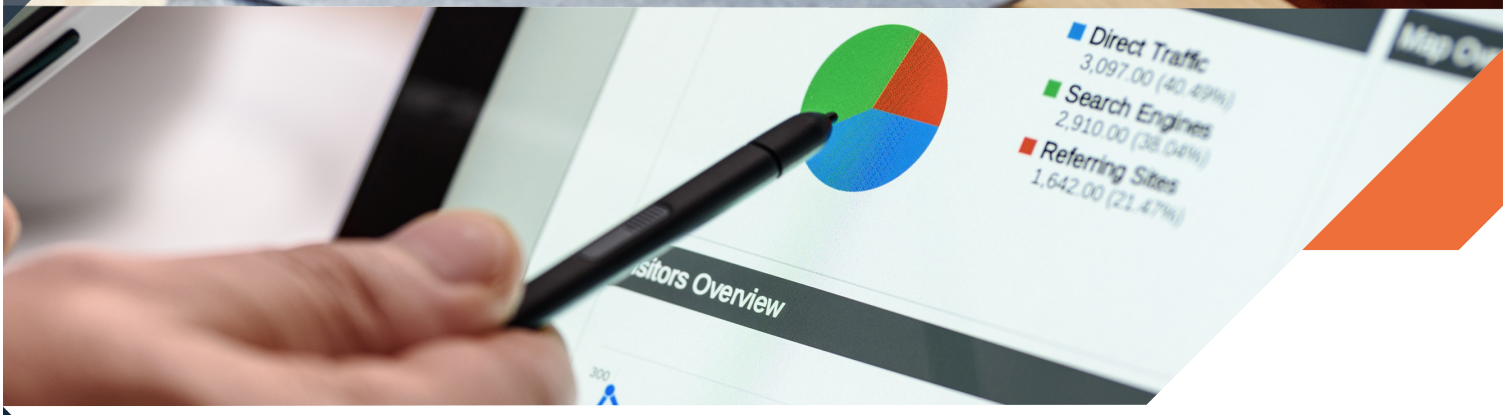
DALDIS

Digital Assessment for Learning informed by Data to motivate and Incentivise Students



DALDIS

POLAND RESEARCH CASE STUDY

Digital Assessment for Learning informed by Data to motivate and incentivise students

2019-1-IE01-KA201-051567

DALDIS Poland Case Study (2022)

Lead Authors: Dr Galanciak, S., Weiss, A. & Prof. Judge, M.

Maria Grzegorzewska University

Dublin City University (DCU)

Additional Contributors

Mr. P. Hamilton (Ed Tech Ventures Ltd.)

Mr D. McSweeney (DCU)

Prof. K. Koutsopoulos (Eurogeo)

Erasmus+

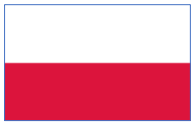


Table of Contents

Table of Contents 4
Executive Summary 6
The DALDIS Project Overview 10
Overview of Polish Education System and the DALDIS Project Schools 13
Introduction 13
Poland's Education System 13
Implementation Timeline 15
Participating Schools 16
DALDIS/JCQuest Curriculum Subjects 17
A Systems Data Perspective on the Implementation of DALDIS/JCQuest in Polish Schools 20
Devices and Operating Systems 21
Students and their Perspective on the Implementation of DALDIS/JCQuest in Polish Schools 27
Introduction 27
Key Demographic and Subject Data 28
School and Home Usage 31
System Usability, Design and Suggestions for Improvement 33
Feedback, Preferred Question Type and other Learning Aids 35
Contribution to Learning and Continuing Use of DALDIS/JCQuest 40
Teachers and their Perspective on the Implementation of DALDIS/JCQuest in Polish Schools 49
Introduction 49
Key Demographic and Subject Data 50
Technology Infrastructure and Usage 51
General Approaches of Respondents to Assessment 57
Experience with using DALDIS/JCQuest 63

Erasmus+

Discussion – Conclusions and Recommendations 75

Summary 79

References 80

Erasmus+

Executive Summary

The DALDIS/JCQuest project, involving eight partners from seven European countries, aimed to explore the potential of digital technologies for formative assessment. The application, which was developed and tested as part of the project supports learning subjects in Science and Modern Foreign Language (MFL), which for most partners meant English language learning (EFL). It has been adapted to the national core curricula, with the aim of providing feedback to students on their progress and help them understand their mistakes while also helping the teacher to analyse students' needs and preferences, as well as personalising learning. The key feature of the tool is the design of precise feedback for the tasks faced by the student.

This summary concerns the results of research on the application with Polish users conducted by the Maria Grzegorzewska University in Warsaw in conjunction with Dublin City University regarding the use of the DALDIS/JCQuest system in four Polish schools.

During the pilot testing of the project which ran from March to November 2022 in Poland, 646 students used the application, completing a total of 1,256 sessions using DALDIS/JCQuest. As part of the curriculum development process, Polish teachers created 71 sets of questions covering topics from the curriculum for five subjects - chemistry, physics, biology, geography and English (grammar and vocabulary separately). At the end of the project, participants using the application were invited to participate in quantitative and qualitative research evaluating DALDIS/JCQuest as a teaching aid, as well as examining attitudes towards the use of new technologies in school and the effectiveness of formative assessment as a form of feedback to students.

Both students and teachers rated the DALDIS/JCQuest application very positively. They pointed out its strengths as well as elements that need improvement (mainly technical details) and submitted ideas for further development of the application. Research conducted as part of the project also allowed the researchers to collect respondents' opinions on the usefulness of digital tools in school education and formative assessment in teaching and learning.

The students, who completed the survey and later took part in the focus group studies, attended the sixth, seventh and eighth grades. Most of them used DALDIS/JCQuest for learning English, physics

Erasmus+

and chemistry. An interesting attempt to use the resource was undertaken by one of the physics teachers, who, at the end of the school year, started using the DALDIS/JCQuest set for physics with sixth-grade students, who, according to the curriculum, were not due to start learning this subject until after the summer holidays. This proved effective and demonstrated that DALDIS/JCQuest is also suitable for introducing completely new material in the classroom as well as facilitating ongoing subject knowledge consolidation and assessment.

Most students used the application at school under the supervision of a teacher. In the case of 27% of respondents, the use of DALDIS/JCQuest was related to exam preparation. This finding was also confirmed by research conducted among teachers. The subsequent highest usage was every two weeks and once a semester. The latter case probably mainly concerned students who joined the project just before the end of the school year, where teachers did not have time to work with them on the application for too long.

In general Polish teachers mainly used the application in school with their students. This could be because schools participating in the project are relatively well equipped with computer equipment and willingly use technology to support learning. At home, some students would probably have to use mobile phones which due to the small screen real-estate, are not as conducive for learning. On the other hand, tablets or desktop computers were available at school.

Most (84%) of the students considered that one of the most significant advantages of the DALDIS/JCQuest application is its ease of use. At the same time, 85% declared that they liked working with the application, 75% felt that it helped them learn, and 38% became more interested in the subject as a result of using it. These findings were also confirmed by the statements of students participating in focus groups. The system was considered intuitive and easy to learn, although observant users also pointed out some technical shortcomings that could make using the application challenging at times. DALDIS/JCQuest was assessed similarly by the teachers in the survey questions (8 out of 9 respondents found the application easy to use) and in interviews, in which they talked about the intuitiveness of use. Nevertheless, some of them emphasised that full intuitiveness takes place primarily on the student's section of the app, meaning that a less tech-savy teacher may encounter some difficulties in the initial use of the system.

Nearly 40% of students rated the multiple-correct questions in DALDIS/JCQuest as their favourite type question. At 26% single-choice questions with feedback (26.5%), was their second favoured type. However, a slightly different picture emerges from the analysis of focus group research results. There participants often pointed to tasks consisting of filling gaps in the text, usually assessed as more complex. It is difficult to indicate confidently the reason for this discrepancy. However, one possible explanation is that students participating in focus groups were more involved in learning and interested in the project.

The majority of students (57%) rated the feedback questions positively and very positively, but their motivations varied. Some of the respondents appreciated the opportunity to find out what their mistake was and how to change their way of thinking to solve the task, while others believed that these types of questions are preferred because they are simple and do not require much work. For some students they were insufficiently challenging, bringing fewer benefits than questions that required more intellectual effort (gaps, categorisation). Some students completely ignored the feedback given to their responses and either did not pay any attention to it or skipped reading it. These findings suggest that when using applications of this type, teachers need to place more emphasis on making students aware of what feedback is for and that it should not be ignored but read and understood carefully.

Almost all of the teachers highlighted the value of feedback contained in the DALDIS/JCQuest question sets. They emphasised its importance in the survey, in open questions, and in interviews, where they indicated it as a critical element of the application that distinguished it from other teaching resources of this type.

In general, students appreciated the help of the application in the learning process. As many as 75% of students unequivocally assessed that it was supportive or very supportive in learning, with only 7% responding negatively and a relatively small group hesitating. Respondents emphasised the advantages of using digital learning aids, claiming that learning with the application is easier and more pleasant than learning from a textbook, it has an element of fun, it is dynamic and therefore does not get boring as quickly as arduous learning from a book. In addition, they assessed that they liked the subjects they used DALDIS/JCQuest on more and that using the application motivated them to learn.

Similar reflections were made by teachers, who found the resource facilitated more independent learning, made learning more enjoyable learning, and - thanks to feedback – helped students understand their mistakes. They also pointed to the benefits of using DALDIS/JCQuest for their own teaching practice. The app allowed them to save time that otherwise would have to be spent providing students with detailed feedback on individual tasks. Therefore, according to the study participants, the project may lead to more use of formative assessment, a technique usually associated with consuming excessive time. However, most of them did not need to be encouraged to do so, as they already had experience with this assessment method before joining the project or at least were beginning to apply elements of it.

About 70% of the surveyed students declared their willingness to continue learning with the application, and 60% would like to see its use extended to all subjects. When asked about the most significant advantages of DALDIS/JCQuest, focus groups participants stressed in particular: the importance of feedback, the ability to attempt the task several times, efficiency and ease of use, and the variety of content offered. All teachers participating in the survey and interviews also expressed their willingness to continue working with DALDIS/JCQuest.

Among the students, there were many ideas for improving DALDIS/JCQuest, ranging from removing specific faults and technical inconveniences to improving graphics, adding sound effects and music, personalising the user's desktop, adding space for notes or introducing a rule for the functionality of all images (not posting images for illustrative purposes only).

Just like students, teachers also submitted their ideas to enhance the application. The most interesting ones included: adding a sound layer and using artificial intelligence, especially useful in language learning, expanding the offer with additional tasks for volunteers or adding new types of questions.

In summary, it can be observed that DALDIS/JCQUEST was favourably rated by students and teachers. It has become an example of how new technologies, which are often a symbol of **unification and automation in** society, can be creatively used to individualise the learning process, facilitating the work of teachers and providing students with knowledge and precise feedback that will increase the effectiveness of their learning in an enjoyable way.

Chapter One

The DALDIS Project Overview

The DALDIS (Digital Assessment for Learning informed by Data to motivate and incentivise students) Project is a three-year EU funded Erasmus+ eAssessment Project that commenced in 2019. Involving eight partners and schools in five countries (Ireland, Poland, Turkey, Greece and Denmark) the project aimed to pilot test and adapt a digital assessment for learning solution designed to drive students' learning progress using well designed question sets and student feedback. Although Assessment for Learning (AfL) or Formative Assessment (FA) using digital technology has great potential for teaching and learning (Maier, 2014; Russell, 2010) it is still in its infancy and not widely used in European classrooms. DALDIS set out to address this deficit by designing and researching the application of AfL methodology using technology for two subject areas - Science and Modern Foreign Language learning (MFL), namely English and French, in years 5 through 9.

DALDIS is underpinned by AfL/FA theory and educational technology. The project is built on the principle that formative assessment is one of the best methods to encourage student achievement (Hattie, 2009) and William and Black's (1988) definition of formative assessment practices as methods of feedback which inform teaching and learning activities. Good assessment practices are essential for learning and teaching and the increased use of technology in education has been demonstrated to improve assessment at various levels (JISC, 2007). However, the implementation of formative assessment in education has proven to be challenging (Birenbaum DeLuca, Earl, Heritage, Klenowski, Looney, Wyatt-Smith, 2015; Marshall & Drummond, 2006) due to deficits in both teachers' assessment literacy skills (Doolin, Black, Harlen & Tiberghien, 2018; Popham, 2011) and technology skills. Teachers need to be assessment-literate and technology literate to effectively utilise eAssessment systems (Lee, Feldman & Beatty, 2012; Feldman & Capobianco, 2008). Research has shown that the role of assessment literacy in teacher education programs is limited (DeLuca and Bellara, 2013), that the successful implementation of AfL requires long-term professional development (Gottheiner & Siegel, 2012) and that greater investment is needed in teacher education to exploit the potential and usage of technology in the classroom (OECD, 2015; Stringer, Lewin & Coleman 2019).

The backbone of the project is the Study Quest technology platform (www.study-quest.com) and methodology in which well-designed question-sets and student feedback help to build students' knowledge and understanding of core curriculum concepts. To this end a key feature of the DALDIS project design is the use of carefully designed '*Feedback'* for all questions that helps to 'nudge' students towards the right answer while at the same time reinforcing basic knowledge and conceptual understanding. This is achieved by giving feedback on both correct and incorrect answers thereby eliminating the perils of guesswork where students choose the correct answer by chance, or do not understand why the answer they chose is wrong when a simple 'X' with no explanation appears. An example of the type of online feedback that DALDIS provides is illustrated in figure 1, below.

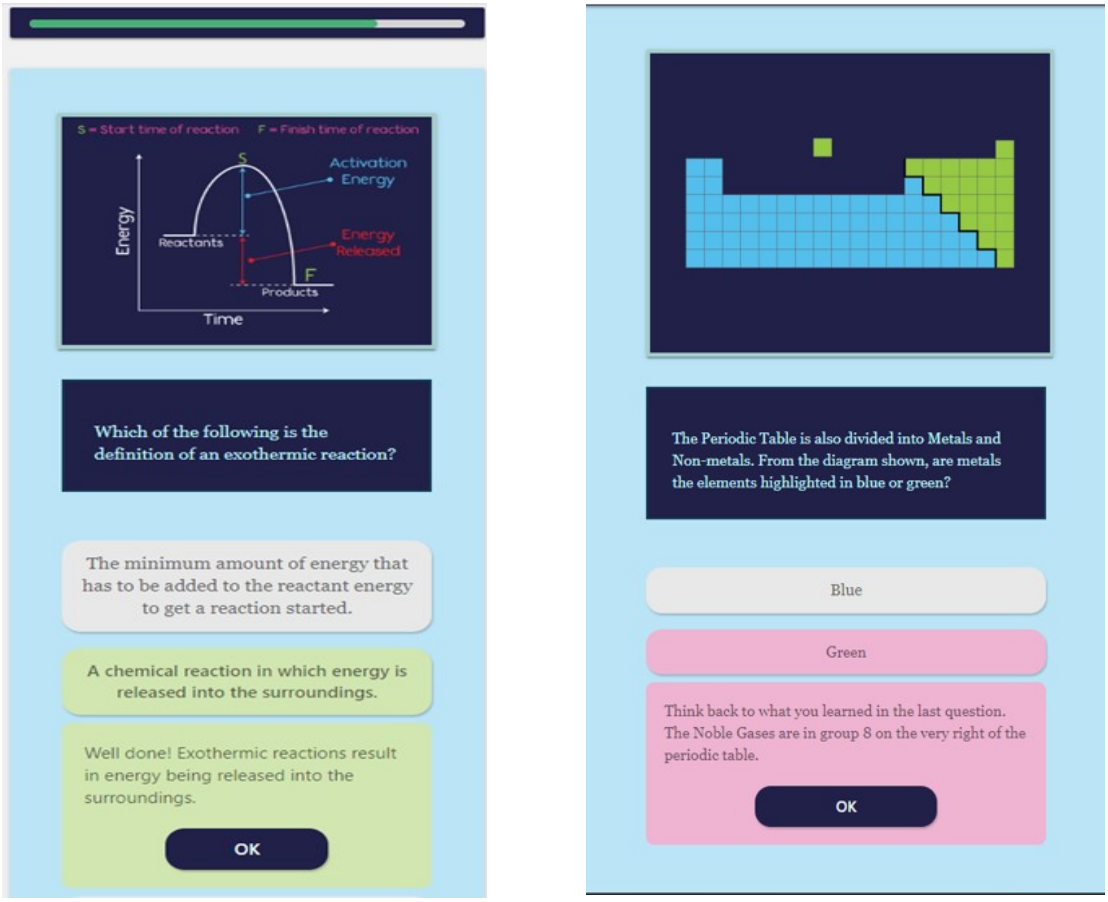


Figure 1. Feedback for RIGHT and WRONG answers Supports the student with positive 'nudges' in DALDIS

At a technical level, DALDIS, underpinned by Study Quest, incorporates the most important elements of a robust eAssessment system including ease of use and accessibility, interoperability,

Erasmus+

security, and effective feedback features to provide vital information to students and teachers. Importantly, it has been designed to support a variety of systems, devices, and browsers at school and at home (Tomasik, Berger & Mosser, 2018). It also provides functionalities to manage student assessment data such as background statistical information and analysis of student progress (Figure 2) via a teacher dashboard.

Thus, united by a common technology platform and methodology the project consortium came together under the auspices of DALDIS to trial and test out an eAssessment approach to AfL/FA in their respective countries and adapt it for their own unique curricula. As each country has its own story to tell this case study will now exclusively present and report on the experience of piloting the DALDIS project in Ireland.

The first implementation of StudyQuest known as JCQuest (www.jcquest.ie) was substantially complete in beta form immediately prior to the project's commencement. Targetting Science and French (MFL) in Ireland's Junior Cycle Curriculum, a 3 year programme aimed at 12-15 year olds, this innovative resource comprises multiple choice question-sets in the form of lesson units, derived from core curriculum resources which ensures the assessment material fully aligns with classroom lessons. DALDIS set out to create similar adaptations, working models and curriculum aligned question-sets for its school based partners in Poland, Turkey, Greece and Denmark and evaluate their effectiveness. Thus, united by a common technology platform and methodology the project consortium came together under the auspices of DALDIS to trial and test out an eAssessment approach to AfL/FA in their respective countries and adapt it for their own specific curricula. As each country has its own story to tell this case study will now exclusively present and report on the experience of piloting the DALDIS project in Poland.

Erasmus+

Chapter Two

Overview of Polish Education System and the DALDIS Project Schools

Introduction

This case study reports on the overall implementation and evaluation of DALDIS/JCQuest in Poland. To enhance context and understanding this chapter, Chapter Two, contains an overview of the Polish education system, including its structure and provides information about the public and non-public school systems. It also provides details on the implementation of DALDIS/JCQuest in Poland and participating schools. It is followed by a system analytics data chapter detailing key indicators in relation to the number of students availing of the DALDIS resources during the key pre-pilot and pilot project phases, the most popular content and topics accessed, an analysis for question difficulty based on correct and incorrect student responses and the variety of devices used to access the system. This data is supplemented by Chapters Four and Five where research findings from students and teachers who participated in the research element of the project are presented. The final chapter, Chapter Six, comprises a discussion and summary of the project's research finding.

Poland's Education System

The education system in Poland includes public and private kindergartens, primary schools, post-primary, post-secondary and art schools, special schools, and educational care centres. However, the education system does not include nurseries, children's clubs, youth detention centres and universities.

According to the Constitution of the Republic of Poland, Art. 35 sec. 2, every person staying on the territory of Poland has the right to education. Therefore, children of migrants (mainly Ukrainian at present) are, at the request of their parents, included in the Polish education system and attend Polish schools with the same rights as children with Polish citizenship.

The Polish education system consists of two levels: 8-year primary school and 4-year general secondary or 5-year technical secondary school or 3-year vocational school. As a result of the

Erasmus+

education reform in 2017, the three-cycle system, consisting of primary school (3 years of early childhood education + 3 years of subject education), secondary school (3 years) and upper secondary school (3-year high school, 4-year technical-vocational secondary school or a 2-year vocational school), was abolished.

Full-time compulsory education lasts for nine years. It comprises the last year of preschool education (preschool class in a nursery or primary school) and eight years of primary school education. Primary school education includes grades 1-3 (early school education, children aged 7-9) and grades 4-8 (teaching by subject, children aged 10-14). In grades 1-3, education is integrated, and most subjects taught by one teacher, except for foreign language, music, art, and computer science, which usually have separate teachers.

In grades 4-8, education takes place within subjects. For example, scientific topics are implemented in the context of subjects such as nature (grade 4, 1 hour per week), biology and geography (both in grades 5-8, in grades 5-6, 1 hour per week, in grades 7-8 two hours per week), physics and chemistry (both in grades 7-8, two hours per week), technology (classes 4-6, 1 hour per week), computer science (4-8, 1 hour per week). At this stage, children are always taught a modern foreign language (usually English, throughout the entire period of school education, 3 hours per week in grades 4-8) and a second modern language (most often German, Spanish, or French, in grades 7-8, 2 hours per week). At the end of grade 8, primary school students take a compulsory external examination consisting of 3 parts: Polish, mathematics and a foreign language. These examination results, together with end-of-school achievement significantly, impact admission to secondary school.

Secondary education is part-time compulsory, and it may take place either in school settings (a student attends secondary school) or in non-school settings (e.g., a student follows vocational training offered by employers). Most students continue their education in secondary schools. This stage of education may take place in 4-year high schools (preparing for studies and ending with the external examination), 5-year technical secondary schools (combining general and vocational education and finishing with the external examinations), or in 3-year vocational schools (preparing for professions). Passing the external exam is a condition for admission to study. The DALDIS project was implemented in Polish primary schools with pupils aged 10 to 14.

Polish schools may be public or non-public. In the 2019/20 school year, about 7% of students attended non-public schools, due to various challenges faced by Polish public education, and this is an increasing trend. The main problems in public education include insufficient financing and a shortage of teaching staff due to low wages. Public schools are free and managed by local government units. Among the non-public, paid schools, there are private schools (profit-oriented) and community schools (non-profit organizations).

The number of hours in public school is 24 hours per week in class 4, 25 hours per week in classes 5 and 6, 32 hours per week in class 7 and 31 hours a week in class 8. In addition, there are extracurricular activities, interest clubs etc. The number of hours in non-public schools (especially in foreign languages) is often higher than in public schools. Polish public and non-public (community) schools participated in the DALDIS project.

Implementation Timeline

During 2020, conceptual work, training and building a team of authors for the Polish DALDIS/JCQuest curriculum got underway to ensure familiarity with the assessment for learning methodology, pedagogical approaches, and the content development approach. Work on creating the content of the Polish version of the application began in January 2021. The Polish and the other international partners joined the implementation works a little later than the core group from Ireland as the Irish group was responsible for the digital technology of DALDIS, which supported the entire project. The implementation period was challenging as the vast majority of the DALDIS project took place during the height of the worldwide Covid-19 pandemic, with its enforced lockdowns and the pivot of all schools to remote education. The period of remote and hybrid education in Poland was one of the longest in Europe[1]. The need to adapt the education process to these unprecedented regulations, to solve hardware and software problems, and to provide training to improve the technical competencies of teachers and students, were huge challenges for schools. All these factors impacted the schedule of work during the project lifecycle.

[1] Lockdowns of Polish schools were imposed several times: March 12 to June 26, 2020, for all schools and schools in the so-called yellow and red zones from October 26, 2020, to May 16, 2021. In almost the whole country, all schools were closed again from December 20, 2021, to January 09, 2022, and finally from January 27 to February 20, 2022, - students of grades 4-8 of primary schools and older.

Erasmus+

As the world emerged from the Covid-19 restrictions, another unexpected and inimical circumstance arose as a result of the outbreak of war in Ukraine on February 24, 2022. The Russian attack on Ukraine, Poland's eastern neighbour, resulted in the influx of millions of refugees (by November 2022, over 8 million people had fled to Poland). The refugees were predominantly mothers with children, who needed shelter and food, and access to education. However, most children did not speak Polish, and educators focused on supporting new students and their families, including minimising the stress in students terrified by war. Naturally, such important work brought additional challenges to the implementation of the DALDIS research project. However, despite these two exceptional adversities, the Polish part of the DALDIS project was successfully implemented.

Work on creating the application's content for the Polish curriculum, covering knowledge in the field of STEM subjects (chemistry, physics, biology, geography) and English Modern Foreign Language (MFL) learning (vocabulary and grammar), was completed in January 2022, following an earlier pre-pilot phase in December 2021 when researchers trialled the content with small groups of students to check its suitability. The formal pilot study commenced in March 2022 and lasted until November 23, 2022 (with a break during the school summer holidays).

Participating Schools

Five Warsaw schools participated in the Polish part of the DALDIS project, four of whom remained engaged throughout the project implementation lifecyle. The five schools were:

- ***Społeczna Szkoła Podstawowa (SSP) 11 STO Toruńska*** was the most active participant in the DALDIS project. SSP 11 STO Toruńska is a non-public, community primary school accredited by the Erasmus organisation with almost 300 students (aged 6-15, about 18 students in each class) and over 40 teachers. The school offers extended comprehensive education, promotes intense language learning (English as the first foreign language and German or Spanish as the second foreign language), develops creativity and constantly improves the quality of its education. The school has been promoting the use of ICT in teaching and learning for a long time: teaching with ICT (educational apps, tablets, smartphones etc.)and encouraging teachers to discover new opportunities for personalised and group learning. The school has been particularly interested in collaborative teaching and learning within and with partner schools abroad. The school has been awarded a five-year Erasmus Accreditation, which has created numerous opportunities for mobility and cooperation in education. As the accredited Erasmus organisation, the school has been

developing collaboration with foreign schools, all based on project work, promoting, among other things, freedom, tolerance and non-discrimination. The projects also support the development of innovative pedagogies and practices, promote language learning and make the participants aware of linguistic/ cultural diversity. For example, close cooperation with a Spanish school in Galicia, participation participated in many eTwinning projects with different countries, such as Spain, France, Ireland and Switzerland.

- ***Jan Nowak-Jeziorański Complex of General Education Schools STO No. 1*** is the oldest and first social-educational institution in Warsaw. For 30 years, it has provided comprehensive, harmonious student development in a friendly atmosphere, a culture of modern values and building competencies for the future. The school has extensive experience implementing international projects (Erasmus+, eTwinning). It cooperates with schools from Malta (Birkirkara), Portugal (Braganca), Spain (Madrid), Finland (Bennas) and France (Mortagne du Nord).
- ***Wanda Turowska Primary School No. 115***, established in 1933, is a public school with about 400 students and a long tradition. Its public nature results in children from all over the region studying there - regardless of their achievements or their parents' social or financial status.
- **Primary School No. 404** is a new public school in the suburbs of Warsaw with about 600 students. Children from all over the region study there, regardless of their achievements or their parents' social or financial status. The school has been operating for three years. A hallmark of the school is its use of formative assessment to improve teaching and learning.
- ***Hetman Jan Zamoyski School No. 358*** is a new public school, which, despite its short history, achieves very high results in eighth-grader exams as well as subject and national competitions. Teachers try to work with students using methods derived from cognitive and constructivist assumptions. The school has modern, well-equipped laboratories and, unique in the case of public schools, very extensive relaxation and interaction zones for students: a cinema room and a game zone.

DALDIS/JCQuest Curriculum Subjects

Teachers working in these schools were the authors of curriculum content for all the subjects implemented in the DALDIS/JCQuest application. Sets of questions were created for the following subjects: biology, geography, chemistry, physics, and English (two separate sections; English vocabulary and English grammar).

The authors of individual thematic sections were:

- Anna Kubiak-Mardas (SSP 11 STO Toruńska) – English grammar
- Anna Weiss (SSP 11 STO Toruńska) – English vocabulary
- Agnieszka Ostrach-Kowalska (SSP 11 STO Toruńska) – Biology
- Anna Szczypkowska (Primary School No. 404, Complex of General Education Schools STO No. 1) – Chemistry
- Monika Samczuk (Primary School No. 404) – Physics
- Małgorzata Sawicka (Primary School No. 115) – Geography.
- The author of some of the graphics used in individual courses was Klaudia Markowska (APS). The language consultant (English) was Professor Agnieszka Otwinowska-Kasztelanic (University of Warsaw).

Within individual subjects, the following number of thematic units was created:

- Physics: 12 units (including Measurements and physical units, Solids, liquids and gases, Pressure, Motion, Heat, Electrostatics)
- Biology: 10 units (including Human body, Human health, Genetics and evolution, Ecology and environmental protection, Diversity of life - plants, Diversity of life - mammals)
- Geography: 10 units (including Basics of the map, Society and economy, Landscapes of Poland, Lands and oceans - geographical coordinates, Landscapes of the world)
- Chemistry: 11 units (including Chemical substances and their properties, Formulas of chemical substances, Internal structure of matter, Salts and their properties, Carbon-hydrogen compounds, Hydrocarbon derivatives).
- English Grammar: 14 units (including Possession, location; Articles, demonstrative pronouns, Countable and uncountable nouns, Present Simple and Present Continuous, Present Perfect and Past Simple tenses, Future forms, Conditional Sentences)
- English Vocabulary: 14 units (including People, Place of living, Education, Work, Eating, Shopping and servicing, Travel and tourism, The natural world).

Erasmus+

The following types of quiz questions were used in the construction of questions: Multiple Correct Answer (choose more than one answer); Matching (match the items); Learning Questions (questions with feedback); Categorisation (putting into categories). The questions in Polish version of DALDIS are distributed as follows:

Lesson Name	No. of Lessons/ sets	MCQ	MCA	Cloze	Match	Learn. Screen	Categorise	Text	Total
Geography	10	7	1	7	12	76	0	0	**103**
Chemistry	11	3	3	5	10	88	0	2	
Biology	10	1	0	6	2	91	0	0	**100**
Physics	12	-	-	12	12	113	-	1	**138**
English Grammar	14	0	0	15	8	140	0	1	**164**
English Vocabulary	14	0	10	13	21	97	1	1	**143**
Total Numbers	**71**								

- ***Table 2.1 The Questions in the Polish Version of DALDIS/JCQuest***

Chapter Three

A Systems Data Perspective on the Implementation of DALDIS/JCQuest in Polish Schools

The academic year 2021-2022 was a key period for the DALDIS project as the system was rolled out to participating schools across the partnership, consisting of a pre-pilot and main pilot phase. As the system data show the pre-pilot phase in Poland took place in November/December 2021 as planned. Activity in November mainly involved setting up classrooms on the system and familiarising teachers and students with the application in advance of running it live in classrooms. After the pre-trial, content adjustments based on feedback was made to the core materials before the main pilot period commenced in March, 2022. Figure 2 below illustrates the level of activity in Poland through the full academic year from September 2021 to June 2022. It clearly shows the pre-pilot live classroom trials carried out in December, 2021 and the main pilot phase (March-June, 2022). A peak of 6,800 page views occurred from June 5th to June 11th. In total, 738 users completed 1,571 sessions (an average of 2.1 each) during the full academic year 2021/2022 .With an average of 19.3 pages, students finished one unit in each session.

Figure 3.1. Activity on the DALDIS Poland Study-Quest Site for the Entire Academic Year from September 2021 to June 2022

Erasmus+

Piloting of the project materials continued in Polish schools from September to November, 2022 meaning that in all a total of 61 Classrooms/units were created in the DALDIS/JC Quest Poland database during the project. During this time 1,096 units (lessons) were started by students who were logged into these classrooms and 814 were finished – representing a very strong completion rate of almost 80% (79.74%).

Number of Units Started	Number of Units Finished	Completion Rate
1096	874	79.74%

Devices and Operating Systems

Detailed studies of usage patterns were conducted on users over the period from **January first through June 30th, 2022.** In Poland the Apple iOS operating system (for iPhones and iPad tablets) was the most popular, used by 237/655 or 36% of all users. The relatively high usage of Apple devices results from the fact that one of the study schools (the most active) was a school equipped with Apple devices. Overall, the usage of the different OS and device types was more balanced in Poland between Mac, iPad/iPhones, Windows computers, and Android phones than in other study countries, as the data and chart below show. When the Mac and Windows users are added together, to show the amount of laptop and desktop PC users in total, these devices represent 41% of all devices used by students. **Phones and iPads represented 58% of all usage.** (Note: The small number of Linux devices is largely due to the specificity of the digital tools used in the project and is not relevant in the overall analysis).

Jan – July 2022
No of users of each operating system

Operating System	No
Mac iOS	100
iOS	237
Windows	171
Android	144
Linux	3
Totals	**655**

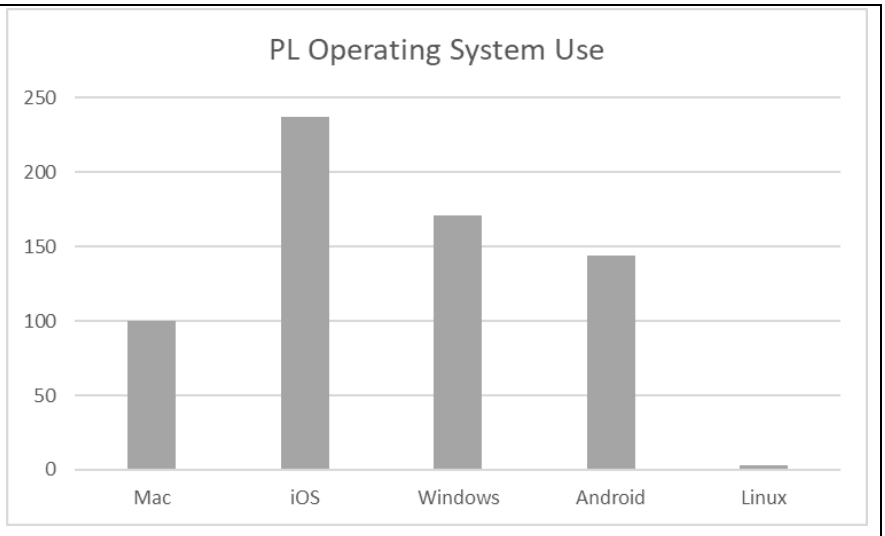


Figure 3.2. Operating System Use measured from January to June, 2022

A closer study was done of 646 users from Poland in the January to June, 2022 period. This shows the users completed 1,256 sessions with an average of 1/94 session per user (see figure 5). The high number of pages per session for each session (19 pages/session) and long average session duration of 13 minutes shows high quality usage. This indicates that in the majority of sessions students are completing at least one lesson/unit. The regions shown in yellow signify the high-quality usage with each session shown representing approximately one full lesson/unit for users from these regions. This is supported by a relatively low bounce rate of 26% which measures the number of users who exit the site after viewing only one page. A content website bounce rate below 40% is considered to be high quality use. For comparison the DALDIS Turkey website had a bounce rate of 27% for in-country users for the same period.

Region	Users	New Users	Sessions	Bounce Rate	Pages/ Session	Avg. Session Duration mins
Masovian Voivodeship	605	594	1206	25.62%	19.25	13.25
Lower Silesian Voivodeship	6	4	7	28.57%	10.71	6.38
Lublin Voivodeship	6	5	7	28.57%	3.14	0.64
Pomeranian Voivodeship	6	4	6	66.67%	3.67	0.56
Greater Poland Voivodeship	5	2	8	25.00%	11.75	6.63
Lodz Voivodeship	4	3	6	16.67%	35.67	44.15
Silesian Voivodeship	4	2	4	50.00%	10.25	3.52
West Pomeranian Voivodeship	4	3	4	25.00%	14.00	8.66
Lesser Poland Voivodeship	3	2	3	33.33%	26.00	18.23
Podlaskie Voivodeship	1	0	1	100.00%	1.00	0.00
Podkarpackie Voivodeship	1	1	2	50.00%	13.00	6.22
Warmian-Masurian Voivodeship	1	1	2	0.00%	5.00	0.44
Totals/Averages	646	621	1256	25.96%	18.99	13.11

Table 3.1 Google Analytics - Website Use

The data obtained using Google Analytics made it possible to select the most popular/most frequently used units/lessons. The table below shows the top twenty pages used in Poland in the Pilot period 1 March to 30 June. This main pilot period is the most representative period as lessons were still being finished and test usage was more common among teachers in the pre-pilot period.

Erasmus+

The top unit/lesson is Związki węgla z wodorem (Carbon-hydrogen compounds) with 1075 page views and an average of 55 seconds on each page. The second highest lesson, namely Substancje chemiczne i ich właściwości (Chemical substances and their properties), with 790 views, is also connected with Chemistry.

The page 'CHEMISTRY. EGZAMIN ÓSMOKLASISTY – Student' (Eighth Grade Exam) was the second highest content page with 827 page views. The next 5 units/lessons account for 2,576 page views. Taking these together with the top two Chemistry units, these 7 lessons account for a total of 4,441 page views (almost 19% of the total 23,810 pages viewed in the pilot period). This demonstrates that the Chemistry units were very popular, possibly due to the quality of the lessons, but first of all due to very active teachers using these with their students at school and as homework.

Page Title	Translation	Users	Time on Page
Poland StudyQuest: Sole i ich właściwości.	Salts and their properties.	696	101.42
Poland StudyQuest: Powietrze. Tlen, wodór i ich związki chemiczne.	Air. Oxygen, hydrogen and their chemical compounds.	531	86.43
Poland StudyQuest: Wzory substancji chemicznych. Reakcje chemiczne.	Chemical formulas. Chemical reactions.	481	73.15
Poland StudyQuest: Wodorotlenki.	Hydroxides.	442	64.83
Poland StudyQuest: Podstawy mapy (mapa Polski)	Map Basics (Map of Poland)	426	55.20

Table 3.2. Google Analytics – Page Usage and Time on Page

Users spent an average of 44 seconds on each page and together with the 13-minute session duration, indicates a positive use of the materials. The 80% completion rate is very positive for online learning materials. Polish students used the application only at school. Individuals also used it at home, on their own initiative, to review the material before a test. The top twenty pages used are shown in the table below.

Page Title	Page Views	Unique Page Views	Avg. Time on Page	Entrances	Bounce Rate	% Exit
Poland StudyQuest: Student Home	1286	768	13.46	177	16.95%	7.15%
Poland StudyQuest: Związki węgla z wodorem.	1075	755	55.17	14	92.86%	4.56%
Poland StudyQuest: chemistry. Egzamin ósmoklasisty - Student	827	430	43.17	33	81.82%	13.42%
Poland StudyQuest: Substancje chemiczne i ich właściwości..	790	632	46.77	3	33.33%	1.65%
Poland StudyQuest: Student Registration	759	624	21.54	612	6.05%	6.19%
Poland StudyQuest: Sole i ich właściwości.	696	564	101.42	27	81.48%	7.90%
Poland StudyQuest: Powietrze. Tlen, wodór i ich związki chemiczne.	531	415	86.43	3	66.67%	3.20%
Poland StudyQuest: Wzory substancji chemicznych. Reakcje chemiczne.	481	365	73.15	4	50.00%	1.87%
Poland StudyQuest: Wodorotlenki.	442	340	64.83	2	50.00%	2.94%
Poland StudyQuest: Podstawy mapy (mapa Polski)	426	334	55.20	3	100.00%	2.58%
Poland StudyQuest: PLACE OF LIVING	413	303	45.77	0	0.00%	0.24%
Poland StudyQuest: Fizyka - Pomiary i jednostki	406	363	43.85	5	40.00%	2.71%
Poland StudyQuest: PEOPLE	403	332	43.68	0	0.00%	0.74%
Poland StudyQuest: EATING	387	335	68.52	1	100.00%	3.88%
Poland StudyQuest: EDUCATION	353	255	42.64	2	100.00%	1.98%
Poland StudyQuest: Geografia Europy. Sąsiedzi Polski.	349	306	49.88	3	33.33%	2.58%
Poland StudyQuest: Kwasy i ich właściwości. Skala pH	333	264	70.42	1	0.00%	3.30%
Poland StudyQuest: Pochodne węglowodorów.	325	257	103.97	6	33.33%	4.31%
Poland StudyQuest	313	224	80.45	113	65.49%	32.59%
Poland StudyQuest: Społeczeństwo i gospodarka Polski	306	275	63.83	3	66.67%	3.27%

Table 3.3 Google Analytics – Top Twenty Pages Used

Erasmus+

Similar to what was scrutinised in the Irish data, the Polish database was analysed too to identify questions that may be too difficult or too easy for students. The same indicators as in the Irish study were used: the % of correct answers on the first attempt and the % of incorrect answers on all attempts in the case of the questions, where students can have up to four attempts at some questions. Complete lessons (units) were studied to both identify more difficult or challenging lessons and lessons with a very high number of correct answers. Interestingly, and similar to what was identified in the Irish data, almost all the most difficult questions in this analysis were Cloze, Match, MCA plus Categorize. Among the 25 most challenging questions identified in the analysis, only 3 of these 25 questions are Learning Screens (12%) even though Learning Screens are the most used question types.

The analysis of the results obtained in this way, made it possible to modify the educational content in the application. For instance, the question Organizm człowieka I (Human organism 1), identified as causing difficulties, was only the 2nd question in the question set and caused a lot of frustration among students. In general terms, it was found that it would be a better strategy to keep the most difficult questions for the final stages of a question set or unit. Similarly Map Basics (Map of Poland) was a learning screen and question 1 in the unit. It was necessary to introduce modifications in this case as well.

Cloze and Match questions, which gave students a large number of options, were studied. In many questions the student was given options to match between 7 and 9 answers. It is likely that these questions with this number of options are not appropriate for this level of education. Designing questions with 4 or 5 options to match against 3 to 4 answers may be more appropriate for all, except the strongest students in years 7 and 8, who participated in the DALDIS study. It was suggested that all of the questions below, which are set early in the unit, should be reviewed for level of difficulty so as to give students a more positive and productive learning experience.

The most valuable and incisive feedback regarding the DALDIS/JCQuest application was provided by information collected directly from students and teachers. Their opinions are presented in the following subsections.

Unit Name	Question Number	Question Type	Number Correct on 1st Attempt	Number Incorrect on 1st Attempt	% Correct on 1st Attempt	Total Number Correct	Total Number Incorrect	% Incorrect of all attempts	Total Number Attempted
The natural world	3	Cloze	0	19	0.0%	2	32	94.1%	34
Organizm człowieka (Human organism)	2	Learning Screen	0	1	0.0%	1	14	93.3%	15
Shopping and services	1	Match	1	18	5.3%	2	26	92.9%	28
Present perfect and past simple tenses	10	Cloze	0	3	0.0%	1	5	83.3%	6
Science and tech-nology	8	Match	1	10	9.1%	3	15	83.3%	18
Eating	6	Cloze	1	37	2.6%	13	59	81.9%	72
Magne-tyzm (Magne-tism)	11	Match	0	5	0.0%	3	12	80.0%	15
Sport	6	Match	1	13	7.1%	4	15	78.9%	19
The natural world	10	Cloze	2	13	13.3%	5	18	78.3%	23
Travel and tourism	2	Cloze	4	12	25.0%	6	21	77.8%	27
Social life	1	Cloze	2	13	13.3%	5	17	77.3%	22
Ciepło (Heat)	11	Match	3	4	42.9%	4	13	76.5%	17
Ciała stałe, ciecze i gazy (Solids, liquids and gases)	9	Learning Screen	2	11	15.4%	13	39	75.0%	52
Countable and uncounta-ble nouns	11	Cloze	3	9	25.0%	4	12	75.0%	16
Science and techno-logy	10	Catego-rize	2	9	18.2%	3	9	75.0%	12
Social life	7	MCA	2	12	14.3%	7	21	75.0%	28
Ruch (Move-ment)	3	Learning Screen	1	6	14.3%	7	20	74.1%	27
Krajobraz polski (Land-scape of Poland)	7	Cloze	4	18	18.2%	7	20	74.1%	27
Ruch (Move-ment)	11	Match	1	4	20.0%	3	8	72.7%	11
People	1	Cloze	9	25	26.5%	17	45	72.6%	62
Place of living	4	Cloze	7	24	22.6%	13	34	72.3%	47
Podstawy mapy (mapa Polski) Map Basics (Map of Poland)	1	Learning Screen	12	20	37.5%	38	96	71.6%	134

Table .3.4 Google Analytics – Question Type

Erasmus+

Chapter Four

Students and their Perspective on the Implementation of DALDIS/JCQuest in Polish Schools

Introduction

This chapter deals exclusively with the feedback data obtained from students in four of the five schools participating in the piloting of DALDIS/JCQuest in Poland. The data was collected using the following tools and techniques:

- Two student pre-pilot questionnaires (4 schools)
- Two student detailed questionnaires (4 schools)
- Focus research conducted in 9 groups of students (1 school)
- Fifty-five student surveys were conducted across all four schools as part of a rapid pre-pilot study and a further 75 student detailed surveys were conducted
- Forty-two students took part in 9 focus group interviews.

Surveys, focus groups and research interviews were carried out from May to November 2022. The detailed student survey questionnaire consisted of 19 questions (25 items) that examined critical aspects of students' interactions with DALDIS/JCQuest, such as feedback usefulness, ease of use, access to devices, classroom and home use, preferred type of questions, and overall benefits of DALDIS/JCQuest as a learning tool. This information was complemented by focus group interviews with 42 students, which provided the opportunity to explore some of these areas in more detail. Each focus group interview lasted approximately 15-20 minutes and involved two to eight students per group.

Key findings from the survey and focus group will be presented and discussed in the following sections. Complementary to this core data are some interesting data from the pre-pilot survey, which consisted of 11 questions, mainly about the user experience of the application and elements that need improvement. Another element subjected to parallel analysis is the data obtained from interviews in focus groups, which allowed us to confirm, deepen and enrich the information resulting from quantitative data analysis. In Poland, the application functioned under the name DALDIS, which is also the name used by the respondents.

Erasmus+

In the interests of clarity and readability, the following classification terms will be used in the following sections used when presenting the numeric (quantitative) findings from the student and teacher surveys.

Classification Term	Approximate Occurrence %
Almost All	More than 90%
Most	75-90%
Majority	50-74%
Less than half	25-49%
A small number	16-24%
A few	Up to 15%

Table 4.1 Classification Terms and Approximate Occurrence

Key Demographic and Subject Data

Almost all of the respondents were aged between 12-14. The second largest group consisted of students aged 9-11, and 2 students were over 15 years old. The upper limit results from the fact that the last grade of primary schools in Poland is attended mostly by children under the age of 15, and the lower limit - from the level of difficulty of the application, which worked best in grades 7 and 8, where children between 13- and 14-years old study. There is no physics or chemistry in grade 6 yet. The group of younger respondents was therefore relatively small.

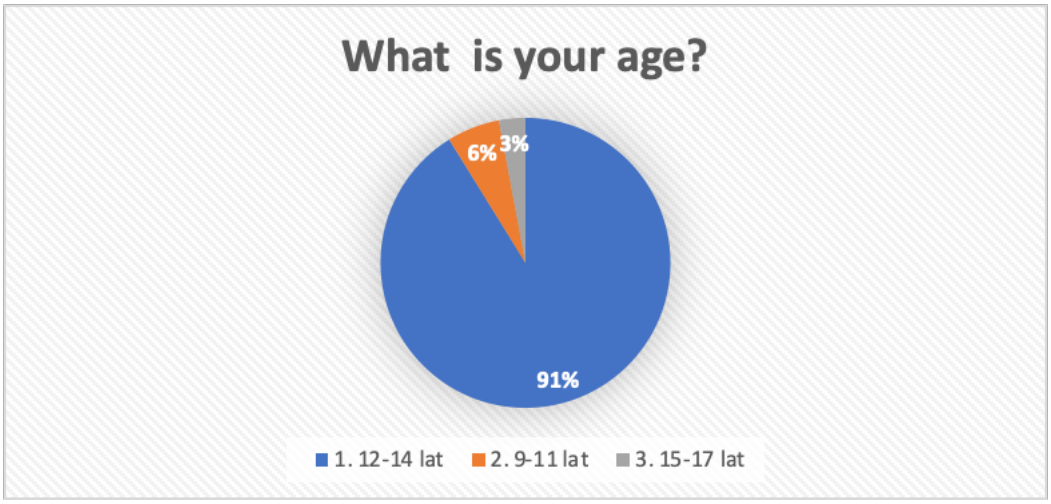


Figure 4.1. Age Ranges of Pupils

The distribution of students attending individual classes was quite similar. The majority of respondents attended grade 7 (54%), 32% attended grade 6, and 13% attended grade 8.

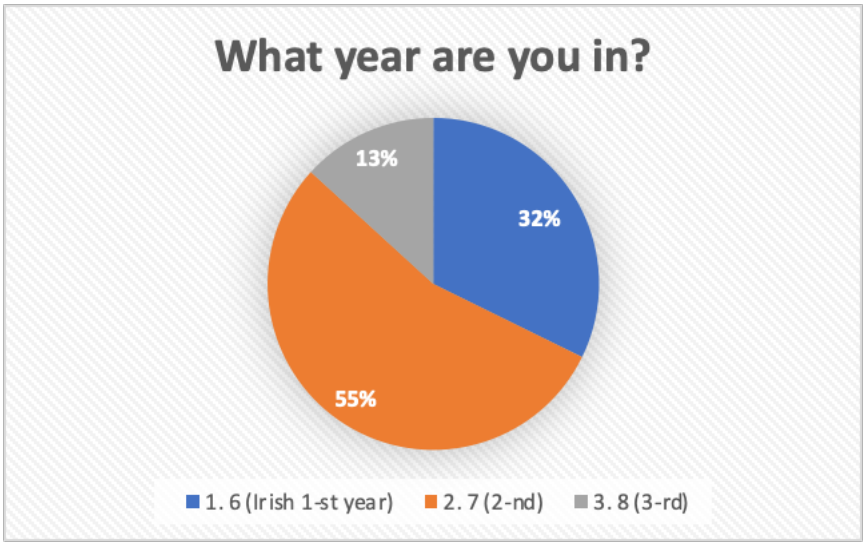


Figure 4.2 Year Group or Grade of Students

In terms of gender, 55.9% of respondents declared female, 23.5% male, and 19.6% chose not to answer this question. 30% of students who responded to the survey used the DALDIS/JCQuest materials for English subjects, followed by Chemistry at 29%, Physics at 26%, Biology at 9% and then Geography at 6%. (Note: this differs from the overall usage information from the quantitative analysis above where Chemistry was the most popular subject.)

Erasmus+

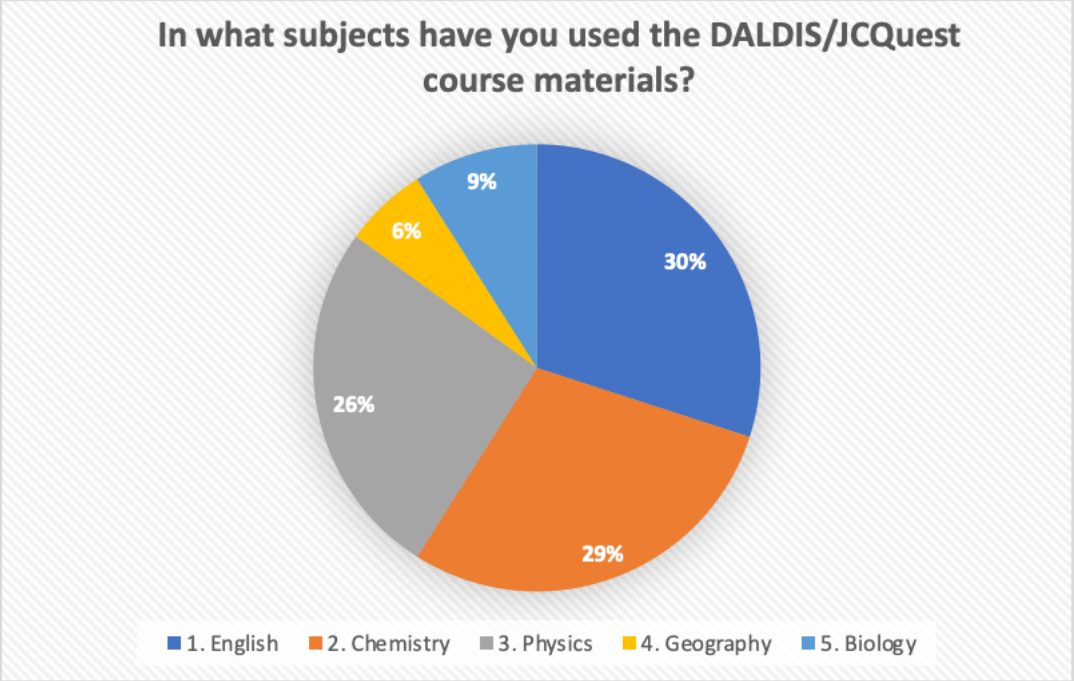


Figure 4.3 Subjects in which DALDIS/JCQuest Materials were Used

As can be observed, the proportions between the use of sets by the respondents for learning English, Physics and Chemistry are similar. The lower level of use of Biology and Geography could be related to the lower involvement of teachers and students, but more likely due to the existing large availability of teaching and learning aids in these subjects. Physics and Chemistry, taught for a shorter period than biology and geography, are considered more difficult by students, so they are more likely to take advantage of additional study opportunities.

School and Home Usage

As far as the use of the resource is concerned, the use at school is dominant in Poland. Of the surveyed students , a few (9%) declared that they had never used the application at school. The remaining 91% knew about it from school lessons. It was most often used as a useful tool to review the material (27%); 16% used it occasionally (once a semester), the same number used it twice a week. A small number (13%) used DALDIS/JCQuest every two weeks.

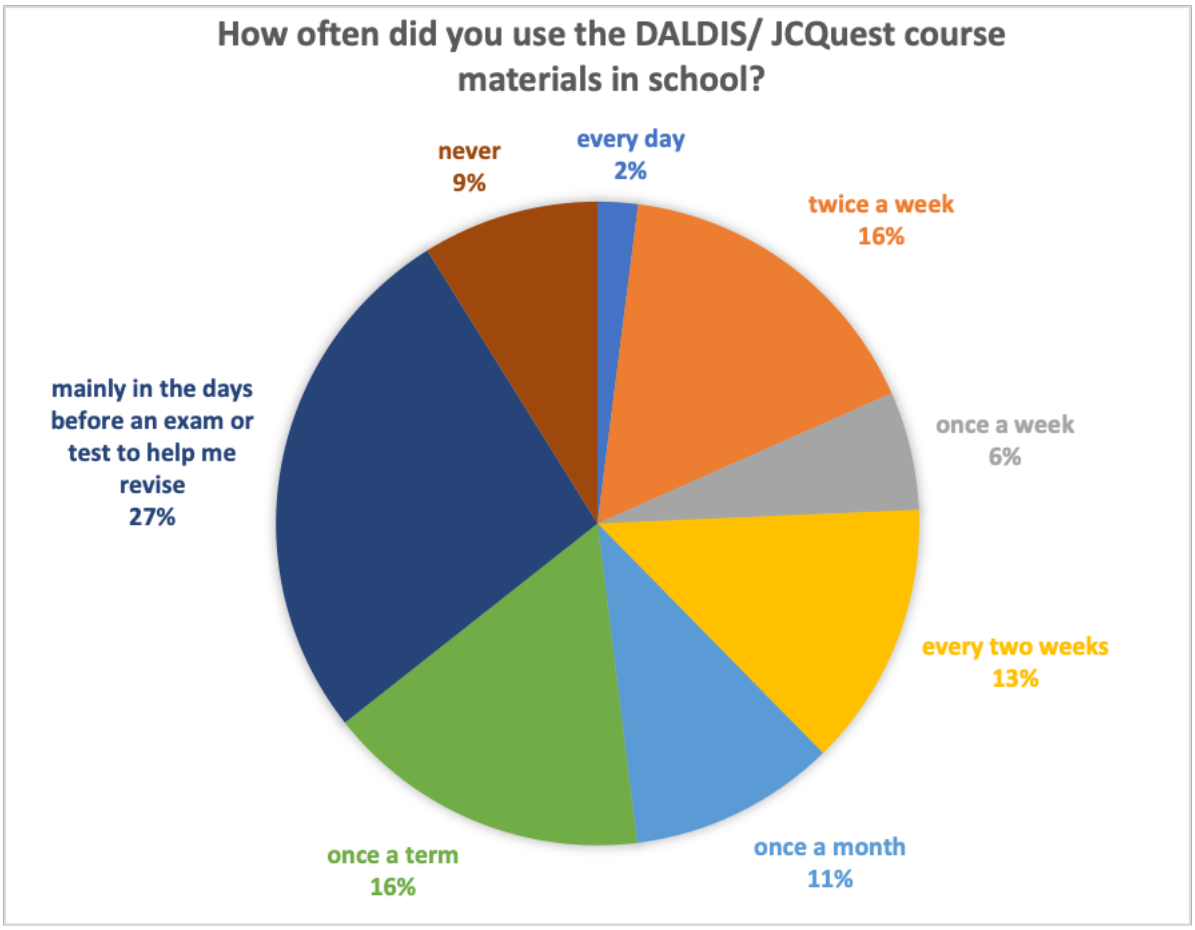


Figure 4.4 Frequency of Use of DALDIS/JCQuest Materials in School

The frequency of using the application at school was related, among others, to the variation in the number of hours allocated to individual subjects in the curriculum. The graph presenting the model of using DALDIS/JCQuest by students at home is completely different. As many as 53% of respondents have never used the application at home. Those who used it most often, did so, similarly to those using DALDIS at school before a test in order to revise the material.

Erasmus+

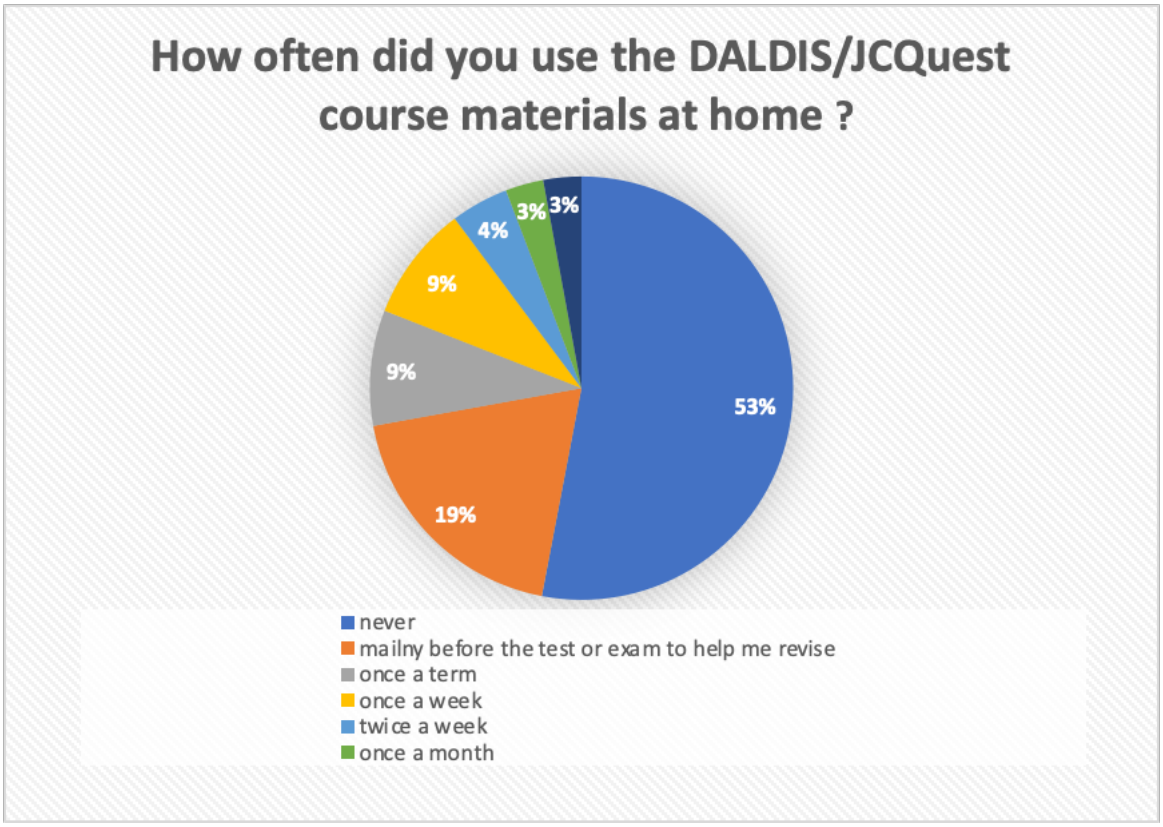


Figure 4.5 Frequency of Use of DALDIS/JCQuest Materials at Home

The distribution of answers clearly indicates that Polish teachers preferred the option of using the application at school. This could be because schools participating in the project are rather well equipped with computer equipment and willingly use it during lessons. At home, some students would probably have to use mobile phones, whereas tablets, laptops and desktop computers were available at school. This is confirmed by the interview data of the focus groups. All the students participating in the interviews used tablets and sometimes phones at school. The small group that also used the app at home tended to use phones and PCs or laptops.

A student who declared that she uses the app both at school and at home states:

> *"I use a tablet at school and a phone and computer at home"*
> (Focus 9 Physics & English, S1).

Another student says:

> "*We didn't use the homework app, but you could repeat the messages"*

(F4 Chemistry & Biology, S3).

Other respondents are of a similar opinion:

> *"We used lessons in the form of repetition, but sometimes also an introduction to the topic, because it was one big section. There was no homework for it. (...) We used iPads, sometimes also phones"* (F5 Ch&B, S1).

System Usability, Design and Suggestions for Improvement

The ease of use of an educational application is one of the crucial conditions for its functionality. An extensive curriculum designed to be delivered at school does not allow for a large part of the lesson to be devoted to explaining to students how the application works. On the other hand, at home, children have to deal with it on their own, without the support of a teacher. Parents do not always have the time and appropriate digital competences to help their child cope with digital teaching aids. Hence, we asked respondents whether the DALDIS/JCQuest application was easy to use for them. The distribution of answers is presented in the chart below.

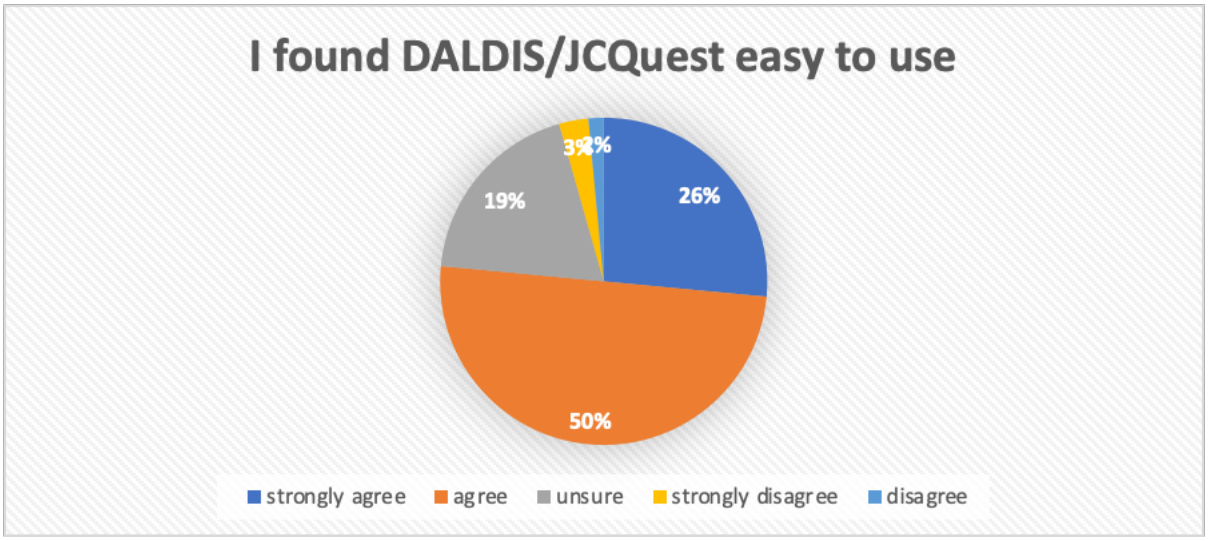


Figure 4.6 I Found DALDIS/JCQuest Easy to Use

These findings were confirmed in one of the survey questions, in which users were asked what they thought about the DALDIS application. 84% of respondents assessed that one of its advantages is its ease of use. Most (85%) of them declared that they liked working with the application too. In addition, most students (75%) felt that it helped them learn, while less than half (38%) became more interested in the subject as a result of using DALDIS.

The participants of the focus groups, who assessed that they liked the application, expressed a similar opinion:

> *"We used the app this school year. The teacher opened a class account for us. It's fun to use."*
> (F1 B&Ch, S2)

> *"We took English last year, we liked it"* (F3 B&Ch, S1).

> *"We have been using the app since last year, teachers gave it to us, we liked it"*
> (F7 Eng.&P, S3).

In general, they also found DALDIS to be an easy-to-use application:

> *"The system is very intuitive, so it's easy to use"* (F9 E, S1).

> *"It was easy to click so as to choose answers" (*F2 Ch&B, S2).

> *"Nicely divided into lessons, sections. Everything was in order"* (F3 Ch&B, S1).

> *"Similar to Quizzlet, it has fewer features, but that makes it easier"* (F4 Ch&B, S3).

> *"Simple, I had no problems with it, the instructions were clear, it was enough to turn on the logic"* (F7 Eng&P, S5).

However, there were also comments about technical details that made it difficult to use the application and which should be improved.

> *"The app is easy to use, just stutters. I suspect it was an internet problem. For example, I couldn't choose some answers, and when I chose, the incorrect one was marked, and when I chose another, it turned out that the one was correct. But it's generally easy to use, you don't need to explain how to use it too much"* (F1 Ch&B, S1).

> *"At first there were a lot of icons and we didn't know what to click. It was only when we saw what the teacher was doing, that we understood what we had to do"* (F4 Ch&B, S4).

> *"In general, it's intuitive, but some mechanics are not very well done, because you have to hold the word you want to drag quite well and it doesn't always work"* (F6 Eng., S3).

> *"Easy, the nice thing is that everything is broken down into chapters and it's spelled out what's going to happen in which chapter, but those drag and drop tasks were actually a bit annoying because if something didn't work out I had to do it all over again"* (F6 Eng., S2).

"It was easy to use, but I didn't like that when you clicked on the wrong answer, the options got mixed up, and sometimes you clicked on the wrong one by accident" (F7 Eng&P, U3).

The developers deliberately introduced the latter function to avoid mindless clicking by students who do not know the solution to all the answers. If the answer is wrong, this mechanism extends the response time since a student must re-read the options. The app does not have a built-in time-based competition feature, and the benefits of reading the questions carefully are many.

Feedback, Preferred Question Type and other Learning Aids

Given the critical importance of feedback in the formative assessment process and the essential role feedback played in the development of the DALDIS app, the survey included a series of questions to assess how students felt about the usefulness and quality of the feedback received and whether and how it impacted their learning.

Respondents were first asked what type of questions they liked best. Less than half (40%) of the respondents indicated multiple correct answers as their favourite type of task, followed by the Learning Screen Questions (which are multiple choice with feedback designed to support learning) (26%), which proves their importance for users. What is worth noting is that in the pre-pilot study, in which 55 students took part, the questions with feedback were indicated as the most valuable (44% of all indications). Note: respondents have described the Learning Screen questions as "single choice"

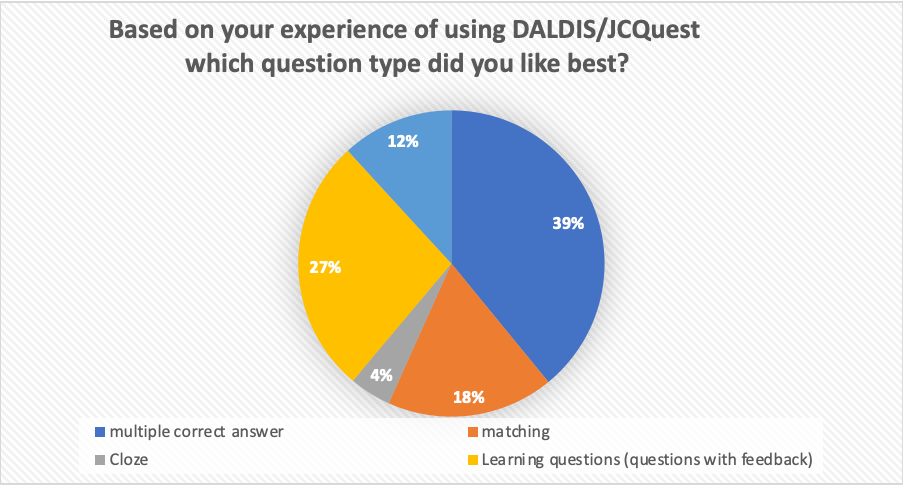


Figure 4.7 Based on Your Experience of DALDIS/JCQuest, Which Question Type Did You Like Best?

Erasmus+

Opinions of students participating in the focus group interviews were also varied, with a slight predominance of questions with one correct answer and feedback. They also allowed for the collection of valuable materials on the subject of motivation, which guided the respondents in their preferences.

Student 1 (F8, Physics) considered the tasks with gaps in the text to be the most valuable, justifying her choice as follows:

"Because it was the most educational and you can learn a lot of things from it".

Sometimes preferences varied depending on the subject:

"In the language part I liked the most putting the words into the sentence to fill the gap. In physics I liked the multiple choice questions. So I like the multiple-choice questions most" (F8 P, S7).

"And I liked the single-choice ones, because the ones with multiple choices were stuck" (F1 B&Ch, S3).

"Gap and single choice. Just like that, I liked it best. Others I do more often, maybe that's why" (F2 B&Ch, S1).

"It's fun to do such tasks with gaps" (F2 B&Ch, S2).

"With gaps, open. I learn more than. In others I can shoot" (F3 B&Ch, S1).

"Closed but also filling in the gaps. The gaps are cool because you can see how the word works in a natural context, you can use it, come up with it yourself" (F4 B&Ch, S4).

"The easiest and most pleasant - closed, you have specific answers and you have to choose" (F4 B&Ch, S2).

"Single choice, more tests. Then there was some curiosity or hint" (F5 B&Ch, S1).

"I like simple questions, ABCD" (F8 F, S5).

Test questions come with answers, it's easier to remember the answer when there are suggestions. If you click on the wrong answer, then everything is mixed up and things are not in the same order as before, so you cannot click blindly, you have to think" (F5 B&Ch, S1).

As observed, some students found the questions with multiple choice answers too simple and thus less effective in learning, giving less chance to remember the information. The statements of respondents who prefer tasks with gaps to fill (usually considered the most challenging) sound optimistic. Recognizing the advantages of this type of language tasks related to using them in a "natural environment" proves the student's high maturity and reflectiveness. In general, the choice of more difficult options shows the research participants as young people taking responsibility for the learning process, not looking for shortcuts. Single-choice questions aroused little enthusiasm among some students. However, students who appreciated those questions valued the feedback and not just the simplicity of the format. Subsequently, to deepen their knowledge about the type of tasks crucial for the project, students were asked only for their opinion on questions with one correct answer and feedback.

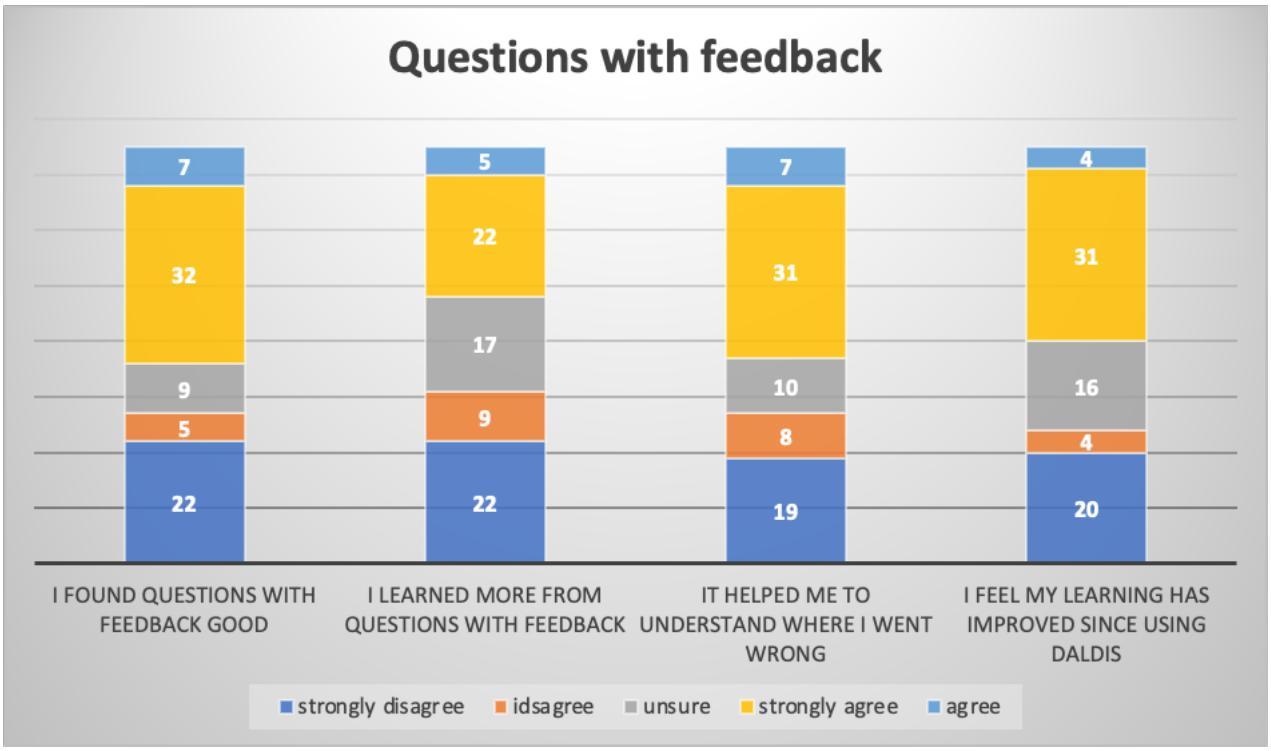


Figure 4.8 Questions with Feedback

As the results of the research show, most students positively and very positively evaluated both the questions containing feedback and the application itself. In the opinion of the majority (57%) of respondents the multiple-choice questions with feedback (Learning Screens) were good. A few had no opinion on this subject, and less than half assessed that it is not a good type of question. From the students' statements collected in the focus group research, it appears that although most students

were satisfied with these types of questions, their motivations varied. Some of the respondents believed that they were good because they were simple, did not require much work and were easy to click, while others believed that they were too little challenge and brought less benefits than questions requiring more intellectual effort (Cloze, Categorization). There were also students who completely ignored the feedback - did not pay attention to it at all or skipped reading it.

Perhaps for these reasons, students' opinions on the effectiveness of this type of questions were almost evenly divided (and even with a slight majority of those who believed that multiple-choice questions with feedback did not make respondents learn more), and the small number of undecided (23%). However, the majority (51%) of the respondents felt that this type of question allowed them to better understand what the mistake they had made was. They also assessed the impact of using the application on improving learning efficiency rather positively (47% noticed a positive impact, 21% were not sure, and 32% did not notice such an impact). This is confirmed by many of the statements of participants in focus groups. These results suggest that when using the application, special emphasis should be placed on making students aware of what feedback is for and that it should not be ignored but should be read carefully and understood. Otherwise, some may take the easiest path until they succeed by clicking randomly in the answer. This is most unlikely to bring any positive educational results and waste the potential of the application.

These observations are confirmed by students' opinions collected in the focus groups.

> *"The cool thing is that after marking each answer, wrong or right, the app shows an explanation as to why. This is very helpful"* (F2 B&Ch, S3, all vigorously affirm).

> *"Feedback is super useful, because when I made a mistake in a chemistry task, this generator showed me why it was a mistake and my next answer was already correct"* (F3 B&Ch, S1).

> *"This is a cool idea, it makes it easier to remember and understand"* (F4 B&Ch, S3).

> *"This form is very useful, because if you barely understand what the topic is about and you click on the wrong answer, it starts to remind you a bit of the lesson and such a hint can direct you to the right answer"* (F3 B&Ch, S5).

> *"It was useful for me because I knew what I had to learn more"* (F8 P, S7).

Students also noticed and appreciated details in building the content and design of the application, facilitating effective learning from feedback:

"These hints are sometimes included later in other questions. If you mark it wrong and the application tells you that it is part of something else, then when you get to the question of what is part of this something else, you already know what to mark" (F, B&Ch, S6).

"It's cool that it highlights the right answer so that it stands out. I am a visual person and I need to have a good answer highlighted or in a different color to make it stand out" (F3 B&Ch, S3).

One of the participants of the study reflected on the feedback prompting her to sum up:

"We have learned more from DALDIS than from the other apps / We have learned more from DALDIS than from other apps" (F8 F, S2).

"The feedback was useful but the problem was that if you don't understand there are no examples which help understand" (F7 Eng&P, S1)

Students were also asked to rate the pictures accompanying each question. The majority (51%) considered that the drawings attached to the tasks were helpful in learning, although at the same time there is also a fairly large number of unsure. The detailed distribution of responses was as follows:

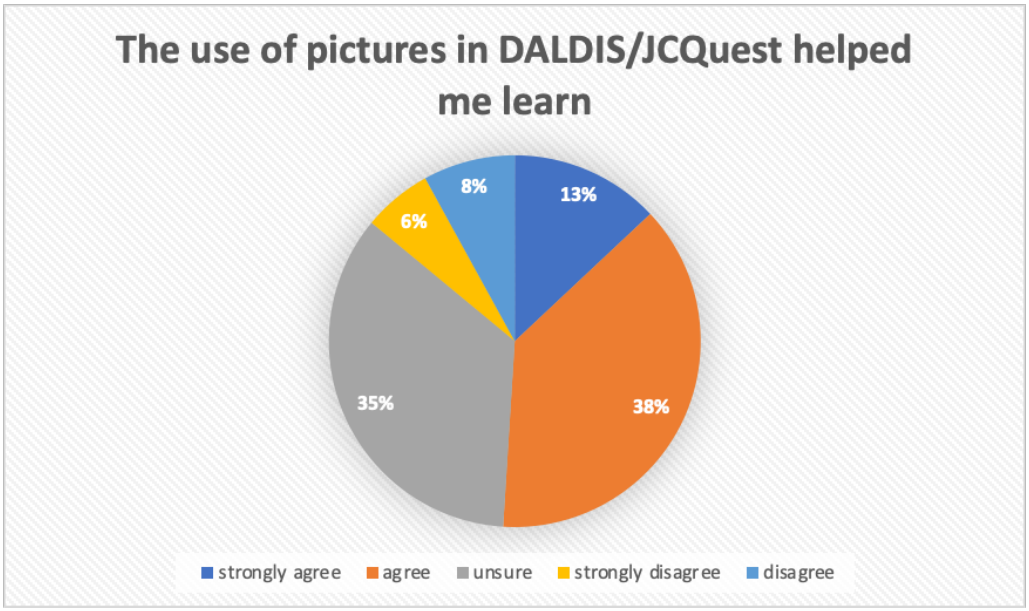


Figure 4.9 The Use Pictures in DALDIS/JCQuest Helped Me to Learn

The explanation for such a large percentage of respondents uncertain about the usefulness of pictures can be found in student focus groups. Authors created questions for individual sections with different notions of the picture function. For some, they were an integral part of the task, carrying additional

Erasmus+

information, while for others, they were mainly illustrative. This second version of the drawings was, inevitably, rated worse.

> *"These graphics aren't always helpful, sometimes they're just pictures. It would be nice if these pictures were more described and there were more of them."* (F2 B&Ch, S3).

> *"In chemistry, some pictures are just illustrations, they don't add anything to the task"* (F5 B&Ch, S3).
> *"Sometimes, instead of describing something in a command for a long time, it would be better to show it in a picture (e.g. that a solid is e.g. ice, etc.)"* (F3 B&Ch, S1).

There were also other comments regarding functional and aesthetic improvements:

> *"Some images are in English, they should have subtitles in Polish and there should be an option to select the language"* (F4 B&Ch, S2)

> *"Possibly some graphics could be improved to make them more aesthetically pleasing"* (F2 B&Ch, S1).

Contribution to Learning and Continuing Use of DALDIS/JCQuest

The survey questionnaire also includes several summary questions to allow students to indicate whether they are generally satisfied with the effects of using the application and whether they would like to use it in the future, and if so, how. Among other things, respondents were asked to respond to the statement that DALDIS/JCQuest helped them in learning. The distribution of answers is presented in the chart below.

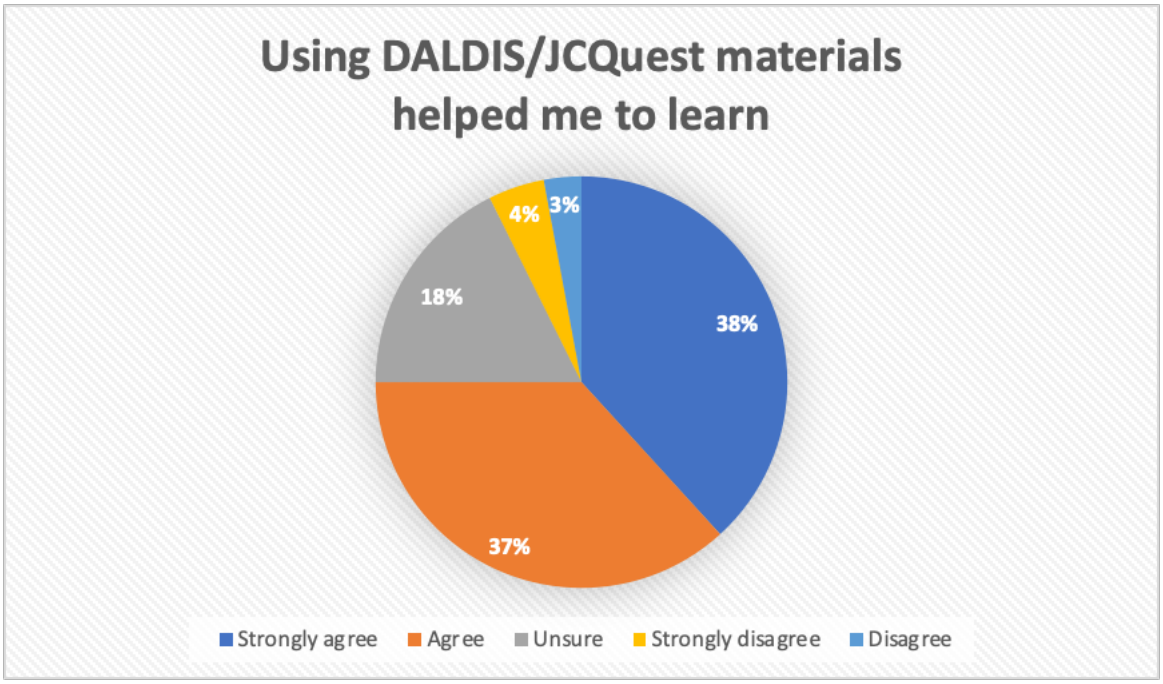


Figure 4.10 Using DALDIS/JCQuest Materials Helped Me to Learn

As we can see, as many as 75% of students unequivocally assess that the application was useful for them in learning, with just a few (7%) disagreeing and a small number (18%) adopting a more neutral stance.

An interesting complement to these declarations were the statements of students from the focus groups. To the question "How do you think, did DALDIS help you learn?", the students answered positively, often justifying their statement in an interesting way.

> *"It's better to learn that way than from a book. Just like with other apps or notes on the internet. Knowledge enters the head more easily"* (F2, B&Ch, S2).
>
> *"Rather before revising for the test, not for learning, but in this she was very helpful"* (F 8 Eng.&P, S1).
>
> *"It's more interesting than cramming from books"* (F 7 Eng&P, S2).
>
> *"I was remembering older messages more than learning new ones, but that was fun"* (F 7 Eng&P, S3).
>
> *"It's easier to find time to do some short, principal exercises, and that way you learn more"* (F 8 Eng.&P, S3).
>
> *"It helped me a little bit to remember the tasks and to know what I have to learn more"* (F 8 Eng.&P, U4). (F 8 Eng.&P, S4).

"I learned more words in English than I knew before" (F9, Eng., P&Ch, S1).

"I think it's pretty cool, especially if you start to learn something new like physics or chemistry. This feedback will be really useful for us next year when we have chemistry and physics"
(F9, Eng., P&Ch, S2).

Students also said that it is easier to like a subject when it is learned in a fun way:

"Yes, it's possible to like a subject more when you learn it with this app" (F1, B&Ch, S2).

"And how! Because you can do the same thing in a different, more interesting way. When you take a book, there are no questions there, you just read the given issue and you have to learn it, and in the application we have questions and if we don't know, we click Explain"
(F2, B&Ch, S3).

"I'm definitely familiar with physics and I have expectations for this subject, I think it's very cool" (F8, Eng.&P, S1).

"Learning from app or other devices is better than just from a book" (F9, Eng., P&Ch, S1).

"It's very motivating to be told why something is wrong and congratulated if it's answered correctly. It's also good to bold a false sentence so that it is immediately obvious that it was a false answer and that no one remembers it wrong." (F5, Ch&B, S5).

"I remember better this way than doing a traditional exercise, so yes, it motivates me."
(F5, Ch&B, S6).

"In general, these lessons were more interesting than sitting at a notebook" (F6, Eng., S1).

However, there were also voices full of doubts or even negative ones, but the reasons given are certainly noteworthy:

"Motivating? Depends on what situation. If we're studying for a test, yes, but if I had to run it while I'm resting, no. I prefer to do other things" (F1, B&Ch, U3).

"It's an interesting thing, because you can focus more on the lesson if you know that there will be an application task later. But I wouldn't replace a normal lesson with a teacher"
(F4, B&Ch, U4).

"No, I'm motivated anyway" (F7 Eng&P, U1).

"No, because I don't like learning very much and that's unlikely to change" (F7 Eng&P, U2).

Erasmus+

Respondents, however, had mixed opinions as to the possibility of motivating students to learn thanks to the use of DALDIS. Many felt that their motivation increased when they used the app, because learning was easier and more enjoyable. In the further part of the survey, respondents were asked whether they would like to continue their education using the DALDIS/JCQuest course materials. The students' opinions were consistent in this matter - they liked learning with the application so much, that they wanted to continue using it. This was confirmed by over 70% of the respondents.

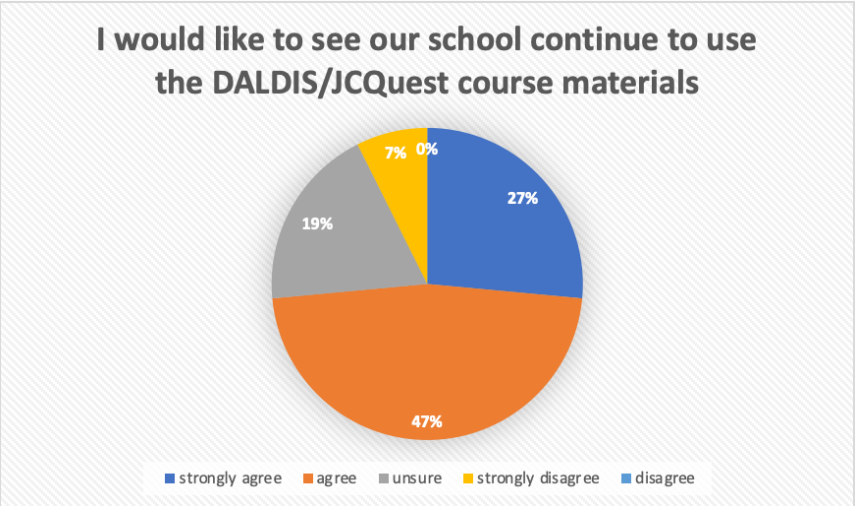


Figure 4.11 I would Like to See Our School Continue to Use the DALDIS/JCQuest Course Materials

Interestingly, there were no student choose the answer "I do not agree" [that I would like to continue using the application], and only 7% assessed that they do not want to continue using DALDIS. It is possible that some students who encountered some technical difficulties, had problems with answering questions or preferred more traditional way of learning. This seems to be confirmed by the statements from the focus groups.

Participants in the focus groups also commented on which learning styles and which students the application may or may not suit. The following aspects were particularly often mentioned:

> *"The app is good for children who learn by sight because there is no sound"* (F2, B&Ch, S1).
>
> *"It's for visual learners. But for someone who prefers to write everything down in a notebook, it will be more difficult"* (F6, Eng., S1).
>
> *"For people who cannot learn from books and need to learn more actively"* (F3, B&Ch, S2 and 4 others).

"For people who like to use technology and for introverts who like to work on their own" (F5, B&Ch, S1).

"For people who like to learn on their own. You don't have to ask the teacher for any worksheets, you just have something to learn by yourself. And for people who like when something happens - you have to click, move, it doesn't get boring." (F2, B&Ch, S3).

"Some need a form other than a book and that will be fine for them, but others need to focus and will find it harder" (F7 Eng&P, S2).

The students also commented on whether they would like to use the application in other subjects than those included in the project. The answer to this question was also positive in most cases. Detailed distribution of the answers to the question is presented in the chart below.

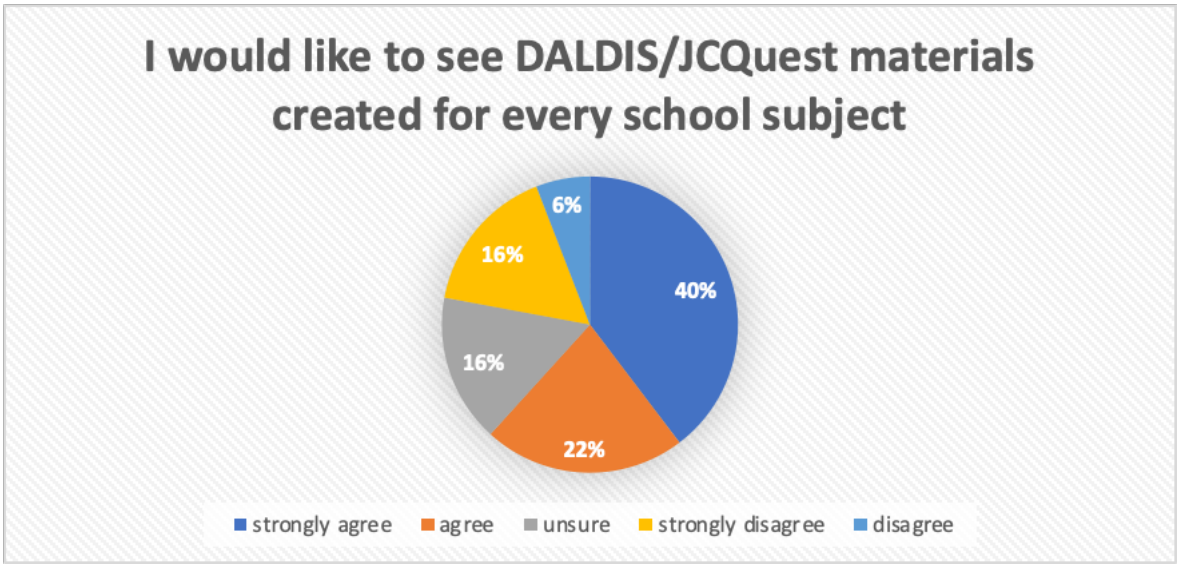


Figure 4.12. would Like to See DALDIS/JCQuest Materials Created for Every Class

The majority (60%) of respondents were enthusiastic about the idea, but 38% were more reserved. A few of this group were people who did not like the application. The hesitations of the others may result from a rather radical way of formulating the question. The version of the application for PE classes or technique could raise their doubts.

This topic is complemented by the statements of students from the focus groups. Most of them would like teachers of other subjects to use more applications similar to DALDIS. There were concrete suggestions:

> *"Yes. It would be possible to make an application for Polish, e.g. from readings"* (F5, B&Ch, S3).
>
> *"Yes, Polish, math, definitely"* (F8, Eng.&P, S2).
>
> *"Yes, it would be right for most of subjects"* (F9, Eng., S1).

Importantly, some of the respondents set certain conditions:

> *"Yes, but it shouldn't be used throughout the lesson, just explain a little first. The application itself is very fast to work with and not everyone can keep up if you do these tasks together in class. Some people need more time to understand something. It would be nice if teachers used the application more often, e.g. before a test and to consolidate knowledge"* (F4, B&Ch, S1).

Students could also answer two open-ended questions about the overall evaluation of the DALDIS/JCQuest application. The first one was about which feature they liked the most. The answers were very diverse, and their range was large - from "Everything" (5 answers), through "I don't know" and "Hard to say" (12 answers), to "Nothing" (2 answers). There was a space for more specific and extensive statements, giving the app authors essential knowledge about the advantages of the application.

The respondents most often emphasized:

- The importance of feedback *("I liked the hints after marking the wrong answer", "Feedback what I did wrong", "Single-choice questions with pictures", "Opportunity to make a mistake and learn from it", "Answers where I made a mistake" , "Feedback*"),
- The ability to try to complete the task several times *("What I liked most about this application is that it can be improved", "Everything was ok, but what I liked most was that if you missed the question, you could still answer the question again", "that you can answer the same question again", "the possibility of correcting the answer"*)
- The efficiency and ease of use *("Quick and effective opportunity to learn through play", "I believe that this way of learning is interesting and not tiring", "Easier form of learning" - 4 answers, "Ease of use", "What I liked most was that the application is a different form of learning from traditional books. It works well as a variety learning", "Clarity of the menu",*

"Using phones during the lesson which improves my concentration", "Easy-to-use aesthetic page").

Positive opinions of respondents were also obtained by the variety of content offered (4 answers) and forms of asking questions.

"I liked the questions the most" - replies one of the students, and another emphasizes:

"I liked the fact that there were a lot of topics and you could choose the topic you wanted to work on. What was cool was that the questions were of very different kinds".

Equally important information was provided by the question about the weaknesses of the DALDIS application and ideas for its improvement. 13 respondents had no idea how to improve the tool. Slightly fewer people believed nothing needs to be changed.

"Nothing needs to be changed, it's great",

"It's perfect",

"In my opinion, the application is very good, so it does not need to be improved",

"I would has not changed because it is perfect").

This opinion was also shared by many participants of focus groups. When asked if anything could be improved in the application to make it easier to use and more interesting, one of the respondents replied:

"Well, it's great. When you study and you know the answers and you want to know more, and there is no more, you can only revise what you did. So the app should be developed all the time" (F8, Eng.&P, S1).

Many students did not indicate any ideas for improving DALDIS. However, both the survey and focus groups also provided constructive critical remarks and specific suggestions. Respondents who filled in the questionnaire indicated e.g., on technical issues that need to be improved:

"So that in the gap-fill tasks you can change the answers after choosing them",

"You can improve logging into the application",

"I think that the version for smartphones needs to be improved" (a topic discussed in 4 statements).

"Tasks with pairing did not work well",

"Slightly reduce the number of questions",

"In some questions the answer depended on the photo and sometimes the photo was not visible. Tasks with long text sometimes repeated words to be entered into the gaps and when I put the same words in a different order, it showed me an error, and it was fine",

In three responses, there was also the question of the popularity of the application and the need to advertise it:

"It needs to be promoted more so that it is used more often."

Interesting threads also appeared in the statements of students participating in focus groups concerning some general and specific issues. Some of the responses were comprehensive and concise:

"I wish they would add more colour to it because it's a little too colourful right now. It would be nice to add some sound to it as well, because right now there is no sound at all. Music and, for example, some sound effects when you give the right answer. So that it rewards you, e.g. with applause. And also that all graphics are in the same style, because, for example, in chemistry they are a bit different than in biology and it's not cool when you use several sets. It would be nice not having to scroll down the page after answering a question to find the next slide button" (F1, Ch&B, S1).

"There are a lot of questions that have very long descriptions. They should be shorter because we don't understand the task. Sometimes there is a lot of description and then a small command. Sometimes, instead of describing something in a command for a long time, it would be better to show it in a picture (e.g. that a solid is e.g. ice, etc.). Where there is a human system, there is no division into departments, but everything is mixed up." (F3, Ch&B, S3).

"Sometimes when there are tasks behind a picture, that picture doesn't help and sometimes they take a long time to load" (F4, Ch&B, S5).

"When pairing with such a blue square, in different categories, there was a terrible problem with it, because you had to constantly refresh the screen for everyone and it was impossible to connect it" (F8, Eng.&P, S2).

In addition to information about what did not work, there were also statements about the direction in which the application should be developed:

"I wish the app had an option to choose a light or dark screen. And the ability to change the wallpaper, personalize a given account. Alternatively, some graphics could be improved to make them prettier" (F2, Ch&B, S1).

"There could be a place for notes to be in one place. The application could check whether, for example, the formulas saved in the notes are correct. The application could also be available in an offline version, so that you can study when you do not have access to the Internet" (F4, Ch&B, S4).

"It would be nice if teachers could add such kits to the application and develop it themselves" (F6, Eng., S2).

"I would expand this application so that there is competition between students. For example, that you collect points, on time or not on time, and that the student with the most points wins" (F2, Ch&B, S2).

The latter proposition seems quite obvious from children who spend a lot of time playing computer games and are used to using gamification mechanisms in digital tools. However, she met with a strong counter in the form of a decisive statement from one of the students:

"In my opinion, the coolest thing about this application is that there is no time pressure, that there is no timer in sight that tells us that there is so much time left, because it sometimes introduces additional stress" (F1, Ch&B, S4).

The desire to compete while learning is therefore not as obvious as it might seem in the case of the generation raised on computer games.

To sum up, it should be said that the students were satisfied with the use of the application, noticed its numerous advantages, but were also able to look at it critically. They showed great competence and commitment, not only pointing out all the significant shortcomings of the tool, but also proposing many ideas for solving problems as well as improving and developing DALDIS.

Chapter Five

Teachers and their Perspective on the Implementation of DALDIS/JCQuest in Polish Schools

Introduction

This chapter deals exclusively with the feedback data obtained from teachers in four of the five schools participating in the piloting of DALDIS/JCQuest in Poland. Surveys, focus groups and research interviews were carried out from May to November 2022. The data was collected using the following tools and techniques:

- Pre-pilot questionnaires 17 teachers (4 schools)
- Detailed questionnaires completed by 9 teachers (4 schools)
- In-depth interviews with 5 teachers (3 schools)

There is analysis of quantitative and qualitative data gathered from teacher surveys and interviews to identify key trends, including how they interacted with students, perceived usefulness and ease of use, impact on teaching and learning, teachers' understanding of Assessment for Learning and how a system like DALDIS/JCQuest handles AfL and other more detailed app usage issues.

The content of the questionnaires completed by nine teachers who were very important for the implementation of the project was analysed, as well as the content of the interviews of 5 key people from this group. The results of the pre-pilot survey conducted among 17 teachers using DALDIS in their classes in the initial phase of the project implementation were treated as supplementary data.

In addition, teachers from each school that used the DALDIS/JCQuest resources, in different age groups, completed initial short pre-pilot questionnaires for teachers (17 people), then teachers who played a key role in the project also completed a detailed summary questionnaire (9 people). Finally, in-depth research interviews were conducted with 6 of them.

Key findings from the survey and focus group will be presented and discussed in the following sections. Complementary to this core data are some interesting data from the pre-pilot survey, which consisted of 11 questions, mainly about the user experience of the application and elements that need improvement.

Another element subjected to parallel analysis is the data obtained from interviews in focus groups, which allowed us to confirm, deepen and enrich the information resulting from quantitative data analysis. In Poland, the application functioned under the name DALDIS, which is also the name used by the respondents.

In the interests of clarity and readability, the following classification terms will be used in the following sections used when presenting the numeric (quantitative) findings from the student and teacher surveys.

Classification Term	Approximate Occurrence %
Almost All	More than 90%
Most	75-90%
Majority	50-74%
Less than half	25-49%
A small number	16-24%
A few	Up to 15%

Table 5.1 Classification Terms and Approximate Occurrence

Key Demographic and Subject Data

All teachers who completed the survey questionnaire teach in co-educational primary schools with 200 to 500 pupils. There were 8 women and 1 man among the respondents. Most of them have extensive professional experience in teaching, which is clearly shown in the chart below.

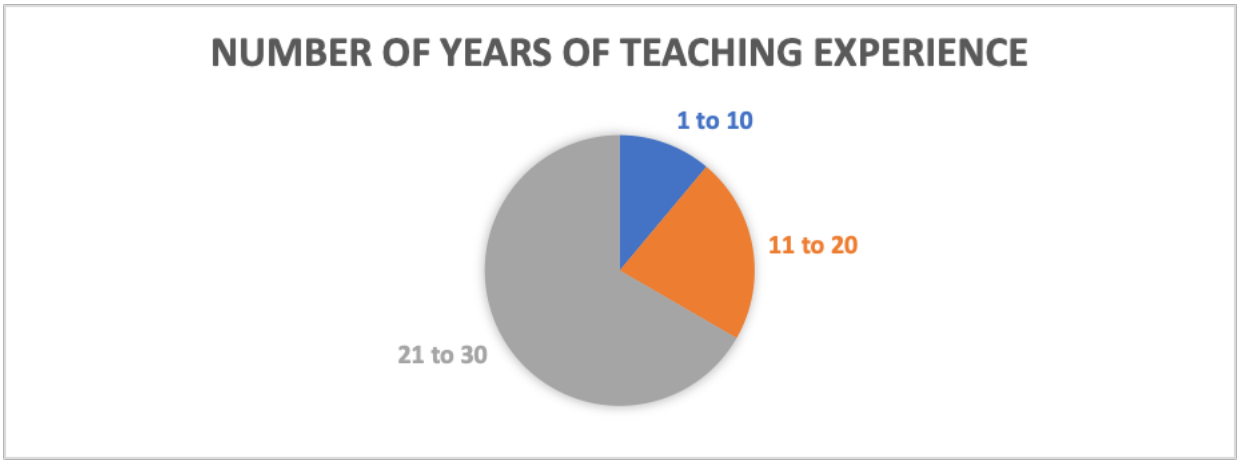


Figure 5.1 Number of Years of Teaching Experience

Five of the respondents were aged 41-50, three aged 51-60, and one person indicated the age range between 31 and 40. At the time of filling in the questionnaire, six of them taught in grades 4-6, seven in grades 7-8, one additionally worked in high school, one also taught in grades 1-3 (English teacher). The results of the survey do not add up to 9 in this case, because teachers could indicate more than one answer. Four people taught English, three geography and two chemistry. The average number of students in the classes where they teach is presented in the chart below.

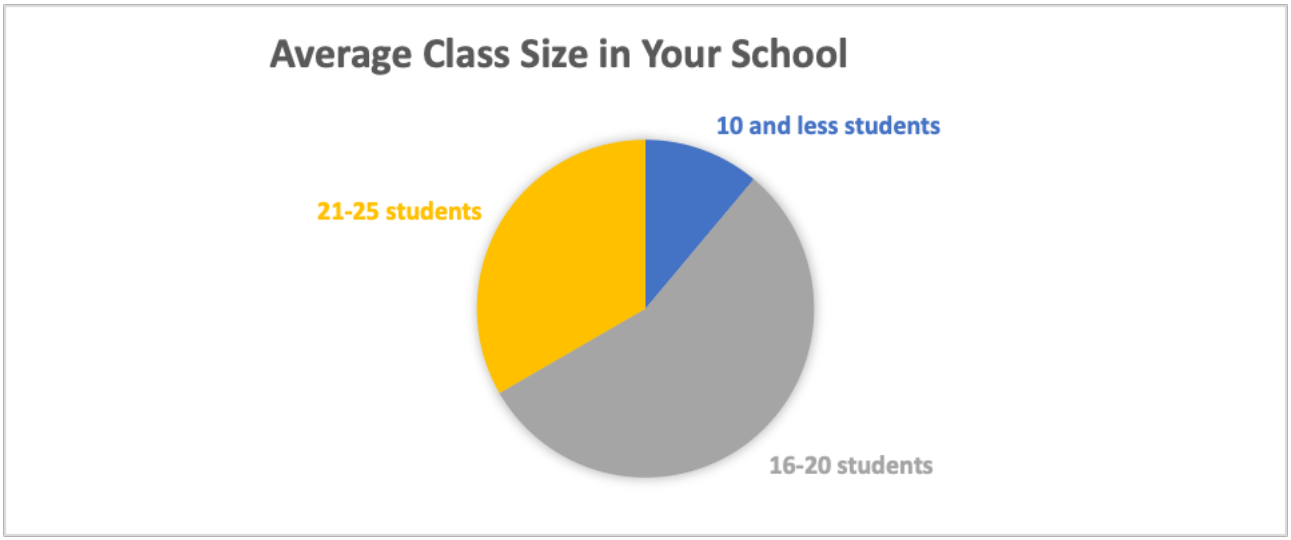


Figure 5.2 Average Class Size in Your School

Technology Infrastructure and Usage

Teachers participating in the survey were asked about several issues related to the presence and function of new technologies in the schools where they work. All respondents worked in non-public schools, which certainly influenced the distribution of answers. These schools are usually better equipped than public schools. The first question concerned equipping the school with digital technologies and its approach to using them in work with students. Teachers were asked to respond to four important statements regarding school policy.

Erasmus+

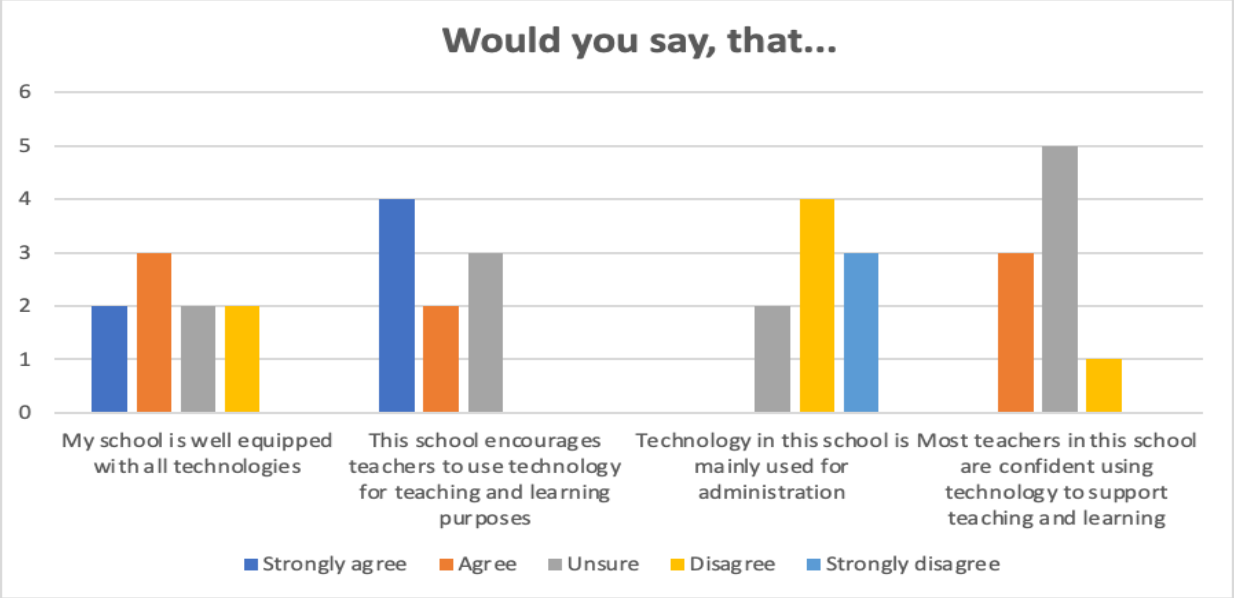


Figure 5.3 Would You Say that …

The majority of teachers believed that their school was well equipped with digital equipment, 2/3 of them were also convinced that the school policy favoured or even very favoured the use of ICT in the classroom. None of the respondents noticed that digital equipment was used in their workplace mainly for administrative purposes, i.e., for keeping an electronic journal or bookkeeping. More doubts were raised by the issue of digital competences of teachers working with the respondents. No one indicated that they strongly agreed with the statement that most teachers in their school freely use digital tools in their work with students. 3 people agreed with this statement, and as many as 5, i.e. the majority of the group completing the questionnaire, were not sure about it. At the same time, only one person assessed that her colleagues did not have sufficient competence in this area. Such a large zone of uncertainty may result from the difficult situation of the teaching community in Poland. Teachers' salaries are low, and the prestige of the profession is inadequate to the effort and responsibility of people practicing it. This causes a high turnover among school staff, which affects the degree of integration of the teaching community in a given school. Due to the frequent changes of the workplace, they are not able to get to know the capabilities of their colleagues well. In addition, it should be emphasized that low salaries force many teachers to work in several schools at the same time or take a lot of overtime. This situation, combined with excess bureaucracy, significantly reduces their time for further training and can be important when it comes to their digital competences.

Teachers were also asked about the model of using digital equipment by students at school. 2/3 of the respondents declared that the school, where they work, has enough equipment, so that students do not have to share it during lessons. 3 people admitted that their students use digital tools together at school.

One of the teachers declared, that in the school where he teaches, there is a strict ban on the use of mobile phones by students. The remaining eight respondents marked the answer, that children can use phones, but only if the teacher allows them to do so, to support learning in the classroom.

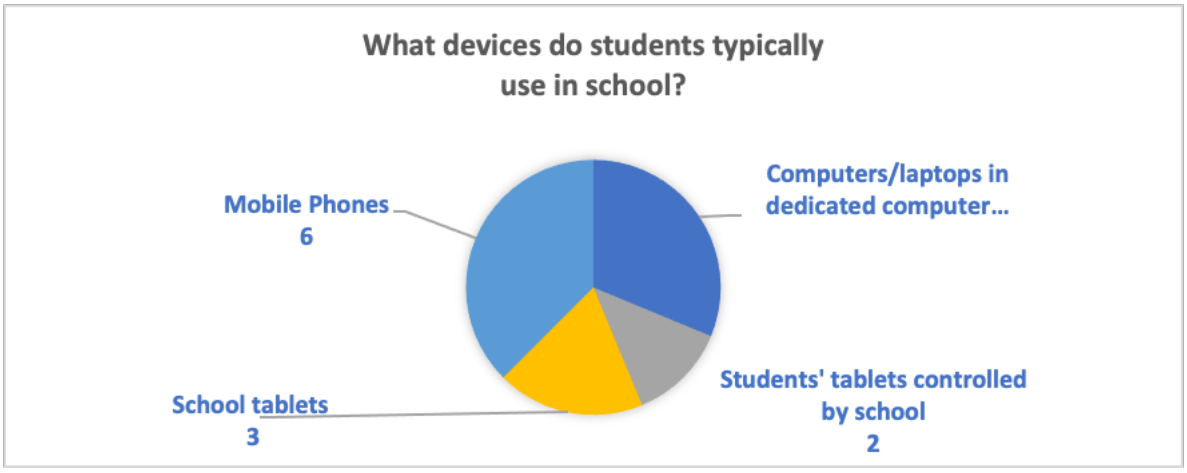


Figure 5.4 What Devices Do Students Typically Use in School

The most commonly used digital tools in the surveyed schools are mobile phones, which, however, according to interviews with teachers, are rarely the devices of first choice. Rather, they are used in emergency situations (not enough tablets or their failures) or when the advantage of small, easy-to-use equipment familiar to students is important to accomplish the task. In equal second place in terms of frequency of use were computers in the classroom and tablets. Schools is the study use two main strategies for using tablets in the educational process: either they invest in them themselves or agree with parents to buy a tablet for their child. Such a tablet is used at school for learning, and at home the student can use it in any way agreed with the parents. In the case of school-owned tablets, the limited number of tablets usually means that students do not get them at home, but they are used in different classes as needed.

Teachers were also asked about their own attitude towards new technologies. All respondents assessed that they feel comfortable (4 respondents) or very comfortable (5 respondents) using digital tools in their work with students.

Erasmus+

This opinion was also confirmed by teachers in interviews:

> *"I felt very comfortable and I didn't have any problems with technology before DALDIS project"* (Gepgraphy teacher 1)

> *"I have been trying to use this technology for many years now in many different ways but it seems I am the most advanced and most ICT friendly teacher in the schools where I teach. So, technology is nothing new for me. I've been using it for many years now"* (Geography teacher 2).

> *"I think that maybe I wasn't a master of it, but I was pretty comfortable with it"* (English teacher 2)

> *"It was not really a problem to start with the new technology"* (Chemistry teacher).

Four teachers declared that they often use digital technologies to support the teaching and learning process in the classroom, and another two said they use it very often. One person said that it was difficult for them to judge, and two - that they did not do it often.

Assessing whether they are considered by others to be very competent in using digital technologies for teaching and learning, caused teachers a visible problem. Four people confirmed that they had such an opinion in the environment, but three teachers indicated the answer "I'm not sure", and two strongly disagreed with the thesis that they should be considered an authority in this field, although they had previously assessed that they felt comfortable using digital technologies in working with students.

Two teachers also declared that they do not use new technologies too often to achieve many goals in their personal lives. Others assessed that they do it often (6 people) or very often (1 person).

Respondents were also asked about the barriers that may face teachers starting work with digital technologies at school. They were asked about their own experience and what could help them act in this area. Detailed answers to individual questions in this section can be found in the charts below.

The first question concerned the support of teachers from colleagues with higher competences in the field of digital didactics.

Erasmus+

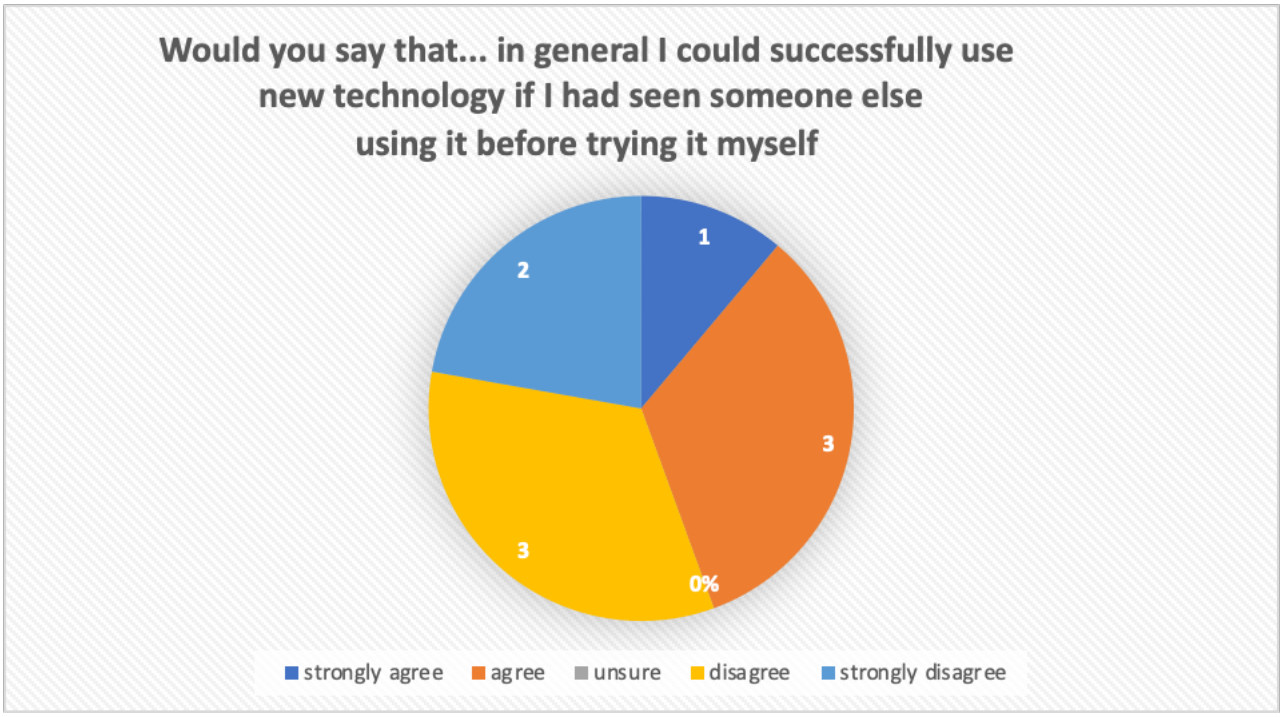


Figure 5.5 Would You Say that in General I Could Successfully Use New Technology if I had Seen Someone Else Using it Before Me

As can be observed, the respondents' votes were split almost in half, and, importantly, there was not a single undecided vote. Almost half of the surveyed teachers, despite the fact that they work in well-equipped schools, indicate the need for substantive and technical support for their work in this area. They manage to use digital tools in their work with students, but they feel that they could do it much better or have much more comfort at work if they were not reliant on their own experience.

In a similar way, there were voices in response to the question of whether it would be easier for teachers to work with the new tools if they had previously had a chance to use similar technological solutions for similar tasks or if someone had shown them how to do it first. More than half of the respondents felt that it would help them cope with new tasks.

Teachers were also asked whether they would use digital technologies in their lessons to a greater extent if they had a lot of time to prepare such activities. The distribution of responses is presented in the chart below.

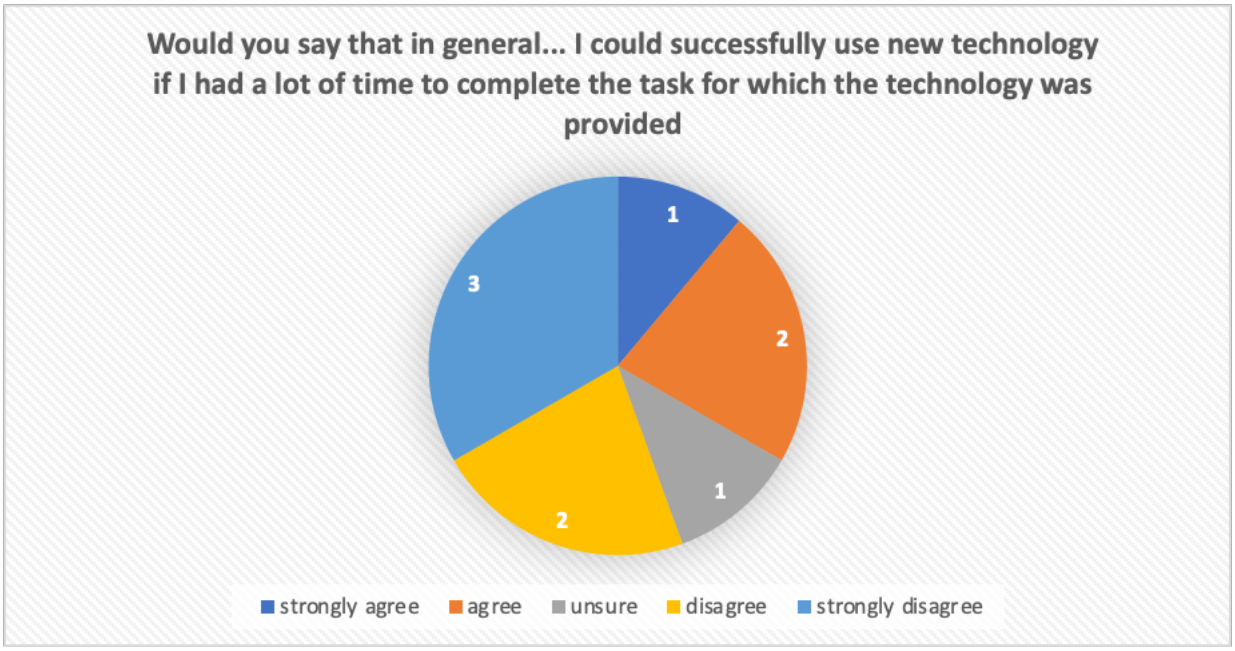


Figure 5.6 Would You Say that in General I Could Successfully Use New Technology if I had a lot of Time to Complete the Task for which the Technology was Provided

Most of the respondents disagreed with this thesis. These were teachers with more experience in working with digital educational tools, who most likely experienced that new technologies can greatly improve teaching and learning. People without much experience in this area, however, need more time to familiarize themselves with a new application or device, and for them it may be a difficult investment to implement.

In most cases, teachers manage without the support of other people, although half of them would prefer to have someone next to them, with whom they can consult in case of problems or share their experience and new discoveries in the world of digital teaching. All they need is a manual for a given tool to start using it, discovering its secrets on their own. This is illustrated by the chart below.

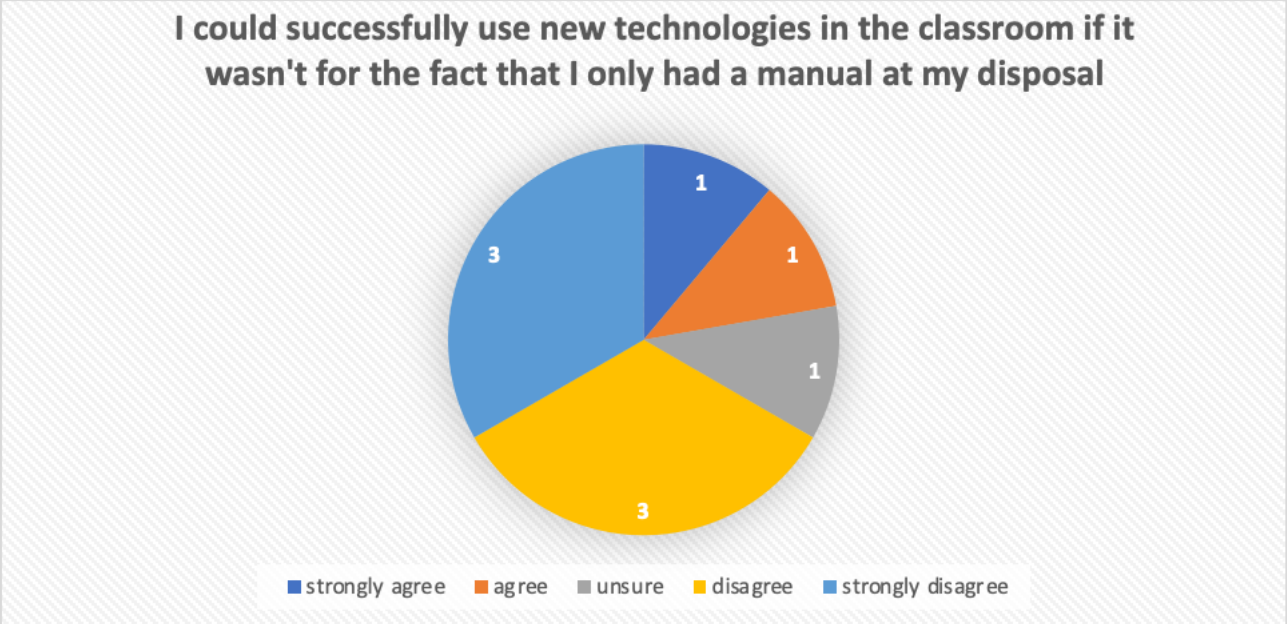


Figure 5.7 Would You Say that in General I Could Successfully Use New Technology if it wasn't for the fact that I Only had a Manual at My Disposal

General Approaches of Respondents to Assessment

Another group of questions addressed to teachers concerned their approach to assessment as a tool supporting their work with students, as well as to formative assessment and the use of digital technologies to support both general assessment and formative assessment.

The first, very extensive survey question from this section, made it possible to find out what, in the opinion of the respondents, student assessment is used for. All respondents agreed that it is needed to improve students' skills through feedback (3 "strongly agree" and 6 "agree") and to inform students about their progress (5 "agree" and 4 "strongly agree").

There were a few more doubts about:

- The usefulness of assessment to assess students' strengths (4 answers "strongly agree", 3 "agree" and 2 "don't know"),
- The usefulness of assessment to help students learn by identifying their own errors or incorrect assumptions (4 answers "strongly agree", 4 "agree" and 1 "don't know"),
- The usefulness of assessment to determine how much students have learned (5 answers "strongly agree", 3 "agree" and 1 "don't know")
- The usefulness of assessment to show students further development path (2 answers "I strongly agree", 4 "I agree" and 3 "hard to say").

Undoubtedly, for teachers participating in the project, student assessment is not only a tool for administrative management of the teaching and learning process, but above all a way to communicate with students, show them their strengths and inspire them to develop. This approach clearly emphasizes the subjective treatment of the student as the most important participant in the educational process, in which the teacher plays the role of a companion, not a supervisor.

Teachers were also asked about their experience of using technology for assessment before learning about the DALDIS/JCQuest app. According to their declarations, five of them regularly used technology to assess students, and four had no experience in this field. Respondents were also able to comment on the benefits and challenges of using technology to assess students. The distribution of answers to some questions in this area is presented in the charts below.

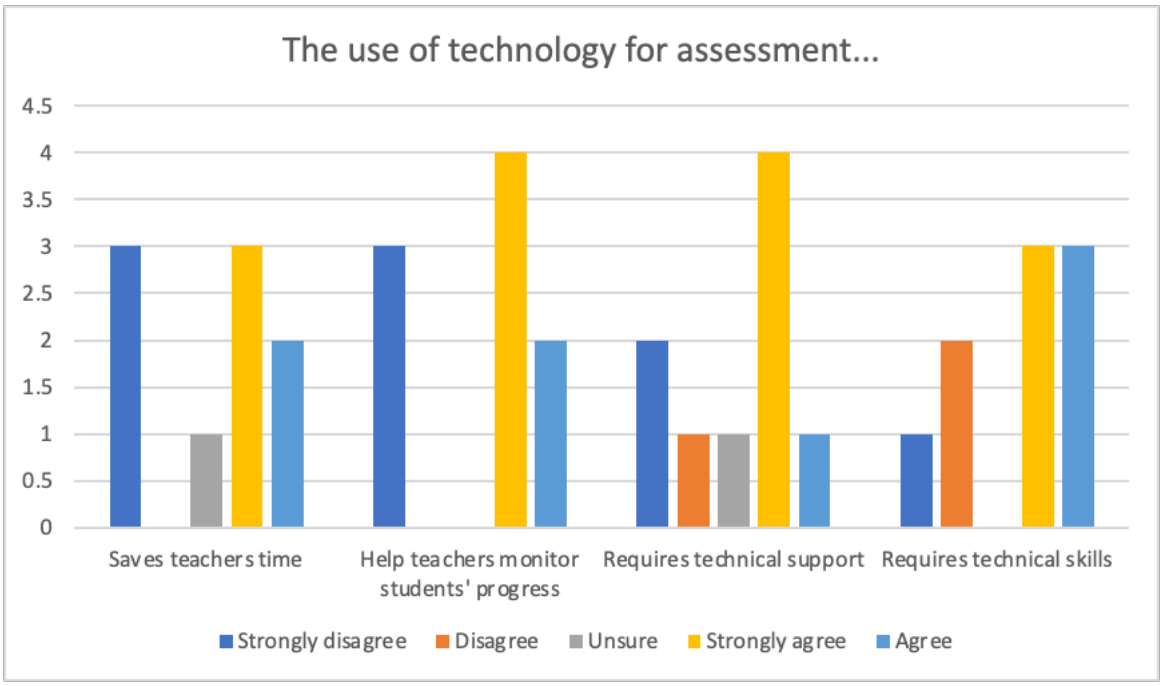


Figure 5.8 The Use of Technology for Assessment …

This is probably because Poland lacks programs for comprehensive preparation of teachers to work with students using digital tools. This results in the need for teachers to independently acquire knowledge on this subject and, consequently, their very diverse experiences, if only due to the fact that the quality of the offered courses and their scope can vary significantly.

Erasmus+

Teachers were also asked to rate whether the use of assessment technology was easy to integrate into their daily assessment practice and their strategies for providing students with feedback on their learning progress. The distribution of answers to this question is presented below.

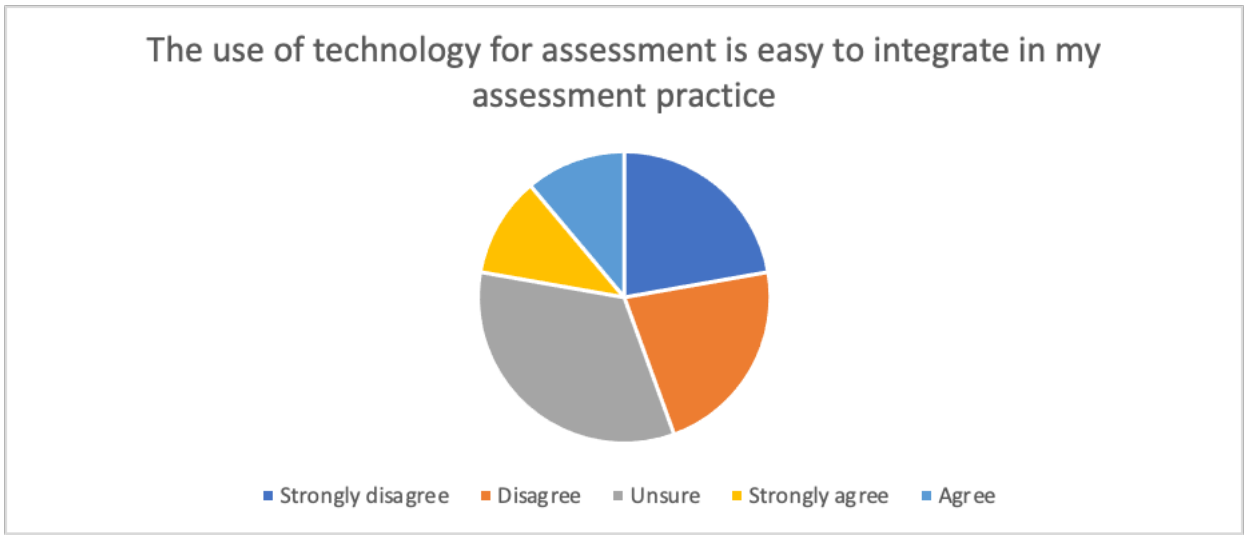


Figure 4.9 The Use of Technology for Assessment is Easy to Integrate in My Assessment Practice

As can be observed, this question caused more uncertainty among the respondents. Perhaps they had trouble reading his intentions. A similar hesitation was caused by the question of whether the use of technology is more suitable for formative assessment or for traditional types of assessment.

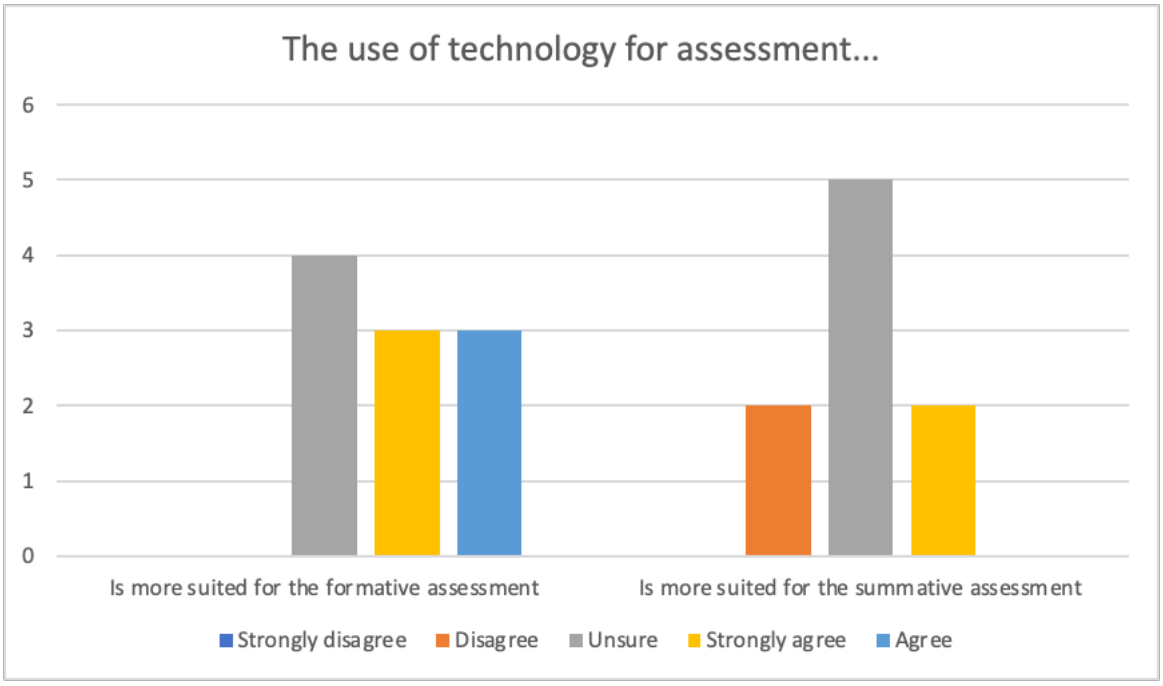


Figure 5.10 The Use of Technology for Assessment …

The fact that the teachers completed the questionnaires after several months of working with DALDIS/JCQuest may have contributed to the differentiation of the results of the answers to this question. The number of educational applications containing elements of formative assessment is small, and this type of assessment is commonly associated with a strong individualized approach to the student, which is not subject to automation. As a consequence, in the general mind, the belief in the possibility of using technology in formative assessment is hardly intuitive. Meanwhile, DALDIS modifies these beliefs gradually.

Teachers were also asked about their daily practice of assessing students. All respondents said that they usually assess students in school, through material summary tests, to see how well they have mastered the material. They were also asked to indicate on a scale of 1-5 which assessment goals are very important to them (5) and which are less or completely unimportant (0). As the most important tasks for assessing students, teachers indicated the objectives presented in the chart below:

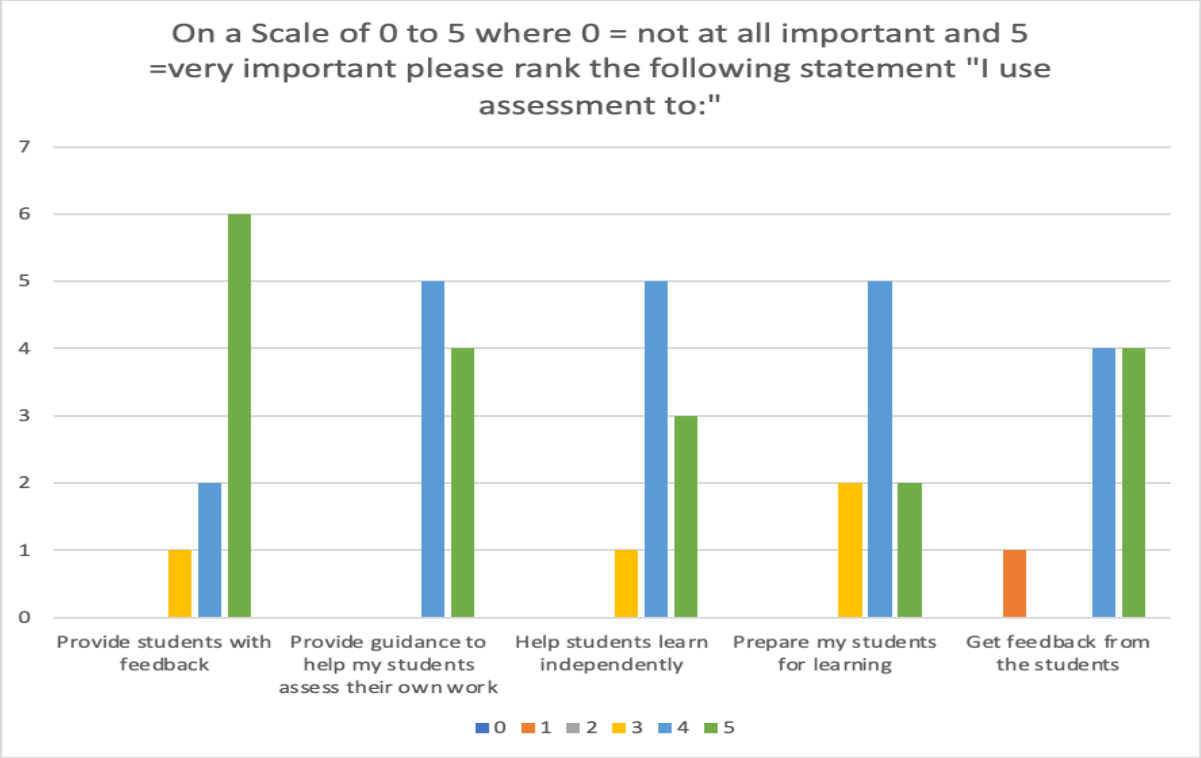


Figure 5.11 I Use Assessment to …

Ensure the achievement of the curriculum objectives, grading and marking, understanding their own students and how well they learn were also defined as important goals. Help in planning subsequent lessons was indicated as the least important objective of assessment. Also in the issues contained in this section, the teachers' attitude towards the student as the main subject of the teaching and learning process was visible.

The last question on teachers' attitudes towards assessment was related to formative assessment. They were again asked to respond to several statements. The distribution of answers is presented in the chart below.

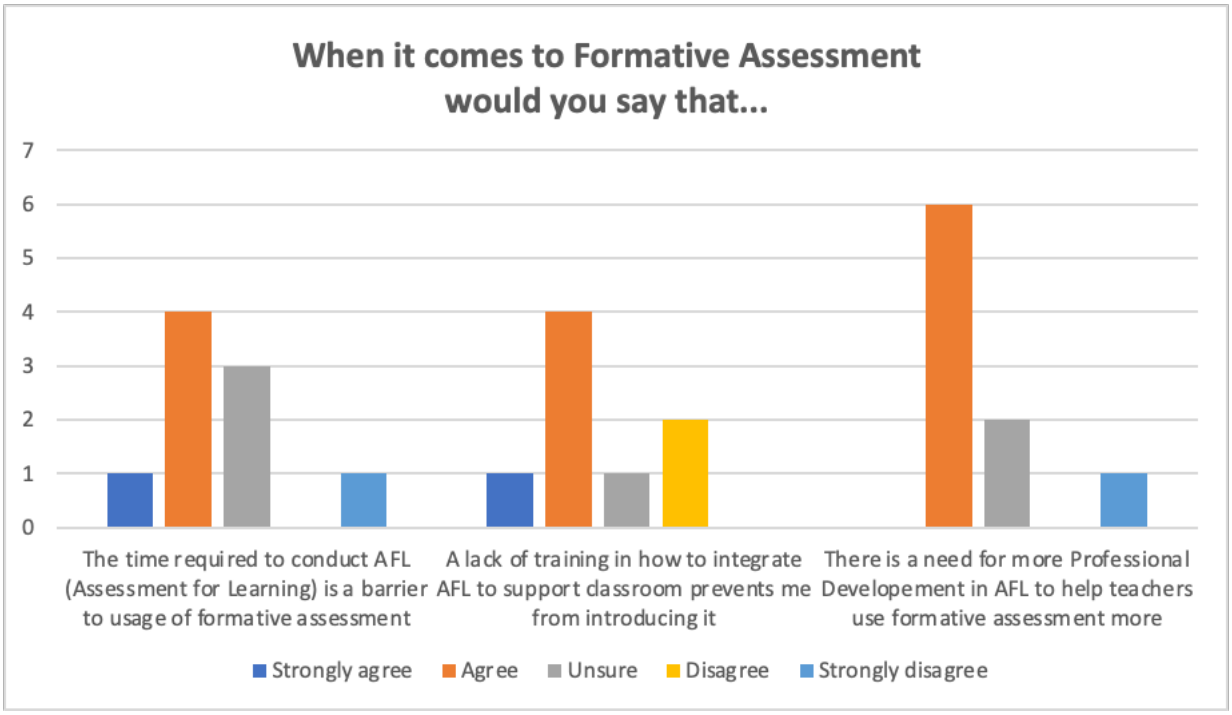


Figure 5.12. When it Comes to Formative Assessment, Would You Say that …

As can be observed in the graph above, the teachers were quite unanimous on the issues raised in the question. A fairly strong barrier to the use of formative assessment is time (although one of the respondents strongly protested against such a thesis, which is probably due to her extensive experience in using this method of assessment and the development of certain operating standards that allow for economical use of time). Teachers, however, suffer primarily from the lack of training in formative assessment. The use of the new assessment method requires the highest professionalism from the teacher and mastering the new technique to the highest possible extent. The importance of

assessment in working with the student, providing him with correct feedback and adequate support is extremely important to the learning process. A responsible educator cannot afford to experiment in this area, hence the strong need for professional training in the field of AfL.

Confirmation and development of these threads can be found in the content of interviews with selected teachers. When asked about the main challenges faced by a teacher who integrates shaping assessment with other forms of work with the class, they mentioned, among others:

> *"Well basically, that's time, because I find it very time consuming. That's why I don't do this with every task, but I give it to my students only for some of the tasks which I really find to be important for students to get good feedback and know what they should work on."* (English teacher 1).

"Time limitations - simple as that! Students different varying in terms of their skills and abilities towards vocabulary and grammar. So, as you can imagine giving detailed feedback each time is simply challenging, if not impossible at some point. So, a teacher himself can only manage two or three students at the time, I think, in terms of giving direct feedback. (...) Using the application, students work on tasks individually and they get feedback right away. So, I think this is something that can bring better results than teacher himself creating feedback with delay" (English teacher 2).

> *"There are a lot of students in the class, a lot of classes which I teach, and obviously it's time consuming to write the information for all the students"* (Chemistry and Biology teacher).

> *"Formative assessment is really time consuming and the DALDIS app helps really to save time"* (Physics teacher).

In the teachers' opinion, the lack of time is related to other consequences - in overcrowded classrooms and in a situation where many groups are taught (as is the case in subjects where the teacher has a small number of hours per week), it is difficult to prepare a formative assessment for each student on time. This, in turn, carries the risk of overlooking something and unfairly assessing the student. These problems are mentioned by the two geography teachers:

> *"I teach 19 classes which is a lot, students are very different and it's always a challenge to adjust my way of teaching to all these students and classes "* (Geography teacher 2).

> *"The most challenging task is to offer reliable information which is honest but at the same time it doesn't hurt anybody's feelings"* (Geography teacher 1).

Despite these difficulties, teachers are aware of the benefits that students derive from formative assessment, so they try to introduce its elements in their work with the class. During the interviews, they mentioned the following benefits:

> *"I can see only benefits for the students actually because it's just a kind of individual approach so every student is treated in their individual way and can work on his or her mistakes. It's a kind of individual way of learning"* (English teacher 1).

> *"The students get feedback so the students get information how they work and what they should work on and what they should improve, what their strong points the weaker ones are, so teachers know and the students know what kind of students they really are"* (Geography teacher 2).

> *"First of all, students know what to do, what to study, which makes them more certain what they want to study and at the same time it makes them more comfortable about the way they study"* (Chemistry and Biology teacher).

> *"Formative assessment is simply fair towards students. It's always better to be told exactly what you're doing well and what needs improvement, in contrast to just giving marks. I mean the mark is just the result of the process and formative assessment is a guideline towards becoming better. So, I think it's much more useful in education"* (English teacher 2).

> *"The students instantly know what they have learned, what they haven't learned yet, what the problems are and what they need to work on"* (Physics teacher).

Experience with using DALDIS/JCQuest

An important part of the questions addressed to the teachers concerned their experiences with the use of the DALDIS/JCQuest application in working with students. When asked how often they worked with the DALDIS application, teachers answered similarly to their students. It was predominantly used as a form of revision before a test or exam.

Erasmus+

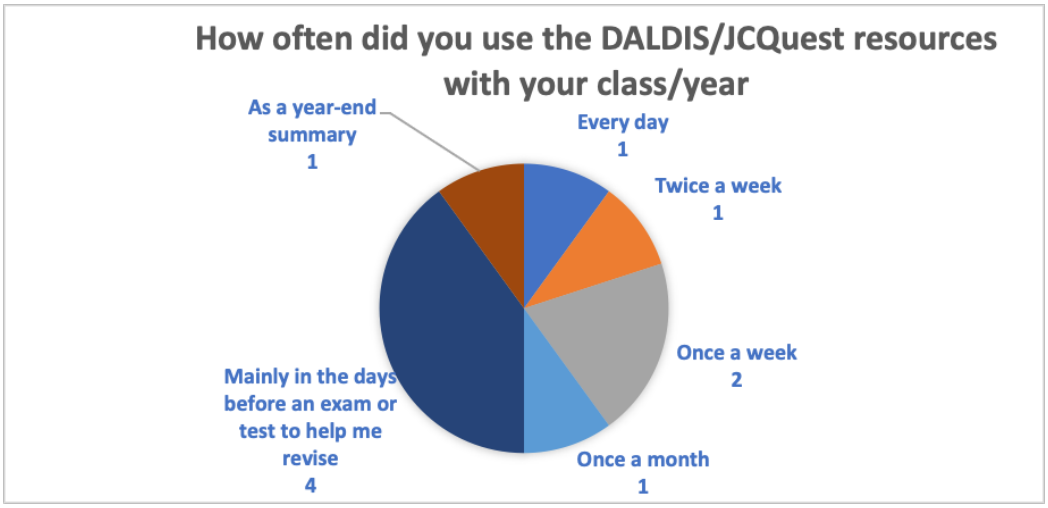


Figure 5.13 How Often Did You Use the DALDIS/JCQuest Resources with Your Class/Year?

According to the teachers' declarations, the students they worked with, were in the next year of biology/geography (3 teachers), the first year of chemistry/physics (3 teachers), the second year of chemistry/physics (3 teachers), English (grade 6 , 7 and 8 - one indication by teachers).
Interviews with teachers provided additional information on how they used DALDIS in their work with students. The Geography teacher 1 outlined his strategy as follows:

> *"I sent the students the link to the DALDIS application and they were supposed to use it as a revision. It was also a chance to get some extra points or grades. And I am planning to use it this year with my students as a kind of revision after each chapter, each unit. And also, as a revision during the lessons, too".*

Other teachers' experiences are similar:

> *"I've been using it to sum up the lesson, to revise the lesson at the end. Also the students who wanted to could use the application at home and also the application was used by those who wanted to, by the willing students as a way of preparing for competitions. At first, I showed them the application on the big screen just to show them how it works and later they often used the app with their phones"* (Geography teacher 2).

> *"So, we just used it just for revision really and we just worked on tablets mainly, and phones. Some of the students, due to some technical issues which we were unable to resolve in the classroom, poor Internet connections, some flaws of the equipment, simply finished the exercises at home on their own computers. But it was a form of revision and, yeah, quite useful"* (English teacher 1).

> *"So first I used it as an introduction to the topic because some of the issues are intuitive and others need to be explained. And then again, I used it for revision to find out what we still*

need to work on. I used the application during the lessons not as homework. In the teachers' opinion, the application definitely worked as a teaching aid" (Physics teacher).

In the teachers' opinion, the application definitely worked as a teaching aid.

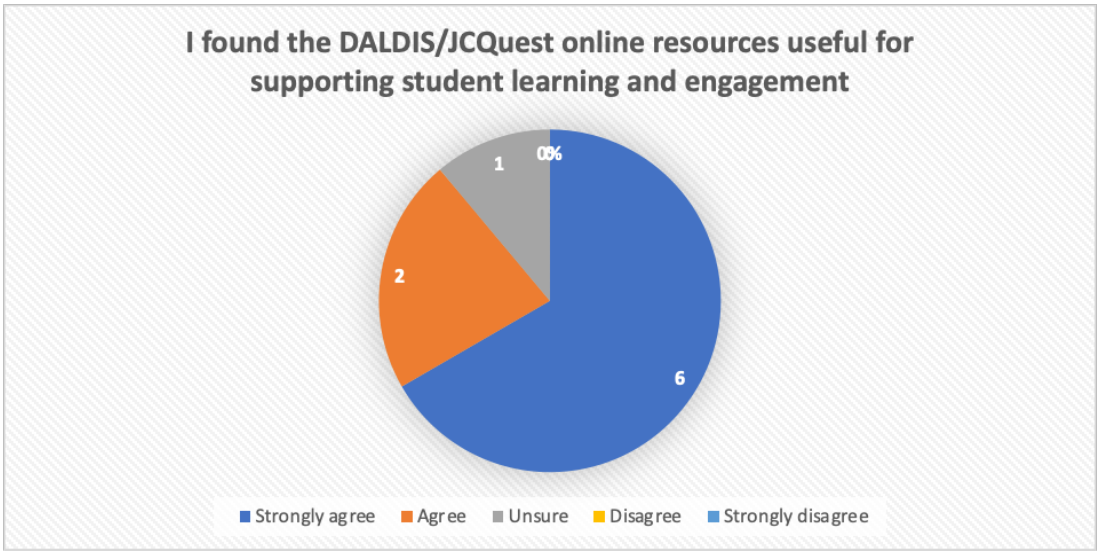


Figure 5.14 I Found the DALDIS/JCQuest Online Resources Useful for Supporting Student Learning and Engagement

This opinion was confirmed by the teachers' statements given during the interview. They emphasized the importance of the fun aspect of using the application and the students receiving immediate feedback while completing the tasks:

"I think my students were happy when using it because it was interesting. They could actually check how well they know the subject; it was the possibility of getting an extra grade, too. (...) It definitely involved a lot of engagement, it definitely made studying more interesting, it was an extra way of revising things" (Geography teacher 1).

"I could literally and directly experience the fact that my students were working at their own pace, and they were actually enjoying it all. Studying was kind of fun. (...) Definitely my students were really engaged and they also liked the fact that they could improve, correct their mistakes, they can get some feedback, some information which lets them change the answers, they can improve their mistakes thanks to the information they get from the feedback"

(Geography teacher 2).

Erasmus+

"I have observed that the students who worked a lot with this application found it was much easier to give good answers when they were studying the same material later on after using the application" (Chemistry teacher).

"They definitely found it interesting because it was definitely something new compared to Kahoot and the other apps I had been using, and also the information was full and complete compared to the other applications" (Physics teacher).

"I think they were quite happy about the app. I mean for some of them, especially in terms of grammar, it simply confirmed their knowledge. They felt more confident because they knew most of the grammar. In terms of vocabulary, I think they've seen that there is still area to improve. So, the application showed them and I think, that some of them learned some new words ... so cool" (English teacher 1).

Teachers also agreed that working with the DALDIS app helped their students become more independent learners. Seven out of nine respondents agreed with this thesis, only two chose the answer

"Unsure", and no one negatively assessed the application's potential in this area.

Opinions of the respondents were slightly more divided on whether the feedback provided by the DALDIS application helped students understand and correct their mistakes. The majority of respondents felt that the application did its job in this respect, but two strongly disagreed. This last opinion is confirmed by some teachers' statements from the interviews, as well as the declarations of some students participating in focus groups. Among them, there were statements that students did not read the feedback, did not pay attention to it. In such a situation, it is difficult for the feedback contained in the application to help students understand the learning material.

Erasmus+

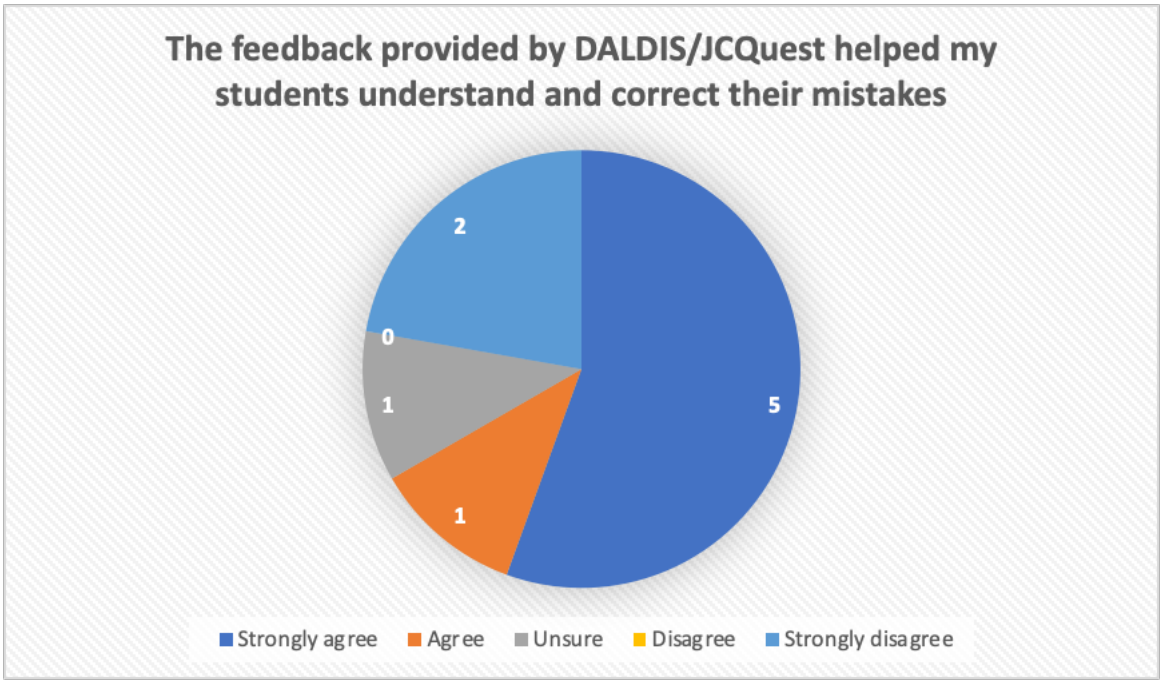


Figure 5.14 The Feedback Provided by DALDIS/JCQuest Helped My Students Understand and Correct their Mistakes

The teachers interviewed were more unequivocally positive about the feedback from the DALDIS tasks. This could have been influenced by the selection of teachers participating in the interviews, as well as the very specificity of the interview as a research tool. Nevertheless, the respondents' statements contain many interesting observations, so it is worth mentioning them:

> *"The feedback was the most important and the most precious. The students were genuinely delighted. The feedback is unique, and they really liked it (...) This is something exceptionally helpful and I got instant feedback about my students' progress. I could monitor how they work and what needs to be improved so it was quick and effective"* (Geography teacher 1).

> *"I think it's very useful, but in the same time it would be good to have the possibility to see different kinds of feedback offered by the other teachers"* (Physics teacher).

> *"Actually, I find it very useful. Ah, and I think that it helped my students to work on their own. They had very few questions. They just read the hints. And I think that I know that also some of them want us to continue to work with this application"* (English teacher 2).

> *"I have been using Quizlet and Kahoot but what is really different, really unique about this application is the fact that even if my students make mistakes they realize that they are actually learning at the same time which makes it really different from all the other apps.*

Erasmus+

Other apps just say what is wrong and what is correct while DALDIS offers much more than that" (Geography teacher 2).

Teachers participating in the interviews were also asked who benefits most from learning when using a resource like DALDIS (in other words, does learning through this medium suit some types of students more than others). Their answers were similar to those of the students. Geography teachers claimed:

> *"Basically the students who like technology in the classroom, all these ICT fans. Which means most of the students. The kids who like playing. It's also good for the students who like to find out more and those who, for example, work slowly - they can spend as much time as they need on it - at home"* (Geography teacher 1).

> *"I have noticed that even the weakest students could benefit a lot from the application. Even if they made a mistake, they got the feedback and eventually they were successful, they could eventually find the good answers - based on the feedback. And they were truly happy about it. Which was also a bit surprising to me but I liked it very much"* (Geography teacher 2).

The English teacher noticed that using the application requires some self-discipline from students:

> *"I think that benefits the most those, who have some sort of motivation in themselves at the beginning of the process and of course those who prefer visual materials to appear"* (English teacher 1).

In the opinion of the Physics teacher, all students can benefit, although in different ways:

> *"I think it's all of them. I mean all students benefit from it. Some students profit more, because they are more interested in some of the issues. The weaker students can discover that physics is actually not so difficult, and it all makes sense. And all the other students being somewhere in between can simply find it interesting and different, which obviously makes the lesson more interesting. I mean makes the subject more interesting."*

Just like students, which is obvious to some extent, teachers also declared that they used the application while teaching at school. Only two people gave students homework related to solving tests in DALDIS or revising the material using it. Seven teachers used the teacher app dashboard (statistics available to teachers) to monitor student progress. Two teachers did not use this facility.

Erasmus+

Teachers, however, were almost unanimous that an automatic grading system, such as that in the DALDIS app, facilitates regular, continuous assessment, as it reduces the time needed for the teacher to grade. Only one respondent expressed hesitation about this advantage of using the app.

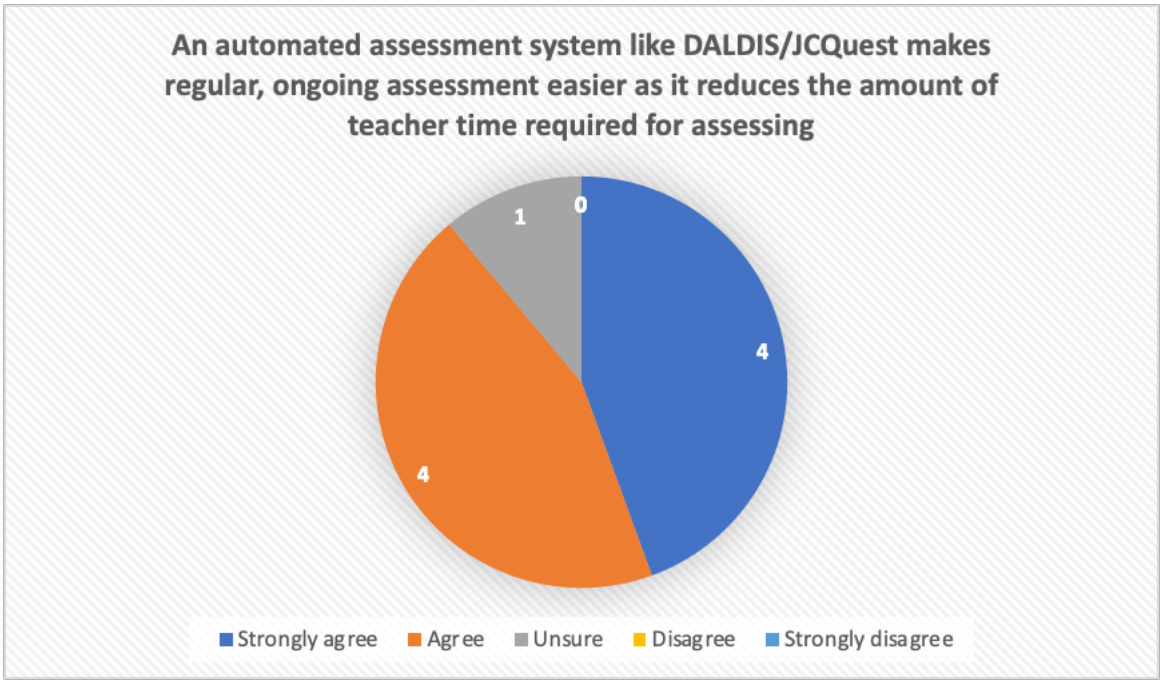


Figure 5.15 An Automated Assessment System like DALDIS/JCQuest Makes Regular, Ongoing Assessment Easier as it Reduces the Amount of Teacher Time Required for Assessing

The teachers also answered a few questions about the use of the DALDIS application. One of the people who previously declared a lack of confidence in their digital competences also expressed doubts about the intuitiveness of using the application in this case. Detailed data can be found in the chart below.

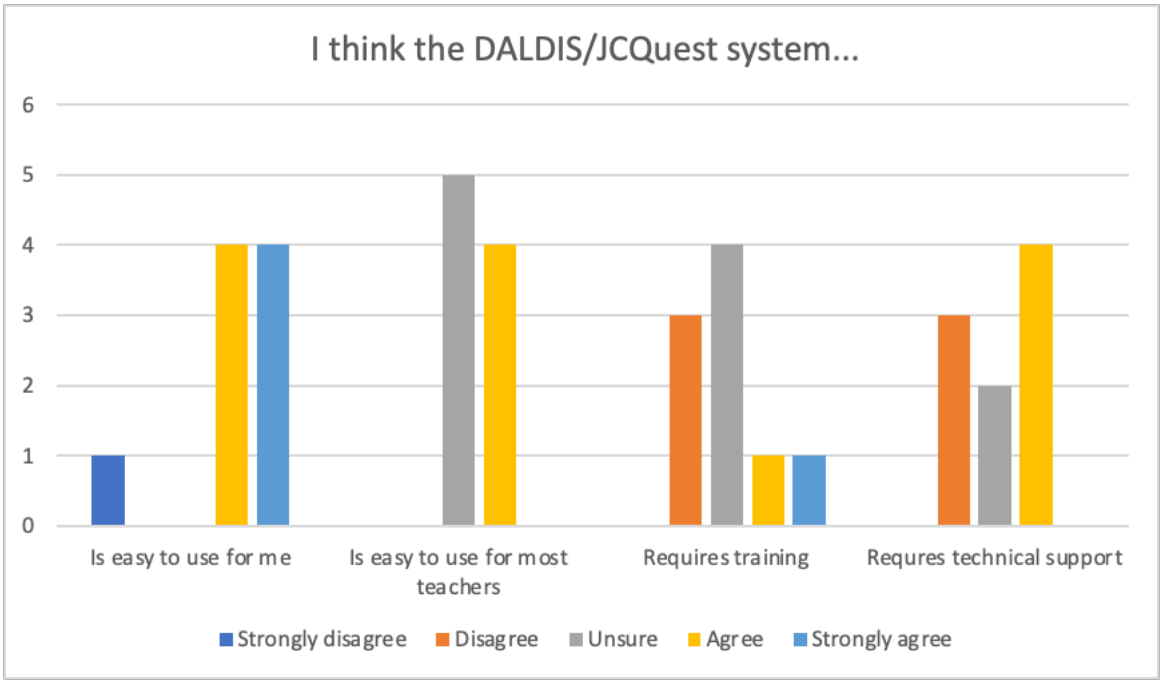


Figure 5.16 I Think the DALDIS/JCQuest System …

According to the collected data, the vast majority of teachers believe that DALDIS is a user-friendly application for them. However, they take into account their own experience in using digital teaching aids and are much more cautious in assessing the ease of use of the application in the case of less experienced teachers. Apparently, the user interface on the side of the teacher, who is the administrator of the class resource in the application, is not as intuitive to use as on the side of the students.

Teachers were also asked, based on their experience of using the DALDIS app, to assess whether it encourages students to self-assess. As many as eight respondents confirmed that in their opinion it has such an advantage (one person indicated the answer "Unsure"). Six respondents assessed that the application also encourages teachers to use formative assessment (two people indicated the answer "Unsure").

However, none of the teachers was sure whether the application had the potential to encourage students to make peer assessments - all choose the answer "Unsure", apparently unable to figure out how to use this potential during the survey. Indeed, in a situation where the application does not activate gamification mechanisms based on comparison, encouraging students to peer assessment

seems to be an unlikely application. The app seems to have a relatively low potential to stimulate students to this type of activity.

Respondents were also asked to rate whether learning about DALDIS has changed their approach to formative assessment. The answers presented in the graph below may seem quite surprising, as 2/3 of the respondents hesitate as to whether they have become more confident in using formative assessment to improve their teaching practice since using the application.

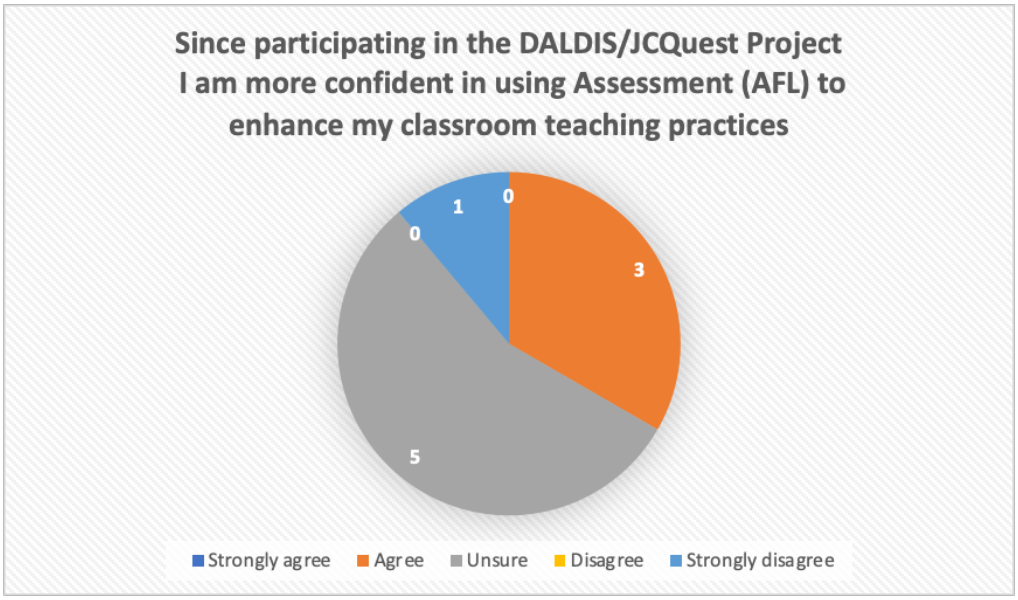


Figure 5.17 Since Participating in the DALDIS/JCQuest Project, I am More Confident in Using Formative Assessment to Enhance my Classroom Teaching Practices

However, reading interviews with teachers provides a plausible explanation for this distribution of responses. The vast majority of respondents know the formative assessment model and use it or its elements in practice. They are experienced teachers who understand the advantages of this type of assessment and are familiar with its principles. This is evidenced by the following statements:

> *"I have been working with formative assessment and using formative assessment in the Montessori School where I also work at present, so when I used to teach at home-schooling education I also had to prepare feedback information it was an online teaching. At first it was a bit difficult but then it was easy it was a kind of routine...."* (Geography teacher 1)

> *"I'm using the following elements of formative assessment: the plan for action, the key questions, and feedback which is in the form of spoken information and the evaluation of colleagues"* (Chemistry and Biology teacher).

> *"I've been always trying to implement different elements of formative assessment, also peer assessment and other things"* (Geography teacher 2).

> *"I think that I was pretty comfortable with it because that was the idea which had been introduced long before DALDIS project in our school. But I think that's something that we do naturally, like, for some types of tasks, we just use it naturally -- we give some hints or ways for hints to improve … um … students' work. In some of the tasks and in the other tasks, we just don't do this because that's obvious"* (English teacher 2).

Not surprisingly, their approach to formative assessment has not changed significantly in this situation. But despite extensive experience in using elements of formative assessment, teachers noticed completely new features in the application, that additionally supported them in using the already familiar form of assessment.

> *"I've always used formative assessment methods, especially in writing teaching because I think this is the basis, I mean the feedback … teacher's feedback is one of the most important things in this matter. However, in terms of drama, or in terms of vocabulary, I didn't used to give as much feedback as the application itself provided"* (English teacher 1).

> *"I think this application is really good and it helps us introduce the topics and also is very useful for revision. I used to work with formative assessment before the project. When I'm using formative assessment i have to work a lot, it takes a lot of time, it's time-consuming, while the application really helps because it actually saves a lot of my time and it's just ready to use"* (Physics teacher).

Importantly, teachers' work with the application significantly changed their approach to the potential of new technologies as support in student assessment and their belief in the benefits that the use of technology can bring to the assessment process. Two-thirds of those surveyed said they feel more confident about using technology to support student assessment since using the DALDIS app. The same people declared that since using the DALDIS app, they have become more appreciative of the potential benefits that technology can bring to the assessment process. All respondents also declared that they would like to continue using the application after the end of the project, in which they strongly agreed with their students.

An open-ended question at the end of the survey questionnaire also allowed them to indicate whether, in their opinion, DALDIS had any particular advantages worthy of attention. In their response, the respondents primarily emphasized the importance of feedback attached to the questions:

"Comment on wrongly selected answer (hint)";

"Feedback to the student provided on an ongoing basis".

The issue of feedback appeared in four of the seven posted statements (the answer to this question was not mandatory). Two people emphasized the aspect of saving time, simplicity and the possibility of obtaining answers about student involvement. For one, the most important was:

"Creating independence and self-reliance in students' learning".

These opinions should be supplemented with the teachers' statements during the interview. They were asked, just like the students, e.g. whether they can suggest any improvements that could be made to the DALDIS application. Here are the most interesting of them:

"One of these things is the possibility to see the application from both teacher's and student's perspective from one account. Which is probably the most important to me. And I would be happy to have the possibility to add my own content, also the possibility to edit the information" (Geography teacher 2).

"First of all, the elimination of technical errors, as in the case of filling gaps in the text. But also, maybe adding two or three types of questions..." (English teacher 2)

"When I use the app on the phone, I simply cannot see anything clearly, so it should be a little bit bigger. Because I can see an information, but I would like to see it more clearly" (Chemistry and Biology teacher).

"For example I would introduce something like extra tasks, in each chapter, in each part. In the DALDIS application I have created questions for all the curriculum and the different parts of the curriculum, and what I would change, I would have extra tasks that are not obligatory, so the students wouldn't have to go through them to move further to the next chapter, the next lesson. So I would simply introduce the optional questions, probably more difficult questions, that students could simply skip and move forward" (Physics teacher)

"Two ideas actually. One of them are technical issues, should be improved, but also if possible, I would love to see some audio materials in the application to not only practice vocabulary and grammar but maybe some listening comprehension as well. Why not try to include some artificial intelligence, you know, we have those Google Assistant voice that can react to what you're saying in real time. That would be interesting if students could make jokes and have, even very simple interaction, with artificial voice over intelligence - that would be nice" (English teacher 1).

Summing up, it can be said, that the tested application was generally approved by the teachers. They positively assessed its usefulness in supporting assessment with elements of feedback addressed directly to students, the immediacy of the information obtained by the student on the need to correct the way of thinking about solving the task, saving the teacher's time and the simplicity of DALDIS as a digital tool. They also noticed the flaws of the solution and areas for possible improvement of the tool, carefully looking at it from the interface of the person administrating the class resources.

Chapter Six

Discussion – Conclusions and Recommendations

Both students and teachers participating in quantitative and qualitative research evaluated the DALDIS/JCQuest application very positively. They indicated its strengths, as well as elements needing improvement (mainly technical details) and submitted ideas for further development of the application. The research carried out during the project also allowed to collect respondents' opinions on the usefulness of digital tools in school education and the usefulness of formative assessment in the teaching and learning process.

The students who completed the survey and later took part in the focus group studies attended the sixth, seventh and eighth grades. Most of them used DALDIS kits for learning English, Physics and Chemistry. An interesting attempt to use the application was made by one of the physics teachers who, at the end of the school year, started using the DALDIS set for physics with sixth grade students, who, according to the curriculum, were to start learning this subject only after the holidays. Contrary to the most common way of using the application as a tool to facilitate the repetition and consolidation of knowledge, as demonstrated by research by both students and teachers, it turned out that DALDIS is also suitable for introducing completely new material in the classroom. Everything depends only on the initiative and ingenuity of the teacher.

The vast majority of students used the application at school, under the supervision of a teacher. In the case of 27% of respondents, the use of DALDIS was related to the repetition of the material and took place irregularly, as needed. The second in order of indication was to use it every two weeks and once a semester. The latter case probably mainly concerned students who joined the project just before the end of the school year and teachers did not have time to work with them in the application for too long.

Polish teachers chose the variant of using the application mainly at school. This could be due to the fact that schools participating in the project are rather well equipped with computer equipment and willingly use it during lessons. At home, some students would probably have to use mobile phones. Tablets or desktop computers were available at school.

Erasmus+

84% of the surveyed students assessed that one of the greatest advantages of the DALDIS/JCQuest application is its ease of use. At the same time, 85% declared that they liked working with the application, 75% felt that it helped them learn, and 38% became more interested in the subject as a result of using it. These declarations were also confirmed by the statements of students participating in focus groups. The system was considered intuitive and easy to learn, although attentive users also pointed out some technical shortcomings that could make it difficult to use the application. DALDIS was assessed in a similar way by the surveyed teachers, both in the survey questions (8 out of 9 respondents found the application easy to use) and in interviews, in which they talked about the intuitiveness of use. Some of them, however, emphasized that full intuitiveness takes place primarily on the student's interface side, but a teacher less experienced in working with technologies may encounter some difficulties in the initial use of the system.

39.7% of the respondents in the survey assessed that their favourite type of questions in DALDIS were multiple-choice questions. In second place were single-choice questions with feedback (26.5%), which proves that they are also important for users. A slightly different picture emerges from the analysis of the results of focus groups, whose participants most often indicated tasks consisting in filling gaps in the text, usually assessed as more difficult. It is difficult to clearly indicate the reason for this contradiction, but one of the possibilities was the fact that students, who were more involved in learning and interested in the project, participated in focus groups.

Most students (57%) rated the feedback questions positively and very positively, but their motivations varied. Some of the respondents appreciated the opportunity to find out what their mistake was and how to change their way of thinking to solve the task, while others believed that these types of questions are good because they are simple and do not require much work. For some students, they were too little of a challenge, bringing less benefits than questions that required more intellectual effort (gaps, categorization). There were also students who completely ignored the feedback in the questions – either did not pay attention to it at all or skipped reading it. These results suggest that when using the application, special emphasis should be placed on making students aware of what feedback is for and that it should not be ignored but should be read and understood carefully.

Most teachers also noticed the value of feedback contained in single-choice questions. They emphasized its importance both in the survey, in open questions, and in interviews, where they

indicated it as a key element of the application that distinguished it from other teaching aids of this type.

In general, students appreciated the help of the application in the learning process. As many as 75% of students unequivocally assessed that the application was useful or very useful for them in learning, with only 7% negative answers and a relatively small group of people hesitating. Respondents emphasized the advantages of using digital learning aids, claiming that learning with the application is easier and more pleasant than learning from a textbook, it has an element of fun, it is dynamic and therefore does not get bored as quickly as arduous learning from a book. They revealed that they liked the subjects in which they used DALDIS more, and that using the application motivated them to learn.

Similar were the reflections of their teachers, who assessed that the application worked as a teaching aid, making their students more independent, enjoying learning more, and - thanks to feedback - better understanding their mistakes. They also pointed to the benefits of using DALDIS for their own teaching practice. The app allowed them to save time that otherwise would have to be spent providing students with detailed feedback on individual tasks. According to the participants of the study, it can therefore encourage the use of formative assessment tools, usually associated with consuming huge amounts of time. However, most of them did not need to be encouraged to do so, as they had extensive experience in assessing this method before joining the programme, or at least they were starting to apply elements of it.

About 70% of the surveyed students declared their willingness to continue learning with it, and 60% would like to use it in all subjects they learn at school. Participants of the focus groups, when asked about the greatest advantages of the application, emphasized in particular: the importance of feedback, the possibility of attempting to complete the task several times, efficiency and ease of use, and the variety of content offered.

All the teachers participating in the survey and interviews expressed their willingness to continue working with DALDIS. Among the students, there were also many ideas for improving DALDIS, ranging from removing specific faults and technical inconveniences, to ideas for improving graphics, adding sound effects and music, personalizing the user's desktop, adding space for notes or introducing a rule of functionality of all images (not posting images for illustrative purposes only).

As was the case with students, teachers also submitted their ideas for the development of the application. The most interesting were: the addition of a sound layer and the use of artificial intelligence, which is especially useful in language learning, the introduction of additional tasks for volunteers, and the addition of new types of questions.

Summary

This report presents the results of using the DALDIS/JCQuest system - a tool that applies digital technology to formative assessment - in four Polish schools. From March to November 2022, the application was used by 646 students who completed 1256 sessions using DALDIS. In addition, Polish teachers created 71 sets of questions covering topics from the curriculum for five subjects - chemistry, physics, biology, geography and English (grammar and vocabulary separately). At the end of the project, participants using the application were invited to participate in quantitative and qualitative research evaluating DALDIS as a teaching aid, as well as examining attitudes towards the use of new technologies in school and the effectiveness of formative assessment feedback for students.

In general terms, students and teachers welcomed the application as an aid to teaching and learning: they valued the system's effectiveness in increasing student engagement and motivation to learn. In addition, they highlighted its strengths as well as some elements in need of improvement (mainly technical details) and submitted ideas to assist the further development of the application. The DALDIS app is an example of a new technology, which reflects the ongoing ceaseless automation in society in general. DALDIS can be used to individualise the learning process, support the work of teachers, and provide students with knowledge and precise feedback that will increase the effectiveness of their learning.

Erasmus+

References

Białecki, I., Jakubowski, M., Wiśniewski, J. (2017). Education policy in Poland: The impact of PISA (and other international studies). *European Journal of Educ*ation, 52, 167-174.

Birenbaum, M., DeLuca, C., Earl, L., Heritage, M., Klenowski, V., Looney, A., Smith. K., Timperley, J., Volante, L., & WyattSmith, C. (2015). International trends in the implementation of assessment for learning: Implications for policy and practice. Policy Futures in Education, 13, 117-140. https://doi.org/10.1177/1478210314566733

DeLuca, C., and Bellara, A. (2013). The current state of assessment education: aligning policy, standards, and teacher education curriculum. Journal of Teacher Education 64, 356–372. doi: 10.1177/0022487113488144

Dekker, T., & Feijs, E. (2005). Scaling up strategies for change: Change in formative assessment practices. *Assessment in Education*, 12(3), 237-254.

Dolin, J., Black, P., Harlen, W. & Tiberghien, A. (2018). Exploring relations between formative and summative assessment. In Dolin, J. & Evans, R. (eds.). Transforming Assessment Through an Interplay Between Practice, Research and Policy. Springer International Publishing. (53-80).

Feldman, A., & Capobianco, B. M. (2008). Teacher learning of technology enhanced formative assessment. Journal of Science Education and Technology, 17, 82-99. https://doi.org/10.1007/s10956-007-9084-0

Gottheiner, D. M., & Siegel, M. A. (2012). Experienced middle school science teachers' assessment literacy: Investigating knowledge of students' conceptions in genetics and ways to shape instruction. Journal of Science Teacher Education, 23, 531-557. https://doi.org/10.1007/s10972-012-9278-z
Hattie, J. (2009) Visible Learning- Meta Study. Routledge, Abingdon, Oxon, UK.

Irving, K. (2015). *Technology-assisted formative assessment*. In M. J. Urban and D. A. Falvo (Eds.), *Improving K-12 STEM education outcomes through technological integration* (380 – 398); http://doi.org/10.4018/978-1-4666-9616-7.ch017

Jakubowski, M. (2021). *Poland. Polish education reforms and evidence from international assessments.* In: Crato, N. (Ed.). *Improving a Country's Education*. Springer International Publishing: Cham, Switzerland, pp. 137–158.

JISC (2007) Effective Practice with e-Assessment. An overview of technologies, policies and practice in further and higher education. Joint Information Systems Committee. Retrieved from https://www.webarchive.org.uk/wayback/archive/20140613220103/http://www.jisc.ac.uk/media/documents/themes/elearning/effpraceassess.pdf

Lee, H., Feldman, A., & Beatty, I. D. (2012). Factors that affect science and mathematics teachers' initial implementation of technology-enhanced formative assessment using a classroom response system. Journal of Science Education and Technology, 21, 523-539. https://doi.org/10.1007/s10956-011-9344-x

Maier, U. (2014). Computer-based, formative assessment in primary and secondary education – A literature review on development, implementation and effects. Unterrichtswissenschaft Volume 42, Issue 1, 69-86.

OECD (2015). *The ABC of Gender Equality in Education: Aptitude, Behaviour, Confidence.* PISA, OECD Publishing. http://dx.doi.org/10.1787/9789264229945-en

Popham, W.J. (2011) Assessment Literacy Overlooked: A Teacher Educator›s Confession, The Teacher Educator, 46:4, 265-273. Russell, M. (2010). "Technology-aided formative assessment of learning," in Handbook of Formative Assessment, eds H. L. Andrade and G. J. Cizek New York, NY: Routledge, 125–138.

Ravitz, J. (2015). CILT2000: Using technology to support ongoing formative assessment in the classroom. *Journal of Science Education and Technology*, 1(3), 293-296. Retrieved from: http://www.bie.org/images/uploads/general/4fee92438c81d1d02ec7fdf785461c2f.pdf

Russell, M. (2010). "Technology-aided formative assessment of learning," in *Handbook of Formative Assessment*, eds H. L. Andrade and G. J. Cizek New York, NY: Routledge, 125–138.

Stringer, E., Lewin, C. and Coleman, R. (2019). Using Digital Technology to Improve Learning: Guidance Report [online].

Tomasik, M. J., Berger, S., & Moser, U. (2018). On the Development of a Computer-Based Tool for Formative Student Assessment: Epistemological, Methodological, and Practical Issues. Frontiers in psychology, 9, 22 - 45. https://doi.org/10.3389/ fpsyg.2018.02245 William, D. & Black, P. (1998) Inside the Black Box: Raising Standards Through Classroom Assessment. Kings College, London.

William, D. & Black, P. (1998) Inside the Black Box: Raising Standards Through Classroom Assessment. Kings College, London.

Wiśniewski J., Zahorska M. (2020). *Reforming Education in Poland.* In: Reimers F. M. (Ed.). Audacious Education Purposes. How Governments Transform the Goal of Education System. Springer International Publishing: Cham, Switzerland.

https://eurydice.eacea.ec.europa.eu/national-education-systems/poland/poland [date of access: 02.09.2022]

https://eurydice.eacea.ec.europa.eu/publications/supporting-refugee-learners-ukraine-schools-europe-2022 [date of access: 02.09.2022]

https://eurydice.eacea.ec.europa.eu/publications/teachers-and-school-heads-salaries-and-allowances-europe-20202021 [date of access: 02.09.2022]

JCQuest

DALDIS(Digital Assessment for Learning informed by Data to motivate and incentivise students)

The DALDIS project comprising 8 partners will address open access e-assessment for learning through the application and dissemination of innovative assessment for learning techniques which are established in different curriculum contexts and then tested in schools in 6 European countries. Innovative data analysis processes will be applied to support learners and teachers, and to evaluate the most effective questioning and learning models. The project, based on Study Quest technology (wwwstudy-quest.com), will drive student learning progression using well designed question sets and student feedback to help the student build their knowledge and understanding and support the investigation of key curriculum concepts. The key objective is to evaluate 'assessment for learning' (AFL) informed by feedback using digital technology in 6 countries with a focus on Science teaching and learning (Physics, Chemistry, Biology and Earth Science), and modern foreign language (through the teaching of English and French) in years 11 through 18.

For more information

daldis.eu/

jcquest.ie

doğa KOLEJİ

Trinity College Dublin The University of Dublin

DCU

EdTech Ventures

euro geo

ΕΚΠΑΙΔΕΥΤΗΡΙΑ ΔΟΥΚΑ

UNIVERSITY

Memoconsult I/S
IT didaktisk rådgivning

Funded by the Erasmus+ Programme of the European Union.

Co-funded by the Erasmus+ Programme of the European Union