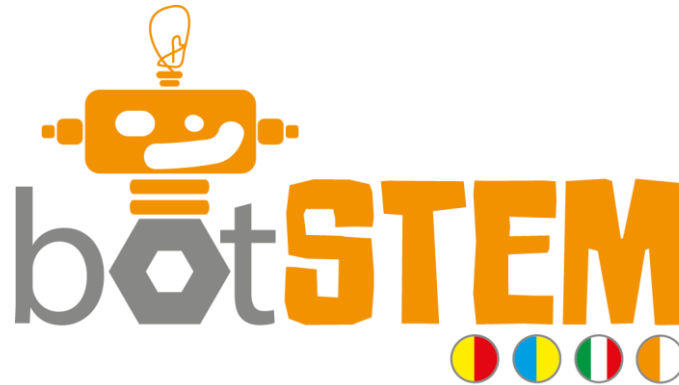




Project BOTSTEM

2017-1-ES01-KA201-038204



QUALITY MANAGEMENT EVALUATION

October 2020

Kveloce I+D+I (Senior Europa SL) – Valencia, España.

INTERNAL MANAGEMENT DOCUMENT



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Disclaimer

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List of Acronyms

DA n.n	Dissemination activity (number)
DM n.n	Dissemination material (number)
DoW	Document of Work
EC	European Commission
FM	Financial Manager
GA	General Assembly, Grant Agreement (depends on context)
MB	Management Board
Mnn	Project Month (number from 1 to 36)
IO _n	Intellectual Output (number)
IO _n An	Intellectual Output (number) Activity (number)
IO _L	Intellectual Output Leader
PC	Project Coordinator
PM	Project Manager
QA	Quality Assessment
QC	Quality Control
QM	Quality Management, Manager
QP	Quality Plan (document)

Y _n	Project Year (number from 1 to 3)
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1. INTRODUCTION TO THE BOTSTEM QUALITY PLAN

This deliverable describes the **Quality Plan and Evaluation** of the project BOTSTEM

In a highly specialized and technologized world, a critical and competent citizenship in science and technology is more needed than ever. STEM (Science, Technology, Engineering, and Mathematics) could be addressed since early childhood promoting an active and participative methodology, focused on inquiry-based learning and collaborative projects. Also, Educational Technology – such as robotics and code-learning - brings new opportunities for designing attractive approaches and tools to improve the engagement of kids, enhancing the academic outcomes in Science, Maths and Technology subjects and increase the scientific vocations.

Although STEM programmes increase rapidly, these are focused on high schools and after-school activities. While these approaches are being considered by policy makers, still remains a lack of research in this field and its adaptation to Childhood and Primary Education. These stages are a crucial period for enhancing future careers and changing the societal misconceptions and prejudices against science and technology.

The objective of BOTSTEM was to develop new tools by means of inquiry teaching, open robotics and code-learning for enhancing current didactics of STEM subjects. BOTSTEM is aimed and fully in-line with the formal education curricula and its purposes for childhood and primary schools.

Specifically, BOTSTEM aimed at 1) improving the acquisition and competencies and, thus, potential students' achievement in STEM, particularly in Natural Sciences and Maths, through innovative methodologies and resources, open source software/hardware, inquiry-based projects and code languages (IOs); 2) developing tools more appealing for pupils (educational games, open robots, playable code-learning and suitable methods for implementing them) ; 3) enhancing the quality and integration of Long-life training aimed at teachers through VLEs which allow a peer-learning more flexible and cost-effective; 5) optimising the public image and perception of Science and Technology, overcoming the prejudices that kids assume in their early childhood leading an early intervention in STEM integrated with a gender-based approach.

BOTSTEM consortium brings together a multidisciplinary team with a wide geographical coverage: Spain, Sweden, Italy and Cyprus, reflecting a wide variety of cultural backgrounds and formal education systems. It is comprised by

- University of Burgos (UBU) and Kristianstad University (HKR), both experts in Education, STEM and robotics
- EUROPOLE and Ideodromio (IDEO), non-profit organisations promoting the STEM education and Citizens' Science



- Adele Robots (ADL)¹, a highly-innovative SME working on social robots, artificial emotions and collaborative robotics
- K-Veloce (KVC), experts on Social Impact Assessment, gender and Dissemination strategy.

BOTSTEM, during the proposal stage, aimed to reach 14000 individuals during its lifecycle; 50000 at long-term. More than 1500 teachers, 600 researchers, 20 policy makers, 3000 families and more than 1500 children (4-8 years old)

The following Intellectual Outputs were produced, sustained by an intensive dissemination activity and designed through a systematic and participatory research. O1) Toolkit for early STEM education by means of robotics and coding; O2) Virtual Learning Environment (VLE) and Knowledge Transfer Platform (KTP) aimed at teachers on STEM subjects for childhood and primary education; O3) Guidelines for policy makers: How to encourage scientific and technological vocations since early childhood. Two events were organised: 1) Workshop on STEM Education, robotics and new technologies; 2) I Conference on Integrated STEM with Robotics and Code-Learning for Childhood Education.

This report is aimed to

- **explain** the general protocol for Quality Management conducted during the BOTSTEM project, including both the QA (Quality Assessment) framework and principles, and the QC (Quality Control) procedures and checkpoints for the BOTSTEM project as a whole
- **evaluate** the overall results in terms of quality for all IOs produced and the activities conducted during the execution of the project.

The target users of this document are the **project partners and the staff involved in the BOTSTEM project**, and specifically the bodies and teams involved in the project management:

- **Project Coordinator (UBU)**
- **Quality Manager (KVC)**
- **Dissemination & exploitation leader (POLO)**

Moreover, this document is addressed to the three main management bodies created under the project:

- The **Management Board**, henceforth MB, comprised by the project coordinator, quality manager, dissemination and exploitation leader and pilot phase coordinator
- The **General Assembly**, henceforth GA, comprised by the project coordinator and one person representing each partner
- the **Intellectual Output Leaders**, henceforth, IOL.

Under the QP, the following mechanisms were put in place, in order to ensure the quality of the project and its scientific and technical outputs:

- The PC and the IOLs will use the Quality Management processes and results to monitor the overall project management and to ensure the achievement of the milestones in accordance with the project timetable.

¹ ADL went to bankruptcy in the Year 2, being its tasks redistributed among partners.

- The GA and MB coordinated the cooperation among the partners and give feedback about the results generated in the project, reviewing the progress and results.
- The Quality Manager (KVC) overviewed all these processes, establishing the foundation for conducting the QM and the QA principles for determining the QC procedures and checkpoints.

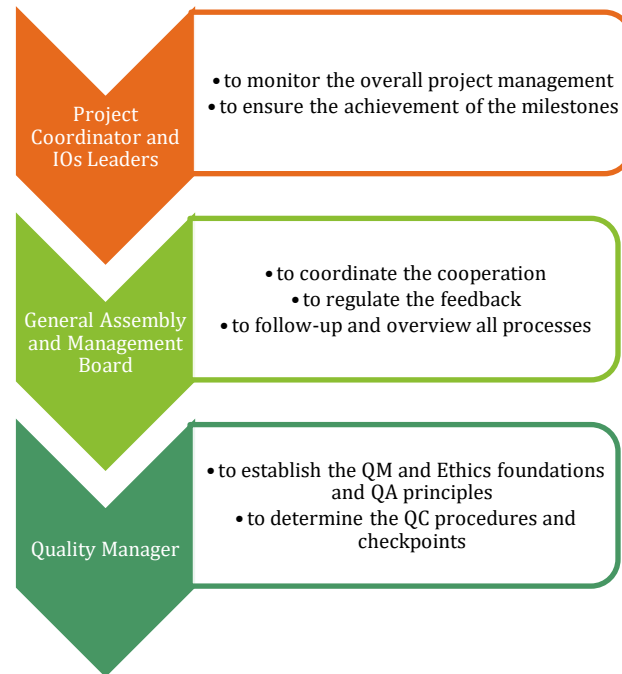


FIGURE 1 - ROLES AND RESPONSIBILITIES

The present report is addressed to the SEPIE (Servicio Español para la Internacionalización de la Educación) – the Spanish national agency for the E+ programme - and the European Commission, as the funding body of the Erasmus+ programme.



2. SCOPE AND OBJECTIVES OF THE QUALITY PLAN

The aim of the QP framework is to reflect the general protocol for Quality Management within the BOTSTEM project, that is, to define the conceptual and methodological framework to assess the quality within and project as well as the required procedures and checkpoints. In addition, the document includes the corrective measures to be implemented in a timely manner to avoid the decline in the quality of the project outcomes, such as resource allocation and the involvement of the partners in the project activities.

Therefore, the **general objective of the Quality Management** is the evaluation (that is, the comparison with standards and guidelines previously validated and recognised) to ensure that the project activities and the developed outputs are adequate with the objectives established and fulfil the quality requirements. The Quality Management includes both the Quality Assessment (QA) and the Quality Control (QC), which also includes the foresight of problems and the corrective actions to be adopted by the Consortium.

- QA defines how the project quality will be managed and includes methodologies, standards and guidelines and the organization structure. The QA framework is defined at the beginning of the project, before the execution of the project activities, in order to ensure that they accomplish the appropriate and established quality standards.
- QC refers to the execution of the procedures identified in QA. These activities include review of project deliverables, in order to verify if they comply with specifications and standards and meet the requirements set. This will be a continuous process, where the deliverables from tasks are examined in detail with particular emphasis on quality control checkpoints.

4.1.1 Key outputs

In the case of BOTSTEM, the key outputs to be considered within the QA and QC are:

The Intellectual Outputs:

- IO1. Toolkit for early STEM education by means of robotics and coding
- IO2. Virtual Learning Environment (VLE) and Knowledge Transfer Platform (KTP) aimed at teachers on STEM subjects for childhood and primary education
- IO3. Guidelines for policy makers: How to encourage scientific and technological vocations from early childhood
 - While, at the beginning, the IO3 was not funded, the extraordinary situation due to the COVID-19 changed to some extent the situation: 2 new materials were produced under the IO3. A guide for decision-makers and teachers and a guide for families were produced under the IO3 during the project extension.

The Multiplier Events organized for the dissemination of the project outputs

- E1. Workshop on STEM Education, robotics and new technologies
- E2. 1st Conference on Robotics and Code-Learning for Childhood Education (held online)

The Dissemination and Communication materials

3. QUALITY ASSESSMENT (QA)

The QA applies to the project outputs and deliverables, the Events organized within the project, as well as to the project as a whole.



The assessment of the quality evaluates the project outputs and events against specific quality criteria in order to ensure that the proper quality standards are met.

4.1. Technical reports: quality criteria

The quality standards used within the present evaluation framework are based on the United Nations Evaluation Group Standards for Evaluation in the UN System (UNEG Standards, 2005²).

The project will be evaluated against these standards and will be assessed as highly satisfactory when they are credible reports that address the project purpose and objectives based on evidence, and therefore can be used with confidence. That is to say, the project output will be evaluated as highly satisfactory when:

- it provides a clear and complete analysis of the object of the action
- based on evidence compiled and analysed in accordance with standards
- generating conclusions and recommendations deemed to be credible and thus a sound basis for decision-making

The present quality assessment will also determine, thus, whether the project allowed a clear and complete understanding and produced credible knowledge deemed to be a sound basis for decision making.

Accordingly, the **quality criteria** to evaluate the project outputs, adapted to the project environment, scope and goals, are as follows:

- 1) Well structured, logical and clear report
- 2) Clear and full description of the 'object' of the action
- 3) The action's purpose, objectives and scope are fully explained
- 4) Appropriate and sound methodology
- 5) Findings, conclusions, recommendations and lessons learned are based on evidence and sound analysis

Technical quality will be revised against the listed criteria by appointed partners, following the procedures specified in section QUALITY CONTROL (QC). A specific questionnaire was developed to facilitate the quality control of the project's outputs by the consortium partners (*Annex I. Quality of Reports*).

4.2 Scientific outputs: quality criteria

Furthermore, specific quality criteria are established for the assessment of the scientific outputs of the project. The scientific quality of the project outputs refers to the papers, posters and conferences that might arise from the project outcomes. It will be measured against:

- Scientific adequacy: comprises the credibility of the findings, the consistency with the project objectives and the alignment with the project scope.
- Rigour: relates to the validity of the obtained results and the consistency of the discussion, and the reliability of the conclusions.

² UNEG Standards for Evaluation are available at <http://www.unevaluation.org/document/download/2787>



Scientific Quality will be revised against the listed criteria by appointed partners, selected following the procedures specified in section QQUALITY CONTROL (QC). A specific questionnaire was developed to facilitate the quality control of articles, posters and conferences by the consortium partners (*Annex II. Evaluation of Scientific Outputs*)

4.3 Multiplier events and Transnational Meetings: quality criteria

Specific quality criteria for the Multiplier events and Transnational Meetings are:

- Provision of information to all participants
- Appropriateness of conferences and exposition
- Quality of the conferences from the point of view of the attendants
- Achievement of objectives in-line with the proposal
- Achievement of objectives from the point of view of the attendants
- Organisation of conferences and workshops
- Place and punctuality

Quality will be revised against the listed criteria by appointed partners, selected following the procedures specified in section QQUALITY CONTROL (QC). A specific questionnaire was developed to facilitate the quality control of multiplier events and transnational meetings (examples were updated to the platform of results), and it will be answered by the Partners (Internal Evaluation) and the attendants after their completion; the feedback will be considered for the organization of the following events or meetings.

4.4 Virtual Learning Environment (VLE): quality criteria

The Quality Control for the VLE (IO2) depended on the feedback obtained from end users in organized events, and consider the following indicators and characteristics, based on ISO/IEC 25010 and analysed by a simplified questionnaires.

- A **quality in use model** is composed of five characteristics that relate to the outcome of interaction when a product is used in a particular context of use. Characteristics are **effectiveness** (accuracy, completeness), **efficiency** (resources spent), **satisfaction** (usefulness, trust, pleasure, comfort), **freedom from risks** (economic, health and safety and environmental risk mitigation) and **context coverage** (completeness and flexibility)
- A **product quality** model composed of eight characteristics that relate to static properties of software and dynamic properties of the computer system. Characteristics are: **functional suitability** (functional completeness, correctness, appropriateness), **performance efficiency** (time-behaviour, resources utilisation, capacity), **compatibility** (co-existence and interoperability), **usability** (appropriate recognisability, learnability, operability, user error protection, user interface aesthetics, accessibility), **reliability** (maturity, availability, fault tolerance, recoverability), **security** (confidentiality, integrity, non-repudiation, accountability, authenticity), **maintainability** (modularity, reusability, analysability, modifiability, testability) and **portability** (adaptability, installability, replaceability)

4.5 Dissemination materials: quality criteria

For dissemination materials and activities, the Dissemination Manager (SM) will elaborate Style guidelines included in the Dissemination and Communication Plan to be followed by the entire consortium. These guidelines will also comprise the rules regarding European Commission statements and acknowledgements. **Annex IV.** Check-list for dissemination materials contains a



Checklist of Quality indicators that will be taken into account for all dissemination materials. All dissemination materials and activities will be recorded in the Dissemination reports.

4. QUALITY CONTROL (QC)

The Quality Control activities and methods are based on the principles explained in the QA section. These activities and tools may include the review of the project deliverables and reports, including QC procedures specifically planned for scientific production and QC for dissemination and communication materials and activities.

The Quality Control will be performed using an Internal Evaluation Approach (IEA), which defines a process performed by the institution or individuals being responsible of the activities under assessment. Internal evaluators (in this case, selected partners, if any) are distinct from external consultants, academic researchers, and funding agency administrators (i.e., SEPIE officers) in that (a) they are directly supervised by, and report to, individuals who are part of the internal management of the organization, and (b) they have ongoing responsibility for evaluation. This internal assessment results will support the project management decision-making process through Recommendations, serving the dual purpose of providing information and influencing behaviour.

The agents involved in the assessment process will be:

- The **Evaluation Group**, headed by UBU as Project Coordinator and KVC as Quality and Ethics Manager. The Evaluation Group oversees the assessment activities, comprising data collection and analysis and the elaboration of evaluation reports. All partners will collaborate in Quality Management, in the tasks required by the Evaluation Group.
- The **General Assembly**, consisting in one representative per partner, will suggest and support the corrective actions to be adopted in the QM processes, if any.
- The **Intellectual Output Leaders (IOLs)** will oversee the quality of the Intellectual Output they lead, prior to the delivery to the Evaluation group, and the engagement of the partners in the tasks in which they are involved (accomplishment of the tasks in time and due form).

Accordingly, the Quality Control will be performed through a peer review process prior to the release of each project output (Intellectual Outputs).

4.6 Quality control of activities and milestones accomplished

Within the BOTSTEM project, the Quality Manager has assumed the responsibility to evaluate the scope of the activities completed and if these contribute to achieve the milestones specified in the proposal, which are:

- Milestone 1 - Kick off meeting and general agreement on project management protocols and methods – Month 1
- Milestone 2 - Project Handbook - – Month 3
- Milestone 3- Project Website and Social Media channels – Month 3
- Milestone 4 - Best practices at European level compiled and revised - – Month6
- Milestone 5 - Collection of OERs and Learning resources - – Month 6
- Milestone 6 - O1 (Toolkit for early STEM education [...]) Delivered to the targeted public - – Month11
- Milestone 7 - VLE and KTP site: beta-version – Month 24



- Milestone 8 - Final version of VLE and KTP site (O2) – Month 36
- Milestone 9 - O3 (Guidelines for policy makers) published and promoted – Month 36

Overview and follow up of activities summaries key check-points although these could be modified and updated as the project progresses.

4.7 Quality control for technical outputs

The IOLs on a rotating basis will review and approve before dissemination the project outputs against the quality criteria and fill the referring Questionnaires (*Annex I. Quality of Reports*; also, *Annex III. KPIs for the VLE performance* for the O2). To this end, the Evaluation Group will receive from the responsible IOL the final draft of the Output three weeks before the due date for delivery and will forward it to the appointed IOLs for the quality control. Appointed IOLs will review the Output according to the Evaluation Questionnaire criteria and send back comments to the EG one week after. IOLs' comments will be forwarded to the Output's author(s) and taken into account in the final version of the Output. IOLs will be involved in the quality control of the Outputs on (a) a rotating basis and (b) based on their expertise.

As the project progresses and mitigation and enhancement measures emerge from the received feedback, the QC checkpoints, and the internal discussions among the partners, the principles which rule the QA approach explained above may change. Thus, as it has been previously explained, the present deliverable is a dynamic and practice-oriented document, which should be updated on demand depending on the necessities of the project.

4.8 Quality control of scientific outputs

The revision of the scientific outputs includes the journals, dissertations and posters derived from the participation of partners in congresses and conferences.

Articles and posters will be object of internal peer review. To this end, they will be shared with the whole consortium, at least 1 month prior to delivery. The corresponding or main author will communicate the upload to the Project Coordinator (UBU) and the Dissemination Leader (EUROPOLE). These will define the partner that will be in charge of the internal review, based on workload, expertise, and the non-involvement in the elaboration of the scientific production. The partner responsible for internal revision will give feedback at least one week before the final submission. Due to the due dates of congresses and scientific events, when this procedure cannot be achieved in proper time, the revision will be directly performed by the Project Coordinator and the Dissemination Manager. The Checklist for the revision of scientific outcomes is detailed in *Annex II. Evaluation of Scientific Outputs*

4.9 Quality control of multiplier events and transnational meetings

Multiplier events will be evaluated through satisfaction questionnaires. These questionnaires will be published online or printed – as the leader organisation prefers – and participants will fill in the form after the events. If the questionnaire is online, participants will complete the questionnaire 1 week after its finalisation.

It also applies to the transnational events, which are the transnational meetings held during the project among partners.



4.10 Quality control of the VLE (IO2) developed under the project

The *Annex III. KPIs for the VLE performance* is based on the indicators already detailed in the section on QA for software and online applications but adapted to the tool to be designed. However, it is expected to update and adapt the quality criteria for evaluating the tool as the project progresses in order to cover all these issues that the developers (Jointly HKR and IDEO) and the Quality Manager (KVC) considers measuring.

4.11 Quality control of dissemination materials

The *Annex IV. Check-list for dissemination materials* summarises a set of checklists for assessing the quality of the dissemination and communication materials produced, such as posters, leaflets or videos, among others.

Also, it includes key issues to be considered by all partners in order to accomplish the National Authority and the European Commission requirements as regards the acknowledgment and the dissemination of Erasmus+ Projects.

5. QUALITY EVALUATION

Feedback and corrective actions undertaken during the BOTSTEM execution

The quality evaluation was conducted as a process, iteratively, in close collaboration with the consortium. In case of deviations, delays, non-conformities, issues or problems identified by the quality managers, the project coordinator or any partners, or concerning issues arising during the project lifecycle, corrective actions were undertaken rapidly to ensure the proper compliance of the quality standards. These corrective actions included consensual changes to the action plan, the quality assurance framework, methodologies, standards or guidelines (preventive actions).

Specifically, bilateral meetings for solving doubts and issues were held, and issues during the QA evaluation were also raising during the periodic consortium meetings.

The Intellectual Outputs:

IO1. Toolkit for early STEM education by means of robotics and coding

The IO1 was materialised into the Toolkit document, translated into Spanish, Italian, Greek and Swedish and also openly available in English. The document meets all the quality criteria except for the acknowledgment of the funding programme, stated in an incorrect format: it was amended as soon as detected.

Question	Answer	Remarks
QR1. Is an executive summary included as part of the deliverable?	Y	
QR2. Does the executive summary contain all the necessary elements? Necessary elements include all of: overview of the purpose, objectives and scope of the deliverable; intended audience; methodology; most important findings, conclusions and main recommendations where applicable.	Y	
QR3. Can the executive summary stand alone? It includes the main elements of the deliverable and should not introduce new information or arguments.	Y	
QR4. Is the purpose of the deliverable clear? This includes why the reported action is needed at this time, who needs the information, what information is needed, how the information will be used.	Y	
QR5. Are the objectives and scope of the deliverable clear and realistic? This includes: Objectives should be clear and explain what the reported action is seeking to achieve; Scope should clearly describe and justify what the reported action will and will not cover.	Y	
QR6. Do the objectives and scope relate to the purpose? The reasons for holding the action at this time in the project cycle (purpose) should link logically with the specific objectives the action seeks to achieve and the boundaries chosen for the action (scope).	Y	
QR7. Does the deliverable specify the methodology used (data collection methods, analysis methods, sampling methods and benchmarks, or others)? This should include the rationale for selecting methods and their limitations based on commonly accepted best practice.	N/A	This item is not applicable
QR8. Does the deliverable specify data sources, the rationale for their selection, and their limitations? This should include a discussion of how the mix of data sources was used to obtain a diversity of perspectives, ensure accuracy and overcome data limits. If the action does not envisage collecting data, the answer should be N/A.	Y	
QR9. Are the levels and activities of stakeholder consultation described? The deliverable should include the rationale for selecting this level of participation. Please consider the soundness of the description and rationale for the degree of participation rather than the level of participation itself.	N/A	This item is not applicable. Stakeholders' consultation is not conducted at this stage.
QR10. Does the methodology answer the reported action questions in the context of the reported action?	Y	
QR11. Do the findings address all of the reported action's stated purpose and objectives? The findings should seek to systematically address all of the stated purpose and objectives according to the planned framework articulated in the deliverable.	Y	



QR12. Are gaps and limitations discussed? The findings may be inadequate to answer all the reported action questions as satisfactorily as intended, in this case the limitations should be clearly presented and discussed	N/A	This item is not applicable
QR13. Are unexpected findings discussed?	N/A	This item is not applicable
QR14. Do the conclusions present both the strengths and weaknesses of the results? Conclusions should give a balanced view of both the stronger aspects and weaker aspects of the results with reference to the purpose.	N/A	This item is not applicable

Please, note that some of the items contemplated in the template for evaluating reports are, in fact, addressed to evaluate more standard deliverables, so are not applicable to the present toolkit, aimed at education professionals or families rather than researchers or funding entities.

IO2. Virtual Learning Environment (VLE) and Knowledge Transfer Platform (KTP) aimed at teachers on STEM subjects for childhood and primary education

Based on constant feedback by partners and teachers, the VLE was continuously redesigned in order to become more flexible, easier to use by novice teachers and other interested parties. The initial version was based on the standard user interface of Moodle and it was populated with content by April the 1st, 2018. Based on the feedback we received by teachers and partners, the main content was placed in a Moodle 'Course' page. It was decided to present all content within a single 'page' of the same course, instead of multiple courses (ie one for Science, one for Technology etc) for two main reasons: first, all STEM subjects are or can be interrelated, therefore it was necessary to provide all information on a single page and second, it was decided that it was easier for teachers to navigate for the content within the same course instead of several different ones.

Nevertheless, a final evaluation of the IO2 was done by an online form. 14 persons responded, which supposed a barrier in regards evaluating the overall quality performance of the platform. However, similar issues were observed during these final evaluations and it may be attributable to the COVID19 crisis and its consequences: in fact, to move from the classroom to telematic education (which implies to face problems regarding to the use of ICT, digital gap and competencies, etc.) and to experience an increased workload might undermine the teachers' engagement in the BOTSTEM platform.

The questionnaire was formed by these questions, deliberately short and brief:

- Did you experience technical problems using the platform? (e.g., things do not work as expected, features are not working properly, etc.?)
- Please, would you mind to further explain the type of problem you experience within the platform?
- Do you have any condition relevant from the point of view of the accessibility? (e.g., disability, acute motor impairment, etc.?)
- If you have accessibility issues, did you find troubles or challenges interacting within the platform?
- Would you mind giving us more details?
- Please, rate your experiences in the courses by rating from 1 to 5 each one, being 1 "absolutely disagree" and 5 "absolutely agree"
 - The structure was clear enough from my point of view: it is easy to understand the utility of each feature, where things are within the courses, etc
 - I found the platform "self-explanatory" or intuitive: the navigation within the platform was natural, buttons and the use of the course, in general, were obvious
 - The information in the course is useful and valuable from my point of view

- Could you select the main advantages of taking these courses?
- Could you select the main disadvantages of these courses? Did you encounter problems in following the course?
- Please, specify which problems did you encounter
- What is the most useful feature of this course?
- Will you recommend the course to your colleagues? [Net Promoter Score]

Key insights obtained from this questionnaire are:

- Only 1 user experienced technical problems in the platform; specifically, he or she did not receive the confirmation email thus having problems for log-in.
- There was not any person with accessibility issues reported (e.g., motor or visual impairments)

Please, rate your experiences in the courses by rating from 1 to 5 each one, being 1 “absolutely disagree” and 5 “absolutely agree”

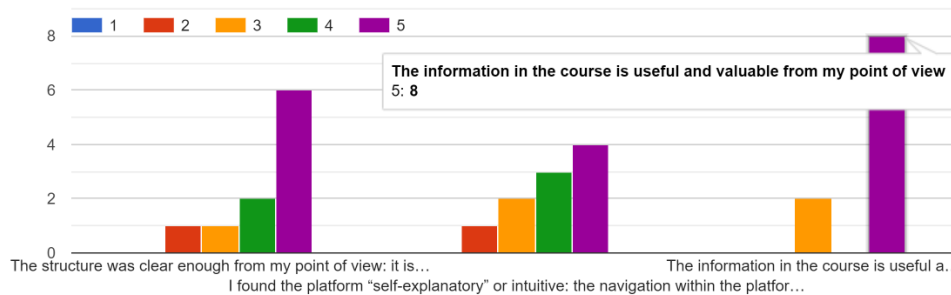


FIGURE 2 - USERS' EXPERIENCE

- It seems that users are mostly satisfied in their interaction, while problems in regards the structure and its clarity as well as the intuitiveness and self-explanatory nature of the navigation and interaction arose.
- Users value the practical and innovative nature of the platform while considering the time as the biggest barrier.
- Two users encountered problems in following the course in regards the accessibility from certain web-browsers, inaccessible links or web subpages, and structure of the site.
- The overall satisfaction of users was measured through the NEP (Net Promoter Score); NEP is a widely used tool in marketing and business: while these fields are far from the BOTSTEM project aims, the use of the NEP provide insight about
 - The willingness to widespread the project outputs and the VLE acting as multipliers
 - The long-term sustainability based on the users' satisfaction

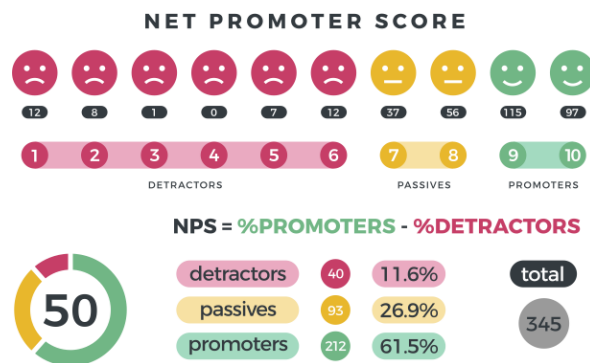


FIGURE 3 - NPS.

SOURCE: [HTTPS://WWW.YCOINBOUND.COM/BLOG/NET-PROMOTER-SCORE-O-NPS-QU%C3%A9-ES-Y-PARA-QU%C3%A9-SIRVE](https://www.ycoinbound.com/blog/net-promoter-score-o-nps-qu%C3%A9-es-y-para-qu%C3%A9-sirve)

- Specifically, the IO2 obtained a very positive NPS: 87 points

Will you recommend the course to your colleagues?

10 respuestas

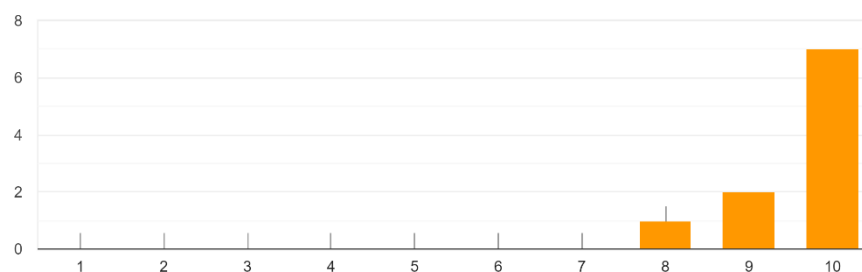


FIGURE 4 - NPS FOR THE BOTSTEM PROJECT

IO3. Guidelines for policy makers: How to encourage scientific and technological vocations from early childhood

- While, at the beginning, the IO3 was not funded, the extraordinary situation due to the COVID-19 changed to some extent the situation: new materials were produced under the IO3. A guide for families were produced under the IO3 during the project extension and its translations to the consortium's languages.

Multiplier Events

Two ME were organised: the first one in 2019 in Verona, face-to-face, and the Final Conference, in Burgos; reports and satisfaction questionnaires from participants were gathered and are attached to the technical report, as well as uploaded separately at the Erasmus Results Platform. Overall, no quality issues were observed and the participants' satisfaction was positively evaluated for both events.

The Dissemination and Communication materials

All dissemination materials and communication actions were jointly revised by the whole consortium and supervised by UBU and KVC as Quality Manager. All materials produced accomplishes the acknowledgment requisites as well as all items contemplated in the *Annex IV. Check-list for dissemination materials*.

Scientific dissemination and publications

The publications and scientific dissemination papers and conference proceeding were non-formally evaluated through two mechanisms:



- Peer-review process within the consortium considering the key indicators in Annex II but also the journals or conference objectives and scope
- Revision and feedback obtained during conferences

Overview and follow up of activities

The following section summarises the outcomes reflected in milestones, QM and KPIs used for assessing the quality.

Control of Milestones and QC checkpoints conducted:

Milestones	Due Date	Achieved?	QC conducted?	
Milestone 1	Kick off meeting and general agreement on project management protocols and methods	Month 1	Y	Y
Milestone 2	Project Handbook	Month 3	Y	Y
Milestone 3	Project Website and Social Media channels	Month 3	Y	Y
Milestone 4	Best practices at European level compiled and revised	Month6	Y	NA
Milestone 5	Collection of OERs and Learning resources	Month 6	Y	NA
Milestone 6	O1 (Toolkit for early STEM education [...]) Delivered to the targeted public	Month11	Y	Y
Milestone 7	VLE and KTP site: beta-version	Month 24	Y	Y
Milestone 8	Final version of VLE and KTP site (O2)	Month36	Y	Y
Milestone 9	O3 (Guidelines for policy makers) published and promoted	Month 36	Y	Y

- All project meetings (TPM) were followed by a satisfaction questionnaire; positive results are observed all along the satisfaction questionnaires, enclosed by the Project Coordinator in the periodic reports delivered.
- M3 is considered a dissemination material: the website accomplishes all the requirements stated in the Annex IV.
- M4 and M5 are process-related milestones, so QA was not formally conducted.

Quality of methodology at project level

Quality of Methodology - at Project Level	Validation	Date of validation	Comments	
QM1	The methodology for evaluating qualitative results is adequate and evidence-based	Y	1/2020	
QM2	There is enough resources for conducting the analysis foreseen in the proposal	Y	6/2020	COVID 19 supposed a challenge in regards recruiting and engaging the sample ³ .
QM3	The number of decision-making entities and policy-makers is relevant for the project aims and scope	Y	10/2020	
QM4	The dissemination and communication activity is conducted and reported following a comprehensive and consistent methodology or protocol	Y	10/2020	
QM6	The VLE pass the Quality Assurance from a technical point of view	Y	9/2020	

Quality of tasks accomplished

Quality control in accomplishing tasks	Validation	Date of validation	Comments	
AT1	A comparative research on STEM subjects and innovation in these fields across Europe has been carried out	Y	9/2018	
AT2	A comparison of European curricula and current adaptation to childhood education requirements has been conducted	Y		
AT3	Academic, sociocultural and socioeconomic barriers are being identified	Y		

³ Thus, an alternative plan were agreed by partners on June 2020. Due to the crisis, the analysis and activities expected could not be done as planned; partners agreed on evaluating the VLE through a online questionnaire and the interviews for the SIA, addressed to decision-makers, were done through an email interview obtaining highly valuable and conceptually rich feedback



AT4	Output O1 has been delivered and revised by the consortium and external experts.	Y		7/2020 – substantial improvements were added to the O1 ⁴
AT5	Output O1 has been disseminated among education professionals	Y		
AT6	Output O2 has been delivered and revised by the consortium and external experts.	Y	9/2020*	Included substantial improvements ⁵
AT7	The Statistical evaluation of the Virtual Learning Environment (VLE) participants has been performed	Y	10/2020	
AT8	The dissemination and networking activity during the project lifecycle is regularly analysed	Y	10/2020	
AT9	The exploitation plan (sustainability strategy after the project finalisation) have been delivered	Y	10/2020	
AT10	HKR defined KPIs for evaluating the quality of the VLE	Y	1/2019	
AT11	The evaluation and Quality Assessment of VLE and TKP based on Key Performance Indicators defined by HKR has been conducted	Y	6/2019-10/2020	
AT12	The VLE integrates well and fluently within the main BOTSTEM's website	Y	10/2020	
AT13	Output O3 has been delivered and revised	Y	10/2020	
AT14	Output O3 has been disseminated among decision-makers	Y		
AT15	the networking activity with education professionals and policy makers (O2) has been positively evaluated and all partners agreed on that.	Y	10/2020	
AT16	KPIs for evaluating the events performance has been defined	Y	3/2019	
AT17	The E1 has been evaluated; results are positive. The evaluation of the report is also available	Y	4/2019	
AT18	The E2 has been evaluated; results are positive. The evaluation of the report is also available	Y	10/2020	
AT19	The Literature review for defining the baseline conditions has been conducted	Y	6/2019	
AT20	The Indicators and variables for measuring the impact has been defined	Y	3/2018	
AT21	All tools for data collection have been developed	Y	6/2018	

⁴ Translated into portuguese; more activities were also added; a desk research of implementations and best practices improved the first version of the IO2 as well. Several workshops and webinars were held too.

⁵ Several improvements and performance modifications; games added; sustainability plan and post-project development foreseen in the O2 report.



Corrective actions for overcoming the COVID-19 situation at the project level

Although the COVID19 crisis supposed and supposes a challenge for all projects, including BOTSTEM, all partners have devoted important and critical efforts for finding new opportunities and improving the project outputs and results:

- The Toolkit in IO1 was translated in Portuguese: partners detected an opportunity in Brazilian research and educational community so, while the enrichment was not foreseen, the BOSTEM consortium added this new translation and, also, networking at international level for fostering the inquiry-based learning and early-STEM education also in LMIC (Low and Medium Income Countries).
- Research partners responsible for the implementation in Sweden and Spain conducted an in-depth revision of the implementation in both countries, leading to a precise and integrative evaluation of the process as a whole
- After Adele's situation (bankrupt), IDEO assisted by the consortium developed a game, aimed at teachers, about the scientific method, engineering design and programming. The game is aimed at students older than 7: it is in-line with the sustainability strategy, as long as the BOTSTEM project was initially addressed to childhood and early Primary Education (4-7 years old). The game covers more students than initially planned and supposes a great step beyond the initial plans.
- New activities were added as Addendum to the O1
- The recommendations for decision-makers were designed, edited and translated on time
- The recommendations for families and parents, not initially foreseen, was also designed, edited and translated.
- Webinars were held, aimed at teachers during the lockdown, organized by IDEO and EUROPOLE.

All these enrichment and additional activities supposed an extra hint of quality able to contribute to the long-term projection and sustainability of the project while ensuring the high quality of materials and resources delivered by the BOTSTEM consortium.



6. QUALITY CONTROL MECHANISMS, TOOLS AND CHECKPOINTS: ANNEXES

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Annex I. Quality of Reports

Answer: Y= Yes; N=No; NA= Not applicable

Question	Answer	Remarks
QR1. Is an executive summary included as part of the deliverable?		
QR2. Does the executive summary contain all the necessary elements? Necessary elements include all of: overview of the purpose, objectives and scope of the deliverable; intended audience; methodology; most important findings, conclusions and main recommendations where applicable.		
QR3. Can the executive summary stand alone? It includes the main elements of the deliverable and should not introduce new information or arguments.		
QR4. Is the purpose of the deliverable clear? This includes why the reported action is needed at this time, who needs the information, what information is needed, how the information will be used.		
QR5. Are the objectives and scope of the deliverable clear and realistic? This includes: Objectives should be clear and explain what the reported action is seeking to achieve; Scope should clearly describe and justify what the reported action will and will not cover.		
QR6. Do the objectives and scope relate to the purpose? The reasons for holding the action at this time in the project cycle (purpose) should link logically with the specific objectives the action seeks to achieve and the boundaries chosen for the action (scope).		
QR7. Does the deliverable specify the methodology used (data collection methods, analysis methods, sampling methods and benchmarks, or others)? This should include the rationale for selecting methods and their limitations based on commonly accepted best practice.		
QR8. Does the deliverable specify data sources, the rationale for their selection, and their limitations? This should include a discussion of how the mix of data sources was used to obtain a diversity of perspectives, ensure accuracy and overcome data limits. If the action does not envisage collecting data, the answer should be N/A.		
QR9. Are the levels and activities of stakeholder consultation described? The deliverable should include the rationale for selecting this level of participation. Please consider the soundness of the description and rationale for the degree of participation rather than the level of participation itself.		
QR10. Does the methodology answer the reported action questions in the context of the reported action?		
QR11. Do the findings address all of the reported action's stated purpose and objectives? The findings should seek to systematically address all of the stated purpose and objectives according to the planned framework articulated in the deliverable.		
QR12. Are gaps and limitations discussed? The findings may be inadequate to answer all the reported action questions as satisfactorily as intended, in this case the limitations should be clearly presented and discussed		
QR13. Are unexpected findings discussed?		
QR14. Do the conclusions present both the strengths and weaknesses of the results? Conclusions should give a balanced view of both the stronger aspects and weaker aspects of the results with reference to the purpose.		



Annex II. Evaluation of Scientific Outputs

Scientific Outputs could be alternatively evaluated using a third-party's instrument, such as CASP checklists or any other tool.

Answer: Y= Yes; N=No; NA= Not applicable

Question	Answer	Rationale
Thematic relevance, related to the journal or congress in which it will be published.		
High level of proficiency in the topic.		
Clarity of the exposition		
Originality and importance of the scientific output within the context of the research in this field and the state of the art.		
Consistency in the line of argument as regards the foundation of the key theoretical approaches.		
Robustness in the evidence selected and rigour in the revision of sources and cited references. References from recognised and specialised sources. Recent sources.		
Rigorous and sound methodology. Appropriateness and relevance of methods used.		
Correspondence between methodology and objectives.		
Correspondence between methodology and theoretical foundation.		
Correlation between the discussion and the conclusions		

Annex III. KPIs for the VLE performance

Dimension		Indicator		
VLE_KPI1	Usability	Design	Clarity of the structure	The structure is clear enough; users report punctuations over 4 (on a Likert-5 scale) in questions related to clarity
VLE_KPI2			Intuitiveness as regards navigating the tool	The navigation is intuitive; users report punctuations over 4 (on a Likert-5 scale) in questions related to intuitiveness
VLE_KPI3			User-friendliness of the search tool	Users report less than <20% problems using the VLE
VLE_KPI4				Only 10% of users or less have sent requests to the technical support as regards problems navigating the tool only attributable to intuitiveness
VLE_KPI5	Usefulness	Content	Value of the information	The information provided is considered valuable by the users, obtaining punctuations over 4 on a Likert-5 scale
VLE_KPI6			Usefulness of the information as regards their institution	The information provided is considered useful - from the point of view of its practical application - by the users, obtaining punctuations over 4 on a Likert-5 scale
VLE_KPI7			Accessibility of the tool in regards the W3C	The platform punctuates over 6 points in the examiner.ws or obtains a positive punctuation in any other alternative application (for instance, examiner.ws might be unavailable for the moodle if it requires a user and a password to work)
VLE_KPI8	Robustness	Functioning	Errors and problems navigating the tool	Only 10% of users or less have sent requests to the technical support as regards problems navigating the tool due to errors and problems only attributable to its technical development
VLE_KPI9			Observed bugs in-context	Bugs were detected on time and measures have been implemented to fix them in an adequate and cost-effective way, supposing a minimal deviation from the budget, expressed in working days



Annex IV. Check-list for dissemination materials

All materials designed should accomplish these required items:

Acknowledge and Project Reference (ALL)

- Branding: colours, fonts and margins.
- BOTSTEM Logo.
- SEPIE acknowledge
- E+ acknowledge
- Legibility (27", 21", 15",10", smartphones Android IOS, MacBook).

Size

- Margins and shadows allow visibility and facilitate readability.
- Orto-typography revised.
- Grammar revision completed.
- Check-list for pictures published on the internet, including also posters:
 - o Resolution: at least, 100ppt.
 - o Type PNG-24.

Check-list for printable materials (should be applied to posters presented to congresses and conferences)

- At least, 300ppt resolution.
- Profile: CMYK – FOGRA27⁶.
- Type TIFF, PSD, AI and/or PDF.
- Safe margin: 3mm (DIN A5, DIN A4) 5 mm (larger formats).
- Crop marks.

Check-list for videos

- EC Acknowledge and Project Reference.
- SEPIE acknowledge
- Branding: colours, fonts and margins (specially, when publishing on YouTube).
- BOTSTEM Logo.
- Orto typography revised.
- Grammar revision completed.

If the video includes subtitles or texts:

- Legibility (27", 21", 15",10", smartphone Android IOS, MacBook).
- Adequate size (check also EC acknowledge in low-resolution YouTube videos).
- Image, pictures and photos resolution (27", 21", 15", 10", smartphone Android IOS, MacBook).
- Audio quality, volume and background noises.
- Dropped frames revised.
- Orto typography revised.
- Grammar revision completed.

⁶ Standard