** | Item ID: **M1_03**



The figure is made up of squares. Each square has sides 2 cm long.

What is the perimeter of the figure?

☐A 9 cm

☐B 14 cm

☐C 28 cm

☐D 36 cm

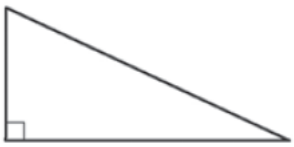
Test Book: **M1** | Item ID: **M1_04**

Which of these shapes could be made by placing one triangle and one rectangle next to each other?

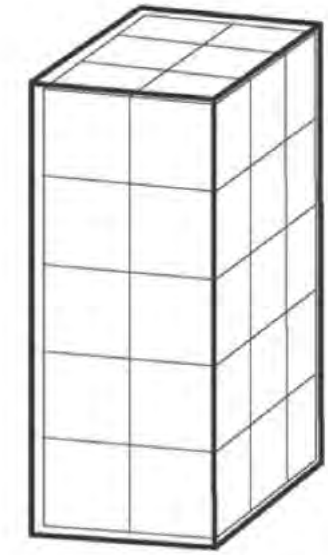
Ⓐ  ☐A

Ⓑ  ☐B

Ⓒ  ☐C

Ⓓ  ☐D

Test Book: **M1** | Item ID: **M1_05**



This box is full of cubes. How many cubes are in the box?

☐A 10

☐B 26

☐C 30

☐D 31

Students in Sara's class sold boxes of cookies.

The table below shows how many boxes each student sold.

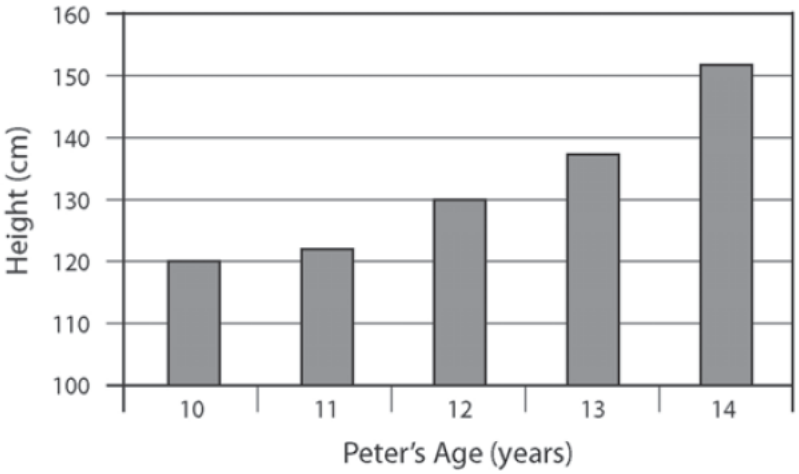
Name	Boxes of Cookies Sold
Sara	12
Mark	7
Phillip	8
Cassandra	11
Brian	13
Jane	9
Linda	12

HOW MANY students sold more than 10 boxes of cookies?

Answer: _____

Test Book: **M1** | Item ID: **M1_07**

Peter's Height on his Birthday



Between which ages did Peter's height increase most?

☐A 10 and 11

☐B 11 and 12

☐C 12 and 13

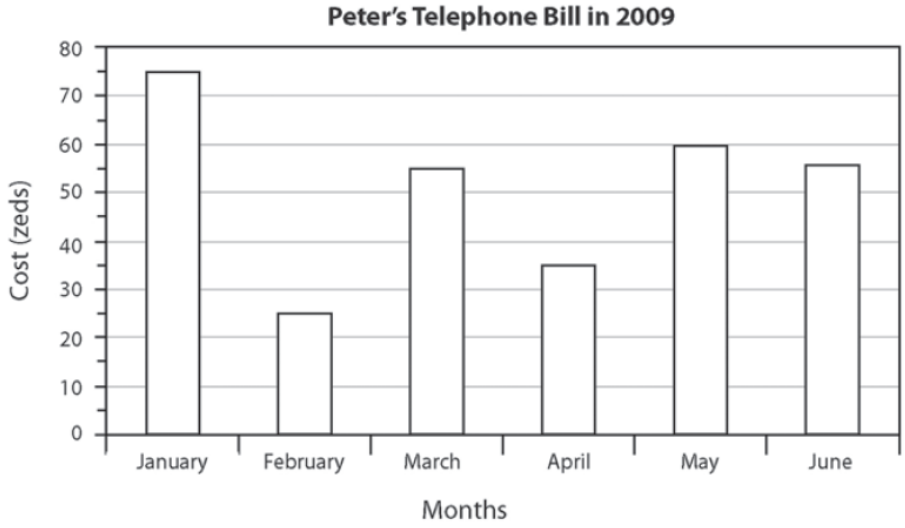
☐D 13 and 14

In 2008, Peter paid the following amounts in the first six months for his telephone bill.

Peter's Telephone Bill in 2008

Month	January	February	March	April	May	June
Cost (zeds)	65	20	60	40	60	45

In 2009, Peter paid the following amounts in the first six months for his telephone bill.



In some months, Peter paid **less** for his telephone bill in 2009 than in 2008.

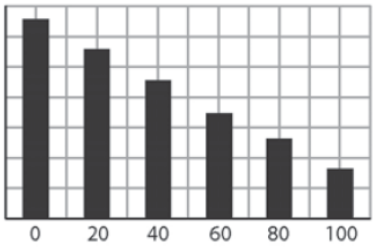
In which months?

Answer: _____

Test Book: **M1** | Item ID: **M1_09**

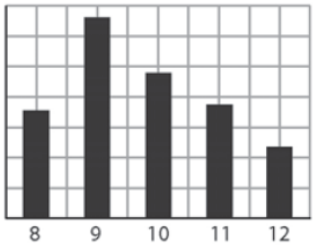
Roy made a survey of how many students watched television each night for one week. Which graph could show Roy's results?

Ⓐ



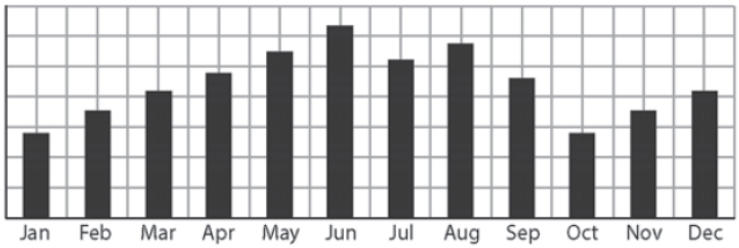
☐A

Ⓑ



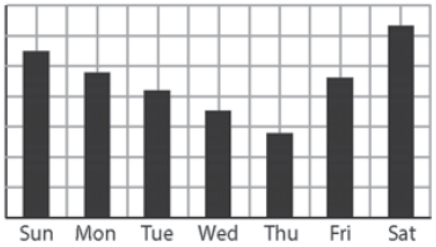
☐B

Ⓒ



☐C

Ⓓ



☐D

③

Motivation

The next questions are about your opinion on the learning activities over the last few weeks in Maths. There are no right or wrong answers.

Please read each statement and then tick the box that best describes how true it is for you.

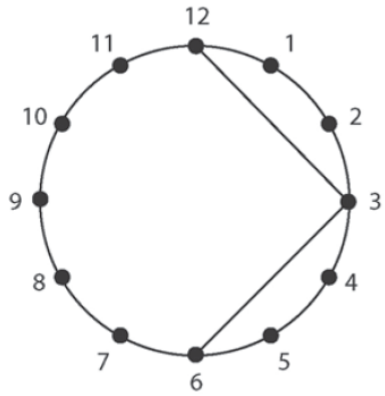
	1 not at all true	2	3	4 Somewhat true	5	6	7 Very true
I enjoyed these learning activities very much.	☐	☐	☐	☐	☐	☐	☐
I put a lot of effort into these learning activities.	☐	☐	☐	☐	☐	☐	☐
I think these learning activities are useful for my maths skills.	☐	☐	☐	☐	☐	☐	☐
I think I am pretty good at these learning activities.	☐	☐	☐	☐	☐	☐	☐
I think these learning activities are important activities.	☐	☐	☐	☐	☐	☐	☐
I felt very tense while doing these learning activities.	☐	☐	☐	☐	☐	☐	☐
These learning activities were activities that I couldn't do very well.	☐	☐	☐	☐	☐	☐	☐
I didn't try very hard to do well at these learning activities.	☐	☐	☐	☐	☐	☐	☐
These learning activities were fun to do.	☐	☐	☐	☐	☐	☐	☐

It was important to me to do well at these learning activities.	☐	☐	☐	☐	☐	☐	☐
I did not feel nervous at all while doing these learning activities.	☐	☐	☐	☐	☐	☐	☐
I am satisfied with my performance at these learning activities.	☐	☐	☐	☐	☐	☐	☐
I think doing these learning activities could help me to improve my my maths skills.	☐	☐	☐	☐	☐	☐	☐
I thought these learning activities were boring activities.	☐	☐	☐	☐	☐	☐	☐
I was very relaxed in doing these learning activities.	☐	☐	☐	☐	☐	☐	☐

Thank you very much!

Test Book: **M1** | Item ID: **M1_01A**

A. Matt started to draw a shape inside this circle. He connected the points with lines from 12 to 3 and from 3 to 6.



Finish the shape by connecting 6 to 9 and 9 to 12.

What shape is made?

☐$_A$ circle

☐$_B$ pentagon

☐$_C$ square

☐$_D$ triangle

Content Domain:
Geometric Shapes and Measures

Topic Area:
Two- and Three-dimensional Shapes

Cognitive Domain:
Applying

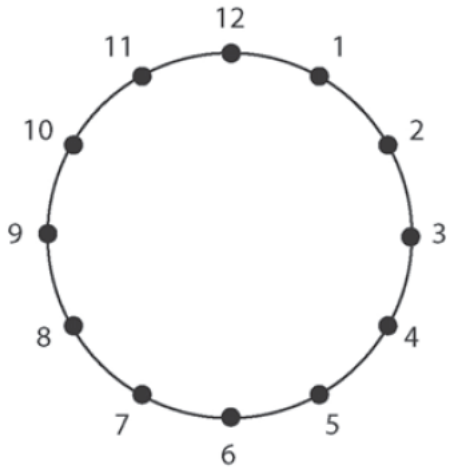
Maximum Points:
1

Key:
C

Option	Rationale	Item ID: M1_01A
A	A circle is given in the diagram.	
B	A pentagon has 5 sides.	
C	KEY	
D	A triangle results from connecting 6 and 12.	

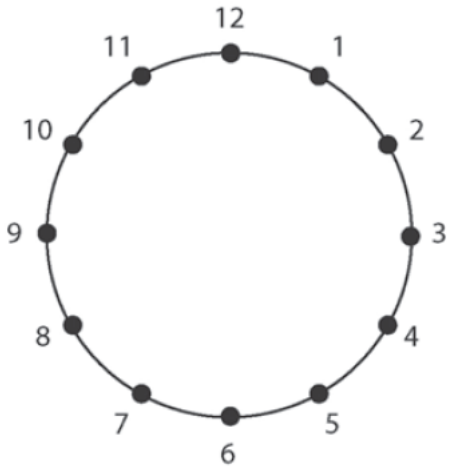
Test Book: **M1** | Item ID: **M1_01B-C**

B. In the circle, draw a triangle with all sides the same length.



What points did you connect? _____

C. In the circle, draw a 6-sided figure with all the sides the same length.



Content Domain:
Geometric Shapes and Measures

Topic Area:
Two- and Three-dimensional Shapes

Cognitive Domain:
Reasoning

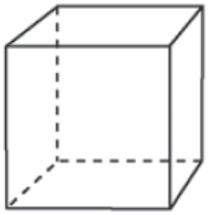
Maximum Points:
1

Key:
See scoring guide

Code	Response	Item ID: M1_01B
	Correct Response	
10	Equilateral triangle drawn through 12-4-8-12, 1-5-9-1, 2-6-10-2, or 3-7-11-3. (Accept 12-4-8 for 12-4-8-12. Accept a sentence giving the same information.)	
	Incorrect Response	
70	Equilateral triangle drawn, but path not described or incorrectly described	
71	Path correctly described but equilateral triangle not drawn or incorrectly drawn	
72	Any other triangle drawn	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

Code	Response	Item ID: M1_01C
	Correct Response	
10	Joins 12, 2, 4, 6, 8, 10, 12	
11	Joins 1, 3, 5, 7, 9, 11, 1	
	Incorrect Response	
70	Draws a hexagon which is not regular	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

Test Book: **M1** | Item ID: **M1_02**



The diagram above shows a cube. How many edges does it have?

☐A 9

☐B 10

☐C 11

☐D 12

Content Domain:
Geometric Shapes and Measures

Topic Area:
Two- and Three-dimensional Shapes

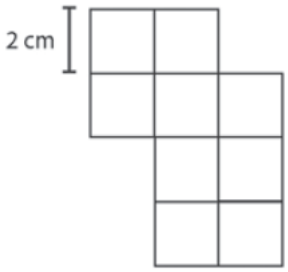
Cognitive Domain:
Knowing

Maximum Points:
1

Key:
D

Option	Rationale	Item ID: M1_02
A	The number of solid lines in the figure.	
B	Misconception that the three dotted lines in the figure are one line.	
C	Misconception that two of the dotted lines in the base of the figure are one line.	
D	KEY	

Test Book: **M1** | Item ID: **M1_03**



The figure is made up of squares. Each square has sides 2 cm long.

What is the perimeter of the figure?

☐$_A$ 9 cm

☐$_B$ 14 cm

☐$_C$ 28 cm

☐$_D$ 36 cm

Content Domain:
Geometric Shapes and Measures

Topic Area:
Two- and Three-dimensional Shapes

Cognitive Domain:
Applying

Maximum Points:
1

Key:
C

Option	Rationale	Item ID: M1_03
A	The number of squares in the figure.	
B	The perimeter of the figure if the squares had 1 cm sides.	
C	KEY	
D	The area of the figure.	

Test Book: **M1** | Item ID: **M1_04**

Which of these shapes could be made by placing one triangle and one rectangle next to each other?

Ⓐ  ☐A

Ⓑ  ☐B

Ⓒ  ☐C

Ⓓ  ☐D

Content Domain:
Geometric Shapes and Measures

Topic Area:
Two- and Three-dimensional Shapes

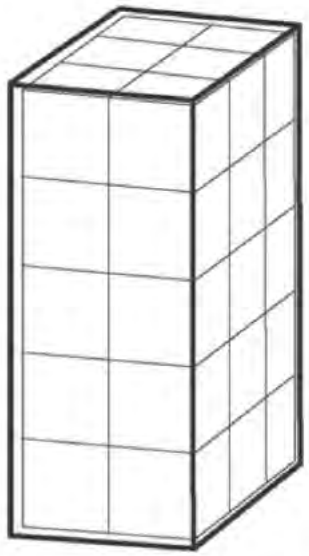
Cognitive Domain:
Applying

Maximum Points:
1

Key:
A

Option	Rationale	Item ID: M1_04
A	KEY	
B	The shape could be made from a rectangle and two triangles.	
C	The shape could be made from a square and two triangles.	
D	The shape is only one triangle.	

Test Book: **M1** | Item ID: **M1_05**



This box is full of cubes. How many cubes are in the box?

☐A 10

☐B 26

☐C 30

☐D 31

Content Domain:
Geometric Shapes and Measures

Topic Area:
Two- and Three-dimensional Shapes

Cognitive Domain:
Applying

Maximum Points:
1

Key:
C

Option	Rationale	Item ID: M1_05
A	The number of faces of the cubes visible through the front of the box.	
B	Twice the number of faces of the cubes visible through the front of the box, plus the number of faces of the cubes visible through the top of the box ((2x10)+6).	
C	KEY	
D	The total number of visible faces of the cubes in the box.	

Test Book: **M1** | Item ID: **M1_06**

Students in Sara's class sold boxes of cookies.
The table below shows how many boxes each student sold.

Name	Boxes of Cookies Sold
Sara	12
Mark	7
Phillip	8
Cassandra	11
Brian	13
Jane	9
Linda	12

HOW MANY students sold more than 10 boxes of cookies?

Answer: _____

Content Domain:
Data Display

Topic Area:
Reading, Interpreting, and Representing

Cognitive Domain:
Knowing

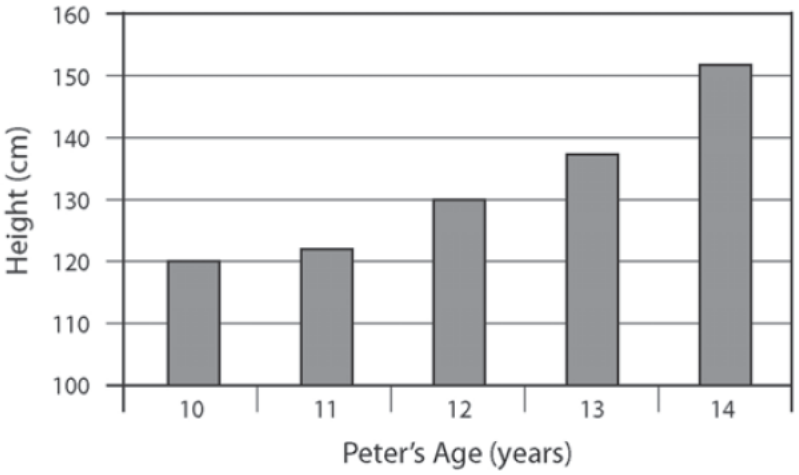
Maximum Points:
1

Key:
See scoring guide

Code	Response	Item ID: M1_06
	Correct Response	
10	4 (Do not accept a list of four names.)	
	Incorrect Response	
79	Incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

Test Book: **M1** | Item ID: **M1_07**

Peter's Height on his Birthday



Between which ages did Peter's height increase most?

☐$_A$ 10 and 11

☐$_B$ 11 and 12

☐$_C$ 12 and 13

☐$_D$ 13 and 14

Content Domain:
Data Display

Topic Area:
Reading, Interpreting, and Representing

Cognitive Domain:
Applying

Maximum Points:
1

Key:
D

Option	Rationale	Item ID: M1_07
A	The smallest increase shown on the graph (120 to 122).	
B	The second largest increase shown on the graph (122 to 130).	
C	The third pair of consecutive ages shown on the graph.	
D	KEY	

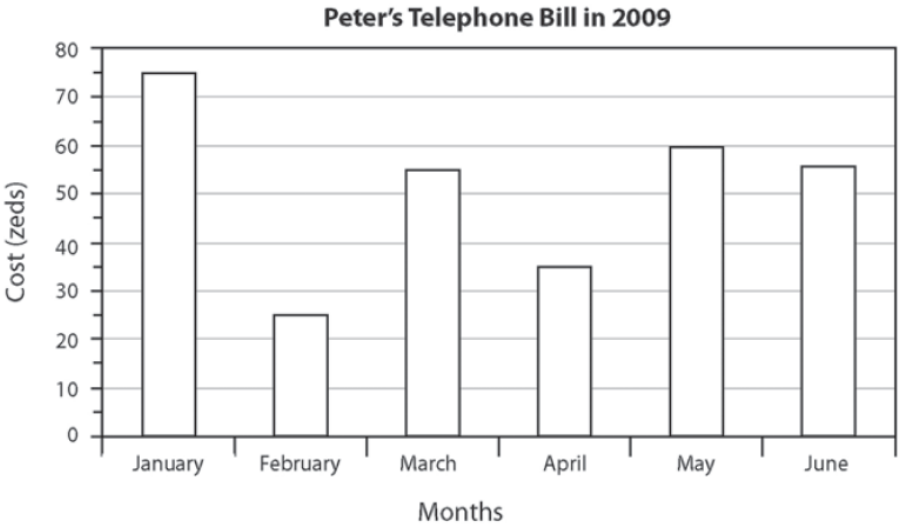
Test Book: **M1** | Item ID: **M1_08**

In 2008, Peter paid the following amounts in the first six months for his telephone bill.

Peter's Telephone Bill in 2008

Month	January	February	March	April	May	June
Cost (zeds)	65	20	60	40	60	45

In 2009, Peter paid the following amounts in the first six months for his telephone bill.



In some months, Peter paid **less** for his telephone bill in 2009 than in 2008.

In which months?

Answer: _____

Content Domain:
Data Display

Topic Area:
Reading, Interpreting, and Representing

Cognitive Domain:
Applying

Maximum Points:
1

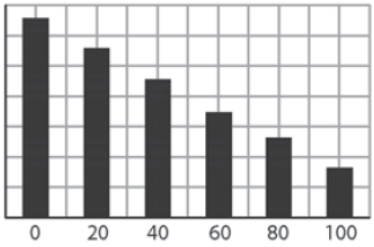
Key:
See scoring guide

Code	Response	Item ID: M1_08
	Correct Response	
10	March AND April and no incorrect months listed	
	Incorrect Response	
70	March OR April and no incorrect months listed	
79	Other incorrect (including crossed out, erased, stray marks, illegible, or off task)	
	Nonresponse	
99	Blank	

Test Book: **M1** | Item ID: **M1_09**

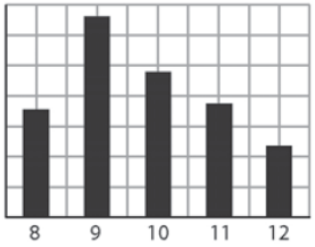
Roy made a survey of how many students watched television each night for one week. Which graph could show Roy's results?

Ⓐ



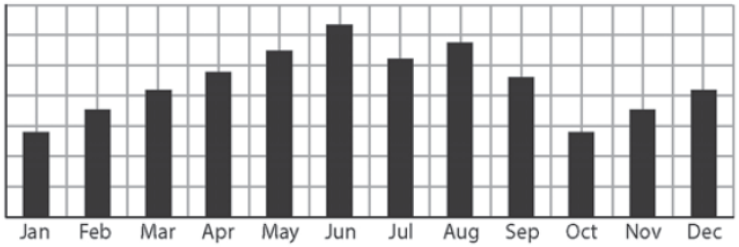
☐A

Ⓑ



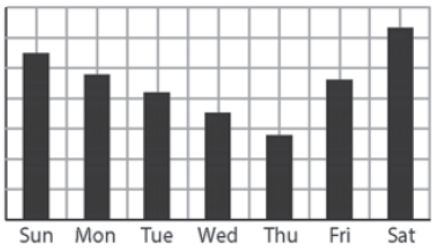
☐B

Ⓒ



☐C

Ⓓ



☐D

Content Domain:
Data Display

Topic Area:
Reading, Interpreting, and Representing

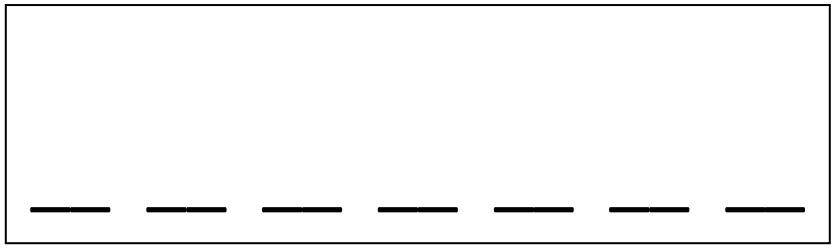
Cognitive Domain:
Reasoning

Maximum Points:
1

Key:
D

Option	Rationale	Item ID: M1_09
A	There are only 6 categories and the *x*-axis labels do not clearly represent days of the week.	
B	There are only 5 categories and the *x*-axis labels do not clearly represent days of the week.	
C	The graph shows data for the months of a year.	
D	KEY	

Please enter your **7-digit student ID code** here:



①

Context Questions

Are you a girl or a boy? CG1

(Fill one circle only.)

- ○ Girl
- ○ Boy
- ○ Other/ don't want to say

When were you born? CG2 a+b

(Fill the circles next to the month and year you were born.)

a) Month

- ○ January
- ○ February
- ○ March
- ○ April
- ○ May
- ○ June
- ○ July
- ○ August
- ○ September
- ○ October
- ○ November
- ○ December

b) Year

- ○ 2008
- ○ 2009
- ○ 2010
- ○ 2011
- ○ 2012
- ○ 2013
- ○ Other

How often do you speak English at home? CG3

(Fill one circle only.)

- ○ I always speak English at home
- ○ I almost always speak English at home
- ○ I sometimes speak English and sometimes speak another language at home
- ○ I never speak English at home

Do you have any of these things at your home? CG4 a-g

(Fill one circle for each line.)

		Yes ↓	**No** ↓
a)	A computer or tablet of your own	○	○
b)	A computer or tablet that is shared with other people at home	○	○
c)	Study desk/table for your use	○	○
d)	Your own room	○	○
e)	Internet connection	○	○
f)	Your own mobile phone	○	○
g)	A gaming system (e.g., PlayStation®, Wii®, Xbox®)	○	○

Was your mother (or stepmother, female guardian or first parent) born in Ireland? CG5

(Fill one circle only.)

- ○ Yes
- ○ No
- ○ I don't know

Was your father (or stepfather, male guardian or second parent) born in Ireland? CG6

(Fill one circle only.)

- ○ Yes
- ○ No
- ○ I don't know

Were you born in Ireland? CG7

(Fill one circle only.)

- ○ Yes
- ○ No

How often do you use a computer or tablet in each of these places for schoolwork (including classroom tasks, homework, studying outside of class)? CG8 a-c

(Fill one circle for each line.)

		Every day or almost every day ↓	Once or twice a week ↓	Once or twice a month ↓	Never or almost never ↓
a)	At home	○	○	○	○
b)	At school	○	○	○	○
c)	Some other place	○	○	○	○

How much do you agree with these statements about learning mathematics? CM1

(Fill one circle for each line.)

		Agree a lot ↓	Agree a little ↓	Disagree a little ↓	Disagree a lot ↓
a)	I enjoy learning mathematics	○	○	○	○
b)	I wish I did not have to study mathematics	○	○	○	○
c)	Mathematics is boring	○	○	○	○
d)	I learn many interesting things in mathematics	○	○	○	○
e)	I like mathematics	○	○	○	○
f)	I like any schoolwork that involves numbers	○	○	○	○
g)	I like to solve mathematics problems	○	○	○	○
h)	I look forward to mathematics lessons	○	○	○	○
i)	Mathematics is one of my favorite subjects	○	○	○	○

How much do you agree with these statements about your <u>mathematics lessons</u>? CM2

(Fill one circle for each line.)

		Agree a lot ↓	**Agree a little** ↓	**Disagree a little** ↓	**Disagree a lot** ↓
a)	I know what my teacher expects me to do	○	○	○	○
b)	My teacher is easy to understand	○	○	○	○
c)	I am interested in what my teacher says	○	○	○	○
d)	My teacher gives me interesting things to do	○	○	○	○
e)	My teacher has clear answers to my questions	○	○	○	○
f)	My teacher is good at explaining mathematics	○	○	○	○
g)	My teacher lets me show what I have learned	○	○	○	○
h)	My teacher does a variety of things to help us learn	○	○	○	○
i)	My teacher tells me how to do better when I make a mistake	○	○	○	○
j)	My teacher listens to what I have to say	○	○	○	○

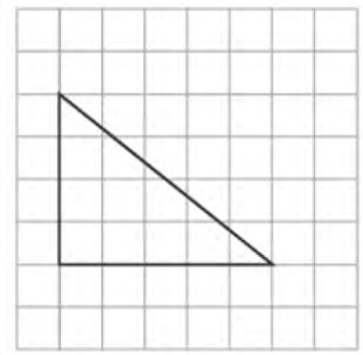
How much do you agree with these statements about <u>mathematics</u>? CM3

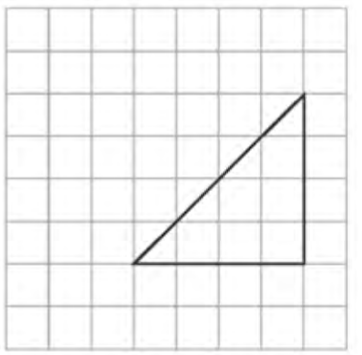
(Fill one circle for each line.)

		Agree a lot ↓	**Agree a little** ↓	**Disagree a little** ↓	**Disagree a lot** ↓
a)	I usually do well in mathematics	○	○	○	○
b)	Mathematics is harder for me than for many of my classmates	○	○	○	○
c)	I am just not good at mathematics	○	○	○	○
d)	I learn things quickly in mathematics	○	○	○	○
e)	Mathematics makes me nervous	○	○	○	○
f)	I am good at working out difficult mathematics problems	○	○	○	○
g)	My teacher tells me I am good at mathematics	○	○	○	○
h)	Mathematics is harder for me than any other subject	○	○	○	○
i)	Mathematics makes me confused	○	○	○	○

②

Mathematics





Which of the statements about these triangles is true?

☐A Each triangle has 2 equal sides.

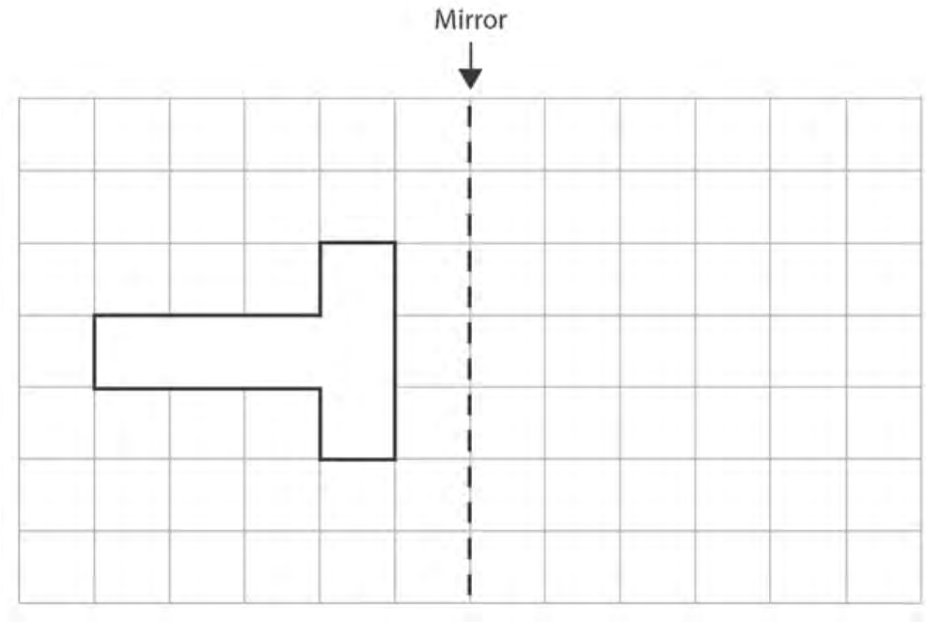
☐B Each triangle has 3 sides of different lengths.

☐C Each triangle has an angle larger than a right angle.

☐D Each triangle has a right angle.

Test Book: **M2** | Item ID: **M2_02**

Draw the reflection of the shape below.



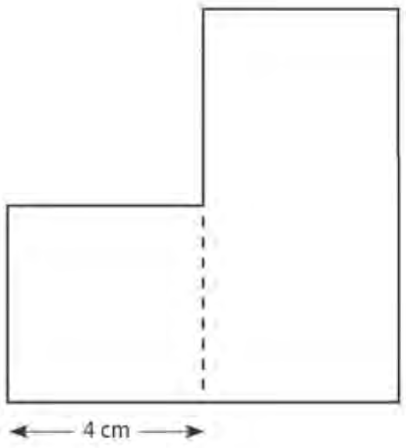
Test Book: **M2** | Item ID: **M2_03**

This shape consists of a square and a rectangle.

The width of the rectangle is the same as the width of the square.

The length of the rectangle is twice as long as its width.

Find the perimeter of the shape.



☐A 28 cm

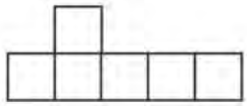
☐B 32 cm

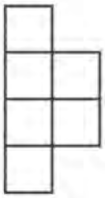
☐C 36 cm

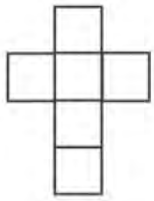
☐D 40 cm

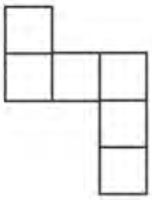
Test Book: **M2** | Item ID: **M2_04**

Which shape makes a cube when it is folded?

Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

Answer:

☐ A

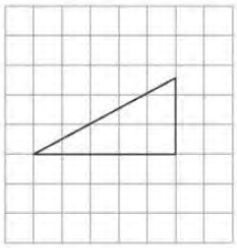
☐ B

☐ C

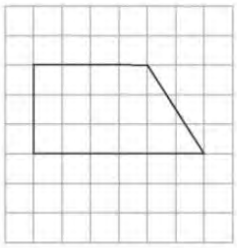
☐ D

Test Book: **M2** | Item ID: **M2_05**

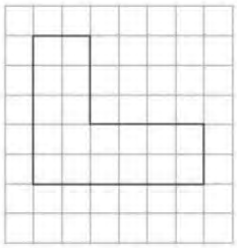
Which shape has a line of symmetry?

Ⓐ 

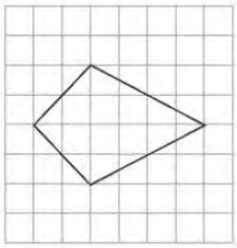
☐A

Ⓑ 

☐B

Ⓒ 

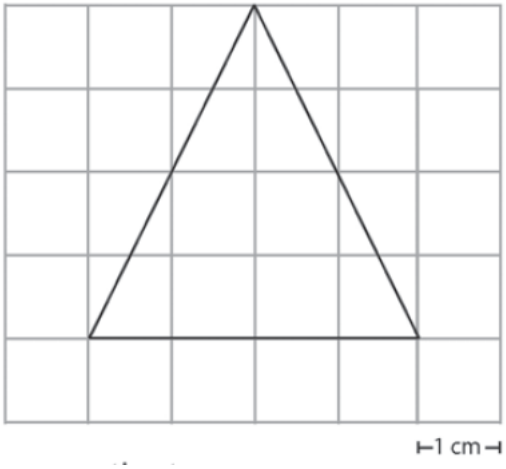
☐C

Ⓓ 

☐D

Test Book: **M2** | Item ID: **M2_06**

This triangle is on a centimeter grid. What is its area?



☐A 4 square centimeters

☐B 8 square centimeters

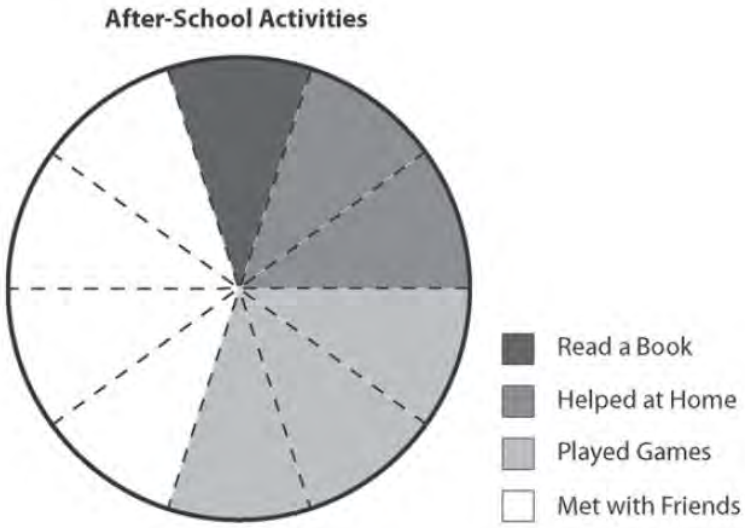
☐C 12 square centimeters

☐D 16 square centimeters

Test Book: **M2** | Item ID: **M2_07**

This pie chart shows what some students did after school.

The chart is divided into 10 equal sections.



20 students read a book. How many met with friends?

☐A 40

☐B 60

☐C 80

☐D 100

Mrs. Jones asked her students to name a favorite color. She wrote each student`s answer on the chalkboard:

Sara – green	Barbara – yellow
Tom – blue	Christine – green
Ron – brown	Juan – red
Tina – red	Bill – brown
Mary – green	Emma – red
Don – blue	John – blue
Sally – yellow	Paul – red
Linda – blue	Jeff – yellow

Mrs. Jones then asked the students to make a table showing these results.

Fill in the missing numbers in the table.

Color	**Number of Students Who Like the Color**
Blue	4
Brown	
Green	3
Red	4
Yellow	

The table below shows the sizes of large snakes.

Type of snake	Weight (kilograms)	Length (meters)
Boa Constrictor	27	4
Burmese Python	90	5 to 7
Green Anaconda	227	6 to 9
King Cobra	9	4

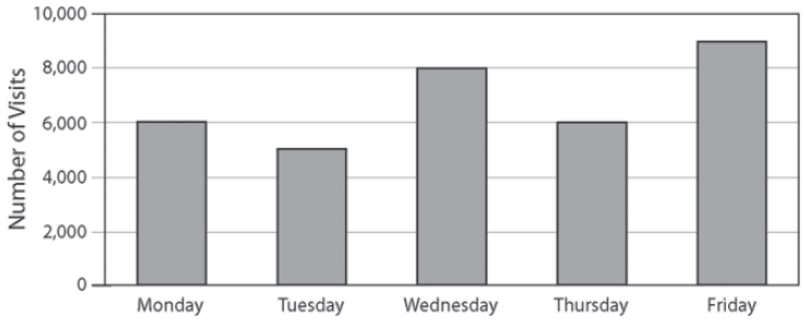
A. James saw a snake that was 8 meters long. Which type of snake could it be?

Answer: _____

B. Naima saw a snake that was 6 meters long and weighed about 80 kilograms. Which type of snake could it be?

Answer: _____

Visits to the "Find the Answer" Website



The chart shows the number of visits to the "Find the Answer" website.

A. How many visits were there on Wednesday?

Answer: _____

B. How many more visits were there on Friday than on Tuesday?

☐$_A$ 1,000

☐$_B$ 2,000

☐$_C$ 3,000

☐$_D$ 4,000

③

Motivation

The next questions are about your opinion on the learning activities over the last few weeks in Maths. There are no right or wrong answers.

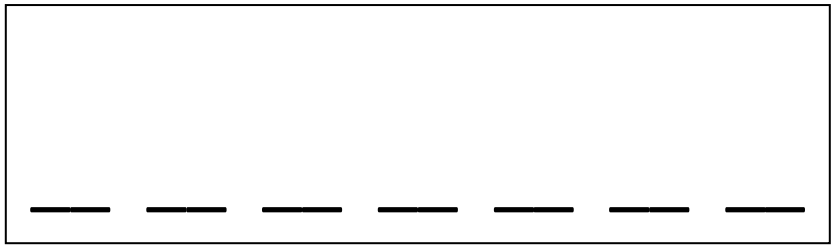
Please read each statement and then tick the box that best describes how true it is for you.

	1 not at all true	2	3	4 Somewhat true	5	6	7 Very true
I enjoyed these learning activities very much.	☐	☐	☐	☐	☐	☐	☐
I put a lot of effort into these learning activities.	☐	☐	☐	☐	☐	☐	☐
I think these learning activities are useful for my maths skills.	☐	☐	☐	☐	☐	☐	☐
I think I am pretty good at these learning activities.	☐	☐	☐	☐	☐	☐	☐
I think these learning activities are important activities.	☐	☐	☐	☐	☐	☐	☐
I felt very tense while doing these learning activities.	☐	☐	☐	☐	☐	☐	☐
These learning activities were activities that I couldn't do very well.	☐	☐	☐	☐	☐	☐	☐
I didn't try very hard to do well at these learning activities.	☐	☐	☐	☐	☐	☐	☐
These learning activities were fun to do.	☐	☐	☐	☐	☐	☐	☐

It was important to me to do well at these learning activities.	☐	☐	☐	☐	☐	☐	☐
I did not feel nervous at all while doing these learning activities.	☐	☐	☐	☐	☐	☐	☐
I am satisfied with my performance at these learning activities.	☐	☐	☐	☐	☐	☐	☐
I think doing these learning activities could help me to improve my my maths skills.	☐	☐	☐	☐	☐	☐	☐
I thought these learning activities were boring activities.	☐	☐	☐	☐	☐	☐	☐
I was very relaxed in doing these learning activities.	☐	☐	☐	☐	☐	☐	☐

Thank you very much!

Please enter your **7-digit student ID code** here:



①

Context Questions

Are you a girl or a boy? CG1

(Fill one circle only.)

- ○ Girl
- ○ Boy
- ○ Other/ don't want to say

When were you born? CG2 a+b

(Fill the circles next to the month and year you were born.)

a) Month

- ○ January
- ○ February
- ○ March
- ○ April
- ○ May
- ○ June
- ○ July
- ○ August
- ○ September
- ○ October
- ○ November
- ○ December

b) Year

- ○ 2008
- ○ 2009
- ○ 2010
- ○ 2011
- ○ 2012
- ○ 2013
- ○ Other

How often do you speak English at home? CG3

(Fill one circle only.)

- ○ I always speak English at home
- ○ I almost always speak English at home
- ○ I sometimes speak English and sometimes speak another language at home
- ○ I never speak English at home

Do you have any of these things at your home? CG4 a-g

(Fill one circle for each line.)

		Yes ↓	**No** ↓
a)	A computer or tablet of your own	○	○
b)	A computer or tablet that is shared with other people at home	○	○
c)	Study desk/table for your use	○	○
d)	Your own room	○	○
e)	Internet connection	○	○
f)	Your own mobile phone	○	○
g)	A gaming system (e.g., PlayStation®, Wii®, Xbox®)	○	○

Was your mother (or stepmother, female guardian or first parent) born in Ireland? CG5

(Fill one circle only.)

- ○ Yes
- ○ No
- ○ I don't know

Was your father (or stepfather, male guardian or second parent) born in Ireland? CG6

(Fill one circle only.)

- ○ Yes
- ○ No
- ○ I don't know

Were you born in Ireland? CG7

(Fill one circle only.)

- ○ Yes
- ○ No

How often do you use a computer or tablet in each of these places for schoolwork (including classroom tasks, homework, studying outside of class)? CG8 a-c

(Fill one circle for each line.)

		Every day or almost every day ↓	Once or twice a week ↓	Once or twice a month ↓	Never or almost never ↓
a)	At home	○	○	○	○
b)	At school	○	○	○	○
c)	Some other place	○	○	○	○

How much do you agree with these statements about learning mathematics? CM1

(Fill one circle for each line.)

		Agree a lot ↓	Agree a little ↓	Disagree a little ↓	Disagree a lot ↓
a)	I enjoy learning mathematics	○	○	○	○
b)	I wish I did not have to study mathematics	○	○	○	○
c)	Mathematics is boring	○	○	○	○
d)	I learn many interesting things in mathematics	○	○	○	○
e)	I like mathematics	○	○	○	○
f)	I like any schoolwork that involves numbers	○	○	○	○
g)	I like to solve mathematics problems	○	○	○	○
h)	I look forward to mathematics lessons	○	○	○	○
i)	Mathematics is one of my favorite subjects	○	○	○	○

How much do you agree with these statements about your <u>mathematics lessons</u>? CM2

(Fill one circle for each line.)

		Agree a lot ↓	**Agree a little** ↓	**Disagree a little** ↓	**Disagree a lot** ↓
a)	I know what my teacher expects me to do	○	○	○	○
b)	My teacher is easy to understand	○	○	○	○
c)	I am interested in what my teacher says	○	○	○	○
d)	My teacher gives me interesting things to do	○	○	○	○
e)	My teacher has clear answers to my questions	○	○	○	○
f)	My teacher is good at explaining mathematics	○	○	○	○
g)	My teacher lets me show what I have learned	○	○	○	○
h)	My teacher does a variety of things to help us learn	○	○	○	○
i)	My teacher tells me how to do better when I make a mistake	○	○	○	○
j)	My teacher listens to what I have to say	○	○	○	○

How much do you agree with these statements about <u>mathematics</u>? CM3

(Fill one circle for each line.)

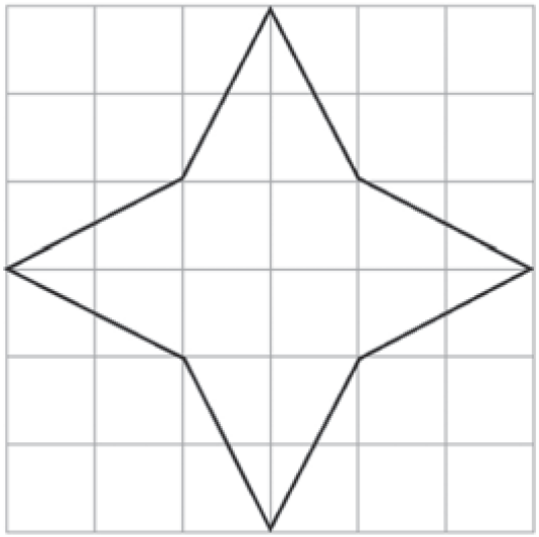
		Agree a lot ↓	**Agree a little** ↓	**Disagree a little** ↓	**Disagree a lot** ↓
a)	I usually do well in mathematics	○	○	○	○
b)	Mathematics is harder for me than for many of my classmates	○	○	○	○
c)	I am just not good at mathematics	○	○	○	○
d)	I learn things quickly in mathematics	○	○	○	○
e)	Mathematics makes me nervous	○	○	○	○
f)	I am good at working out difficult mathematics problems	○	○	○	○
g)	My teacher tells me I am good at mathematics	○	○	○	○
h)	Mathematics is harder for me than any other subject	○	○	○	○
i)	Mathematics makes me confused	○	○	○	○

②

Mathematics

Test Book: **M3** | Item ID: **M3_01**

Draw ALL the lines of symmetry on this shape.



Test Book: **M3** | Item ID: **M3_02**

Here are some statements about a rectangle. Put an X in one box in each row to show whether each statement is true or false.

		True	False
A.	It has 4 sides.	☐	☐
B.	All the sides must be the same length.	☐	☐
C.	All the angles are right angles.	☐	☐
D.	There are two pairs of parallel sides.	☐	☐

Test Book: **M3** | Item ID: **M3_03**

The perimeter of a 5-sided figure is 30 centimeters. Three of the sides are each 4 cm long. The other two sides, A and B, are the same length.

What is the length of side A?

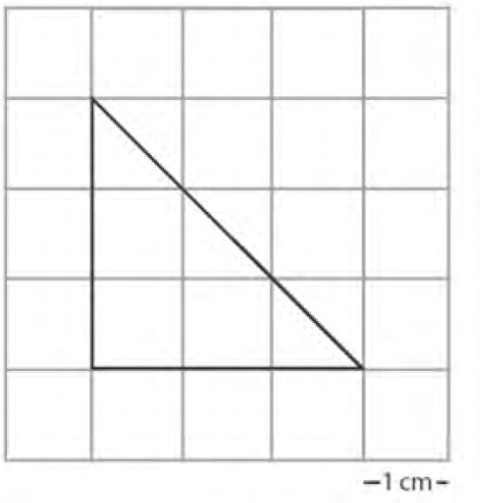
☐$_A$ 6 cm

☐$_B$ 9 cm

☐$_C$ 12 cm

☐$_D$ 18 cm

Test Book: **M3** | Item ID: **M3_04**



The triangle is on a centimeter grid. What is its area?

☐A 4.5 square centimeters

☐B 6 square centimeters

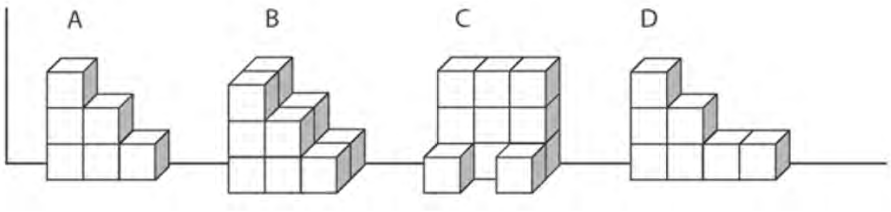
☐C 9 square centimeters

☐D 9.5 square centimeters

Test Book: **M3** | Item ID: **M3_05**

Each of the following solids is constructed by stacking cubes of the same size.

The cubes are stacked against a wall.



Which solid has the largest volume?

☐$_A$ Solid A

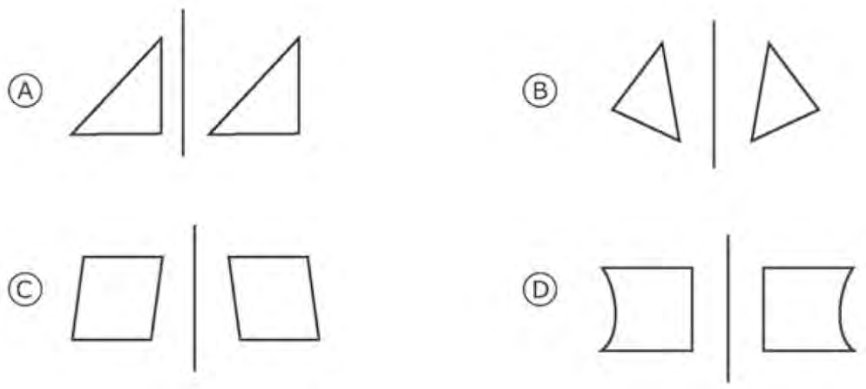
☐$_B$ Solid B

☐$_C$ Solid C

☐$_D$ Solid D

Test Book: **M3** | Item ID: **M3_06**

Which does NOT show a shape and its reflection (mirror image)?



Answer:

☐ A

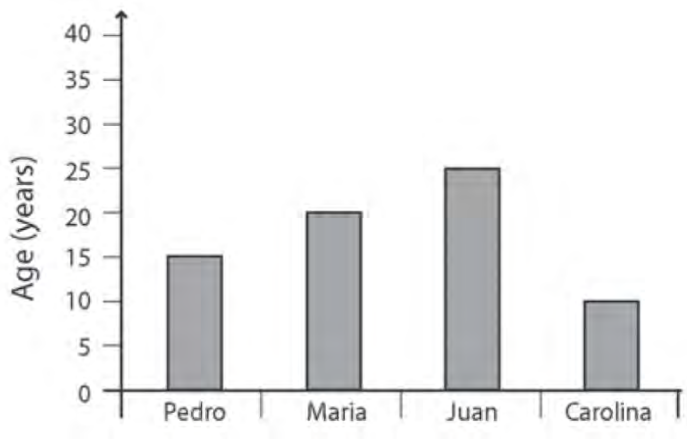
☐ B

☐ C

☐ D

Test Book: **M3** | Item ID: **M3_07**

The graph shows the ages of 4 people.



How many years older is Juan than Carolina?

☐A 5

☐B 10

☐C 15

☐D 20

In a triathlon race, athletes first swim, then cycle, and then run. The table below shows the race results for Kathy, Barbara, and Sue. One total has been filled in for you.

Triathlon Results in Minutes

	Kathy	**Barbara**	**Sue**
Swimming	35	25	50
Cycling	80	90	85
Running	135	130	120
Total:	250		

A. The person who finishes in the smallest number of minutes wins.

Who won the triathlon? How long did she take?

Answer: _____ _____minutes

B. Sue wants to finish the triathlon race faster next year. What does she need to improve in most so that she can beat Kathy and Barbara?

(Check one box.)

☐ Swimming

☐ Cycling

☐ Running

Explain why, using the information in the chart.

_____

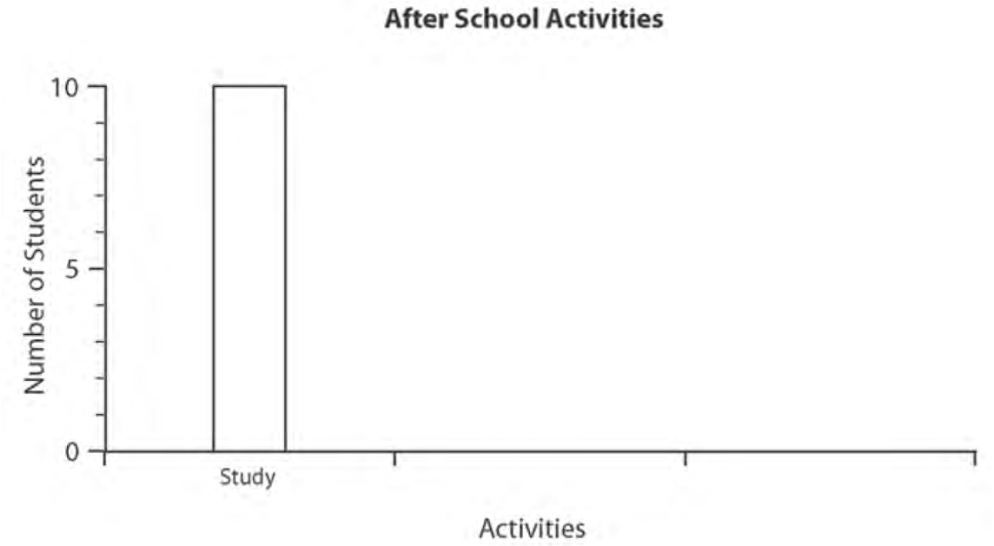
Mr. Smith asked the students in his class about what they did after school. These are the results for 3 things they did.

After School Activities

Activities	Tally Marks
Play sports	𝍸 |||
Watch TV	𝍸
Study	𝍸 𝍸

Mr. Smith started making a bar chart showing how many students did each activity.

Complete the graph by drawing and labeling the other two bars.



③

Motivation

The next questions are about your opinion on the learning activities over the last few weeks in Maths. There are no right or wrong answers.

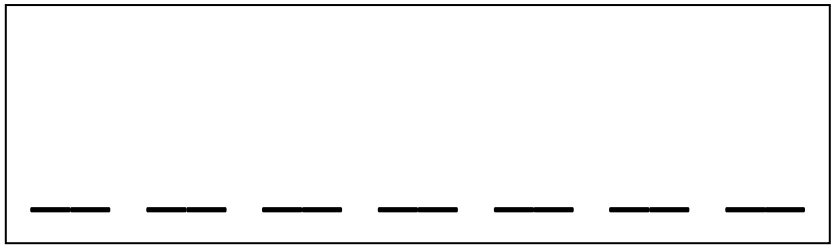
Please read each statement and then tick the box that best describes how true it is for you.

	1 not at all true	2	3	4 Somewhat true	5	6	7 Very true
I enjoyed these learning activities very much.	☐	☐	☐	☐	☐	☐	☐
I put a lot of effort into these learning activities.	☐	☐	☐	☐	☐	☐	☐
I think these learning activities are useful for my maths skills.	☐	☐	☐	☐	☐	☐	☐
I think I am pretty good at these learning activities.	☐	☐	☐	☐	☐	☐	☐
I think these learning activities are important activities.	☐	☐	☐	☐	☐	☐	☐
I felt very tense while doing these learning activities.	☐	☐	☐	☐	☐	☐	☐
These learning activities were activities that I couldn't do very well.	☐	☐	☐	☐	☐	☐	☐
I didn't try very hard to do well at these learning activities.	☐	☐	☐	☐	☐	☐	☐
These learning activities were fun to do.	☐	☐	☐	☐	☐	☐	☐

It was important to me to do well at these learning activities.	☐	☐	☐	☐	☐	☐	☐
I did not feel nervous at all while doing these learning activities.	☐	☐	☐	☐	☐	☐	☐
I am satisfied with my performance at these learning activities.	☐	☐	☐	☐	☐	☐	☐
I think doing these learning activities could help me to improve my my maths skills.	☐	☐	☐	☐	☐	☐	☐
I thought these learning activities were boring activities.	☐	☐	☐	☐	☐	☐	☐
I was very relaxed in doing these learning activities.	☐	☐	☐	☐	☐	☐	☐

Thank you very much!

Please enter your **7-digit student ID code** here:



①

Context Questions

Are you a girl or a boy? CG1

(Fill one circle only.)

- ○ Girl
- ○ Boy
- ○ Other/ don't want to say

When were you born? CG2 a+b

(Fill the circles next to the month and year you were born.)

a) Month

- ○ January
- ○ February
- ○ March
- ○ April
- ○ May
- ○ June
- ○ July
- ○ August
- ○ September
- ○ October
- ○ November
- ○ December

b) Year

- ○ 2008
- ○ 2009
- ○ 2010
- ○ 2011
- ○ 2012
- ○ 2013
- ○ Other

How often do you speak English at home? CG3

(Fill one circle only.)

- ○ I always speak English at home
- ○ I almost always speak English at home
- ○ I sometimes speak English and sometimes speak another language at home
- ○ I never speak English at home

Do you have any of these things at your home? CG4 a-g

(Fill one circle for each line.)

		Yes ↓	**No** ↓
a)	A computer or tablet of your own	○	○
b)	A computer or tablet that is shared with other people at home	○	○
c)	Study desk/table for your use	○	○
d)	Your own room	○	○
e)	Internet connection	○	○
f)	Your own mobile phone	○	○
g)	A gaming system (e.g., PlayStation®, Wii®, Xbox®)	○	○

Was your mother (or stepmother, female guardian or first parent) born in Ireland? CG5

(Fill one circle only.)

- ○ Yes
- ○ No
- ○ I don't know

Was your father (or stepfather, male guardian or second parent) born in Ireland? CG6

(Fill one circle only.)

- ○ Yes
- ○ No
- ○ I don't know

Were you born in Ireland? CG7

(Fill one circle only.)

- ○ Yes
- ○ No

How often do you use a computer or tablet in each of these places for schoolwork (including classroom tasks, homework, studying outside of class)? CG8 a-c

(Fill one circle for each line.)

		Every day or almost every day ↓	Once or twice a week ↓	Once or twice a month ↓	Never or almost never ↓
a)	At home	○	○	○	○
b)	At school	○	○	○	○
c)	Some other place	○	○	○	○

How much do you agree with these statements about learning science? CS1

(Fill one circle for each line.)

		Agree a lot ↓	Agree a little ↓	Disagree a little ↓	Disagree a lot ↓
a)	I enjoy learning science	○	○	○	○
b)	I wish I did not have to study science	○	○	○	○
c)	Science is boring	○	○	○	○
d)	I learn many interesting things in science	○	○	○	○
e)	I like science	○	○	○	○
f)	I look forward to learning science in school	○	○	○	○
g)	Science teaches me how things in the world work	○	○	○	○
h)	I like to do science experiments	○	○	○	○
i)	Science is one of my favorite subjects	○	○	○	○

How much do you agree with these statements about your <u>science lessons</u>? CS2

(Fill one circle for each line.)

		Agree a lot ↓	**Agree a little** ↓	**Disagree a little** ↓	**Disagree a lot** ↓
a)	I know what my teacher expects me to do	○	○	○	○
b)	My teacher is easy to understand	○	○	○	○
c)	I am interested in what my teacher says	○	○	○	○
d)	My teacher gives me interesting things to do	○	○	○	○
e)	My teacher has clear answers to my questions	○	○	○	○
f)	My teacher is good at explaining science	○	○	○	○
g)	My teacher lets me show what I have learned	○	○	○	○
h)	My teacher does a variety of things to help us learn	○	○	○	○
i)	My teacher tells me how to do better when I make a mistake	○	○	○	○
j)	My teacher listens to what I have to say	○	○	○	○

How much do you agree with these statements about <u>science</u>? CS3

(Fill one circle for each line.)

		Agree a lot ↓	**Agree a little** ↓	**Disagree a little** ↓	**Disagree a lot** ↓
a)	I usually do well in science	○	○	○	○
b)	Science is harder for me than for many of my classmates	○	○	○	○
c)	I am just not good at science	○	○	○	○
d)	I learn things quickly in science	○	○	○	○
e)	My teacher tells me I am good at science	○	○	○	○
f)	Science is harder for me than any other subject	○	○	○	○
g)	Science makes me confused	○	○	○	○

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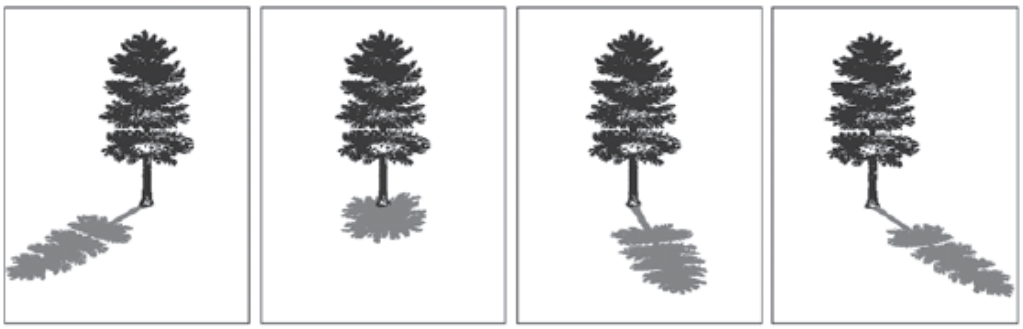
②

Science

Test Book: **S1** | Item ID: **S1_01**

Some children look at the shadow of a tree at different times of the day.
Which shadow do they see at mid-day?



Test Book: **S1** | Item ID: **S1_02**

How long does it take for Earth for orbit the sun once?

☐A 24 hours

☐B a month

☐C a year

☐D 12 years

Test Book: **S1** | Item ID: **S1_03**

Why are the stars not visible during the day?

Test Book: **S1** | Item ID: **S1_04**

Scientists believe that many millions of years ago there were many kinds of animals on Earth that no longer exist today.

What is the best evidence for this belief?

☐A remains of the food the animals ate

☐B paintings done by ancient peoples

☐C animal droppings found in woods

☐D parts of animals that have hardened into rock

Test Book: **S1** | Item ID: **S1_05**

A scientist finds fossils of shellfish in some rocks that are lying on the ground.

What does this tell the scientist?

☐$_A$ that different kinds of plants lived in the area

☐$_B$ that the shellfish were old when they died

☐$_C$ that the shellfish ate other shellfish

☐$_D$ that the area used to be under water

Test Book: **S1** | Item ID: **S1_06**

Sarah has a balloon.

Sarah says that there is air inside the balloon. Robin says that there is nothing inside the balloon.

Who do you think is correct?

(Check one box.)

☐ Sarah

☐ Robin

Explain your answer.

Test Book: **S1** | Item ID: **S1_07**

This is a natural rock formation found in a desert.

How did the wind help shape these rocks?

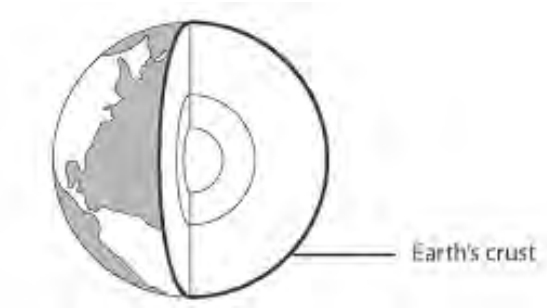
☐A Wind cools off the rocks and they break down.

☐B Wind blows grains of sand, which rub the rocks.

☐C Wind is hot in the desert, and it melts the rocks.

☐D Wind caries moisture, which washes away the rocks.

Test Book: **S1** | Item ID: **S1_08**



The picture shows the structure of Earth. The outer layer is called crust.
Name two things that make up the crust.

1. _____

2. _____

Test Book: **S1** | Item ID: **S1_09**

In a food chain, a **predator** is an animal that eats another animal. The animal that gets eaten is called **prey**.

Which statement about predators or prey is true or false?

Put an X next to each statement.

	True	**False**
An animal with sharp teeth is likely to be a predator.	☐	☐
Predators are always bigger that their prey.	☐	☐
A large animal cannot be prey.	☐	☐
Some animals can be both predators and prey.	☐	☐

Test Book: **S1** | Item ID: **S1_10**

The human activities listed below can have either a positive of a negative effect on the environment.

For each activity, put an X in the correct column to show which has a positive effect and which has a negative effect.

Human Activity	**Positive Effect**	**Negative Effect**
Replacing trees that have been cut down	☐	☐
Putting factory waste into rivers	☐	☐
Recycling aluminum cans	☐	☐
Draining marshes for housing	☐	☐
Riding bicycles for transportation	☐	☐

Test Book: **S1** | Item ID: **S1_11**

David wants to get rid of the spiders in his garden. Mohammad tells him this is a bad idea because spiders are important for the environment.

Write down one reason why it is important to have spiders in a garden.

Test Book: **S1** | Item ID: **S1_12**

Monarch butterflies are poisonous to birds.

Why is this an advantage for the monarch butterflies?

☐A The butterflies can survive to lay eggs.

☐B The butterflies can eat different plants.

☐C The butterflied can pollinate more plants.

☐D The butterflies can reduce the bird population.

.

Test Book: **S1** | Item ID: **S1_13**

Many mammals live in parts of the world where the temperature is much lower in the winter than in the summer.

Describe one physical change that can take place in a mammal as the weather gets colder.

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③

Motivation

The next questions are about your opinion on the learning activities over the last few weeks in Science. There are no right or wrong answers.

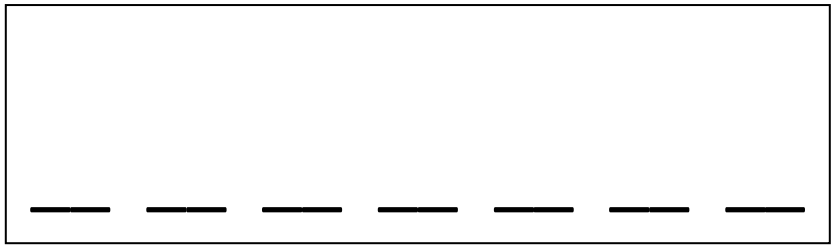
Please read each statement and then tick the box that best describes how true it is for you.

	1 not at all true	2	3	4 Somewhat true	5	6	7 Very true
I enjoyed these learning activities very much.	☐	☐	☐	☐	☐	☐	☐
I put a lot of effort into these learning activities.	☐	☐	☐	☐	☐	☐	☐
I think these learning activities are useful for my science skills.	☐	☐	☐	☐	☐	☐	☐
I think I am pretty good at these learning activities.	☐	☐	☐	☐	☐	☐	☐
I think these learning activities are important activities.	☐	☐	☐	☐	☐	☐	☐
I felt very tense while doing these learning activities.	☐	☐	☐	☐	☐	☐	☐
These learning activities were activities that I couldn't do very well.	☐	☐	☐	☐	☐	☐	☐
I didn't try very hard to do well at these learning activities.	☐	☐	☐	☐	☐	☐	☐
These learning activities were fun to do.	☐	☐	☐	☐	☐	☐	☐

It was important to me to do well at these learning activities.	☐	☐	☐	☐	☐	☐	☐
I did not feel nervous at all while doing these learning activities.	☐	☐	☐	☐	☐	☐	☐
I am satisfied with my performance at these learning activities.	☐	☐	☐	☐	☐	☐	☐
I think doing these learning activities could help me to improve my science skills.	☐	☐	☐	☐	☐	☐	☐
I thought these learning activities were boring activities.	☐	☐	☐	☐	☐	☐	☐
I was very relaxed in doing these learning activities.	☐	☐	☐	☐	☐	☐	☐

Thank you very much!

Please enter your **7-digit student ID code** here:



①

Context Questions

Are you a girl or a boy? CG1

(Fill one circle only.)

- ○ Girl
- ○ Boy
- ○ Other/ don't want to say

When were you born? CG2 a+b

(Fill the circles next to the month and year you were born.)

a) Month

- ○ January
- ○ February
- ○ March
- ○ April
- ○ May
- ○ June
- ○ July
- ○ August
- ○ September
- ○ October
- ○ November
- ○ December

b) Year

- ○ 2008
- ○ 2009
- ○ 2010
- ○ 2011
- ○ 2012
- ○ 2013
- ○ Other

How often do you speak English at home? CG3

(Fill one circle only.)

- ○ I always speak English at home
- ○ I almost always speak English at home
- ○ I sometimes speak English and sometimes speak another language at home
- ○ I never speak English at home

Do you have any of these things at your home? CG4 a-g

(Fill one circle for each line.)

		Yes ↓	**No** ↓
a)	A computer or tablet of your own	○	○
b)	A computer or tablet that is shared with other people at home	○	○
c)	Study desk/table for your use	○	○
d)	Your own room	○	○
e)	Internet connection	○	○
f)	Your own mobile phone	○	○
g)	A gaming system (e.g., PlayStation®, Wii®, Xbox®)	○	○

Was your mother (or stepmother, female guardian or first parent) born in Ireland? CG5

(Fill one circle only.)

- ○ Yes
- ○ No
- ○ I don't know

Was your father (or stepfather, male guardian or second parent) born in Ireland? CG6

(Fill one circle only.)

- ○ Yes
- ○ No
- ○ I don't know

Were you born in Ireland? CG7

(Fill one circle only.)

- ○ Yes
- ○ No

How often do you use a computer or tablet in each of these places for schoolwork (including classroom tasks, homework, studying outside of class)? CG8 a-c

(Fill one circle for each line.)

		Every day or almost every day ↓	Once or twice a week ↓	Once or twice a month ↓	Never or almost never ↓
a)	At home	○	○	○	○
b)	At school	○	○	○	○
c)	Some other place	○	○	○	○

How much do you agree with these statements about learning science? CS1

(Fill one circle for each line.)

		Agree a lot ↓	Agree a little ↓	Disagree a little ↓	Disagree a lot ↓
a)	I enjoy learning science	○	○	○	○
b)	I wish I did not have to study science	○	○	○	○
c)	Science is boring	○	○	○	○
d)	I learn many interesting things in science	○	○	○	○
e)	I like science	○	○	○	○
f)	I look forward to learning science in school	○	○	○	○
g)	Science teaches me how things in the world work	○	○	○	○
h)	I like to do science experiments	○	○	○	○
i)	Science is one of my favorite subjects	○	○	○	○

How much do you agree with these statements about your <u>science lessons</u>? CS2

(Fill one circle for each line.)

		Agree a lot ↓	**Agree a little** ↓	**Disagree a little** ↓	**Disagree a lot** ↓
a)	I know what my teacher expects me to do	○	○	○	○
b)	My teacher is easy to understand	○	○	○	○
c)	I am interested in what my teacher says	○	○	○	○
d)	My teacher gives me interesting things to do	○	○	○	○
e)	My teacher has clear answers to my questions	○	○	○	○
f)	My teacher is good at explaining science	○	○	○	○
g)	My teacher lets me show what I have learned	○	○	○	○
h)	My teacher does a variety of things to help us learn	○	○	○	○
i)	My teacher tells me how to do better when I make a mistake	○	○	○	○
j)	My teacher listens to what I have to say	○	○	○	○

How much do you agree with these statements about <u>science</u>? CS3

(Fill one circle for each line.)

		Agree a lot ↓	**Agree a little** ↓	**Disagree a little** ↓	**Disagree a lot** ↓
a)	I usually do well in science	○	○	○	○
b)	Science is harder for me than for many of my classmates	○	○	○	○
c)	I am just not good at science	○	○	○	○
d)	I learn things quickly in science	○	○	○	○
e)	My teacher tells me I am good at science	○	○	○	○
f)	Science is harder for me than any other subject	○	○	○	○
g)	Science makes me confused	○	○	○	○

②

Science

Test Book: **S2** | Item ID: **S2_01**

Figure 1 shows some puddles of water on a concrete sidewalk in the morning.

In the afternoon, the concrete sidewalk was dry as shown in Figure 2.

Figure 1

morning

Figure 2

afternoon

What happened to the water?

☐$_A$ It went into the air.

☐$_B$ It turned to dust.

☐$_C$ It was used by trees.

☐$_D$ It spilled into the road.

Test Book: **S2** | Item ID: **S2_02**

Water flows across Earth's surface.

In which direction does it flow?

☐$_A$ mountains → rivers → oceans

☐$_B$ oceans → mountains → rivers

☐$_C$ rivers → oceans → mountains

☐$_D$ mountains → oceans → rivers

.

Test Book: **S2** | Item ID: **S2_03**

The table below shows the weather at four different places.

Place	Temperature	Cloud Cover
A	5 °C	Clouds
B	−5 °C	No clouds
C	−5 °C	Clouds
D	5 °C	No clouds

In which place is it most likely to snow?

☐A Place A

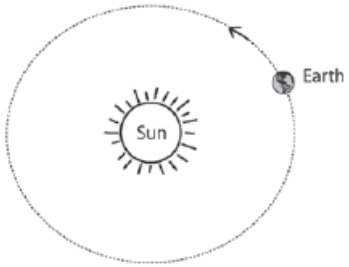
☐B Place B

☐C Place C

☐D Place D

Test Book: **S2** | Item ID: **S2_04**

Earth is a planet that orbits the sun.



Write down two other planets that orbit the sun.

1. _____

2. _____

Test Book: **S2** | Item ID: **S2_05**

The pictures below show a shadow at three different times of the day.

Explain why the shadows changed.

Test Book: **S2** | Item ID: **S2_06A**

A. Ms. Smith puts a glass containing cotton upside down in a beaker of water, as shown in Diagram 1. The glass is not tipped.

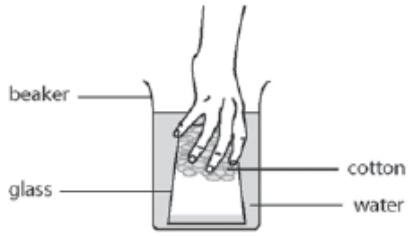


Diagram 1

She pulls the glass out again, as shown in Diagram 2.

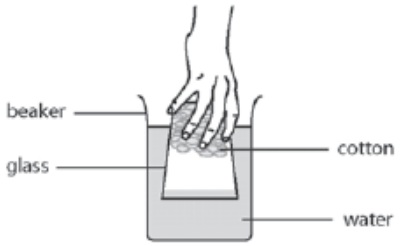


Diagram 2

The cotton does not get wet because water does not go into the glass.

Explain why the water does not go into the glass.

B. Ms. Smith then puts the glass back in the water and tilts it, as shown in Diagram 3.

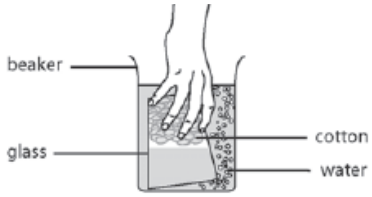


Diagram 3

Water goes into the glass and the cotton gets wet.

Explain why tipping the glass allowed the cotton to get wet.

Test Book: **S2** | Item ID: **S2_07**

Some of the living things below use energy from the sun to make their own food.

Put an X in the box next to each living thing that makes its own food.

(You may put an X in more than one box.)

☐ Lizard ☐ Camel ☐ Seaweed

☐ Grass ☐ Oak tree ☐ Cactus

Test Book: **S2** | Item ID: **S2_08**

Which of the following ways of getting to school produces the **least** air pollution?

☐A a bus that runs on gasoline

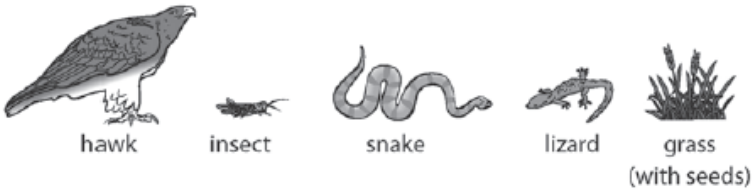
☐B a car that runs on gasoline

☐C a car that runs on electricity

☐D a train that runs on oil

Test Book: **S2** | Item ID: **S2_09**

The living things shown in the picture all live in the desert.



Alfie starts to draw a food chain using the living things shown above. He puts the grass and the insect into the food chain because he knows that insects eat grass seeds.

Complete the food chain by writing in the names of the three missing living things.

grass (with seeds) → insect → _____ → _____ → _____

Test Book: **S2** | Item ID: **S2_10**

The feathers of some birds have similar colors to their surroundings.

How does this help them stay alive?

☐A They are hidden from danger.

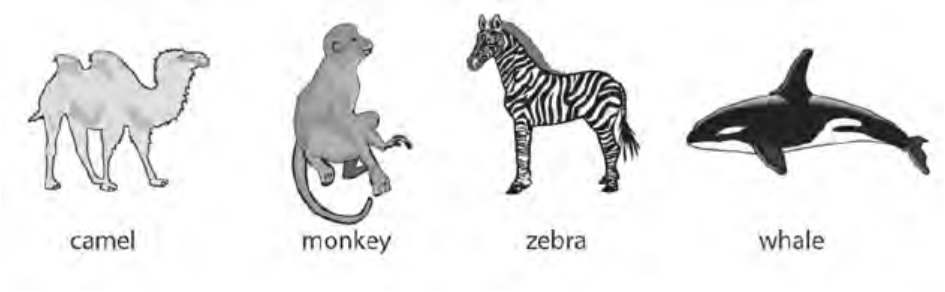
☐B They can see food more easily.

☐C They are protected from the weather.

☐D They can find each other more easily.

Test Book: **S2** | Item ID: **S2_11**

The pictures below show four animals.



In the table below, write the name of the animal beside the ecosystem in which it is most likely to be found.

Ecosystem	**Name of Animal**
Tropical rain forest	
Desert	
Ocean	
Grassland	

③

Motivation

The next questions are about your opinion on the learning activities over the last few weeks in Science. There are no right or wrong answers.

Please read each statement and then tick the box that best describes how true it is for you.

	1 not at all true	2	3	4 Somewhat true	5	6	7 Very true
I enjoyed these learning activities very much.	☐	☐	☐	☐	☐	☐	☐
I put a lot of effort into these learning activities.	☐	☐	☐	☐	☐	☐	☐
I think these learning activities are useful for my science skills.	☐	☐	☐	☐	☐	☐	☐
I think I am pretty good at these learning activities.	☐	☐	☐	☐	☐	☐	☐
I think these learning activities are important activities.	☐	☐	☐	☐	☐	☐	☐
I felt very tense while doing these learning activities.	☐	☐	☐	☐	☐	☐	☐
These learning activities were activities that I couldn't do very well.	☐	☐	☐	☐	☐	☐	☐
I didn't try very hard to do well at these learning activities.	☐	☐	☐	☐	☐	☐	☐
These learning activities were fun to do.	☐	☐	☐	☐	☐	☐	☐

It was important to me to do well at these learning activities.	☐	☐	☐	☐	☐	☐	☐
I did not feel nervous at all while doing these learning activities.	☐	☐	☐	☐	☐	☐	☐
I am satisfied with my performance at these learning activities.	☐	☐	☐	☐	☐	☐	☐
I think doing these learning activities could help me to improve my science skills.	☐	☐	☐	☐	☐	☐	☐
I thought these learning activities were boring activities.	☐	☐	☐	☐	☐	☐	☐
I was very relaxed in doing these learning activities.	☐	☐	☐	☐	☐	☐	☐

Thank you very much!

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