[PRE-KIT FOR EVALUATION]

[Deliverable 6.1]

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ER4STEM - EDUCATIONAL ROBOTICS FOR STEM

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DOCUMENT REVISION HISTORY

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1 EXECUTIVE SUMMARY

1.1 ROLE/PURPOSE/OBJECTIVE OF THE DELIVERABLE

This documents presents the development and contents of the pre-kit which acts as a prototype to pilot the evaluation tools and methods used in WP6 during year one of the project. It also provides an opportunity to collect base-line data on existing activities involving educational robotics within the consortium. The pre-kit represents the first stage in the development of an evaluation framework and tools for ER4STEM activities (O.6.1) and was completed through Task 6.1.

1.2 RELATIONSHIP TO OTHER ER4STEM DELIVERABLES

Technology specific questions identified by partners will be used to inform technical developments (WP5). Integrated into each workshop (WP2) and with adaptations into each conference (WP3), the pre-kit will be used to collect base-line data at each site. This data will be analysed (D.6.3) and used to inform the development of the ER4STEM framework (WP1) and design of best practice activity plans (WP4). Data management is set out in WP8 (D.8.1).

1.3 STRUCTURE OF THE DOCUMENT

This document begins by describing the development of the pre-kit before presenting the contents of the pre-kit. The contents of the pre-kit include data collection instruments, protocols, ethical approval and informed consent documents.

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2 PRE-KIT DEVELOPMENT

In order to design an evaluation framework and tools for ER4STEM activities in the first year of project, it was necessary to consider the methodological approaches taken in existing research in the area of educational robotics and the field of educational research more widely. These were considered with reference to the explicit objectives of the ER4STEM project and questions which had emerged from partners about their specific activities/technologies. The aim was to create a pre-kit which provided opportunities to collect sufficient data to begin to answer these questions, whilst not over-loading the activities that children/students would be engaged, so as not to detract from the purpose of these activities – educational robotics in STEM. Further requirements included the need to conduct rigorous data collection across different sites by different partners and in different languages.

These requirements were used to identify the most appropriate sources of data and the instruments that could be used. For most, multiple sources of data were identified and therefore the requirement to conduct rigorous research was balanced with the need to not overwhelm the ER4STEM activities with excessive data collection.

In tandem with the development of the pre-kit, the ethical issues associated with the project were considered. Permission to conduct the research was sought from appropriate institutions. Documents and procedures were drawn up to gain informed consent and issues around data protection were clarified for each member. Informed consent is an essential part of the data collection process and so is included in this deliverable.

Together with a protocol for administering the pre-kit, a draft version of the pre-kit was circulated to all project partners for feedback. Through this and subsequent meetings, the protocol, ethics documents and data collection instruments were discussed and refined.

2.1 LITERATURE REVIEW

While a review of the literature was not a stated objective of this deliverable, it was necessary to ensure that the evaluation methods were congruent with existing research in the field whilst also providing opportunities for new discoveries. As such the findings of the literature review which have significantly informed the design of the pre-kit are briefly summarised here:

Both quantitative and qualitative data are collected across studies in educational robotics. While qualitative data is collected in large scale studies (such as [1]), these studies often lack rigorous and systematic analysis of the data and can become anecdotal. There is little triangulation between data sources to increase reliability and validity of claims made. In smaller scale studies there is evidence of qualitative data analysis addressing this issue (such as [2]), and therefore one of the challenges of WP6 will be to undertake high-quality analysis of qualitative data at scale.

It is clear from the literature that while some studies aim to understand the learning process, others seek to identify positive learning outcomes or simply a positive user/learner experience with the technology/activity. As such the research questions are either broad and explorative (lending themselves to qualitative data), or narrow but lack depth (answered with quantitative data), which is a common trait of educational research of this type. As a result, while some studies are able to show

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a positive impact of the use of robotics on achievement (i.e. [3]), there is little or no consideration of how the robot or the design of the learning activity resulted in this impact, or how the results could be replicated in other settings. As a result, it is questionable as to what the findings presented in these studies can actually be attributed to. Those studies which attempt to address both the outcomes and how these outcomes are achieved are therefore more valuable to educators and researchers but require substantial data collection from both quantitative and qualitative sources. It is therefore essential that the evaluation pre-kit collects a range of data to explain why and how ER4STEM impacts on learning and provides the evidence that is missing from many studies.

Part of the review of the literature focused on the use of questionnaires to measure attitudes towards STEM. Several established questionnaires were reviewed to identify suitable questions to measure attitudes towards STEM subjects and careers. The Michigan Study of Adolescent and Adult Life Transitions (MSAALT) [4] was chosen as it is an established questionnaire which measures attitudes and perceptions and is used in other robotics in education studies which have focused on gender (e.g [5]). A modified version of the MSAALT was adapted and integrated into the pre-questionnaire.

As part of the review of questionnaires, the 'Draw-A-Scientist' test [6] was found to address some concerns that providing a list of 'known' stereotypes about scientists, engineers [7] and so on, directs participants to provide answers that the researchers have chosen, rather than allowing free expression and is therefore used in this study. More detail on the data collection approaches is provided in the sections which follow.

2.2 REQUIREMENTS

To evaluate ER4STEM in practice, it is necessary to develop a detailed understanding of the experience of learners and identify key factors for analysis: age, gender, culture and socio-economic status. The former primarily requires in-depth qualitative data, while the latter can be captured using easily administered questionnaires.

2.2.1 ER4STEM OBJECTIVES

The following questions are taken from the ER4STEM project objectives. Reformulating the tasks within objectives as research questions provided a mechanism through which the types of data which could be used to answer each question could be identified, these are listed under each question. Each set of questions is organised below according to the focus of the question: STEM, 21st Century skills, ER4STEM activities and Other.

- STEM
  - Do they learn basic scientific concepts?
    - Questionnaire
    - Observations
    - Interview
    - Reflection
  - Do the activities encourage interest in STEM education?
    - Questionnaire
    - Interview
    - Reflection
  - Do the activities encourage interest in STEM careers?

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        - Questionnaire
        - Interview
        - Reflection
    - Are girls interested in the STEM topics?
        - Interview
        - Reflection
        - Questionnaire
    - Are popular gender stereotypes about STEM held? Are they changed?
        - Interview
        - Questionnaire
    - Were those who were not interested in STEM inspired by their peers?
        - Reflection
        - Interview
        - Questionnaire
- 21st Century skills
    - Do girls engage with challenges or let boys 'take over'?
        - Observations
        - Reflections
        - Interviews
    - Did they participate in collaborative work?
        - Observations
        - Reflection
        - Interview
    - Do they have an opportunity to present their ideas and artefacts to each other as 'proper' scientists?
        - Lesson plan
        - Reflection
        - Interview
    - Do they develop 'soft-skills'?
        - Questionnaire
        - Reflection
        - Interview
    - Do they learn intra-relational (how well they know themselves) and interpersonal skills?
        - Questionnaire
        - Interview
        - Reflection
- ER4STEM activities
    - Are there multiple entry points facilitated through the ER4STEM framework?
        - Lesson Plan (intended outcomes)
    - Do the activities allow learners to connect robots to their personal interests?
        - Interview
        - Reflection
        - Lesson Plan
    - Do children share their ideas with/through these tangible artefacts?
        - Observations
        - Interview
    - Do the approaches/activities appeal to girls?

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        - Interview
        - Reflection
        - Questionnaire
    - Did children identify and define problems that influence their lives?
        - Lesson plan
        - Interview
        - Reflection
        - Questionnaire
- Other
    - Were they equipped with the necessary skills to solve problems?
        - Lesson plan
        - Interview
        - Reflection
        - Observation
    - How many children who participated in conferences and workshops?
        - WP2/workshop data
    - How many presented at conferences?
        - WP3/conference data
    - How satisfied were participants with the conference and workshops?
        - Questionnaire
        - Interview
        - Reflection
    - Number of children in the different age groups that reported increased interest in STEM.
        - Questionnaire
        - Interview
        - Reflection
    - The number of girls that reported increased interest in STEM
        - Questionnaire
        - Interview
        - Reflection
    - Number of children pursing STEM in 3rd level education
        - Questionnaire
        - Interview
    - Number of models built
        - Artefacts (photos/videos)
        - Workshop data
        - Observations

From these sub-categories it is clear to see that while questionnaires are particularly relevant to identifying attitudes towards STEM, qualitative data can provide additional depth. To find evidence of 21st Century skills and understand the workshops in action, a range of qualitative methods are needed and only a limited surface understanding can be acquired through questionnaires.

Additional questions identified by project partners which directly relate to the development of the framework and activity plans (WP1 and WP4) and the development of technologies (WP5) were also considered:

- Do robots support creative thinking?

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    - Artefacts
    - Observation
    - Reflection
- How does past experience affect their motivation?
    - Questionnaire
    - Observation
    - Interview
- How do combinations of experience and inexperience affect collaborative work and the way the child is inspired by their peers?
    - Questionnaire
    - Reflection
    - Observation
    - Interview
- What differences are there in the use of physical versus virtual robots and environments?
    - Observation
    - Interview
    - Reflection
    - Artefacts
    - Lesson plan

At this point in the project the repository has not been created and so is not included in the evaluation pre-kit. Similarly, as the virtual robot 'SLurtles' (WP5) have not yet been created it may not be possible to begin to answer this question with the pre-kit data. The ER4STEM framework is currently under development and is therefore not integrated into workshops, thus it is not evaluated with this pre-kit. These will be included in the final evaluation kit to be produced in D.6.2.

2.2.2 PRACTICAL CONSIDERATIONS

In order to be able to conduct rigorous data collection across different sites by different partners and in different languages the following requirements were identified:

- All materials for participants should, where possible, be relevant for all age groups.
- All partners need to collect the same data in the same way.
    - A clear evaluation protocol is required so those partners without previous experience of collecting data are able to do so to the same high standards.
- Limit the need for translation.
- Provide both paper and online versions of questionnaires.
    - A single CSV or Excel file should be generated for easy integration of paper-based and online data.
- Maximise opportunities for students to participate in ER4STEM activities.
    - Whilst acknowledging that evaluation data is essential to the project, it should not be detrimental to the learning activities.
- Limit duplication of effort between WP2, WP3 and WP4.
- Identify a secure file transfer and storage of data protocol (see D8.1)
- Qualitative data analysis needs to be possible at scale, across cases.
    - Therefore comparable data needs to be collected across sites.
- Quantitative data needs to provide sufficient fine-grained information to identify factors with which to analyse individual case studies to understand the process.

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2.3 EVALUATION APPROACH

The evaluation approach incorporates mixed-method, multiple case study approaches. Each implementation of an ER4STEM activity is considered a single case study. This provides an opportunity to analyse each implementation in sufficient depth to be able to identify examples of best practice which can be used to inform the development of WP1 and WP4, along with evidence of the process in which learners engage. Each single case study can form part of a multi-dimensional multiple case study, allowing analysis across or within countries, age groups, gender and other factors.

Following both best-practice in educational research and the requirements of the research, a mixed-method approach to data collection was most appropriate. This provides the opportunity to collect different types of data for different purposes, for example quantitative data collected through questionnaires can be quickly administered to every participant, while observation data provides an opportunity to examine in-depth the learning process of a few. Data is collected from both students and teacher/tutor/mentor/facilitator, to uncover different views on the same activity to reduce bias. Importantly the use of multiple data sources provides opportunities for validation through triangulation between sources, such as questionnaires, observations and interviews.

Within each case study, both quantitative and qualitative data are collected. In order to evaluate the learning activities at the heart of the ER4STEM project both qualitative and quantitative data are collected. Taking a mixed-methods approach, the relative speed at which quantitative data can be analysed provides an opportunity to use this data to focus the qualitative inquiry.

Based on the requirements of the research, it was necessary to identify data collection approaches which could be applied systematically across multiple research sites in multiple countries by both experienced and relatively inexperienced researchers. To support this a detailed research protocol was developed and agreed. It was also necessary to consider variations between countries on the types of data that could be collected, resulting in alternative data sources. Practicalities, such as the fact that the researcher could also be the lead teacher in workshops resulted in the prioritisation of different forms of data.

The pre-kit content is presented in detail in the following section. Here the rationale for each data collection instrument is presented. Questionnaires are used as the primary medium to collect quantitative data, whilst qualitative data is collected through multiple sources. If we are to understand why a particular activity is successful, we need to understand the experience of multiple learners. To do this data is collected from a variety of sources to increase validity.

Qualitative data need not be collected from all participants as it will be used to develop an in-depth understanding of the learning process. However, it will be important to collect qualitative data during every workshop to explore how and why the quantitative results occur for that case. They are also necessary to understand the differences between activities and technologies in each workshop.

The collection of data occurs at several different points throughout each workshop, whether held over several days or on a single day. It is important that data collection is rigorous and the process is detailed in the Evaluation Protocol.

The conferences use the same pre-kit in WP3. However the expectation is that students attending the conference will already have participated in the workshops and therefore already engaged with

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the data collection activities. Therefore a modified version of the pre-kit is used at conferences. This includes observations, interviews, planning and conference materials, reflection and artefacts of learning.

2.3.1 QUESTIONNAIRES

Pre- and post-workshop questionnaires are used to collect largely quantitative data. Questions are split into personal information (age, gender and school), past experience and existing attitudes to STEM subjects and careers. Existing attitudes to STEM subjects and careers are measured with a modified version of MSAALT [4], used in other studies to explore gendered attitudes towards STEM subjects and the impact of educational robotics activities on these attitudes (e.g. [5]).

The post-workshop questionnaire also includes questions about the activities to help us understand learners' experiences of the workshop as a whole, what participants feel they have learned and what their future intentions are.

Likert style questions are used where possible to reduce the time spent on completing the questionnaire during the workshops. This also reduces the need for translation of responses. However, each questionnaire includes an open question to capture some qualitative data from all participants.

However, without a lot of open questions in the questionnaires (and therefore a lot of translation work for partners and more time for students to complete) it is impossible to gain depth of understanding based on the answers to questionnaires. So while the questionnaires provide an opportunity to collect a lot of surface level data from a lot of students, we need observations and interviews to collect more in-depth data from a smaller number of students.

2.3.1 OBSERVATIONS

Observations allow the researcher an unbiased insight into the learning activity as it does not rely on either teacher or student self-report. Also, through the use of video, it provides the researcher a valuable insight into the learning context and activity without having to be present at every workshop. Therefore the pre-kit involves both the capture of video observations and a short observation protocol to be completed by those running the workshop.

However observational data can be difficult to record and reviewing a video only provides one angle on the action. Therefore blogs, mentioned below in 'artefacts of learning' are also trialled in the pre-kit as an alternative approach to capture the process.

2.3.1 INTERVIEWS

While observations allow the collection of unbiased data, it is not possible to ascribe reasons for actions. Therefore interviews provide an opportunity to understand the experience of participants and their reasons for particular actions [8]. It also provides a valuable opportunity to understand responses to the questionnaires and ask 'why?', which is time consuming in a questionnaire.

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2.3.1 DRAW A SCIENTIST

A questionnaire was considered in order to answer the question “Are popular gender stereotypes about STEM held?”. However reviewing the literature on stereotypical assumptions about people in STEM revealed the ‘Draw a Scientist’ activity [6]. This is a visual approach to data collection in which the student is asked to draw a scientist or a scientist at work.

It removes the difficulty of pre-identifying young people’s stereotypes for the pre-kit. However if common stereotypes are found to exist across ages, genders, socio-economic background and cultures through this activity, they can be used to develop a short questionnaire in the final evaluation kit.

Taking a visual approach to this data collection provides an opportunity to remove linguistic barriers to data collection and students’ expression of ideas. It is attractive to both young and older students and does not require reading or writing skills which are less developed in the younger age category.

2.3.1 PLANNING AND WORKSHOP MATERIALS

All planned lesson materials, for example documents created for WP2 and WP4 are used to understand the intended workshop activity. However each learning context and group of learners is unique. This data will be used to understand the initial intentions of the teacher/tutor/mentor/facilitator and compared with observational, interview and other data generated by learners. Other workshop data will include the composition of each group.

2.3.1 REFLECTION & ARTEFACTS OF LEARNING

Reflection is an important part of learning and provides a great opportunity for data collection. Reflection needs to be facilitated through questions and thus the reflection documents in the draft version of the pre-kit appeared as short questionnaires. However the reasonable concern of the over-use of questionnaires and distracting from learning activities was raised. As a result the reflection process for learners was modified into one of two activities: The first is a blog which acts as a reflection tool with specific question but also a living artefact of the learning process which learners are engaged in, created by the learners. The advantage of this approach is that this can be integrated as part of the ongoing workshop activities. However concerns were raised regarding the abilities of younger children to complete this and the time it would take. As the pre-kit is intended to pilot the evaluation methods, the decision was taken to offer the original reflection questionnaire as an alternative.

Reflection is also an important part of teaching [9]. Therefore the teachers/tutors/mentors/facilitators of the workshops are asked to regularly reflect (with the aid of a questionnaire) on the workshop as it is implemented. The purpose of this is two-fold: 1) To document changes to workshop plans and the reasons for these; and 2) To document the evolution of activity plans between workshops.

Additionally, within either the blog or separately, the artefacts of learning created through and as a result of the workshop need to be captured as evidence of engagement and the learning process.

2.4 ETHICS & DATA PROTECTION

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The design of the pre-kit was informed by ethical and data protection considerations in the member countries. The ethical guidelines of the British Educational Research Association provided the initial ethical underpinning of the research design. This was then reviewed in light of each member country's requirements. For example, while video recordings are acceptable in the UK, they cannot be made in Greek schools, yet observational notes can be taken. However these are time consuming and require a dedicated member of the team. Therefore blogs are trialled as an alternative means to uncover the actions and experiences of learners during the workshops.

Detailed information sheets and consent forms, detailing the workshop activities and purpose of the research were created for schools, parents and children. These detail how the data will be stored and used, referring to the Data Protection Act in each country. It is clear that participation in the research is voluntary and that participants or their parents have the right to withdraw at any point.

Clear protocols for the storage and sharing of data under the Data Protection Act of each country have been established. Each partner will anonymise and/or encrypt personal information before it is shared with the work package leader for analysis. More information on the data protection and storage can be found in D8.1.

As work package lead, Cardiff University provided ethical approval for the research to be undertaken by all partners.

3 PRE-KIT CONTENTS

3.1 EVALUATION PROTOCOL

This section presents the agreed evaluation protocol to be used in the pre-kit to be used in workshops, with modification as described above for conferences. This will be treated as a living document: As partners undertake workshops and conferences they will be asked to report on their experience of using the pre-kit and alternations will be made as required. This will be part of the development process for D.6.2.

The audience for the protocol are the members of ER4STEM.

3.1.1 BEFORE THE FIRST WORKSHOP SESSION:

Ethics:

- If conducted in a school, informed consent **must** be given by the school to carry out the research.
- Informed consent to collect and store data **must** be given by parents.
    - If a parent does not give consent, no data can be collected from their child.
    - There must be an opportunity for parents to ask questions about the research before giving consent – it may be helpful to hold a short meeting to brief parents.
- Informed consent to collect and store data **should** be given by students.
    - They need to be informed in an age appropriate manner and within schools, this may be facilitated by the class teacher.

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- There needs to be an opportunity for students to ask questions about the research before giving consent.
- Informed consent to collect and store data must be given by tutors (those running the workshop)
- All signed consent forms must be stored by the partner organisation.

Data Protection:

- Student's names should not be included in the raw data, where possible. For example, on a questionnaire.
- Each student should be randomly allocated a student number **before** the workshop and told to use this on the questionnaire and any other written material.
  - This must be recorded and held separately from the evaluation data according to the Data Protection Act in your country.
  - The 'Participant Key' Excel document is a proposed solution for storing the participant number and student name together. You will need this at various points throughout the project and it may be required in the future. **N.B.** You must adhere to your own country's Data Protection Laws in the storage of this data.
  - This must be held securely within the partner organisation and not shared with anyone outside the organisation.
  - N.B. It is up to individual partners to ensure that a returning student is given the **same** student number at every workshop that they attend. PRIA and TUW will need to find a mutually beneficial system, supported by the pre-questionnaire.

Data Collection:

- Draw a scientist at work:
  - Must be done before the first experience.
  - If in a school, this could be done in advance by the teacher in class.
  - These need to be digitised with names removed and student numbers added (see instructions at end).
- Complete the 'Workshop Information'
  - Some information may be unavailable, so please complete by end of first workshop session at the latest.
  - This will also be used in WP2

3.1.2 AT THE START OF THE FIRST WORKSHOP SESSION:

Data Protection:

- Give the students their student number. An easy solution to this is by providing the number at the top or on the back of name badges.

Preparation:

- Set up video/audio recording equipment.
  - Explain that video/audio recording equipment will be/is set up in the room.
  - You may ask for a volunteer group to be recorded during the sessions
    - This group could be shown how to use the recording equipment and empowered to act as researchers – moving video cameras to make sure important moments are captured, or turning off audio recorders when

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they don't want to be recorded (obviously encourage them to keep these on but equally we don't want to record personally sensitive information).
    - N.B. This should be the same group which participates in a group interview at the very end of the workshops.

Data Collection:

- Pre-questionnaire (online or papser copy):
    - This collects background information on each student and requires their student number.

3.1.3 DURING EVERY WORKSHOP SESSION:

Data Collection:

- Observations:
    - Monitor video/audio recording equipment.
    - Formal observations on the 'case study' group as possible.
        - Note when you make these observations (timestamp).
        - These include written notes and photographs.
    - Note your own thoughts/ideas throughout the sessions.
        - Written notes are easiest to keep but you could use an audio recorder.

3.1.4 AT THE END OF EVERY WORKSHOP SESSION:

Data Collection:

Tutor reflection:

- Complete online or on paper.
- This is a reflection on how the session went, possible changes for the following workshop and possible change for re-runs – including why.
- Be as honest as possible.

3.1.5 HALF-WAY THROUGH:

Data Collection:

- Artefacts of learning:
    - For EACH team collect:
        - Code
        - Images of robots (video if relevant)
        - Team reflection.
            - Each team writes a short team reflection on what they have done so far in the format of a blog post. See 'Artefacts of learning' document for examples.
            - The team's response should be discussed within the team (not a sub-set of the team) and should be as honest as possible.
    - Other Artefacts:

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- Plans/diagrams/notes/presentations and any other artefact (evidence of engagement/learning) should be recorded digitally.

3.1.6 AT THE END OF THE FINAL WORKSHOP SESSION:

Data Collection:

- Artefacts of learning
  - For EACH team collect:
    - Code
    - Images of robots
    - Team reflection (in blog as before)
- Small group interview.
  - This should be with the focus group and include a minimum of 2 students.
    - It could include two group of students
  - Other students can participate in separate small group interviews if there is interest/willingness and there are staff available.
  - The interviews may be conducted at the same time as students write their final blog post.
    - If this is not possible, in a classroom setting, each group 'interviews' another group. This should be audio recorded, transcribed and translated.
      - N.B. In this situation one interview MUST be led by the workshop lead.
  - All interviews should be audio recorded.
- Post-questionnaire
  - Online or on paper
- Final tutor reflection

3.1.7 AFTER EACH COMPLETED WORKSHOP:

Data Collection:

- Observations:
  - Use video and audio recordings to finalise own observation notes.

Preparing Data:

- Session information:
  - Workshop Information
  - Group information
  - Lesson Activity Plans (in English)
  - Teaching materials: Handouts, worksheets, presentations, videos or any other material created for the purposes of teaching (in English).
- Draw a scientist:
  - Blank out student names and add numbers where necessary.
- Observations:
  - Translate & anonymise observation notes
- Artefacts of learning:
  - Translate and anonymise.

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- Digitise any non-digital data (scan or take a high-quality photograph)
- Collate each group's work in a separate folder.
  - The folder should be labelled with the group's name

- Audio recordings of interviews:
  - Transcribe (using template) and translate into English.
  - Anonymise
- Paper-based questionnaires & tutor reflections:
  - Translate free-text responses.
  - Anonymise
  - Input all questionnaire responses in provided Excel files.
- Online questionnaires & tutor reflections:
  - Email Carina to inform her that the workshop has been completed.
  - She will return 3 Excel files of free-text responses which need to be translated.
  - Translate and update each Excel file.
  - Return to Carina.

Data Management:

- **All original files (including audio and video) must be kept by the partner who collected the data.**
- **File naming:**
  - For documents created by CU:
    - Organisation_6digitDateOf Workshop_OriginalFileName.doc
    - E.g. PRIA_160416_ObservationSchedule.doc
  - If multiple from the same organisation on the same date, add identifiers as appropriate to the data, i.e. TutorName or GroupName
    - E.g. TUW_250616_Lara_TutorReflection.doc
    - TUW_250616_Julian_TutorReflection.doc
  - If no CU template (typically for artefacts, audio and video), state the group name and data type:
    - E.g. AL_040216_RobotAdicts_AudioInterview
- **Zip all but audio and video recordings and email to Carina:**
  - **N.B. ONLY Anonymous data may be sent in this way. ANY data with personally identifying information in it (e.g. videos) must be encrypted – follow separate instructions below.**
- **Encrypt audio and video recordings and send to Carina.**
  - **N.B. Encryption keys must be kept private.**
  - ONLY audio recordings which have not be translated and transcribed need to be sent.

ALWAYS keep a secured copy of original files (until October 2023)

3.2 CHECKLIST

While the protocol provides a comprehensive description of the data collection process, a quick review checklist was created to increase rigor. The checklist combines the requirements of WP2 and WP6 to ensure that all information that is required for the success of the project is prepared, collected and stored in a systematic way and to reduce the duplication of effort.

Preparation for the workshop				
Task	**When**	**Notes**	**File /**	**WP**

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			Template	
Adapt/Distribute information about workshop/project	1 month before			General
Send consent form to parents	2 weeks before			WP 6
Send consent form to teachers/schools	2 weeks before			WP 6
Send consent form to students	2 weeks before	You may want to do this in school or ask the teacher to do it.		WP 6
Draw a scientist	1-2 weeks before	This can be done in class by the teacher before the workshop		WP 6
Get the list of students participating in workshop	1 week before	And confirm informed consent has been given.		General
Assign students to the code (anonymisation)	1 week before			WP6
Prepare badges for the students with the student code	1 week before			General
Prepare materials for workshop Presentations, Materials, Hardware, Software	2 weeks before			
Print or have link - Pre/Post Questionnaires - Interview Questions - Observation protocol - List of artefacts of learning to collect - including a plan for the blog/reflective writing. - Tutor Reflection	2-1 week before		Qualtrics or paper	WP 6
Fill in the Measurement Data				WP2
Change Log / Activity Plan?		Upload to TUV Server		WP2
On the workshop day				
Set up and explain video/audio equipment	-			WP 6
Give group names to every "team"	-			WP 6
Distribute the Pre-Questionnaire	-		Qualtrics or paper	WP 6
Student Observation (might require extra person)	-			WP 6
Complete workshop & group information	-			WP6
End of every workshop session				
Tutor Reflection	-			WP 6
Take Videos/Pictures of the	-			WP 6

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artefacts created				
Copy the code created				WP6
Half-way through				
Ask student to do the blog	-			WP6
End of final workshop				
Ask students to do the blog	-			WP 6
Small group interview with the group - Audio recorded	-			WP 6
Distribute the Post Questionnaire	-		Qualtrics or paper	WP 6
Take Videos/Pictures of the artefacts created	-			WP 6
Copy the code created				WP6
Tutor Reflection	-			WP 6
After the workshop				
Anonymise / Scan and Upload the "draw a scientist"	2 weeks after workshop			WP 6
Translate / Anonymise / upload paper-based Questionnaires (excel)	2 weeks after workshop		Excel files for pre- and post-	WP 6
Translate / upload paper-based tutor reflections	2 weeks after workshop			WP 6
Complete / translate / upload observation notes	2 weeks after workshop			WP 6
Transcribe / translate / upload in English the audio recordings	2 weeks after workshop		See Word doc for template	WP 6
Upload Artefacts of learning encrypting any sensitive record	2 weeks after workshop			WP 6
Translate / Anonymise / upload Blogs	2 weeks after workshop			General
Encrypt and upload sensitive audio/video	2 weeks after workshop			WP 6
Split meta data for workshop and evaluation	2 weeks after workshop			WP 2 / WP 6
Develop proposal for improvement of the workshop	2 weeks after workshop			WP 2

Table 1 WP2 and WP6 checklist for workshops

3.3 INFORMED CONSENT

Standard informed consent forms were created for each partner to translate and insert context specific information. Informed consent is requested from schools in which the research will take place, teachers (mentor/facilitator/tutor) involved in the delivery of the workshop, parents and children. Two versions of the child information sheet were created, with one designed for children over the age of 14 (the 3rd age group in the project). The assumption is taken that if information is

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delivered in an age appropriate way, with opportunities for questions to be asked, even very young children are able to decide whether they are willing to be included in research data or not. Only children who also have parental permission to participate are included in data collection.

Within the informed consent forms, there is an option to opt-out of video and audio recordings and the open data pilot, to address concerns which are anticipated. Below is an example of the parental information sheet and informed consent form:

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EDUCATIONAL ROBOTICS FOR STEM RESEARCH

INFORMATION FOR PARENTS

Researchers:

Prof. Markus Vincze (vincze@acin.tuwein.ac.at), Senior Research, Automation and Control Institute, Technical University of Vienna, Austria.

Dr Carina Girvan (girvanc@cardiff.ac.uk), Lecturer in Education, School of Social Sciences, Cardiff University, UK.

With: _____

This research is funded by the European Commission, EU Horizon 2020 (Project reference No. 665972)

Purpose of the research

The purpose of this research is to evaluate the use of robotics for science, technology, engineering and mathematics (also known as STEM) education. To do this we are running many robotics-based learning activities in both school and out-of-school settings across Europe with different age groups. To evaluate the activity your child is involved in, we need to understand their experience of the activities and what they have learnt from them. We also need to understand your child's level of interest in STEM subjects and careers. By the end of this research we will have developed a range of activities to be used by teachers across Europe to develop children's interest in STEM subjects and their curiosity about the natural, mechanical and digital world around them.

Your child's involvement

So that we can develop effective learning materials and understand students' developing ideas, knowledge and attitudes, we request your permission to collect data in the following ways:

- Questionnaires at the beginning and end of the lesson/series of workshops.
- Video/audio recording of the lesson/activity/workshop.
- Written researcher observations
- Copies of children's work.
    - Examples include photographs or videos of the robots that they have created, a written account of their experience or drawings.
- Audio recorded interviews in small groups.

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Involvement in the research is voluntary and you may withdraw your permission for your child to be involved in the research at any time without explanation, by contacting _____ or Dr Carina Girvan.

How we will store, protect and use your child's data

This research follows the guidelines set by the British Educational Research Association (BERA) and complies with the Data Protection Act in _____ This research has been reviewed and approved by the School of Social Sciences Ethics Committee at Cardiff University, UK.

- Any personally identifying information will be stored as encrypted files on password protected drives in accordance with the Data Protection Act in _____ .
- Data will be stored for no less than five years.
- All audio recorded data will be transcribed and anonymised.
- Names and any other personally identifying information will be removed from all other data.
- A randomly assigned participant number will be used to refer to your child and their school for the purposes of storing and analysing the data.
- Data will be shared with research partners working on the ER4STEM project, for the purpose of analysis. They will only have access to this data if they agree to the terms specified here.
- Anonymised data, such as quotes or images may be used in reports, publications, presentations and other research outputs.
- No images containing children's faces will be used in research outputs.
- A randomly assigned pseudonym will be used when quoting or referring to any data in presentations and publications.
- Both teachers and researchers will be working closely together throughout the project. If a child discloses any information which raises a child protection issue, this information will be passed on to the school and dealt with in accordance with their child-protection policy.

The project is part of an open access data initiative by the European Commission. This means that some anonymised data from the project will be made available to researchers outside the ER4STEM project. Here are some important points to note:

- Only fully anonymised data will be shared.
    - This means that it will not be possible to identify your child within the data.
- This will include questionnaire responses, written observations, images of objects created by children, documents created by children and transcripts of interviews with children.
- No video, audio or images of children will be included.
- Those researchers will only have access if they agree to the same terms specified in this form.
- You may choose to opt-out this part of the project separately.

Questions and withdrawal

If you have any questions about the research or wish to withdraw your consent, please feel free to contact _____, Dr Carina Girvan at Cardiff University (Email: girvanc@cardiff.ac.uk), _____ or any member of the research team. If you have more questions or concerns, please contact the Chair of the School of Social Sciences Ethics Committee, Prof Alan Felstead (alanfelstead@cardiff.ac.uk)

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EDUCATIONAL ROBOTICS FOR STEM RESEARCH

PARENTAL CONSENT

I, the undersigned, confirm that:

- I have read and understood the above information about the project.
- I have had an opportunity to ask questions about the study and my child's participation.
- I voluntarily agree to my child participating in the research project.
- I understand that I can withdraw at any time without giving reasons and that there will be no penalty for withdrawing.
- The collection, use and storage of all data has been explained to me.
- I understand that only anonymized, data will be used by researchers. I am aware that all names and other personally identifying information will be removed from the data.
- I understand that any personally identifying information, which is collected by the research team, will be stored according to the Data Protection Act. This includes video and audio recordings which will be kept on password protected drive stored in a locked place and will not be distributed to third parties.

❑ Please tick if **you do not want** audio or video recordings to be made of your child for the purpose of this research.

❑ Please tick if you want to **opt-out** of the open access data initiative by the European Commission.

Child:

_____ _____

Name of Child Child's School

Parent/Guardian:

_____ _____ _____

Name of Parent/Guardian Signature Date

To keep you informed about the project, please provide your email address:_____

Researcher:

_____ _____ _____

Name of Researcher Signature Date

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3.4 WORKSHOP INFORMATION

This is standard information that needs to be collected about every workshop and is classed as 'meta-data' in the checklist. While some of this data is required for WP2, the composition of groups is not and so is dealt with on a separate form. The meta-data form is presented below, followed by the data collected on group composition.

3.4.1 META-DATA

Partner:

Workshop Dates (to-from):

Number of sessions:

Location:

Lead by:

Other tutors/mentors:

Age of students:

Total number of students:

Male/Female numbers:

Group sizes:

Total number of groups:

How were the groups formed?

Why?

Robotics kit:

Programming languages:

Domain:

Aims of workshop:

Please include all relevant lesson materials (each session/lesson plan, handouts, etc) in the folder with this document.

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3.4.2 GROUP INFORMATION

In order to analyse qualitative data generated by groups and to track individual students anonymously to join questionnaire and qualitative data together within single case studies, information about the composition of each group is collected. The group name/number is listed for tracking purposes, followed by the student number and gender of each participant within the group. If there is a child who is not participating in data collection, the student number '000' is used. This ensures that no data from these children are mistakenly captured from qualitative sources and the composition of each group can be compared in the analysis.

3.5 DRAW A SCIENTIST

This task is modified based on critiques in the literature from simply 'draw a scientists' to 'draw a scientist at work'. To address concerns that this may appear to be 'childish' to older participants, there is the option to write a description or add text to the picture. To support the open response of participants, this task is presented on a single side of A4, with brief instructions and a blank box to fill.

3.6 QUESTIONNAIRES

The questionnaires are designed to collect data rapidly and systematically from a large number of students. To support the process Qualtrics is used to provide a web-based and mobile-compatible version of the questionnaire which is formatted to closely resemble the paper-based questionnaire. The advantage of the Qualtrics system is that the work-package leader was able to set up one form and copy it for each language that the workshops would take place in. Partners could then translate the questionnaire directly with no concerns about editing the underlying structure. Once the questionnaires have been completed, a CSV form can be generated and merged with questionnaires completed in other languages as they share the same structure. As there are some open questions, this also provides an easy way to identify and translate non-English submissions, for the purpose of analysis.

The school is used as a proxy for socio-economic status which is difficult to measure accurately without information about parental income. This would be an inappropriate question in this research and therefore a proxy for this information was chosen.

Below the paper-based versions of the questionnaire are presented, which are provided to each partners for translation in case of technical issues such as lack of internet access. In this case, partners are provided with an Excel file to complete with the questionnaire data from each workshop.

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3.6.1 PRE-QUESTIONNAIRE

We would like to find out some information about you.

Please take your time to answer these questions.

If you do not understand a question, please tell us.

You may skip any question you do not want to answer.

About You

What is your student number?

I am a: ☐ girl

☐ boy

How old are you?

What language(s) do you speak at home?

Which school do you go to?

When you finish school, what job would you like to do?

Have you ever created a robot before? Yes/No

If yes, where did you create it? ☐ At school ☐ At a club/workshop ☐ At Home

What did you do?

Have you ever done any programming before? Yes/No

If yes, where did you create it? ☐ At school ☐ At a club/workshop ☐ At Home

What did you do?

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How much do you agree or disagree with these statements?

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
I like using computers					
I know a lot about robots					
I learn best with other people					
I like science					
I like maths					
I like working on my own					

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
I like working in teams					
I like trying to solve difficult problems					
I need help solving problems					
I am good at solving problems					
I want to understand more about mechanical things					
I want to solve problems that can help people					

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
I prefer tasks that only have one correct answer					
I like to keep working on a project until it is perfect					
I like it when I can solve problems quickly					
I think it is important to learn about science					
I like learning about how things work					

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About School

What is your favourite subject in school?

Why?

Which subject do you like the least?

Why?

These questions are about maths.

How much do you agree or disagree with these statements?

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
In general I find maths easy					
Maths lessons are boring					
We have fun in maths lessons					
Maths is important for the job I want to do					
My teacher thinks I am good at maths					
I get good grades in maths					
Most of the students in my class are good at maths					
I have to work on my own in maths					
Maths is the most interesting subject in school					
Maths is important to learn					

Would you like to study maths when you are older?

☐ Yes ☐ No

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These questions are about science.

How much do you agree or disagree with these statements?

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Science is the most interesting subject in school					
In general I find science easy					
Science lessons are boring					
We have fun in science lessons					
Science is important for the job I want to do					
My teacher thinks I am good at science					
I have to work on my own in science					
I think science is difficult					
I get good grades in science					
Most of my friends are good at science					
Most of the students in my class are good at science					

Would you like to study science when you are older?

☐ Yes ☐ No

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3.6.2 POST-QUESTIONNAIRE

We would like to find out some information about you.

Please take your time to answer these questions.

If you do not understand a question, please tell us.

You may skip any question you do not want to answer.

About You:

What is your student number?

I am a: ☐ girl

☐ boy

How old are you?

Which school do you go to?

When you finish school, what job would you like to do?

About the activities:

The problems we had to solve were:

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Interesting					
Difficult					
Fun					

Working with robots was:

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Interesting					
Difficult					
Fun					

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Working in a team was:

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Interesting					
Difficult					
Fun					

Working with robots I have used my knowledge of… (please tick all that apply)

☐ Science

☐ Maths

☐ Technology

☐ Art

☐ How things work

Working with robots has helped me to learn more about… (please tick all that apply)

☐ Science

☐ Maths

☐ Technology

☐ Art

☐ How things work

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During the workshop…

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
I identified a problem to solve					
I worked on something that I was interested in					
I tried to solve an important problem					
I worked as part of a team					
I worked on my own					
I helped design a robot					
I helped create a robot					
I helped programme a robot					
I was able to choose what I wanted to do					
I feel that other people did not listen to me					
I did most of the work					
I was encouraged by my team					
I gave up too quickly					
I worked hard					
I was bored					
I helped someone					
I liked sharing what I had done with other people					

What have you learned today?

What have you learned about yourself?

What have you learned about working with other people?

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What have you learned about working with robots?

Now that you have completed the project, think carefully about the following statements and tick all the ones that describe how you feel:

- ☐ I would like to try to solve more challenges like this one
- ☐ I am now more interested in studying science
- ☐ I am now more interested in learning about how things work
- ☐ I think I am good at maths
- ☐ I think I am good at science
- ☐ I think I am good at working in a team
- ☐ I would like to build robots to solve problems in the future
- ☐ I would like to use robots to learn new things in the future
- ☐ I understand how important maths is
- ☐ I understand how important science is
- ☐ I would like to learn more about programming
- ☐ I understand how robots can be used to solve important problems
- ☐ I would like to do more activities like this one

If you are more than 14 years old:

- ☐ I wish I had chosen to learn more science and maths in school.

Overall I would give this workshop:

How many stars? 

Because:

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3.7 OBSERVATION PROTOCOL

To supplement the collection of observation data by video, and provide a necessary back-up, an observation protocol has been developed. Below is the protocol as given to colleagues, beginning with guidance and followed by the document to be completed:

3.7.1 GUIDANCE

We want to know how and why things are done in the particular ways that they are done. But most of these things are common and familiar to us and therefore go unnoticed. The purpose of this observation schedule is to help you look for and notice these things.

You will use and complete this observation schedule in two ways:

1. During the workshop sessions you are asked to look for particular types of events and note anything unexpected (as we often quickly forget these).
2. After the workshop review the video/audio recordings to add events and identify the timing of these events.

During the workshops you will make your recordings on an as-and-when basis, either using the form or a blank sheet of paper. You will also be busy working with students from various groups and may not have time to stop and note the time. This is why we also ask you to review the video and identify the moments that these occur.

For example you may have scribbled a note to say that 'expertise' was mentioned but not have noted the time. Just scan through the recording to find it and note the time. Or you may be aware that the group was dysfunctional in some way. Again, just scan through the recording to find the instance(s) of this.

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3.7.2 DOCUMENT TO BE COMPLETED

Organisation:

Completed by:

Date:

Note the time of each of the following:

Event	Time (on recording)								
Expertise/past experience is mentioned									
Gender is mentioned									
One or more students 'take-over'									
One or more students are not engaged									
One or more students teach another student									
Future plans are mentioned									

What did you notice that was unexpected/noteworthy?

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3.8 TUTOR REFLECTION

The purpose of this reflection is for the teacher/tutor/mentor/facilitator of the workshop to consider how each session has gone and why, as well as identify possible changes that could be made. This is an important log of decisions taken and serves multiple purposes: Development of workshops; data for WP2; and data for WP6. In WP6 it provides the analyst with a way to understand which decisions were taken and why, without having to interview tutors after every workshop. It provides the necessary detail for an outsider to understand how the workshop is run, beyond what is presented in the activity plan and provides a report on action from a specific view point which is unavailable in the observation data.

The tutor reflection has been created both online (using Qualtrics) and in hardcopy, which is reproduced below:

3.8.1 DOCUMENT

Before completing this questionnaire, please take a few minutes to think about today's session. What were the highs and what were the lows?

Organisation:

Date:

Session number (session x of y):

Tutor:

During today's session:

What percentage of your time do you think you spent:

- Teaching the whole class?
- Working with groups?
- Watching/monitoring the students work?
- Other? (please state below)

Were there any students/groups that didn't need any support?

- Yes/no
- Why do you think this was?

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Were there any students/groups that found the activity too difficult?

- Yes/no
- Why do you think this was?

Were there any students that did not engage with the project?

- Yes/no
- If yes -> How do you know this?

- Why do you think this was?

What was the most difficult thing to teach/support students with? Why?

What was the most successful part of today's session? Why?

What 3 things would change for next time?

1.

2.

3.

What have you learnt from today's session?

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3.9 ARTEFACTS OF LEARNING & STUDENT REFLECTION

3.9.1 PROTOCOL

In the **middle** and at the **end** of the full workshop, **collect code**, **pictures** of the robot (or video of the robot in action) and **textual narratives** from EACH team.

Textual Narratives

The textual narratives should be written by the children and could take a number of forms: a written report for other children on what they did and how; a blog post to share what they have done with others; an email to another class; any other ideas that you have.

There needs to be a purpose for the writing, so a class record of what we have done (on a closed VLE/LMS) or communicating with another class (in the same or another school) is valuable.

Template for mid-point:

Group name:

What is the challenge that you are working on?

What is your greatest achievement as a team so far? (this could be team work,

learning, creating, anything relevant to them)

How did you do this? (they could include pictures)

What next?

Template for end day:

Group name:

What have you created? (they could include pictures)

What was your biggest challenge/success?

How did you solve it?

What would you tell someone else who is going to do this project?

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PRIMARY SCHOOL OPTION

Depending on the school and age of the children, in primary schools the writing of a narrative may take too long or be impossible due to network restrictions. In this case you have the option to do EITHER blogs OR use the team reflection documents (below).

EXTRAS

Any other artefacts of the learning activity (children's drawings, powerpoint slides, notes), where possible, should be digitally recorded and the group identifier added to the digital file.

All of these are highly valuable, so please collect all that are available.

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TEAM REFLECTION

As a team, think about what you have done today and agree your answers to these questions.

Try to be as truthful as possible.

Group name:

How would you rate today's challenge out of 5?

- Interesting /5
- Challenging /5
- Fun /5
- Too difficult /5

What was the team's best achievement today?

Overall how would you rate your performance as a team out of 5?

List 3 things you have learned today:

List 3 things the team would like to develop/improve on:

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3.10 SMALL GROUP INTERVIEW

Small group interviews were chosen as the most suitable method to collect the views and opinions of participants to develop a deeper understand beyond the questionnaire data. Small groups are preferable to individual interviews when interviewing children, particularly when they have participated as a group as speaking to an adult (teacher or researcher) can be intimidating and limit the quantity and quality of data.

Options on how the interviews could be conducted, based on context, are presented in the evaluation protocol (section 3.1 above). The questions set out in the protocol below are flexible, they are designed to guide the conversation but not limit it. Split into four topics, which are to be discussed in turn for ease of analysis: Context; Activity; Learning; and Opinions. These cover the research questions and objectives of the ER4STEM project which are difficult to answer/achieve by quantitative data alone.

Below the interview protocol is presented, followed by the interview transcription template to maintain consistency:

3.10.1 INTERVIEW PROTOCOL

Guidelines:

- After asking a question, give the children time to think about their answer. Try not to fill the silence.
- Be responsive to what the children say. Ask 'why' and other follow-up questions if interesting and relevant.
- Questions can be rephrased and reordered but the topics should be covered in the order set out below: Context, activity, learning and opinions.
- It may not be relevant to ask every question.

For out-of school contexts ONLY

1. Why did you decide to take part in the workshop/competition? (did they choose or were they sent)

Context

1. Tell me about what you did.
2. Who did what?
3. Who decided what you would do (the problem to be solved and/or the organisation of the group)? / Who decided that you would do that?
4. Have you ever done anything like this before (robotics/programming/solving problems)?
5. Did you already know how to do some of this or was it all new?

Activity

1. What was the most challenging thing that you did?

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2. What was the most interesting thing that you did?
3. What would you change to make the activities/day/week/competition even better?

Learning

1. What have you learned? (STEM/robots/programming)
2. How did you learn? (working with others, through the robot, watching others, talking to others, listening to the teacher, etc)
3. What have you learned about yourself?
4. What did you already know that helped you today?

Opinions

1. Who do you think would be the best scientists/engineers?
    a. What are their skills/characteristics?
    b. **IF** gender is mentioned, **THEN** ask more about this using 'why' questions'. If no mention, do not ask.
2. Before this activity/workshop/competition were you interested in science/maths/technology/how things worked?
    a. Why/why not?
3. Has this workshop changed that view?
    a. Why?
4. Do you think working with robots will help other students to become interested in science/maths/technology/how things work?
    a. Why?

3.10.2 TRANSCRIPTION TEMPLATE

Date:

Partner Organisation:

Interviewer:

Participants: Here indicate which participant number each speaker is.

Transcript

Interviewer: Text goes here.

Child 1: Text goes here.

Child 2: Text goes here.

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Notes

Note	Example
Use left brackets to indicate the point at which speakers overlap.	I: so [how C2: [and I liked
Punctuation indicates pauses or intonation. Full stop long pause. Comma short pause. No other punctuation should be used.	What do you think?
Empty parenthesise indicate the transcriber's inability to hear what was said.	In science and () and at home
Use parenthesise to indicate words that the transcriber is uncertain about.	Were there (some) things you didn't like?

Table 2 Transcription template notes

3.11 DATA STORAGE

The pre-kit also includes information on the storage and protection of data (see 3.1). The protection of personally sensitive data is key and will be held by the partner who collected the data. Only anonymised files will be shared for the purpose of data analysis. Any potentially sensitive data which must be shared will be encrypted prior to sharing the data. Partners are responsible for protecting and backing-up the data that they store. More details on this are found in the data management plan in WP8.

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4 SUMMARY

This deliverable presents the background development and final pre-kit for the evaluation. The pre-kit includes the tools necessary to collect the required data, along with clear evaluation protocol and checklist to ensure rigour in data collection. The contents and procedures have been reviewed and agreed with all project partners. As the pre-kit is to be piloted in year 1 of the project, this is treated as a set of living documents which will be developed over time.

5 CONCLUSION / OUTLOOK

The next step is for the pre-kit to be used as part of the workshop activities in WP2 and conferences in WP3 during Year1. Data collected by partners will be shared with the WP leader once anonymised and fully processed for the purpose of analysis and evaluation of year 1 (D.6.3) to be used in WP1, WP2 and WP4. During this process feedback from partners will be recorded and used in the development of the final evaluation kit (D.6.2).

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6 GLOSSARY / ABBREVIATIONS

EC	European Commission
ER4STEM	Educational Robotics for STEM
REA	Research Executive Agency
STEM	Science, Technology, Engineering, and Mathematics

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