DALDIS

*D*igital *A*ssessment for *L*earning informed by *D*ata to motivate and *I*ncentivise *S*tudents

IO2: Adapted and Localised Technology Solution and UI

Technology Upgrade Specification

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Summary from Project Proposal Document:

- O2 will create the solution upgrades to the Study Quest assessment for learning software that are required to meet the specific needs of the DALDIS project.
- Stress testing of the solution will be carried out to support the 6 country trials and implementation of upgrades required.
- Specification and implementation of language support requirements will be carried out. Localisation of the user interface, including support for Danish, Polish, Greek and Turkish character sets.
- This activity begins with a requirements definition activity to identify the specific features and functionality required to support the specific needs of this project.

Summary:
The nine priority features reviewed at the June Training Briefing Meeting are outlined in the table on the next page.

Integrated Questions:
From IO1 and the pedagogy guidelines work the need for integrated question sets and multiple question types came through as our top priority upgrade. Our current question setting procedures are not robust enough to properly support the multiple question types proposed. Therefore a fairly significant upgrade is required to the CMS (content management system) and additionally development to support the integrated questioning outlined in this spec.

This is the critical path item for DALDIS and design and initial development of the CMS has been started and will be continued subject to the ratification of this spec version. Target for completion of the CMS upgrade is Dec 2020, with support for all question types to be ready for March 2021.

Additional DALDIS features:
Following the completion of the CMS upgrade the additional features will be completed during the 6 months from Jan through June 2021 including the language localisation required, web-pages, data features and app.

The gamification approach will be scoped and designed during the next 3-6 months and decisions made on the scope that is feasible within the time and budget of this project. A decision will also be made on the application of immersive or CLIL language learning methodologies.

Outline of priority features
Reviewed with partners at Training Briefing Meeting June 4 2020

Priorities:

Stress Testing

Develop & carry out stress-testing plan
Fix issues found

Language Support

Develop 5-language and non-Latin script support – English, Polish, Danish, Greek, Turkish

Navigation Translation

Translate all navigation text to 5 languages

CLIL (Immersive) Language Learning Support

Decide on approach and priority for CLIL language learning
Plan audio graphics for feedback, Identify other CLIL needs

Erasmus+ Specific Requirements

Significant upgrade to add extra question types and CMS to support integrated question sets
Identify and prioritise other proposals

5-Country Web Page set-up

Set up web sites for each country Study-Quest web location

Gamification features

Define phase incentivisation & gamification proposals

Additional data features

Define additional data features for teachers & students

Phone Apps

Android and iPhone (IOS) phone Apps in all 5 languages.

Definition of key terms:

CLIL: Content and language integrated learning is an approach for learning content through an additional language (foreign or second), thus teaching both the subject and the language.

CLOZE Test: A cloze test (often simply described as a fil the blank test) (also cloze deletion test or occlusion test) is an exercise, test, or assessment consisting of a portion of language with certain items, words, or signs removed (cloze text), where the participant is asked to replace the missing language item. Cloze tests require the ability to understand context and vocabulary in order to identify the correct language or part of speech that belongs in the deleted passages.

CMS: Content management System - in DALDIS this is the upgraded system being developed to allow our education content developers create and modify the question

EFL: English as a Foreign Language.

Gamification of Learning: The gamification of learning is an educational approach to motivate students to learn by using game elements in learning environments. The goal is to maximize enjoyment and engagement through capturing the interest of learners and inspiring them to continue learning. Gamification, broadly defined, is the process of defining the elements which comprise games that make those games fun and motivate players to continue playing, and using those same elements in a non-game context to influence behaviour. Gamification is the introduction of game elements in a non-game situation**.**

MCQ: Multiple Choice Question.

MFL: Modern Foreign Language learning and teaching.

MMCQ: Multiple correct answer MCQ questions (MMCQ) provide greater flexibility in questioning and developing higher order thinking. MCQ questions alone can encourage rapid student responses which militates against careful consideration of options.

STA: Short-text answer. An open ended answer to a question to help better seat a student's understanding of the concept being addressed. Generally requires a teacher to assess the relative correctness of the answer.

Stress Testing: A form of deliberately intense or thorough testing used to determine the stability of a given system, critical infrastructure or entity. It can also be described as load testing.

Stress Testing
Initial phase - Sept 2019 to May 2020:
An initial phase of stress testing was carried out starting in Sept 2019 with load testing, and with a Beta test period in schools from Jan to May 2020 where the Study-Quest platform successfully supported 1,200 users and 40,000 page impressions.

A report from these initial phases is included as an attachment to this document.

High Volume Phase: 10,000 to 20,000 users
A high volume stress test will be carried out in the period from April to July 2021, with issues found and fixed by July to support the 6-country school trials starting September 2021.

Language Support and Navigation Translation
By end of December 2020 both the DALDIS software UI and the CMS (content management system) will need to handle the setting questions and presenting questions to students in 5 languages with language and full script support including accents and special characters:
- UK English
- Polish
- Danish
- Greek
- Turkish

The CMS user interface may be only in English at this point. Our international question setters will be able to work in English, perhaps supported by a user guide translated by translators. This need will be fully validated based on the content plans from each country team - and a number will use the DALDIS solution for teaching and learning through English.

CLIL (Immersive) Language Learning Support
There is debate about where and when it is best to apply the traditional and structured method of MFL learning and teaching and the natural CLIL based approaches. This project will decide on a final approach over the summer and early autumn of 2020, and may trial both approaches in different settings.

The current Study-Quest solution is designed for students aged 10 to 15 in Years 4/5 to 9/10. For Natural CLIL learning techniques to be applied for younger students with lower literacy and reading skills new features would be required to support these learners.

In addition for all MFL students the use of audio files in question sets is highly desirable and is being considered. The approach for CLIL will be discussed at the September partner meeting.

Erasmus+ Specific Requirements

The pedagogy guidelines work in IO1 - and in particular the Science Learning and Teaching guidelines demonstrated a need for **integrated question types** using multiple question types for a single sub-topic, particularly to lead to higher order questions. The use of different question types in an integrated question set was demonstrated to reach Bloom level 2 and 3.

Summary of requirement:

To-date Study-Quest is built on multiple choice questions (MCQ) and True/False questions – with feedback for all correct and incorrect answers. In order to create less leading questions, move to assess higher order knowledge, more inquiry-based, and investigative approaches the pedagogy guidelines has shown us that a range of question types well known in research are required.

The use of fill the gap (CLOZE), short-text answers (STA), and matching (MATCH) question types in combination with MCQ in integrated questions allow for the development of more effective question sets. The use of these multiple question types in intelligent combinations enables the question setter to develop better questioning approaches that help build the concept knowledge and then assess for higher levels of understanding.

The key to effective question design is a clear definition of the target learning including process and generic skills and the learning outcomes desired. A process of "backward design" is then carried out by the question setter to design an integrated set of questions to achieve that objective. The pedagogy and subject guidelines provide materials and examples to describe this more fully.

A project has been started to enhance the Study-Quest CMS and range of question types so that these question types can be used in an integrated way. This is expected to be a 6-month project.

Single Upgrade Phase:

We propose all new question types need to come in a single upgrade phase planned between December 2020 and March 2021 - to avoid creating a content management problem. We will want all new content development and upgrades to be able to use all features to avoid a big content management challenge of continuous upgrades. If we decide to de-prioritise one question type we will take a very considered decision on how to phase in and manage content upgrades.

Alpha and early Beta versions may not bring all question types.

The target date for this upgrade is in Dec 2020 - with an initial version by end of Oct 2020 available to technicians and QA team at EdTech Ventures for testing and to support preparation for question setting training and support.

MCQ:
The MCQ as we use today is a very effective method, allowing us to ask detailed questions and give informative feedback.

MMCQ
Multiple correct answer MCQ questions (MMCQ) provide greater flexibility in questioning and developing higher order thinking. MCQ questions alone can encourage rapid student responses which militates against careful consideration of options. A variety of question types requiring different types of thought process and responses is desired. Currently we are achieving something similar by asking for the incorrect answer.

CLOZE (fill the gap) test:
CLOZE test will be a useful tool to give a summary and test the student's understanding of a topic. CLOZE tests can be more open-ended than MCQ if used without prompts. The issue of spell testing or prompting the student with the correct answer, or click and drag needs to be decided on to finalise the spec.

CLOZE tests present the challenge of recognising misspelling, typos, use of upper, lower or mixed-case and missed accents. The current proposal is to create a drop-down list of possible answers to address this problem. A large enough number of answers would be provided to make the questions more open-ended.

Consideration needs to be given to students with dyslexia or other reading and writing challenges which the drop-down approach addresses.
A decision needs to be made on whether a single or multiple attempts are allowed and how the correct answer is then displayed. Managed multiple attempts could promote more effective learning in the frame of formative assessment. Perhaps the default could be for multiple attempts but with an option for a single?

Short Text Answer:
STA will only be included in lessons assigned to a class by the teacher. All lessons remain available at all times. The teacher should have the capability to assign a question set to a class with a date of completion required. Ideally this assignment would

be done in a teacher dashboard and assignment would show up in the student dashboard - but feasibility of this needs to be evaluated?
STA covers two forms: a simple phrase or word but more importantly an open response of up to 4 or 5 sentences. Both could require teacher assessment but in different contexts. Longer STA type opens up higher levels of Bloom that are otherwise very difficult to reach through online questioning. Longer questions will increase workload for teachers using the solution – so this should be considered in the implementation and question setting.

The teacher has to opt in to assign STA to their students. Opt in will be done at question set level. Default should be to run the question set without STA so that unmarked STA answers do not accumulate. If the teacher opts out of STA, or if a student uses lessons without teacher assignment the STA are not shown to the student.

STA questions would generally be the last question on a topic but there could be several topics in a Q set (samples of integrated questions in PISA tests are available for reference) The student receives an instant result when they have finished the question set based on the other question types before the STA is corrected. Teacher gets 2 reminders/week for STA which expire after 2-3 weeks to avoid nuisance factor? Reminders are by class assignment, not for each student

> **Recommendation from pedagogy guidelines:** Instant feedback for a student in a question set is essential so this proposal makes sense. However, to promote formative assessment it will be necessary to engage teachers to use the facility formatively. Responses to STAs provide a useful vehicle for teachers to engage in that process.

As a contingency due to the potential complexity of the STA module - it may be possible to begin without the assignment and opt in capability - and to only use STA questions sparingly in a laboratory mode for the DALDIS project.

> **Recommendation from pedagogy guidelines:** DALDIS is founded on the use of formative assessment. Formative assessment is not the same as programmed learning and so will not be achieved solely through the provision of automated testing with differential hard wired feedback no matter how well designed.
>
> While integrated questions of the type described above are useful, approaching formative assessment without STAs (and so the possibility of more open student – teacher and student – student interaction based on student responses) would

be limiting. Well designed question sets could be used as catalysts to encourage teachers to develop more formative approaches in their work with student groups.

In the DALDIS project there should be an attempt to engage teachers with the formative use of the questioning facility in the real world of the classroom. That would require CPD of some kind since otherwise the traditional model will be unchanged and the question sets will be used in a traditional context. With CPD the opt in to use the STA would become more common.

A traditional teacher review of class results as seen for example in some classroom video from the ASSISTMENTS facility is not what is envisaged by formative assessment (nor by the ASSISTMENTS designers …).

STA covers two forms: a simple phrase or word but more importantly an open response of up to 4 or 5 sentences. Both could require teacher assessment but in different contexts.

MATCH questions:

A 'matching' capability is a useful tool especially to give a student a lot of information in a more interactive format. An example in science would be the functionality of different body systems matched with the appropriate body part or in french matching the pronouns with their conjugated verb. At this point we plan that only one attempt would be provided for this question type but this will be reviewed in the development process. This question type may not be as valuable in meeting the goal of higher order questioning so we may deprioritise.

Match can also accommodate ORDERING questions which can be very useful. Given the other requirements for different question types it is likely matching will be used to accommodate ordering questions e.g match a set of items to 1 2 3 4 ("order these") and so on.

CMS Upgrade:
A significant upgrade has begun to complete a form-based CMS. This will provide a much more efficient and user-friendly editing process and is required to support the integrated question types proposed. The CMS upgrade project will be managed as part of the integrated question type upgrade to be completed by December 2020.

The existing method is effective for single question types but cannot scale effectively to support integrated question setting for question setters other than very experienced technicians.

5-Country Web Page set-up
5 country pages need to be set up with unique Internet addresses in the same manner as www.JCQuest.ie to support the school evaluations in each country.

Gamification features
Additional gamification features are being designed to increase motivation and incentivisation for students to provide:
- Additional progression information
- Credit, merits or badging for achievement of different results
- Clear scoring for different attainments to effectively incentivise and reward students

Some form of student record of achievement based on milestones is proposed - with a visual record of progress and achievement that fulfils the research findings about clear progression, and provides students with increased motivation. A visual record is proposed rather than a numerical points system.
Comparison of students' performance and tables showing best or lowest performers can be damaging to motivation and self-esteem and will be avoided.

Detailed design for gamification features will be completed and reviewed and the feasibility of the proposals will be reviewed within the scope and timeline of this project.

The following is included in the Innovation section of the project proposal:
> Gamification for incentive and motivation: Gamification techniques for learning have been studied in the design of the assessment method. Question sets are designed to incentivise and motivate students to achieve levels, credits and progress against a scorecard. A credit system will be trialied and scoreboards will be evaluated to understand if these have positive or negative effects for students.

Additional data features
Define additional data features for teachers & students will be specified in the first quarter of 2021 based on the new question types and our experiences to that point.

Phone Apps

Android and iPhone (IOS) phone Apps are proposed as part of the project.
A plan will be made for simple phone apps which will provide phone users with a quick path to the Study-Quest solution with each of the 5 language implementations easily available from these Apps.

Attachment: Initial Results from Stress Testing April-May 2020

The Ireland version of the DALDIS Study Quest Platform at www.JCQuest.ie was launched as a Beta version to schools in January 2020

During the lockdown period due to the Covid-19 emergency from March to May 1,200 users accessed the platform. The chart below from Google Analytics shows strong usage during the Covid-19 lockdown before and after the Easter Break. There were a total of 40,136 page impressions recorded in the period from 1st March to 31st May 2020. The aggregate statistics are in the table on the next page showing positive durations and bounce-rates which demonstrates high quality usage of the question sets. The peaks were experienced from mid-March at the beginning of lockdown to the end of the school term at the end of May and fell off quickly due to the cancellation of national examinations and the resulting lack of exam-prep visitors.
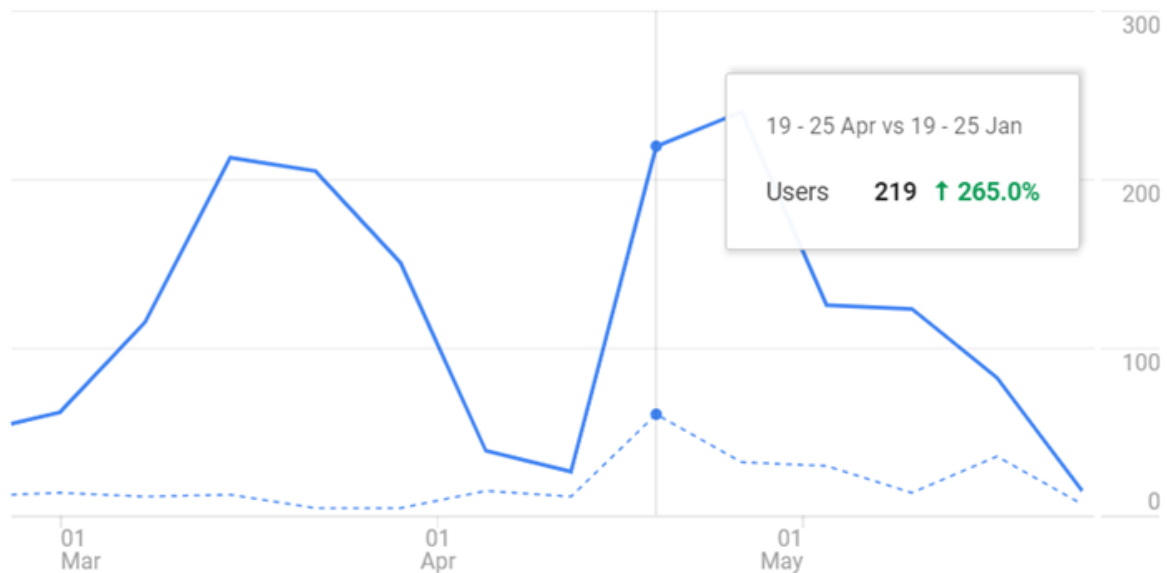
Aggregate Usage of JCQuest between 1 March 2020 and 31 May 2020

Page Title	Total Page Views	Unique Page Views	Avg. Time on Page	Entra nces	Bounce Rate	% Exit	Page Value
Average for all Pages	40,136	33,384	34.41 mins	3,154	34.37%	7.86%	0.00

The top 50 of a total of 174 page titles accessed are shown in the larger table on the next page. Page titles generally align with questions sets at the sub-topic level or key navigation or administration pages such as home, login etc. The science content was completed by March 2020 and directly introduced to teachers in ten schools. The French MFL content was only 50% complete and was not introduced to teachers until the end of April. However, take up of the French courses was very rapid with usage levels catching up to match science by the end of May.

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Page Title	Page Views	Unique Page Views	Avg. Time	Entrances	Bounce Rate
JCQuest: Cells and Living Things	2861	2504	29.94	71	52.11%
JCQuest	2804	1669	39.40	1126	19.01%
JCQuest: Nutrition and Well Being	2272	2127	24.82	35	60.00%
JCQuest: Syllabi	1852	1016	43.40	284	49.30%
JCQuest: Login	1703	1068	17.41	439	54.90%
JCQuest: Force and Work	1442	1190	61.88	123	45.53%
JCQuest: Solids, Liquids and Gases	1114	1033	34.03	70	30.00%
JCQuest: Your Homepage	1066	486	70.77	99	36.36%
JCQuest: Photosynthesis	1029	896	40.61	13	53.85%
JCQuest: The Microscope	936	830	31.23	19	47.37%
JCQuest: Variation and Reproduction	929	853	29.63	24	66.67%
JCQuest: The Circulatory System	869	751	33.04	33	30.30%
JCQuest: The Periodic Table	837	747	25.28	15	66.67%
JCQuest: The Reproductive System	774	734	24.55	5	80.00%
JCQuest: Origins of the Universe	757	659	82.42	124	40.32%
JCQuest: The Digestive System	711	661	34.53	14	71.43%
JCQuest: How Our Body Systems Interact	675	625	28.25	24	20.83%
JCQuest: Electricity	673	635	39.34	28	39.29%
JCQuest: Elements, Mixtures and Compounds	666	527	26.13	5	80.00%
JCQuest: Respiration	665	607	38.19	27	11.11%
JCQuest: Astronomy	601	574	37.79	15	26.67%
JCQuest: Au collège - Classroom Objects	601	552	27.66	10	70.00%
JCQuest: Acids and Bases	597	518	30.53	32	15.63%
JCQuest: Evolution and Natural Selection	547	487	28.12	14	35.71%
JCQuest: Separating Mixtures	535	490	35.46	23	52.17%
JCQuest: Your Dashboard	532	204	40.68	48	16.67%
JCQuest: The Atom	515	467	20.60	10	70.00%
JCQuest: Chez moi - Les adjectifs	506	492	30.15	4	25.00%
JCQuest: Energy	480	438	29.45	9	22.22%
JCQuest: The Respiratory System	473	436	32.69	7	28.57%
JCQuest: Cycles of Matter	468	448	26.17	14	14.29%
JCQuest: Au collège - Le présent	454	424	25.23	0	0.00%
JCQuest: Measuring Physical Quantities	450	431	24.89	4	25.00%
JCQuest: Chez moi - Tu habites où?	403	389	16.32	1	100.00%
JCQuest: Solutions and Crystallisation	379	351	34.83	13	38.46%
JCQuest: La rentrée - Classroom Objects	364	329	32.63	36	72.22%
JCQuest: Density and Floatation	343	302	32.18	15	20.00%
JCQuest: Motion	340	335	28.78	14	64.29%
JCQuest: Au collège - Je me présente	297	291	22.60	9	33.33%
JCQuest: Heat	272	264	22.01	7	85.71%
JCQuest: Cycles of Energy	248	237	31.43	4	25.00%
JCQuest: Les fêtes! - Vocabulary Set	233	231	22.25	3	66.67%
JCQuest: Chez moi - Le futur simple des verbes	222	219	25.20	4	75.00%
JCQuest: Classroom Progress	222	149	55.24	4	50.00%
JCQuest: Habitats	219	203	33.99	7	57.14%
JCQuest: Au collège - Le futur proche	206	201	39.32	8	62.50%
JCQuest: Metals and Non-Metals	204	195	28.11	2	50.00%
JCQuest: Chez moi - Les prépositions	196	193	19.04	0	0.00%
JCQuest: Chez moi - Vocabulaire de la maison	189	170	17.58	1	100.00%
JCQuest: The Sun-Earth-Moon Model	189	172	45.76	16	37.50%
JCQuest: Les fêtes! - Le Passé Composé	179	177	25.56	0	0.00%