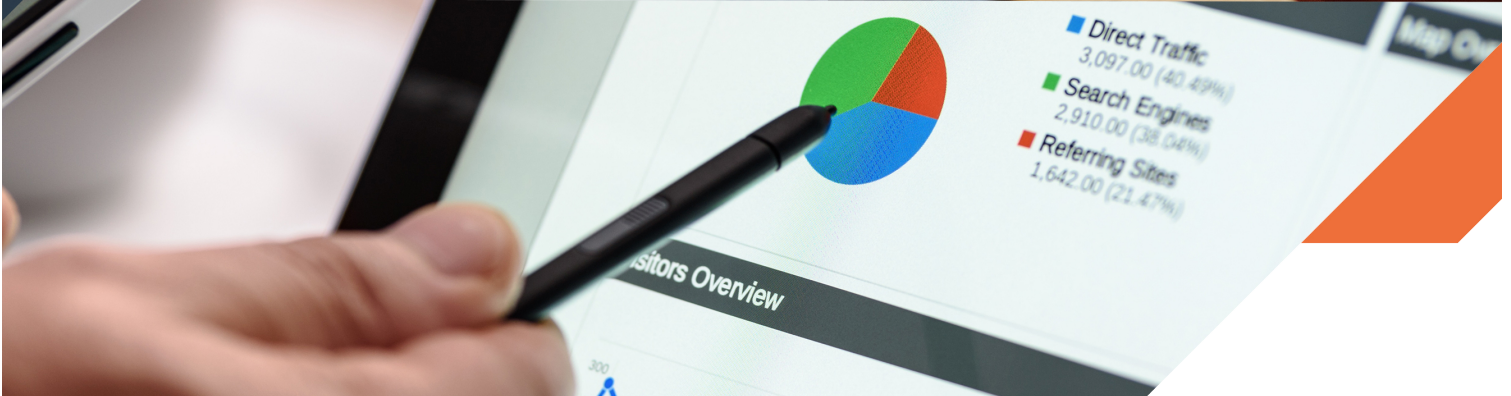




Digital Assessment for Learning informed by Data
to motivate and Incentivise Students



DALDIS

IRELAND RESEARCH CASE STUDY

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

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DALDIS Ireland Case Study (2022)

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Executive Summary

DALDIS (www.daldis.eu) is a 3 year Erasmus+ Project (2019-2022), involving eight partners from five European countries, which aimed to explore the potential of digital technologies for *Assessment for Learning (AFL) or Formative Assessment (FA)*. The application, which was developed and tested as part of the project is designed for Science and Modern Foreign Language (MFL) learning, which in Ireland's case is French. 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, potentially encouraging learning personalisation. 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.

As the lead project partner Ireland was the first country to roll out the DALDIS project. As an early version of the technology and content known as JCQuest (www.jcquest.ie) was substantially complete prior to the project's commencement, a soft launch of the product in beta form occurred in Ireland in January 2020. Designed for second level students studying for Ireland's three year junior cycle programme the key target group for JCQuest was 12 to 15 year olds. Due to this early release, which practically coincided with the **outbreak of Covid-19**, uniquely in Ireland the resource which from here on out will be referred to as *DALDIS/JCQuest*, addressed a desperate need for curriculum-relevant, quality learning and assessment materials at the height of the pandemic, when schools were closed. The system's data analytics reveal that 1,222 students used DALDIS/JCQuest to support online and remote learning during long periods of school closures in Ireland in 2020 and 2021.

With the eventual full re-opening of Irish schools in September 2021 when the 2021/22 academic year began, the pilot phase of the project commenced. This involved testing and researching the resource with schools. To do this five schools were specifically recruited to trial the resource and participate in the project's research. These **pilot school partners (PSP)** provided an invaluable experiential perspective on the usefulness of the resource as an AFL/FA tool. Their perspectives, gleaned through surveys, focus groups and research interviews supplemented the more quantitative data derived from google analytics and the system's database.



Therefore this case study reports on the findings from DALDIS/JCQuest usage over two distinct periods. The first of these represents the peak pandemic period when most schooling in Ireland took place online (March 2020-June 2021). Data collection from this time is based exclusively on quantitative data sourced solely from Google analytics and the system database. The second period encompasses the academic year 2021/2022 when schools re-opened fully and the pilot phase of DALDIS/JCQuest commences. In this phase a mixed methods research approach is adopted as the qualitative data gathered from teachers and students provides added context and richness to the quantitatively derived analytics data.

The quantitative data from phase one reveal many interesting usage patterns and trends as schools moved in and out of lockdown. Most notable among these were surges in usage when schools were closed and at peak exam times, followed by lulls in usage when schools reopened; variety of devices and operating systems used to access the resource; time of day access and the most frequently used material. Significantly, the data demonstrated strong user engagement evidenced by the number of page views recorded, the length of time students spent completing lesson units/question-sets and low bounce rates by comparison with industry norms, both for web traffic generally and e-learning resources specifically.

The PSP qualitative from phase two revealed that the majority of student (78%) were female and the largest user cohort was second year Junior Cycle students. Teachers and students reported they found DALDIS/JCQuest easy and enjoyable to use. From an Assessment for Learning perspective both cohorts reported that feedback provided by DALDIS/JCQuest helped students understand and correct their mistakes, thus encouraging more independent learning. Compared to more open and widely used assessment-like tools such as Kahoot and Quizlet they rated DALDIS/JCQuest as being significantly better for learning, precisely because it contained feedback and varied question types. In particular, students appreciated the immediacy of feedback embedded in the underlying technology as well as the cognitive challenge presented by Multiple Choice Answer (MCA) questions which they identified as their preferred question type. Most teachers reported that the content aligned very well with the curriculum and noted how different learning styles were catered for through the use of accompanying quality visuals.



Nonetheless, findings from the research interviews, focus groups and survey data highlighted a number of challenges which still need to be addressed for a technology based AFL solution like DALDIS/JCQuest to become mainstream. As reported by students technical glitches in relation to ‘drag and drop’ when responding to ‘Match’ questions were frustrating leading to some students unable to complete this task, potentially affecting students’ motivation to use the resource. Disappointingly, very few teachers reported using the system’s analytics dashboard citing lack of time as the key obstacle. Furthermore, technology infrastructural issues in schools such as a paucity of 1:1 devices or limited access to dedicated school computer rooms due to competing priorities, compounded by strict regulation on using mobile phones, curtailed the extent to which DALDIS/JCQuest could be used in everyday classroom learning, thereby limiting its full AFL potential. These findings indicate that there are still areas for improvement to DALDIS/JCQuest and much work yet to be done in helping teachers understand and appreciate how to harness the power of technology driven data to support and advance assessment for learning.

Notwithstanding the above, the overall experience with DALDIS/JCQuest was a positive one for most Irish school users. Encouragingly, the majority of PSP teachers and students expressed a desire to continue using the system beyond the pilot testing phase and identified its expansion for use in all subject areas as the most significant improvement that could be made to the resource. Additionally, during the research interviews teachers indicated they were looking forward to involving other teachers in using DALDIS/JCQuest post-pilot and expressed gratitude for the chance to be involved in the project and the opportunity it gave their students. Undoubtedly these are encouraging signs for the future development of curriculum-focussed technology based AFL solutions like DALDIS/JCQuest .



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.

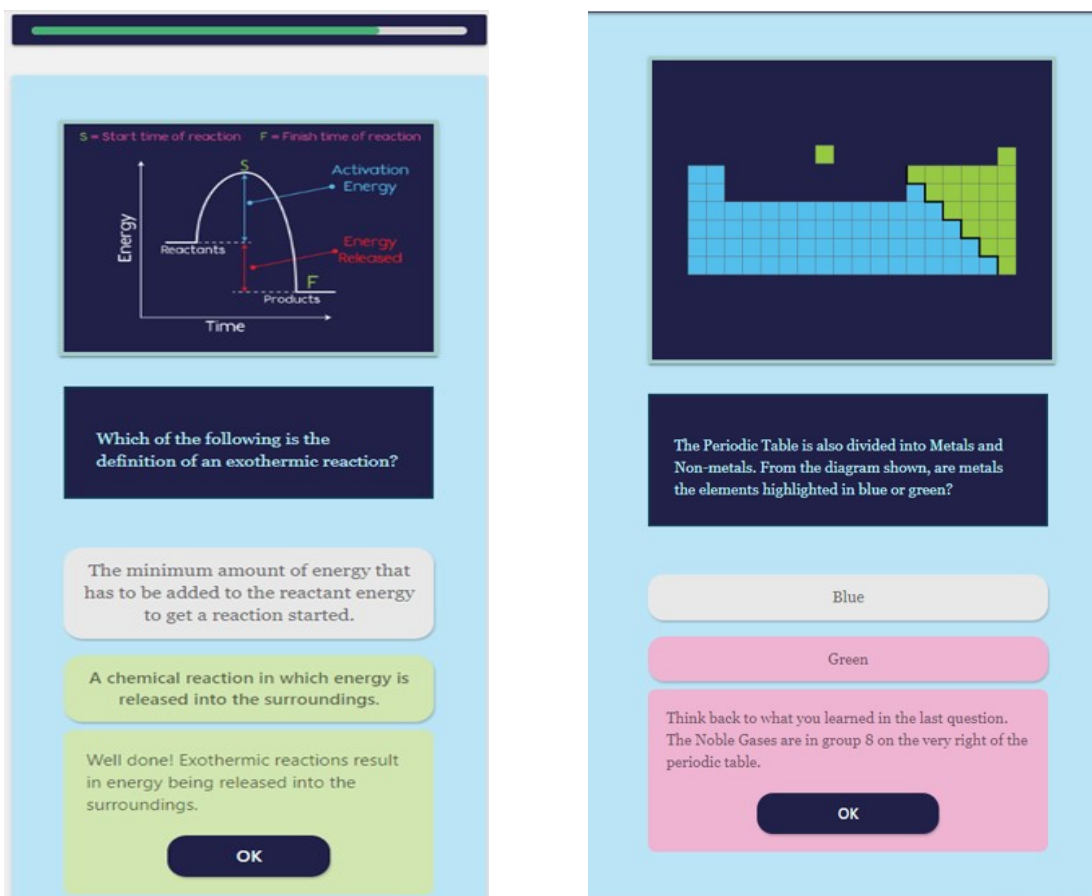


Figure 1. Feedback for RIGHT and WRONG answers Supports the student with positive 'nudges' in DALDIS

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, 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.

The first implementation of StudyQuest known as JCQuest (www.jcquest.ie) was substantially complete in beta form immediately prior to the project's commencement. Targeting 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 Ireland.



Chapter Two

Overview of Irish 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.

Ireland's Education System

The school system in Ireland is small by European standards—just 750 or so post-primary schools and 3,300 primary schools. Schooling is compulsory for all children and young people between 6 and 16, although almost all five-year-olds are in primary school. Under the Irish constitution, all parents have a right to educate their children at home but must ensure that their child receives a 'certain minimum education', and state-funded education is available at all levels – primary and secondary - unless parents choose to send their child(ren) to a private fee-paying school. There are 48-fee paying post primary schools, representing 6.5% of the overall number of schools.

While primary education has its roots in the school system established in the nineteenth century, universal post-primary education is relatively new, available to all only since the end of the 1960s. Primary education consists of an 8-year cycle delivering the child-centred primary curriculum. Afterwards, children (aged 12+) transfer to larger post-primary schools, which generally offer similar



curricula, although they may differ in governance or management structures. At 100%, the enrolment rate of 6-14 year-olds in Ireland ranks first out of 43 countries (OECD 2022). Furthermore, most children continue after post-primary to further education and third-level education. The enrolment rate (90%) for 15-19 year-olds is also one of the highest in the OECD placing Ireland 8th out of 41 countries (OECD, 2020).

Inclusive education is a fundamental principle of Irish education, and it aspires to welcome and meaningfully engage all learners, including those with special educational needs and disadvantaged learners. Educational provision for students with special educational needs ranges from additional support in mainstream schools to specialist support in special schools. In addition, DEIS (Delivering Equality of Opportunity in Schools) is the Government's principal policy initiative to tackle the educational disadvantage of children and young people from disadvantaged communities, from pre-school through to second-level education (3 to 18 years).

For historical reasons at primary level, most children (88%) attend schools under the patronage of the Catholic Church. However, this proportion is in steady decline. At the post-primary level, around 49% of students are educated in Catholic schools, 48% in what is classified as multi-denominational schools, and the remaining 3% in Church of Ireland (Protestant) secondary schools. Other faiths accounted for 0.4% of pupils. Outside of the Arab world Ireland has the highest rate of single sex schools. All-boys and all-girls schools account for 17% of primary schools and about one third of post-primary schools.

Different types of schools provide post-primary or secondary education, which has two stages; Junior Cycle from 12 to 15 and Senior Cycle from 16 to 18. The enrolment rate of students aged 17 in general upper secondary programmes in Ireland is one of the highest among OECD and partner countries at 86.2 % (rank 3/42 in 2020). Students generally start the Junior Cycle at 12 and take the Junior Cycle Profile of Achievement (JCPA) examination at the end of three years. They can then have a two- or three-year Senior Cycle depending on whether or not they opt to include a Transition Year (TY). TY follows immediately after the Junior Cycle and provides an opportunity for students to experience a wide range of educational instruction, including work experience, for a year free from formal examinations. During their final two years in the Senior Cycle, students take the traditional Leaving Certificate Examination. A great deal of public attention is focused on the high-



stakes Leaving Certificate Examination as entry to third-level education is closely linked to the results achieved by students at this examination.

After secondary school, almost all students move on to third-level education. At 96.5%, the percentage of students in public tertiary educational institutions is one of the highest in the OECD, ranking Ireland 5th out of 42 countries (2022). Third-level education comprises several sectors substantially funded by the State, including the university sector, technological sector, and colleges of education. The technological sector includes technological universities (TUs) and institutes of technology (IoT) which provide education and training programmes in areas such as business, science, engineering, linguistics and music to certificate, diploma and degree levels. In addition, other third-level institutions provide specialist education in several professions, such as medicine and law. Most third-level education institutions are supported substantially by the State. In Ireland, 63% of 25-34 year-olds had a tertiary qualification in 2021 compared to 47% on average across OECD countries. In general, universities are autonomous and self-governing and offer degree programmes at bachelor, masters and doctorate levels.

Overall the Irish education system is highly efficient and good value for the State, considering its high ranking in multiple categories and given that, at only 3.2 %, expenditure on primary through tertiary educational institutions as a percentage of GDP is the lowest among OECD countries and partner economies, ranking Ireland 36th out of 36 in 2019.

Implementation Timeline

Due to the fact that Ireland was the lead project partner and had already developed an early version of the Assessment for Learning model and platform known as JCQuest (www.jcquest.ie) prior to the commencement of the DALDIS project, Ireland was the first country to roll out DALDIS/JCQuest in schools. By January 2020, 4 months after the project's commencement a Beta version of the resource was released in Ireland. Consequently the Irish project's implementation took place over a longer period of time compared to other project partners. Given that the launch of DALDIS/JCQuest in Ireland practically coincided with the outbreak of Covid-19 and resultant school closures, the project's initial roll-out was conducted in circumstances unimagined at the project's commencement. While this created very many challenges for the project's implementation, thanks to the systems's analytic functionalities, it also created unique opportunities to observe behaviours during school lockdowns as teaching moved online during 2020 and 2021, chaotic school reopening periods while



the pandemic was still ongoing, and ultimately a return to relatively normal school and exam patterns.

The project's implementation timeline in Ireland can be broken into two key phases. Phase One took place over the 18 month period, January 2020 to June 2021 at the height of the pandemic and school closures. During this time the beta version of the software and subsequent modifications to the platform and content were made available online for use by any school, teacher or student to support remote learning. Phase two which began in September 2021 and lasted till June 30th 2022 (i.e. a full academic year) , coincided with the return to normal in class-teaching following the administration of a highly successful vaccination program in Ireland over the previous six months. This return to face to face teaching meant that a full piloting of the project could proceed as originally envisaged. To this end five schools were specifically recruited to pilot test the materials.

The Pilot Schools

School 1 *School 1* is a voluntary Catholic second level school for girls run under the patronage of a religious order. It is one of the oldest second level schools in Dublin dating back to the early C19th. Located in a socio-economic deprived area the school is a designated disadvantaged school (DEIS) and because of this it participates in the School Completion Programme (PCP) to encourage students to complete their studies. It has a student population of almost 400 students which has been growing significantly in recent years due to a high level of immigration from refugees and other migrants, with over half of its student population coming from outside of Ireland. It offers the Junior Cycle (JC) programme, an optional Transition Year (TY) as well as the Leaving Certificate to its students

School 2 *School 2* is a co-educational voluntary second level school committed to providing a holistic education that respects the Christian tradition of its founders. Originally run by a religious order it is now managed by a lay principal. It is located in a mid-sized rural town in the West of Ireland. By Irish standards it is quite a large school within excess of 600 students. The school offers the Junior Cycle (JC) programme, an optional Transition Year (TY) as well as the Leaving Certificate to its students.

School 3 *School 3* is an all-boys Catholic voluntary secondary school founded by a religious order in the late C19th and now managed by a lay principal. Located in a socio-economic deprived area of Dublin city it too has DEIS school status. The school caters for 220 students and like school



one in recent years students from many nationalities attend here. The school offers the Junior Cycle (JC) programme, an optional Transition Year (TY) as well as the Leaving Certificate to its students.

School 4 School 4 is a fee-paying Catholic voluntary secondary school for girls founded in the mid C20th. Located in one of Dublin’s affluent suburbs it caters for 345 students approx. and attracts students from a wide catchment area within the greater Dublin and neighbouring county area. The school offers the Junior Cycle (JC) programme, an compulsory Transition Year (TY) as well as the Leaving Certificate to its students.

School 5 School 5 is a recently established schools located in a mid-sized town on Ireland’s east coast. It is a secular multi-denominational co-educational school with a student population of over 240. As one of the fastest growing schools in its locality it currently offer the Junior Cycle Programme, TY programme and the Leaving Certificate.

DALDIS/JCQuest Curriculum Focus and Subjects

As noted in the introductory chapter work already underway in Ireland on the design of an AFL technology solution (www.jcquest.ie) for Ireland’s Junior Cycle Curriculum provided the inspiration for the DALDIS project. The Junior Cycle covers the first three years of secondary school and ends when students sit an official state exam and are awarded a Junior Cycle Profile of Achievement (JCPA). Typically, students taking the exam are aged 15 to 16. Over the course of the three years students study between 9 to 13 subjects of which four subjects, English, Irish, Maths and History, are compulsory.

While the wide range of subject choice reflects a broad-based curriculum the need for Irish students to master wider and deeper key competencies particularly in Science and Modern Foreign Languages (MFL) is acknowledged both nationally and internationally (DES, 2016; PISA, 2013). To this end the Junior Cycle Curriculum has been extensively revised in recent years. Crucially one of the significant differences in the ‘revised’ or ‘new’ JC Curriculum as it is known as, is in the broadening of the approach to assessment and in particular, formative assessment. Although students are still required to sit a terminal exam, the scope of assessment has changed to include classroom based assessments (CBA’s) and teachers are specifically encouraged to use a variety of assessment methods for formative learning purposes over the three year cycle. The CBA element is now worth 10% of the overall mark in the final Junior Cycle exam.



Given this context, the initial focus on the development of a technology based AFL solution for Science and MFL, particularly in Ireland is understandable. Although the bulk of the content for these two subjects was well underway prior to the project’s commencement, DALDIS provided an opportunity to test out the robustness of its underpinning technology, i.e. StudyQuest, and make appropriate modifications. It also aided improvement to content involving designing new question types such as ‘multiple correct’, ‘cloze’ and ‘matching’ as well as incorporating additional functionality by way of audio and video to further support AFL. Furthermore, resources to support the Geography curriculum (not initially included in the original project proposal) were also developed during the second and third years of the project. This meant that by the end of the DALDIS project a full set of fully aligned curriculum resources to support Assessment for Learning in Irish schools was available as follows:

- 46 Science lesson units and 43 quizzes
- 70 French lesson units
- 32 Geography Lesson units

Lesson units for all three subject area lesson units incorporated different types of questions as illustrated in figure 2.1 below to add variety and additional challenges to student learning and assessment.

Challenging Students with Multiple Question Types

1. Learning Screen MCQ with Feedback

2. CLOZE Test: Complete the missing item

3. MATCH: Matching Questions

4. MCA: Multiple Correct Answer with Feedback

- Careful combinations of multiple question types on a topic challenge the student.
- Research shows that well-crafted question sets using multiple question types can be used to assess higher-order thinking.

Figure: 2.1 Variety of Question-Types in DALDIS/JCQuest



Chapter Three

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

Introduction

As noted in chapter two the backdrop for much of the DALDIS project’s implementation in Ireland is framed by the Covid-19 pandemic. Phase One of the implementation DALDIS/JCQuest in Ireland, which lasted for 18 months, coincided with the outbreak of Covid-19 when the first beta version of the project software targeting the full three years of the *JC Science Curriculum* was released at the end of January 2020. To promote it and encourage usage a soft launch of the software and project was conducted at the Computers in Education Society of Ireland’s (www.cesi.ie) annual teachers conference on February 29th 2020. Coincidentally this was also the day the first Covid-19 case was confirmed in Ireland. Two weeks later on March 12th Ireland entered a national lockdown as the pandemic accelerated, resulting in the closure of all schools. This marked the beginning of an 18 month period when schools effectively moved in and out of lockdown and conducted a substantial amount of teaching remotely. Fortuitously as the beta version of DALDIS/JCQuest was now online, any student or teacher could use it to support remote learning. Following on from the initial release of the science materials, a full set of French curriculum resources to support Modern Foreign language learning (MFL) in Ireland was released in late April 2020.

Because schools were in lockdown for substantial periods during Phase One, effectively meaning that access to schools, teachers and students was off limits, the system’s analytics data provided an invaluable insight into how students and teachers used DALDIS/JCQuest to support remote teaching and learning at the height of the pandemic during periods of extended school closures. It also provided an independent and objective insight into user engagement with DALDIS/JCQuest throughout the entire project lifecycle, encompassing both phases one and two. These key findings will now be presented.



Phase One – Beta Testing and Pre-piloting of DALDIS/JCQuest during Covid 19

In the first 6 weeks following the release of the Beta version of DALDIS/JCQuest, initial take-up was slow (See Figure 3.1). However this changed dramatically once the national lockdown was declared on March 12th, resulting in the overnight closure of schools with immediate effect. The abruptness of the closure took schools by surprise and initially, as no official guidance was issued by the Department of Education and Skills on how schools should respond teachers¹, organised themselves in whatever way they could to continue to offer teaching support using online and off line methods (sic.snail mail and phone support). It was a challenging situation for most schools as years of under-investment in the technology infrastructure in schools coupled with teachers lack of confidence in their ICT skills and ability (Judge, 2013; 2019/2020, McGarr, 2015), left many unprepared for teaching online. This was further compounded by a lack of Wi-Fi connectivity in many rural areas and small towns, which prevented significant numbers of students from going online. While it wasn't clear at the time of the announcement, schools stayed closed for the remainder of the 2019/2020 academic year and did not re-open again until after the summer holidays at the end of August 2020.

Despite school closures the official position of the Irish Government from the outset was that the two state mandated terminal examinations i.e. the Junior Cycle of Achievement (JCPA) and the Leaving Certificate would still go ahead as planned in June 2020. However on April 29th the government back tracked and announced that the JCPA terminal examination would no longer proceed; instead students would be awarded a state certificate of completion based on teachers' and school assessment of student work. A new deadline of May 29th was announced for any extra assessment to be completed by schools if they felt the need to test some students more before allocating marks.

From the perspective of the beta release of DALDIS/JCQuest these dates and events are significant as online engagement patterns with the resource during this first lock-down period illustrates.

¹ It wasn't until two weeks into lockdown that the Department of Education and Skills (DES), issued its first advisory to schools which advised that teachers were encouraged but not mandated to continue teaching during the shut-down, effectively meaning that the DES was putting faith in the professionalism and dedication of teachers and school leaders to do the right thing.



Examining the period from January to March using Google Analytics the first thing to notice is the surge in usage in the immediate aftermath of the March lockdown. From the graph below it is clear to see that the average weekly users jumped from just 46 pre Covid-19 to over 200 post the emergence of Covid-19, representing a five-fold increase

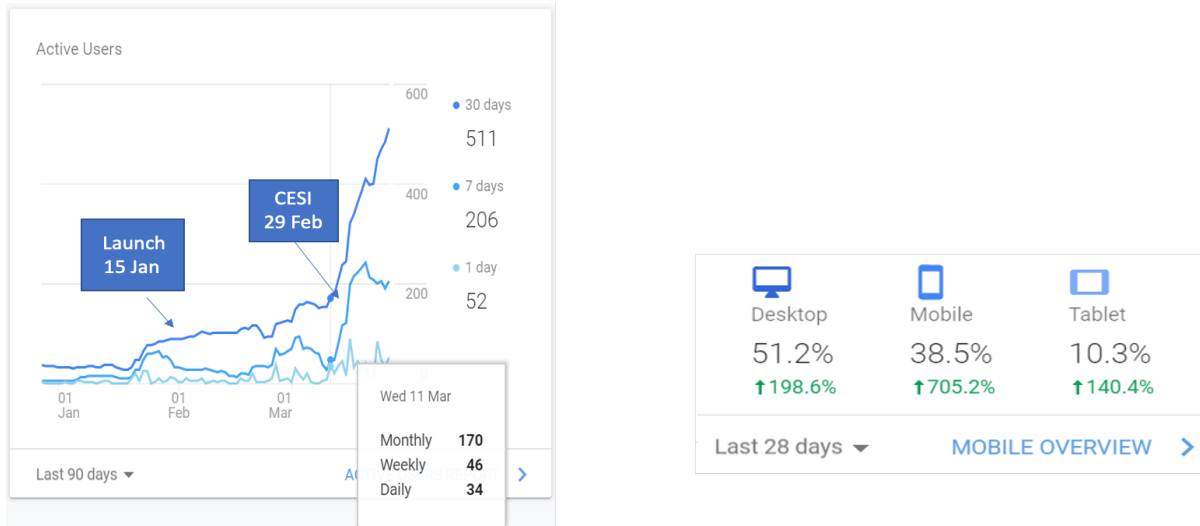


Figure 3.1 Surge in Usage following Covid-19 Schools Shutdown

When the period March to end of May is examined the analytics show strong usage during the Covid-19 lockdown both before and after the Easter holiday break. Over 40,000 page views were recorded in this period and as graph figure 3.2 illustrates peak usage experience was from mid-March at the beginning of lockdown to the end of the school term at the end of May where 1.2 k users were recorded. In terms of usage patterns the data also reveals that the most popular log in times occurred in the mornings from 11 till 12.30, followed by afternoons between 2 and 4 p.m. with another activity spike from 6-8 pm. Surprisingly, the data also showed an intensification of the usage of desktops/laptops (62.4%) rather than phones (38.5%) during home schooling.

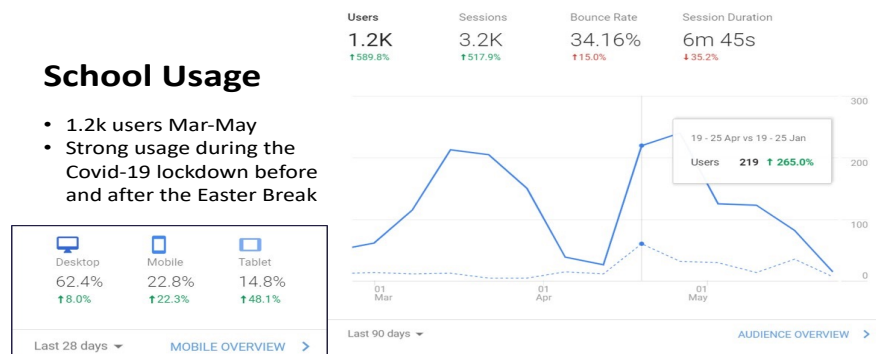


Figure 3.2 DALDIS/JCQuest Usage during Ireland’s first lockdown (March-May, 2020)



The aggregate statistics show positive durations and bounce rates which demonstrates high quality usage of the question sets. The data also shows that the release of the French curriculum material in April proved very popular with usage levels catching up to match science by the end of May. In terms of science it should be noted that seven of the top 15 page views are related to biology.

Most popular Science courses March - May 2020

Page Title	Page Views	Unique Page	Avg. Time	Entrances	Bounce Rate
JCQuest: Cells and Living Things	2861	2504	29.94	71	52.11%
JCQuest: Main Homepage	2804	1669	39.40	1126	19.01%
JCQuest: Nutrition and Well Being	2272	2127	24.82	35	60.00%
JCQuest: Syllabi	1852	1016	43.40	284	49.30%
JCQuest: Login	1703	1068	17.41	439	54.90%
JCQuest: Force and Work	1442	1190	61.88	123	45.53%
JCQuest: Solids, Liquids and Gases	1114	1033	34.03	70	30.00%
JCQuest: Your Homepage	1066	486	70.77	99	36.36%
JCQuest: Photosynthesis	1029	896	40.61	13	53.85%
JCQuest: The Microscope	936	830	31.23	19	47.37%
JCQuest: Variation and Reproduction	929	853	29.63	24	66.67%
JCQuest: The Circulatory System	869	751	33.04	33	30.30%
JCQuest: The Periodic Table	837	747	25.28	15	66.67%
JCQuest: The Reproductive System	774	734	24.55	5	80.00%
JCQuest: Origins of the Universe	757	659	82.42	124	40.32%
JCQuest: The Digestive System	711	661	34.53	14	71.43%
JCQuest: How Our Body Systems Interact	675	625	28.25	24	20.83%
JCQuest: Electricity	673	635	39.34	28	39.29%
JCQuest: Elements, Mixtures and Compounds	666	527	26.13	5	80.00%

Figure 3.4 DALDIS/JCQuest Top 15 Page Views (Science)

The data analytics from the first lockdown period reveals a number of interesting patterns and trends, the most significant of which is the spike in usage in the immediate aftermath of school closures. Undoubtedly this illustrates that DALDIS/JCQuest clearly addressed a need for JC students, particularly those studying for the JC examination. As all of the question sets are fully aligned with the curriculum based on popular textbooks DALDIS/JCQuest clearly served as ideal companion for assisting students to work independently through curriculum material with minimal teacher contact during lockdown.

It is our observation that that a large proportion of users were Year 3 JC students preparing for the upcoming JC state exam which was still expected to go ahead. This is borne out by the fact that the system data revealed that students spent most of their time accessing year 1 and year 2 material. This would suggest that students were revising material covered in the first two years of the JC Curriculum. Typically this material would be revised in class in the final term (after the Easter



holidays in Spring) when teachers would be preparing students for the June JC exam, emphasizing in particular core concepts covered in earlier years that students needed to reengage with as part of the exam preparation process. Obviously this earlier course material is less well remembered by students compared to content covered in the final academic year (i.e. year 3 of the Junior Cycle). This observation is also supported by the big drop-off in engagement from mid-May which happens to coincide with the Government's decision to officially cancel the JC examination at the end of April, while allowing those schools who felt they needed it, to include some additional assessments until the end of May for JC assessment purposes.

Once this announcement took effect the academic year effectively ground to a halt, as did usage of DALDIS/JCQuest. Thus the long summer holiday break commenced without any clarity on when schools would re-open again as the nation remained in lockdown while the Covid-19 pandemic continued to rage and intensify as case numbers surged. However as the summer wore on and case numbers fell to more manageable levels the national lockdown was gradually lifted from June 29th onwards. In light of this the Government announced on July 24th that all schools would fully reopen at the end of August 2020 for the commencement of the new academic year 2020/2021 and plans were put in place for Covid control measures i.e. social distancing, hand sanitizing etc. to be implemented in all schools.

Unfortunately just as schools re-opened Covid related illnesses began to increase again and some areas were put into full lockdown for short periods. This created a lot of uncertainty particularly in relation to the durability of schools remaining open as much of the national discourse, particularly during the month of September 2020, was dominated by the need for another lockdown. As it transpired the country did indeed go into another 6 week national lockdown from mid-October to early December but this time a decision was made to keep all schools open and continue face to face teaching. Official thinking was this was in the best interests of students education, particularly as medical evidence was now showing they were less likely to be adversely affected by the virus compared to adults.

However, as new variants of Covid -19 emerged in December and illnesses soared over the Christmas period, the government moved the entire country, including all schools, into a full national lockdown once more in late December, effectively meaning no face to face teaching for all of January and February, 2021. A gradual easing of restrictions from March 1 onwards permitted some



students to return to their classroom on a phased base starting with senior cycle second level students, children with special needs and primary schools. The last cohort to return were junior cycle students for whom the Junior Cycle terminal state exam had once again been cancelled on February 17th. For these students face to face teaching did not re-commence until after the Easter break in mid-April 2021. At this stage there was just 6 weeks left before the commencement of the 3 month summer holiday break at the end of May.

While all this was happening the DALDIS/JCQuest application underwent significant improvements. This involved the design of a new user interface and content management system based on work carried out in *Intellectual Development Two (I/O2)*, which made the platform more user friendly and easier for teachers and students to use. Pedagogical improvements were also incorporated based on a robust set of pedagogical guidelines produced under *Intellectual Development One (I/O1)*, resulting in the development of more varied question types.

Following completion of these changes the Irish pre-pilot got underway and once again the system’s data analytics provided an invaluable insight into how the platform was being utilized as schools moved in and out of lockdown. Significantly, the data indicates quite clearly that when Irish schools re-opened in late August there was a slow but gradual increase in DALDIS/JCQuest usage, with almost 200 users accessing the system by late September – thus approaching the earlier March-May peak lock-down figures. However October saw a significant drop in users especially coming into the mid-term break. The October flatlining continued into November when students returned after mid-term.

JCQuest.ie Usage - Sept - Dec 2020

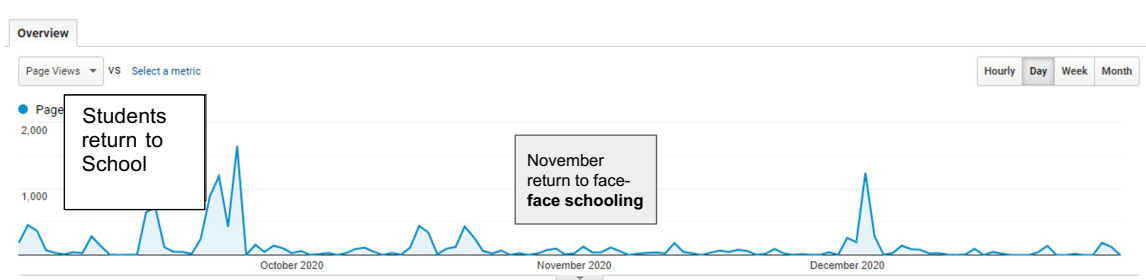


Figure 3.5 – Return to School after first lockdown



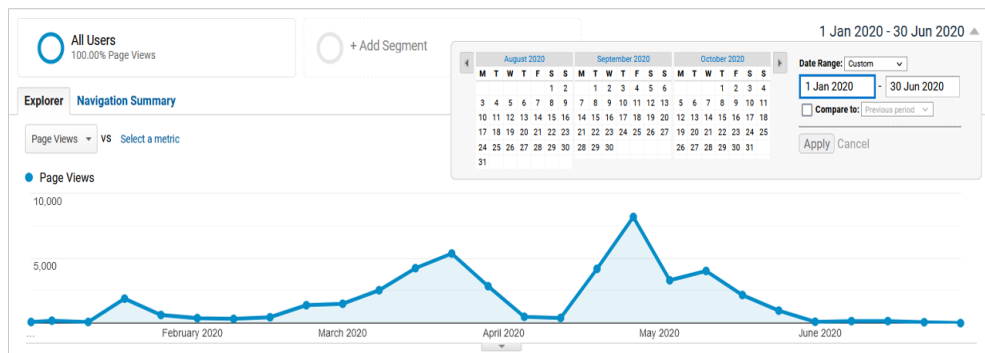
The usage patterns of DALDIS/ JCQuest during the 2020/2021 academic year is worth noting. While the initial spike in usage in September is on a par with that experienced during the first lockdown there follows a clear drop off in October until December. It is our hypothesis that due to the heightened uncertainty around whether schools could remain open as covid cases were on the rise again in September, it is likely that teachers were preparing students to use the system should another lockdown be required imminently as many were expecting. However, as the determination by the Government to resist calls to close schools became more resolute throughout September, mindsets changed and schools gradually settled back into face to face teaching, resulting in a sharp drop off in usage of DALDIS/JCQuest.

The uptick in usage in December is likely due to students using the resource to help them prepare for Christmas in-house exams as well as advance preparation by teachers anticipating another lockdown, which everyone sensed was inevitable as Covid cases nationally moved into overdrive, due to the emergence of new variants. With the return to online teaching in January 2021, when schools moved into their second major lockdown, usage of DALDIS/JCQuest once more rises sharply. However from mid February onwards usage drops significantly and essentially flatlines for the remainder of the year, apart from a small uptick in usage in March and May, 2021 as graph 3.6 illustrates. The mid February drop off is significant as it coincides with the official cancellation of the Junior Cycle terminal examination by the Department of Education on February 19th. This steep decline in usage appears to mirror findings from research work conducted elsewhere (ESRI, 2021) on the effect of the pandemic on student learning in Ireland which found that Junior Cycle students in particular disengaged from learning once they found out that State exams were to be cancelled.

From this detailed examination of the systems data for the academic year 2020/2021, it is possible to conclude that there was a notable drop off in usage of DALDIS/JCQuest when schools were back teaching face to face. It is evident from the systems data, as illustrated in figure 3.6 that usage peaked during the two extended periods of school closures (March to May 2020, and January to March 2021) and declined when students returned to school full time (September to December 2020), or when state examinations were cancelled. The troughs and valleys of usage paralleled online and face to face teaching activities. They also paralleled exam revision periods with noticeable uptake in usage occurring in key months such as December, March and May, traditionally a time when students are busy preparing for house exams, mock exams (preparation session for students due to sit state exams), end of year exams and state exams.



Period A
Lockdown 1



Period A
Lockdown 2
(full & Partial)

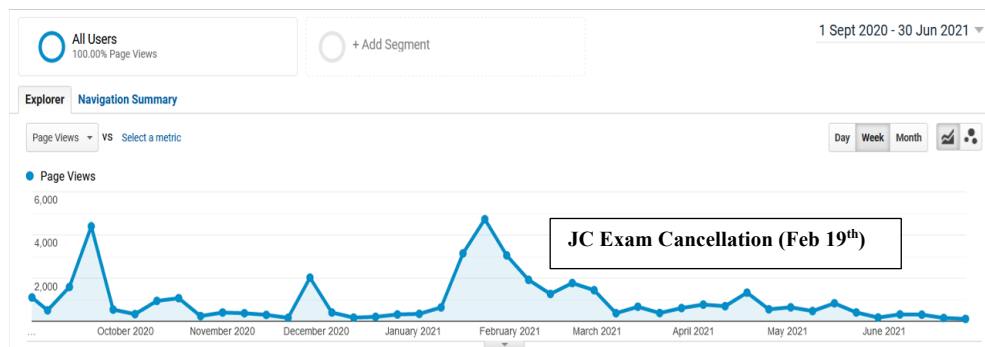


Figure 3.6 Lockdowns 1 (2020) and 2 (2021)

Despite this, figures show that over 1,700 users still continued to use DALDIS/JCQuest from January to May 2021 and bounce rates, although marginally up, remained low at 34.34% and session durations also held up at a very respectable 6.24 minutes. Additional key data from this period indicates that the most popular Science material continued to be Biology, followed by Chemistry in second place and Physics in third. An analysis of the top ten DALDIS/JCQuest question-sets showed these topics represented 57.5% of all usage. The top six biology lessons alone accounted for 36% of all usage; three chemistry lessons accounted for a further 16%; and one Physics lesson accounted for the remaining 5.5%.

When it came to the French materials an analysis of the most used language topics showed that grammar was the most popular topic. Seven of the top ten question sets were Grammar related and accounted for 39% of all usage. Some basic vocabulary topics were also very popular. Three of the top ten basic vocabulary question sets represented 22% of all usage with two of them taking second and third spots in the overall DALDIS/JCQuest top ten.



The top 10 DALDIS/JCQuest French Lessons used by schools Ireland pre-pilot trial Sept 2020 – April 2021

Top ten French MFL lessons	Translation		% Total
Les fêtes! - Le Passé Composé	Festivals & Holidays: English simple past or sometimes called the present perfect	Grammar	12.75%
Au collège - Classroom Objects	At school: Classroom Objects	Vocabulary	9.74%
Au collège - Je me présente	At school: Introducing myself	Vocabulary	8.50%
Au collège - Le présent	At school: The present tense	Grammar	7.64%
Les fêtes! - Forming le passé composé	Festivals & Holidays: Forming the simple past tense	Grammar	6.65%
Chez moi - Les adjectifs	At home: Adjectives	Grammar	4.67%
Au collège - Le futur proche	At school: the near future	Grammar	4.45%
Les fêtes! - Vocabulary Set	Festivals & Holidays: Vocabulary	Vocabulary	3.61%
Chez moi - Le futur simple des verbes réguliers	At home: the simple future tense in English	Grammar	3.21%
Au collège - Lire, écrire dire	At school: regular verbs, to read, to write, to say	Grammar	3.11%

Figure 3.7 Popular French Grammar and Vocabulary Lessons

The data analytics also revealed some interesting insights into the types of devices used to access DALDIS/JCQuest. During the first lockdown period it was a surprise to see that the majority of students were using desktops/laptops to access the platform. It had been anticipated that students of that age group would be more inclined to use their mobile phones. This would suggest that as they were doing most of their school work online during Covid-19 the desktop/laptop provided a more comfortable and convenient working environment when it came to screen use over a sustained period.

The back to school September 2021 usage figures showing an 82% usage in desktop/laptop figures likely points to high in-school usage of the platform, where laptops/desktops are more prevalent and where using mobile phones is either banned or strictly curtailed. It is reasonable therefore to deduct that mobile phone usage, at almost 19% for September and October 2020 combined, points to students using the system outside of school either at home or while travelling to and from school either for independent learning, revision or completing homework assessments.



Ireland: Sept 2020 Back-to-School Usage

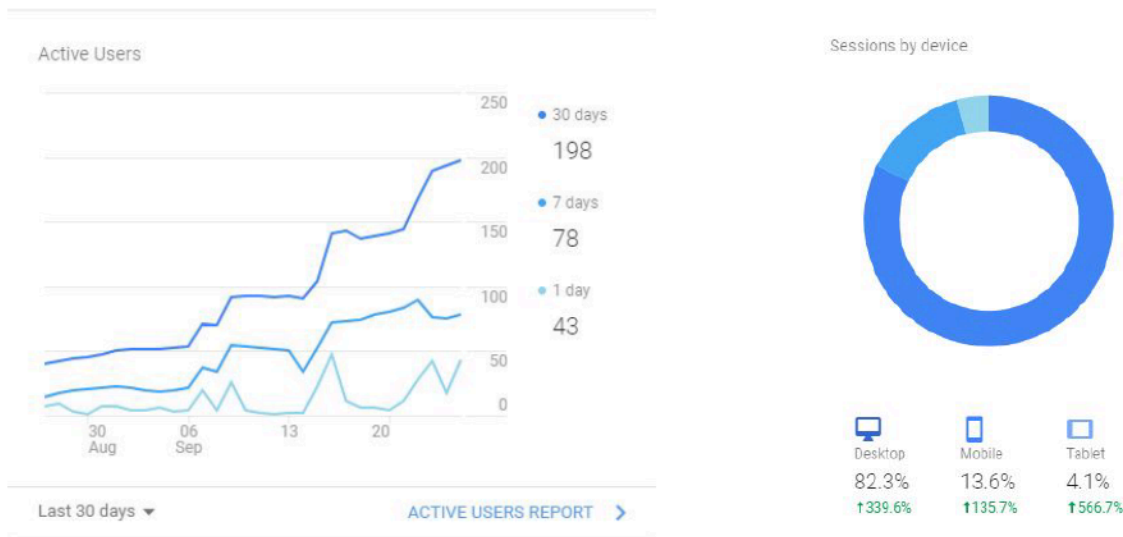


Figure 3.8 Device Usage

System usage patterns provide an invaluable insight into how students organized their ‘school day’ throughout the major lockdown periods based on the three daily activity spikes from 11am to 12.30, 2 to 4 pm and 6 to 8 pm., as mentioned earlier. Apart from the late mid-morning start (which any parent or guardian with young teenagers can identify with) students seemed to follow standard school hours i.e. an intense period of morning study with a break for lunch followed by a similar afternoon pattern. The follow up evening engagement from 6 to 8 pm mirrors the time usually spent on ‘homework’ activities in a pre-pandemic world. This suggests that students either independently or guided by parents/guardians and teachers were regularly engaging with school work and even though operating online, were sticking to a tried and trusted ‘offline’ formula to manage their studies. The level of interaction on each question set amounting on average to 4 to 5 minutes also indicates a high level of student engagement with the DALDIS/JCQuest materials.

Phase Two – Piloting DALDIS/JCQuest in Ireland Post Pandemic as schools reopen

Phase Two covers the academic year 2021/2022, which was the first full year of uninterrupted face to face teaching and the first time in three years that the state assessed Junior Cycle examination was held. Following a very successful Covid-19 vaccination campaign in Ireland that started in Spring 2021, schools reopened fully in September 2021 with government assurances that further school closures would be avoided at all costs. The full re-opening of schools enabled the piloting phase of



DALDIS/JCQuest in Ireland to commence. Recruitment of schools got underway during October when a number of schools were randomly contacted to participate in the pilot and the project's research study. Following meetings and discussion with the lead partner, DCU, five schools volunteered to participate.

Thus, during the final year of the project (September 2021-June 2022) Irish users comprised two cohorts. The first cohort comprised open users and logged in users, some of whom had been using the system already for over 18 months since the pandemic commenced and some who had just started using it. The second cohort comprised the five new schools recruited specifically for the pilot study, none of whom had any prior exposure to the resource. In the interests of clarity these will be referred to as the Pilot School Partners (PSP) while the first group will be referred to as Open Users/Logged in Users (OU/LIL). One of the big differences between the two is that the pilot school partners were requested to officially enrol their classrooms and register their students on the system. This required them to log on whenever they used DALDIS/JCQuest which in turn enabled teachers to avail of the full functionality of the system's dashboard for assessing and tracking student progress.

As Figure 3.9 indicates usage of DALDIS/JCQuest is very flat during the first term when schools re-open fully. However, context is all important and it is our observation that the much of the low level of activity can be explained by the fact that this first full back to school period was a fraught time for schools as teachers found themselves operating in challenging conditions involving following strict infection management control protocols and operating from cold classrooms as windows had to be kept open at all times.

During this period industrial relations were on a knife edge as the Teachers' trade unions were unhappy with the conditions their members were now working in, especially given the high level of covid still circulating in the community, and the dangers this posed to teachers with underlying conditions and teachers who were pregnant. It was a hostile atmosphere and threats of strikes and walk-outs abounded. Understandably, using DALDIS/JCQuest was not high on teachers' priority list at this time especially when one considers that students had had very little face to face teaching in the past two years. Therefore, it is reasonable to assume that the main focus for most teachers during these early months was on direct classroom activities, the resumption of face-to-face teaching and



managing infection control, resulting in an all-time low usage level of DALDIS for most of the first term.

Academic Year 2021/22 – No Lockdown

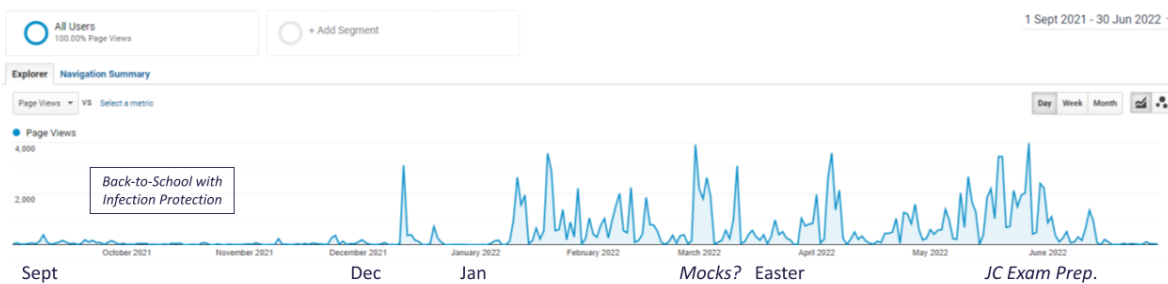


Figure 3.8 DALDIS/JCQuest Pilot on the resumption of Face to Face Teaching

Thankfully as the first term draws to a close, school conditions became much more settled, especially as it became clear that the very high take up of the vaccine in Ireland, had resulted in a dramatic reduction in the severity of the infection, with most people reporting mild symptoms and shorter recovery periods. Hence from December 2021 onwards as the PSP’s classrooms start to engage with the resource and as Covid fears subside nationally resulting in teachers and students nationwide settling into more normal classroom routines, usage of DALDIS/JCQuest increases substantially. In December alone usage levels rose to 5855 monthly page views, with 4201 of these taking place in the week from Dec 12- 18 as students prepared for end of term in-house exams.

Encouragingly, usage levels continue to rise again when schools re-open in January after the Christmas holidays. From then on apart from the February mid-term break and Easter holidays usage remain consistently high until the end of the school year in early June. A new record level of 44,072 monthly page views occurred in May 2022 as students prepared for the Junior Cycle Exam and end of school year exams. Record weekly levels of 13,024 page views was achieved in the week 15-21 May, and 12,660 in the week 22-28 May. As the Junior Cycle exam period begins in June and all other JC year groups finish by the end of May usage levels in June begin to reduce especially once the key subjects associated with DALDIS/JCQuest (Science, French and Geography) exams take place.



JCQuest Page Views	2020-21	2021-22
Sept	8044	2528
Oct	2686	705
Nov	1287	1610
Dec	3073	5855
Jan	8915	23135
Feb	8010	20529
March	3056	21724
April	3711	22203
May	2435	44072
June	1030	6878

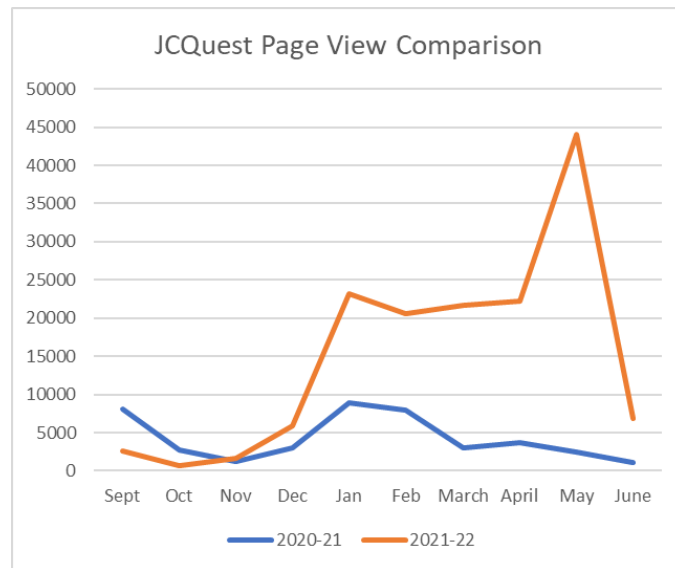


Figure 3.9 DALDIS/JCQuest Page Views

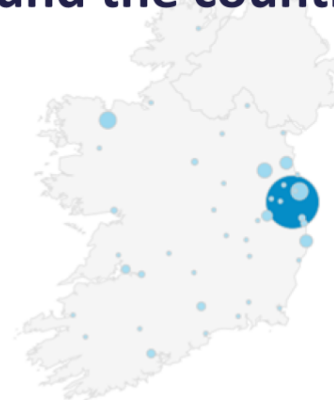
Figure 3.9 presents an interesting comparative snapshot of page views spanning two full academic years of DALDIS/JCQuest usage, encompassing the pre-pilot period and pilot periods is provided in the graph below. Of the 149,236 page views recorded during the pilot, 137,501 amounting to 92.14% are specific to Irish users of DALDIS/JCQuest. During this period a high 19.18 Pages per Session was recorded alongside an outstanding 9.79% Bounce Rate. This demonstrates very high-quality users and confirms that usage is mostly students and teachers doing complete lessons of approximately 15 pages each. The number of users also rose significantly to 3,856 of which 71.2% (2,746) are Irish users. As the PSP’s account for 545 of these users, the remaining 2,201 users are OU/LiL users coming in from all over Ireland. While there is a large concentration of users in Dublin and its environs, figure 3.10 indicates that students throughout the country were availing of the DALDIS/JCQuest material to assist their learning.



Usage well distributed around the country



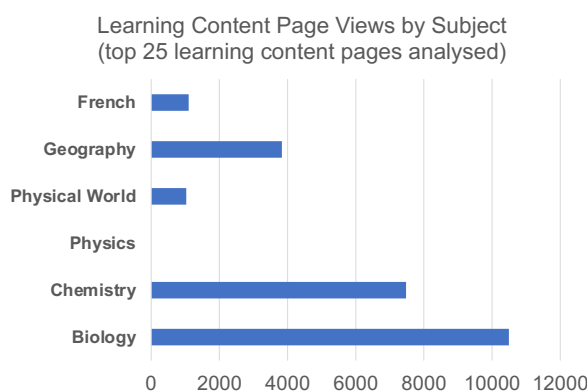
Top 12 Cities Totals/Avg	Users 2921	Sessions 7220	Pages/ Session 19.10	Total Page Views 137,873
Dublin	1762	5140	18.78	96,551
Ballina	172	294	32.62	9,589
Malahide	163	282	14.82	4,180
<i>(not set)</i>	139	229	16.02	3,669
Navan	132	233	22.16	5,164
Wicklow	106	252	13.83	3,486
Drogheda	88	190	17.59	3,342
Naas	73	110	32.36	3,560
<i>(not set)</i>	41	80	24.53	1,962
Clonmel	33	76	9.38	713
Cork	32	47	14.70	691
Shannon	28	34	22.26	757



Data for 2021-22 Academic Year – Sept 2021 to June 2022
Note: Usage based on traffic analysis at Telecom Switches (including Mobile phone services) as measured by Google Analytics.

Figure 3.9 DALDIS/JCQuest - County Breakdown

In terms of subject usage the system data reveals that during the pilot phase science continued to represent the most popular topic. Five of the top ten data sets accessed were Biology related, three were Chemistry and two were specific to the newly released Geography materials. While two French question-sets make it into the top 25 learning content pages by subject studied, no physics related topics do. The newly released Geography materials was the surprise package of 2022. Developed during 2021 it was completed for all three years of the JC Curriculum in January 2022. The top ten geography pages show a relatively rapid and positive take-up of the new materials and it quickly caught up with and surpassed French. Nonetheless, Science usage continued to outnumber either Geography or French by a factor of four to one.



- Science usage outnumbers Geography and French by a factor of about 4:1
- **Biology most popular science** subject: 10,053 page views in top-25
- **Chemistry:** 7,002 page views
- **Physics** does not show up until 33rd place - *Force and Work*
- **NEW Geography** surprise hit with 3,835 pages in the top-25 analysis and a total of almost 6,000 pages for the full academic year
- **French usage has decreased** with only 1,095 page views in the top 25 analysis However analysis of **top-ten French pages** shows 3,563 page views

Figure 3.10 DALDIS/JCQuest – Top Content Breakdown



In terms of devices, usage of desktops/laptops continued to dominate. An analysis conducted in the three months March to May 2021, showed that they amounted to 71.88%. Of these the biggest number by far was Mac computers at 54.74%, followed by a relatively small number of windows machines at 13.84% and a negligible amount of chrome notebooks at 3.3%. Mobile devices comprising android phones at 9.02% and IOS devices (i.e a mixture of iPhones and iPads) amounted to 22.86% in total.

Using data to identify good and poor question setting.

A database of all DALDIS/JCQuest project questions was analysed to identify a metric to help identify questions that may be too difficult or too easy for students. Two ratios were identified based on (a) first attempts and (b) all attempts. For **First Attempts** only the percentage (%) of correct answers on first attempt was used; the hypothesis being that a low number here indicates difficult questions and a high number indicates questions that may be too easy. **For all attempts**, where students can have up to four attempts at some questions, the percentage (%) of incorrect answers on all attempts was measured; the hypothesis being that a relatively high number of multiple attempts indicates too many hard questions and perhaps student frustration. On this basis complete lesson-units/question-sets were studied to identify more difficult or challenging topics for students. To illustrate this process and how it worked two lesson question-set examples *one from Science*, “Cells and Living Things” (CLT) and *one from French* “Les couleurs” (LC) will now be compared. A breakdown of the full content of both these lesson-units/question-sets and level of difficulty are also included at the end of this chapter.

Unit Name	Question Number	% Correct on 1 st attempt	% Incorrect All attempts	Completion rate (Ratio of first to last question)
Cells and Living Things – JC Biology	All questions	56.0%	48.6%	59.8%
Les couleurs – French Getting Started 1	All questions	88.3%	15.9%	80.4%

Table 3.11 Completion Rate

Question-Set Comparisons The French Getting Started lesson ‘Les couleurs’ appears to be one of the easiest lessons for students. The ratios of correct to incorrect answers (see table 3.1) show that students found these questions to be very easy. Some initial questions had a very low number of incorrect answers with a very low average of 19.9% incorrect on all attempts, Some early questions in the lesson had less than 2% incorrect answers in all attempts. While this could suggest that the



questions were too easy, it could also indicate that the level of questioning was appropriate for a beginners Getting Started lesson level, especially when student engagement and motivation factors need to be considered.

By comparison the Science Lesson *Cells and Living Things* shows students having difficulties with quite a lot of questions, even early questions such as questions 4 and 5 as figures 3.12 and 3.13 illustrate. Just 56% of correct responses were recorded on first attempts while the percentage of incorrect responses after all attempts was still very high at 48.6%. Despite this, CLT was one of the most popular lessons with users, suggesting that the difficulty level may be appropriately challenging for students. Nonetheless, there is a danger that the higher number of incorrect answers early on in the CLT question-sets could lead to student frustration and demotivation.

Comparing both data sets from French and Science in our sample we could see that 102 students started LC with 90 students finishing it out, representing an overall completion rate of just over 80%. In CLT 150 students out of 230 who started finished, representing an overall completion rate of almost 60%. A further check was carried out to see if lesson unit length was a factor in this differential as CLT has 15 question-sets while LC has 12. However, this revealed that the completion rate by question 12 of CLT had already dropped to 64.4% suggesting that difficulty level and possible student frustration was the more likely explanation.

<p>← Cells and Living Things</p> <p>Shown here is an image of a plant cell.</p> <p>Which 3 of these labelled parts are only found in a plant cell?</p> <p>Cell membrane, vacuole and chloroplast</p> <p>Mitochondrion, nucleus and cytoplasm</p> <p>Cell wall, vacuole and chloroplast</p> <p>Cell wall, cell membrane and cytoplasm</p>	<p>Example of a relatively/fairly difficult question</p> <p>% Correct on First Attempt = 49.7% = 95/(95+96)</p> <p>% Incorrect of all attempts = 58.7% = 270/460 <i>This is very high for a question early in a lesson.</i></p> <p>This suggests that students do not have a high familiarity with these parts of a plant cell.</p> <p>This question may be too difficult for a question this early (Q4 of 15) in the question set as it asks the student about a large number of complex parts of the Cell. These difficult early questions may contribute to the relatively low completion rate (60%) for this complete lesson.</p>
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Figure 3.12 Example - Question 4 Cells and Living Things



<p>Question: In which of these parts of the cell does photosynthesis take place?</p> <p>Media</p> <p> <input type="radio"/> Cell wall <input checked="" type="radio"/> Chloroplast <input type="radio"/> Vacuole <input type="radio"/> Cytoplasm </p>	<p>Example of a relatively/fairly difficult question</p> <p>% Correct on First Attempt = 56.4% = 102/(102+79)</p> <p>% Incorrect of all attempts = 50.0% = 183/366</p> <p>This suggests that students do not have a high familiarity with these parts of a plant cell. However the assessment for learning approach may therefore be an appropriate way to help teach and reinforce this topic with the images providing strong visual clues.</p> <p><i>A review of the feedback provided to the answers to see if it can be improved in this lesson may produce a stronger overall learning experience.</i></p>
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Figure 3.13 Example - Question 5 Cells and Living Things

Most Challenging Questions and Question Types

The most challenging questions were analysed by looking at those with the highest total number incorrect after all attempts. Questions with between 76% and 100% incorrect answers on all attempts were looked at. A representative sample of these with relatively high number of attempts taken are shown in **Figure 3.6**. Almost all questions in this analysis were **Cloze, Match and MCA**. These generally have lower numbers of correct responses on first attempts – but this may be positive as it challenges students to think more about the answers they are entering, an observation which students from the focus groups made in relation to MCA in particular.

However on further review and analysis of this data we suggest that Cloze, MCA and Match questions with large numbers of options to select from may be too challenging for all but the strongest students at this level. In most questions students had on average between 7 to 9 items to match. Therefore it may be advisable to reduce the number of options. On this basis it is our hypothesis that 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, 8 and 9 (equivalent to 1st, 2nd and 3rd year of the Irish Junior Cycle program) who participated in the DALDIS study.



Unit Name	Question Number	Question Type	Number Correct on 1st Attempt	Number Wrong on 1st Attempt	H/(H+1)	I/O	Total Number Correct	Total Number Wrong	% Incorrect of all attempts	Total Number Attempted
Quiz: The Atom	10	MCQ	4	41	8.9%	0.788	5	47	90.4%	52
Space Exploration	8	Cloze	0	8	0.0%	0.800	1	9	90.0%	10
Urban change - Dublin City	15	Cloze	2	16	11.1%	0.889	2	16	88.9%	18
Patterns of Economic Development	9	Categorise	1	16	5.9%	0.889	2	16	88.9%	18
Urban change - Dublin City	5	Cloze	3	17	15.0%	0.708	3	21	87.5%	24
Electricity	9	Cloze	0	7	0.0%	0.438	2	14	87.5%	16
Origins of the Universe	11	Match	3	18	14.3%	0.783	3	20	87.0%	23
Population Characteristics and Change	2	Cloze	3	25	10.7%	0.595	6	36	85.7%	42
Force and Work	10	Cloze	1	16	5.9%	0.762	3	18	85.7%	21
Urban change - Dublin City	9	MCA	2	17	10.5%	0.850	3	17	85.0%	20
Energy Resources	13	Cloze	2	16	11.1%	0.842	3	16	84.2%	19
The Periodic Table	13	Cloze'	4	32	11.1%	0.762	7	35	83.3%	42
Photosynthesis	14	Match	10	52	16.1%	0.684	14	62	81.6%	76
Nutrition and Well Being	2	MCA	7	56	11.1%	0.691	15	66	81.5%	81
The Circulatory System	13	Cloze	8	60	11.8%	0.732	18	64	78.0%	82
The Periodic Table	10	MCA	8	34	19.0%	0.739	11	35	76.1%	46
Classroom Objects	17	Cloze	4	18	18.2%	0.667	6	21	77.8%	27
Origins of the Universe	3	MCA	5	29	14.7%	0.763	9	29	76.3%	38

Table 3.14 JCQuest Ireland: Some of the most challenging questions and question types



Example of a challenging lesson

Cells and Living Things (Analysis of the full lesson)

Unit Name	Question Number	Question Type	Number Correct on 1st Attempt	Number Wrong on 1st Attempt	% Correct on 1st attempt	I/O	Total Number Correct	Total Number Wrong	% Wrong of all attempts	Total Number Attempted
Cells and Living Things	1	Learning Screen	184	35	84.0%	0.1171	227	72	24.080%	299
Cells and Living Things	2	Learning Screen	171	28	85.9%	0.1000	200	80	28.571%	280
Cells and Living Things	4	Learning Screen	95	96	49.7%	0.2087	190	270	58.696%	460
Cells and Living Things	5	Learning Screen	102	79	56.4%	0.2158	183	183	50.000%	366
Cells and Living Things	7	Cloze	79	86	47.9%	0.4322	91	108	54.271%	199
Cells and Living Things	8	Learning Screen	100	61	62.1%	0.2054	164	133	44.781%	297
Cells and Living Things	10	Learning Screen	95	61	60.9%	0.1773	160	184	53.488%	344
Cells and Living Things	11	Learning Screen	88	66	57.1%	0.2171	156	148	48.684%	304
Cells and Living Things	12	Learning Screen	90	56	61.6%	0.2121	148	116	43.939%	264
Cells and Living Things	13	Learning Screen	91	55	62.3%	0.2091	148	115	43.726%	263
Cells and Living Things	14	Learning Screen	57	85	40.1%	0.2545	145	189	56.587%	334
Cells and Living Things	15	MCA	74	67	52.5%	0.4061	87	78	47.273%	165
Cells and Living Things	16	Learning Screen	50	88	36.2%	0.2438	141	220	60.942%	361
Cells and Living Things	17	Cloze	59	78	43.1%	0.4937	74	84	53.165%	158
Cells and Living Things	18	Match	53	78	40.5%	0.4845	64	97	60.248%	161

Table 3.15 Example of a difficult lesson

Average % Correct on first attempt (all questions) = 56%

Average % Incorrect (Wrong) in all attempts = 48.6%

NOTE: Screen 3 is an information screen, it does not contain any questions so there is no data for screen 3 or other similar **Text Screens**

NOTE: MCA, Match and CLOZE questions function differently than learning screens.

Students can see the answers and move on or chose to retry. This explains the lower number of total attempts for these question types.



Example of a relatively easy lesson

Les couleurs from French Getting Started 1

Unit Name	Question Number	Question Type	Number Correct on 1st Attempt	Number Wrong on 1st Attempt	% Correct on 1st attempt	I/O	Total Number Correct	Total Number Wrong	% Wrong of all attempts	Total Number Attempted
Les couleurs	1	Learning Screen	98	4	96.1%	0.0317	112	14	11.111%	126
Les couleurs	2	Learning Screen	100	2	98.0%	0.0180	109	2	1.802%	111
Les couleurs	4	Learning Screen	98	2	98.0%	0.0182	108	2	1.818%	110
Les couleurs	5	Learning Screen	77	23	77.0%	0.1402	108	56	34.146%	164
Les couleurs	6	Learning Screen	93	7	93.0%	0.0583	108	12	10.000%	120
Les couleurs	8	Learning Screen	86	11	88.7%	0.0846	106	24	18.462%	130
Les couleurs	9	Match	77	11	87.5%	0.1111	85	14	14.141%	99
Les couleurs	10	Learning Screen	84	3	96.6%	0.0297	93	8	7.921%	101
Les couleurs	12	Cloze	73	11	86.9%	0.1222	78	12	13.333%	90
Les couleurs	13	Learning Screen	67	15	81.7%	0.1210	87	37	29.839%	124
Les couleurs	14	Learning Screen	66	16	80.5%	0.1455	87	23	20.909%	110
Les couleurs	15	Learning Screen	64	18	78.0%	0.1525	86	32	27.119%	118

Table 3.16 Example of a relatively easy lesson: Les couleurs from French Getting Started 1

Average % Correct on first attempt (all questions) = 88.3%.

Average % Incorrect (Wrong) in all attempts = 15.9%

Questions 2 and 4 are considered very easy. On further analysis we may find they are too easy.

However, as these are questions early in the lesson the ‘easy’ nature may be appropriate to help students engage and grow in confidence with the subject matter. However, the very high % of correct responses to questions 6 and particularly Q. 10 as lessons advance and in theory should become more difficult, may be indicative of a lack of cognitive challenge. Overall none of the questions in this lesson seem to be very difficult for students and as this is a ‘Getting Started’ lesson this may be appropriately pitched.

NOTE: MCA, Match and CLOZE questions function differently than learning screens.

Students can see the answers and move on or chose to retry. This explains the lower number of total attempts for these question types.



Chapter Four

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

Introduction

This section deals exclusively with the feedback data obtained from the schools (PSP) participating in the piloting of DALDIS/JCQuest, who as already noted agreed to register their classes on the system and have their students log in every time they used it. They also agreed to participate in the research element of the project through surveys, focus groups and research interviews designed to capture feedback on their experiences with the resource. An illness to the main project champion in school 5 during the crucial data collection phase meant that four of the five PSP's originally recruited for the pilot participated in the research. Data was collected from these PSP's via student and teacher surveys (all 4 schools) , student focus groups (3 out of 4 schools) and in-depth teacher research interviews (all 4 schools). The surveys, focus groups and research interviews all took place in May 2022 at the end of the project pilot. As the PSP's had no vested interest in the project and were randomly chosen to participate confidentiality was assured by keeping the identity of schools, teachers and students anonymous. Hence in reporting out the qualitative research findings the schools are referred to as School 1, 2 (S1, S2) etc. Acronyms such ST, FT and GT refer to Science, French and Geography Teacher and FG refers to focus groups.

In the interests of clarity and readability, the following classification terms will be used when presenting findings from the student and teacher surveys, focus groups and interviews

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



Across all four schools 177 student surveys were completed. The Student questionnaire consisted of 19 questions examining key experiential aspects of students interaction with DALDIS/JCQuest such as the usefulness of feedback, ease of use, access devices, classroom and home usage, preferred question type and the overall benefits of DALDIS/JCQuest as a learning tool, among others. This information was supplemented by focus groups interviews that provided an opportunity to explore some of these areas in more detail. Students representing first year, second year and third year in three out of the four schools participated. Each focus group interview lasted for 20 minutes approximately and consisted of two to four students per group. In the following sections the key findings from the survey and focus groups will be presented and discussed.

Key Demographic and Subject Data

The survey data indicated that most students using DALDIS/JCQuest were females (78%). The majority of users were in second year (55%) followed by third years at 28% and just 17% were in first year. Almost half of students (49%) used the DALDIS/JCQuest materials for Science, followed by French at 33% and then Geography at 15%.

Q.3: What year are you in?

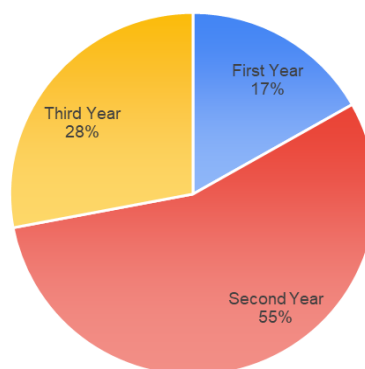


Figure 4.1 What Year Are You In ?

The predominance of females in this sample is attributed to the fact that two of the four schools who completed the survey were all-girls schools while the third school was a mixed gender school. The relatively low numbers using it for Geography is understandable as when the PSP’s signed up for the project only the first year of the Geography curriculum was available and as first years accounted for the smallest number of users anyhow at 17% this is proportionate. The differentiation in usage between French and Science can be explained by the fact that while almost all students study science



(90%) at Junior Cycle level students have a choice of languages to choose from when it comes to Modern Foreign Language (MFL). Although French is the most popular MFL choice for students with 54.5% studying it, a good proportion of students opt to study other languages instead such as German, Spanish, Italian etc. This trend was noticeable in the focus groups where some students from the same year groups revealed they used the platform for both Science and French, while others indicated they used it for Science only. When asked why, they invariably said they weren't studying French as they were studying German or Spanish with some expressing a desire to see the development of DALDIS/JCQuest materials for these subjects too.

School and Home Usage

When it came to usage of the resource, school usage dominates with just a few (7%) claiming they never used it in school compared to 38% saying they never accessed the platform at home. Regular usage in school (defined as daily, weekly or fortnightly usage) amounted to 33% with a further 19% indicating they used it once a month in school. Over a quarter of students (26%) indicated that they mainly used the system for revision purposes and to help them prepare for upcoming exams.

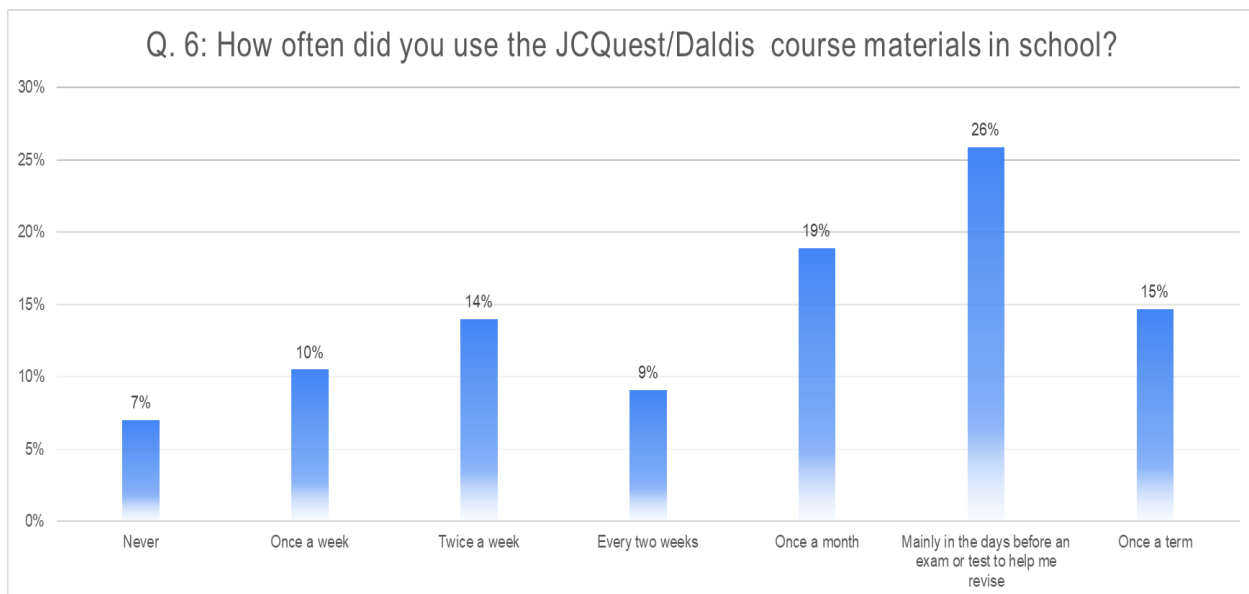


Figure 4.2 Frequency of Use in School?

While on the one hand regular school usage may seem a bit on the low side this is mainly attributable to a lack of access to computers in schools, which will be discussed in greater detail in the teacher section below, rather than issues with the overall platform/product. Similarly, the high numbers claiming (39%) never to use it at home, is attributable to the fact that two of the PSP's were disadvantaged schools and located in deprived areas where access to fixed broadband and devices



was likely limited. As the recent national economic and social council (NESC, 2021) report on Digital Inclusion in Ireland stated:

“Gaps in access to devices (e.g. desktops, tablets) are also evident; Irish people on low incomes are more likely to own older and second-hand devices, to have internet access only on their smartphone, and to have limits on the amount of data they can use. Those with higher incomes are more likely to have broadband, and access to the internet on a range of devices including smartphones, laptops and desktops. These devices are much easier to use for employment or training.”

Therefore, while usage in class for most PSP’s s was curtailed by lack of access to devices in schools this situation was likely further exacerbated for the two disadvantaged schools when it came to home usage. Despite these obstacles it was encouraging to see that the majority of students (61%) used the system at home to varying degrees to support their learning.

System Usability, Design and Suggestions for Improvement

From a usability and design perspective most students (81%) agreed that the system was easy to use with a small number of students (17%) saying they were unsure and just 2% disagreeing.

Undoubtedly this contributed to the enjoyment of the materials which revealed similar patterns with 79% of students agreeing that they enjoyed using the system, 17% declaring they were unsure and just a few (4%) disagreeing.

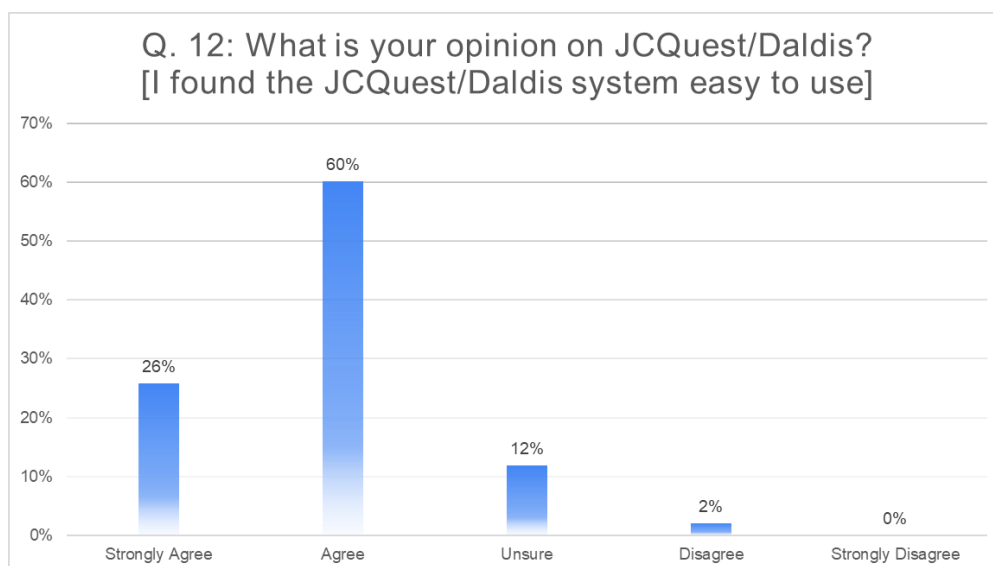


Figure 4.3 Ease of Use

These findings were further supported by the open-ended question option in the survey where students were asked what they liked best about using DALDIS/JCQuest. Ease of Use was cited by



22% with a further 26% citing features such as the accessibility of the resource in terms of variety of device access, enjoyability, fun, the question type options, and the products' technological and multimedia affordances such as online functionality and use of images. Similar findings were reported in the focus groups were almost all students reported they found the system very easy to use and reported few difficulties logging on either at home or school:

“It was so easy to use and it was very practical because it was on your phone or on your laptop so you were able to do it quickly and it was good because if you had just revised a chapter for an exam you could go through the quiz and see what you knew and what you needed to work on more.. so it was just kind of easy and more entertaining to use.”

S2:FG_1

Despite the overwhelming positive endorsement, a small number of technical issues did come to light both as part of the focus group discussions and the open-ended survey question which encouraged students to make suggestions for improvement. The main technical downside reported by a number of students in the focus groups related to the drag and drop facility when using the resource on laptop/desktop and even iPad devices as this student explained:

“I think it was easier on the phone because sometimes when you were moving it on the laptop it might go into the wrong box, like doing the cloze questions, it sometimes clicked into the wrong one and then you weren't able to change it....So it was easier to use on the phone.”

S2:FG1

This issue was also highlighted in the open-ended improvement question where some students mentioned things such as “glitchy, ‘respond faster”, ‘the matching system” etc. with one student providing a comprehensive explanation of the problem encountered:

“When moving an answer to fill in the blanks, you had to put it exactly on the gap, if it was a tiny bit off, it didn't count...Also you should be able to undo one of your answers in the fill in the blanks without starting the whole thing again.”

Survey Open ended Response Question

While this is clearly an issue to be addressed in terms of technical improvements we were surprised and pleased to see so few technical issues emerge during the pilot testing. It was also encouraging to see that 20% of the open-ended responses revealed that DALDIS/JCQuest did not need to be improved and that one of them main recommendations for improvement made by 27% of those responses involved expanding DALDIS/JCQuest to other subject areas.



Feedback and Preferred Question Type

Given the centrality of feedback in the Assessment for Learning process and the key role feedback played in the design and development of DALDIS/JCQuest the survey contained a number of questions to gauge how students felt about the feedback they received and how it contributed to their learning. The majority of students (68%) stated that they found the feedback from DALDIS/JCQuest beneficial with 16% indicating they were unsure and a further 16% disagreeing. Similarly, 67% agreed that the feedback from the resource helped them to understand where they went wrong while a further 62% agreed that they had learned more from questions with feedback.

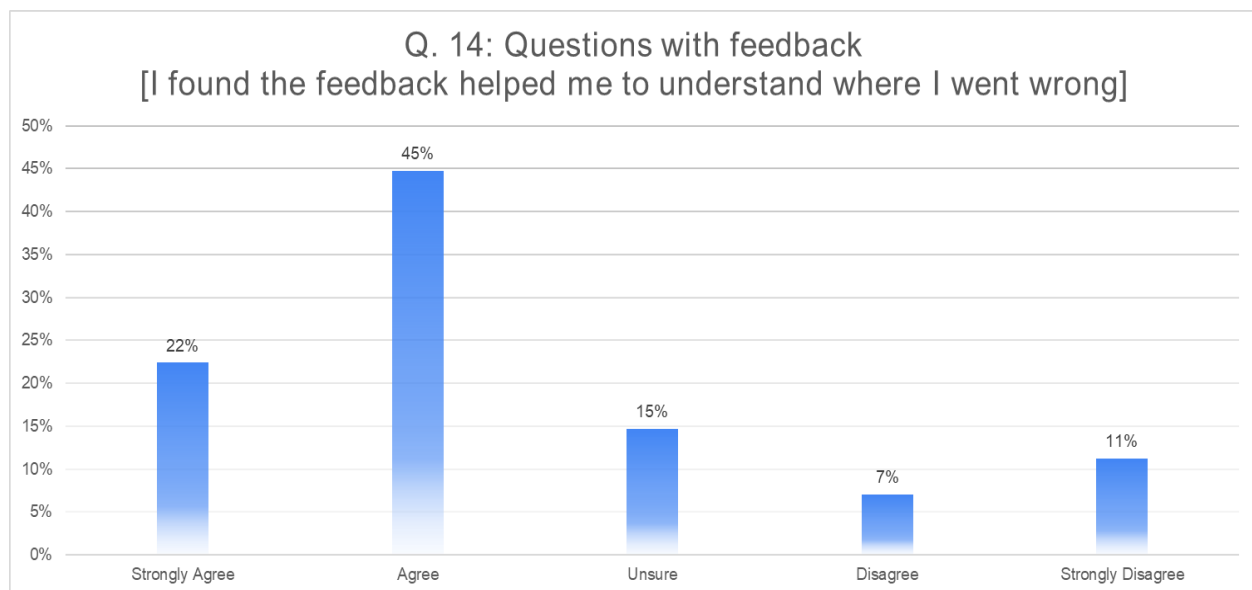


Figure 4.4 Feedback Question Benefits

The contribution of feedback to student learning was explored further in the student focus group discussions where students had the opportunity to explain how they had benefitted from it. Some of the key benefits in terms of helping their understanding between right and wrong answers, where you needed to improve, and the brevity and clarity of explanations provided by DALDIS/JCQuest are summed up in this focus group discussion:

S2: “Yeah...It definitely helped because when you mixed up some words in your head or maybe you got like the cells [reference to Science Cells and living things module] mixed up it would tell you why it’s not that cell, why it doesn’t have it and then obviously the right answer.”

S3: “...And it would highlight or embold main works and it didn’t use very hard language (sic difficult) it was very short and simple...”



S1: “it was very useful because it lets you know where you’ve gone wrong...it’s almost like having a virtual teacher in a way.”
S1:FG2

Likewise in another school a student who admitted finding French a more difficult subject to study than science noted how the feedback was helping:

“I found the French was very good because it gives explanations for the wrong answers when doing the tenses so if you got the wrong ending it explained which ending that tense belonged to...I would find French harder to learn than science so in that way it came in handy” [sic useful]
S2:FG1

The immediacy of feedback provided by the technology was also appreciated by students with students from a focus group in School 4 noting that they felt they were learning more “*because when you submit your answer it checks it right away and we know what we did wrong and then it lets us try again and then we get it right*”.

Students also found that feedback helped their learning especially when it came to revising material for upcoming exams:

“It definitely helped when I wasn’t sure about a topic as I could just go onto JCQuest and if I did get the answer right it would give me good feedback that would help me to remember it if it ever came up in a test...so it was definitely good and it helped me revise.” S2:FG2

While students clearly found feedback questions very useful it was somewhat surprising and unexpected to find that students chose the option “Multiple Correct Answer” as their preferred question type in the survey. Another unexpected, if somewhat disappointing finding was that less than half of survey respondents (45%) felt they had become more interested in a particular subject as a result of using DALDIS/JCQuest with 36% stating they were unsure. However, this finding was not supported in the focus groups where most students stated their interest levels in a subject had increased since using DALDIS/JCQuest with just one student declaring otherwise in a somewhat circumspect and qualified way when she said “*It didn’t make it more interesting as a subject but it was still good to use*”.

From the focus group discussions, it became clear that students particularly liked Multiple Correct Answer types because they enjoyed the challenge they posed. Because they found these questions more difficult students appreciated the cognitive challenge of having to think more to get the right answer:



“I had two favourites. I loved the questions with feedback because when I got it wrong I got told what this actually means and how its wrong and then I liked the multiple correct questions because they made me have to think really hard about it.” [sic answer].

S4:FG1

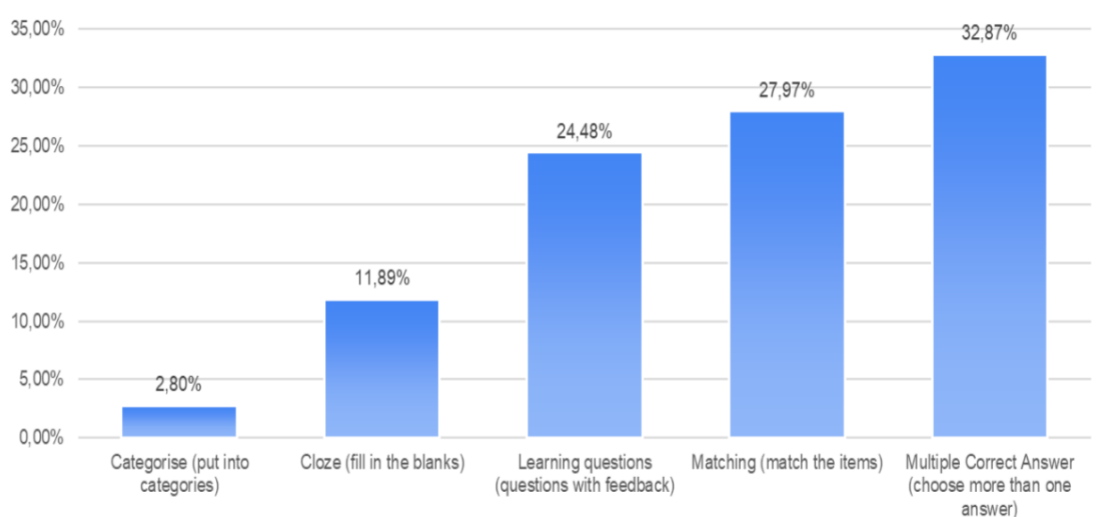


Figure 4.5 Preferred Question Type

Elsewhere students found that multiple correct questions encouraged them to pay more attention to the question itself and more mirrored exam-like conditions as these focus group participants explained:

S1: “My favourite was the multiple correct because it made you think about the question more because some of the answers were similar to each other, so it kind of made you make sure that you read the question properly.”

S3: “And mine is the multiple correct too because I think it gave you more options like if you’re in an exam situation...and because you had at least three answers that were correct type questions it gave you more options in your learning.”

S2:FG3

An added dimension to this discussion was raised by another group of students who argued for the superiority of multiple correct questions on the basis that it was more difficult to second guess answers unlike traditional multiple choice questions where sometimes you can get an answer correct without really understanding why:

“Sometimes when you have the multiple choice answers if you're doing it over and over again you kind of just know yourself like which one to press without really understanding it as you just remember which ones to press... So I kind of like the multiple correct ones cos you get more options and it kind of challenges you more because when they're all there it's harder to remember which ones are correct but with multiple choice you can remember which one was the correct answer.”

S4: FG2



The level of discernment by students in relation to the value of different question types in terms of how they helped their learning as well as their insights into why a good proportion of students was encouraging and refreshing. Furthermore, it indicates that use of DALDIS/JCQuest was helping students develop good levels of metacognitive knowledge and awareness which can only bode well for future development as strong metacognitive skills are crucial for student learning and performance.

Contribution to Learning and Continuing Use of DALDIS/JCQuest

The survey data revealed that the majority of students (76%) agreed that the DALDIS/JCQuest helped their learning with just a few (6%) disagreeing and a small number (18%) adopting a more neutral stance. This finding was further substantiated in the focus group interviews where most students indicated their experience with the resource was a positive one and were able to articulate the different ways in which they felt they had benefitted from using DALDIS/JCQuest be it by way of feedback for correct and incorrect answers, as a revision tool for helping them prepare for exams and understanding areas for improvement.

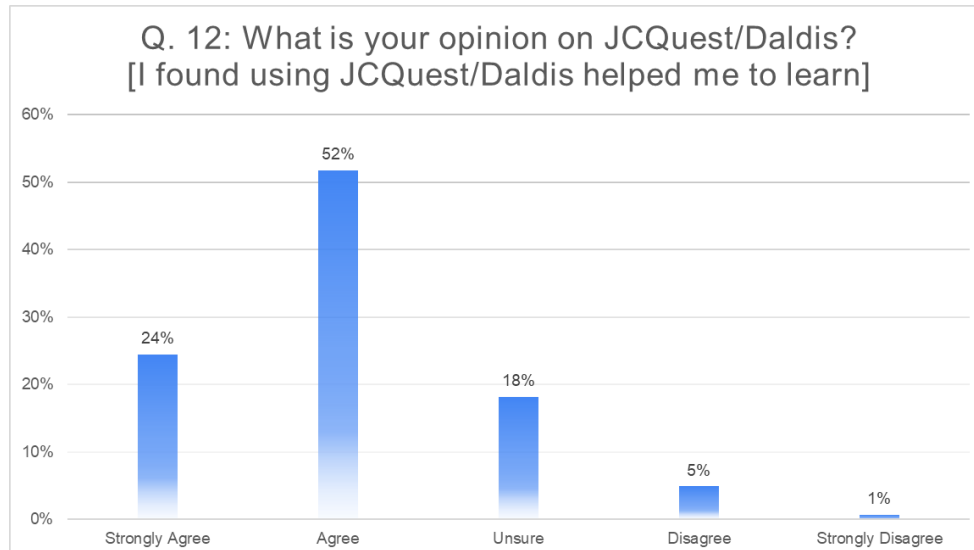


Figure 4.6 Overall Learning Benefit

Additional Learning benefits mentioned by students included the technology itself which provided a break from more traditional classroom learning, the additional material included on the site which was not in the prescribed textbooks and how using this type of resource added an element of fun to the learning process:



S1: *“It made learning more interesting because a lot of the information that was on the quizzes weren’t in our books before so I got to learn a few more interesting facts.”*

S2 : *“... yeah I thought it was like a fun way of learning because you weren’t just reading through a textbook but were like learning off a website.”*

S3: *“It was very easy to use and quite fun as well.... I enjoyed using it in class and it was good to get a break from just writing things down.”* S4:FG

Perhaps though the clearest indication of how DALDIS/JCQuest contributed to overall learning is best encapsulated by students insights into how it compared to other popular well known assessment tools that are regularly used in schools such as Kahoot and Quizlet, among others. In the opinion of most students DALDIS/JCQuest was a superior learning resource due to the quality of feedback and its alignment with the Junior Cycle curriculum.

“I thought it was better than Kahoot because with Kahoot when you answer from 4 questions you don’t know the meaning of the three wrong ones but with JCQuest you get the feedback and you learn from your mistakes” S2:FG1

“It’s similar in ways to an app called Quizlet that we have on the iPad but I actually find it [JCQuest] better because its improving my learning more ..while quizlet is good you have to make the questions yourself or find someone else’s but with JCQuest the topics are already there and you know the answers are reliable and they were all proper Junior Cycle questions rather than questions made by some random person on Quizlet.” S4:FG 1

There was a sense in which JCQuest was considered a more serious learning tool with many students seeing Kahoot and Quizlet as more ‘edutainment ‘ style tools for use in the last few minutes of class or late on Friday afternoon for a bit of fun.

S2: *“Kahoot is more like a childish, fun thing.... a game you do with all your friends that would be a treat at the end of class but with JCQuest its more of a serious, but still fun learning process.”*

S3: *“I think Kahoot would be more like a competition and then JCQuest is more like just by-yourself learning.”*

S2: *“Yeah Kahoot is more like a game but JCQuest is more like a teacher.”*

The fact that JCQuest facilitated more independent learning where students could learn at their own pace and in a less competitive and more private space was considered an additional benefit.

Explaining how she liked using Kahoot and Quizlet once she felt she had mastered a topic one student explained:



“I’m very happy to be competitive if I’ve finished a [book] chapter and know it well but if I don’t know the topic or what’s been tested that well I’d much prefer to use JCQuest where I can think about it for longer if it’s not right.”

S4: FG 1

Similarly another student elsewhere commented:

“JCQuest is definitely much better because you can go at your own pace and you can think about the questions that you were asked, so you’re not trying to beat your friends and you’re actually taking in the stuff [sic learning material]/question that you’re being asked so it’s definitely a lot better for learning.”

S2:FG2

Undoubtedly the clear learning benefits associated with using DALDIS/JCQuest largely explains why a majority of students (74%) expressed a desire to continue using the resource going forward with just a few (4%) disagreeing and a small number (22%) maintaining a neutral position. The majority of students although somewhat less at 66%, also indicated they would like to see the resource expanded to support all subject areas. It should be noted that in the focus group feedback sessions most students, i.e. more than 90% were in favour of both.



Chapter Five

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

Introduction

This chapter deals exclusively with the feedback obtained from teachers in four of the project pilot schools. Seven teachers completed the questionnaire and seven teachers participated in the research interviews. Of these the same six teachers completed both meaning that a research interview was conducted with one teacher who did not do the questionnaire and one teacher who completed the questionnaire was not interviewed. In all then nine teachers who participated in the pilot provided feedback. A four part questionnaire was used to collect data. Part 1 gathered general information regarding the type of school and key demographic and subject teaching data and Part 2 asked about the use of digital technology. The questions in Part 3 specifically related to formative assessment and Part 4 focussed on teachers' overall perceptions about DALDIS/JCQuest. The research interviews supplemented this information. These findings will now be presented and discussed.

Key Demographic Information and Subject Data

The survey revealed that five of the seven teachers (71%) who completed the survey were female and two were male. This is in line with the national average where 70.6% of all second level teachers are women. The majority were also experienced teachers with more than ten years' service; four had been teaching for between 11 and 20 years with one teacher having more than 30 years' experience. Just two respondents had been teaching for less than ten years.

The majority of respondents (5) reported teaching in class sizes of between 21-25 students with two declaring to have between 16-20 students. This is in line with national norms where most subjects have class sizes in the range of 21-30 with core subjects such as English, Irish and Maths having in excess of 25 students with more practical subjects such as Science and some popular optional subjects like French, coming in at the mid to low end of that spectrum. Furthermore, as additional funding for DEIS schools can result in marginally better teacher pupil ratios compared to the national average, this largely explains why some respondents declared class sizes of less than 20.

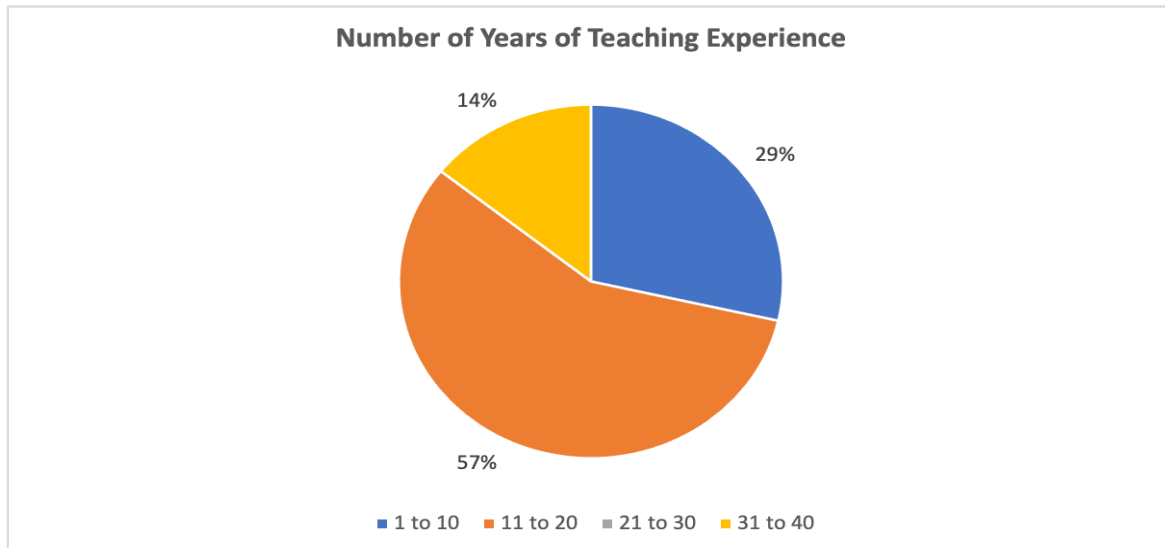


Figure 5.1 Teaching Experience in Years

The breakdown in terms of subject teaching was as follows:

- 3 Science Teachers
- 3 French Teachers
- 1 Geography Teacher

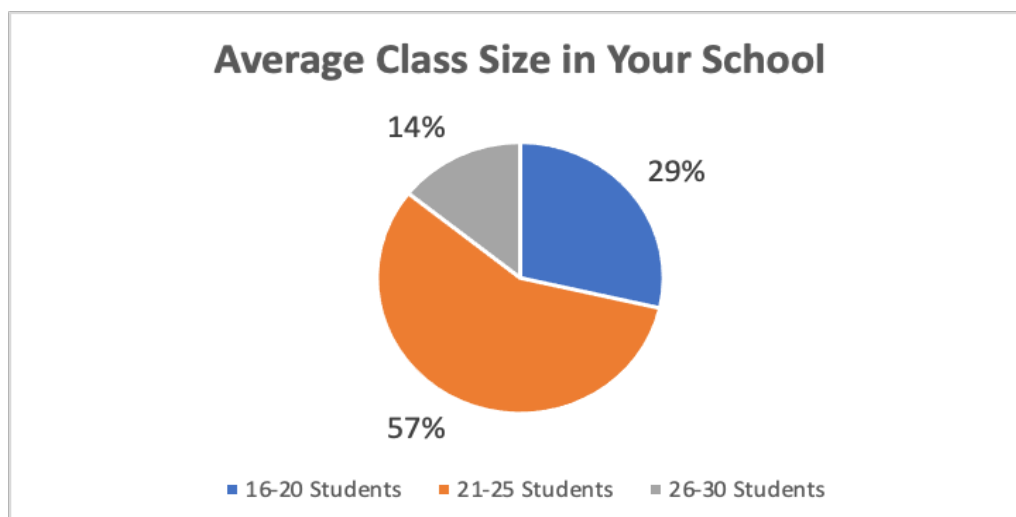


Figure 5.2 Average Class Size

In line with national practice for the Junior Cycle Curriculum they taught across all three years of the Junior Cycle from first years to third years. It should also be noted that they also all taught their subjects at senior cycle level too, although this level was outside the scope of the DALDIS project.



Assessment Approaches and Practices

To ascertain teachers approaches to assessment generally and AFL/Formative assessment specifically, the survey contained a number of questions investigating the strength of the link between assessment and learning based on teachers practices and approaches in everyday teaching and learning.

In response to a series of questions about the role and value of assessment at a general level, all teachers (7) agreed that assessment is fundamentally about improving student learning via feedback, informing students on their progress, helping students learn through identifying their own mistakes and testing how much students have learned. Just one teacher disagreed with the statement that assessment was about helping students identify their strengths while one teacher expressed uncertainty about whether eliciting explanations from his or her students was part of the assessment process. Nonetheless, the overwhelmingly positive response to these questions would suggest that the teachers had a broad understanding and appreciation of the added value that assessment brings to the learning process which aligns with assessment for learning theory.

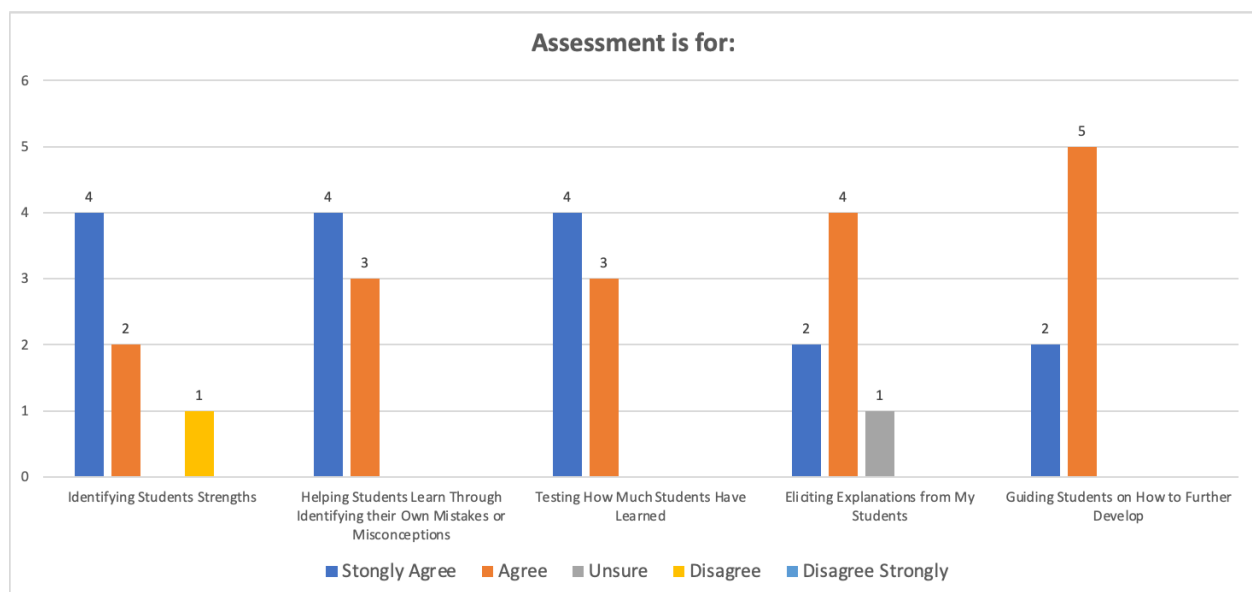


Figure 5.3 Assessment is for ...

This was further substantiated by the responses to a separate questions where teachers were asked to identify how they mainly assessed their students based on three options. Encouragingly the majority of respondents (5 out of 7) indicated that in class assessment was the main vehicle through which they assessed their students. Only two teachers selected end of term tests (i.e. summative assessment) as their primary assessment mechanism while nobody selected homework. As in class assessment



was chosen as the main assessment method this would suggest that the majority treated assessment as an embedded and ongoing process in everyday teaching and learning which aligns with AFL theory and recommendations.

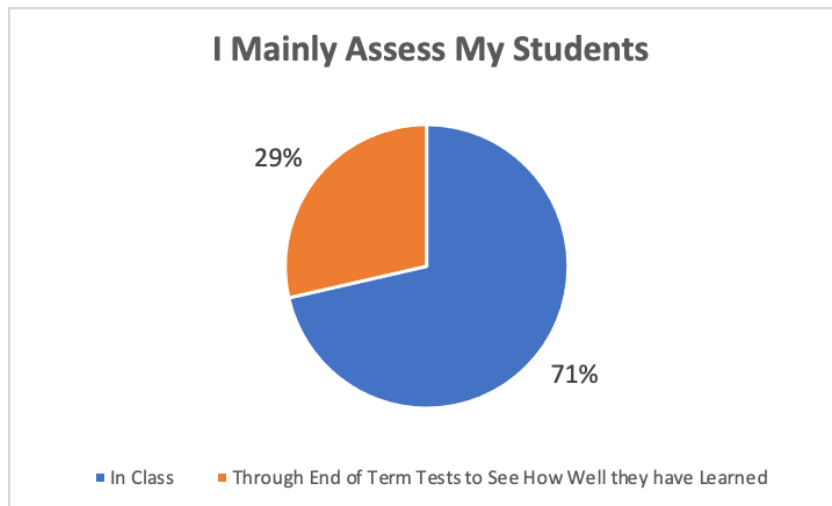


Figure 5.4 I Mainly Assess My Students

This was borne out in the research interviews with teachers, many of whom noted the increased emphasis on formative assessment in recent year since the introduction of the new Junior Cycle Curriculum:

“I’m very comfortable with AFL. It’s all formative assessment in my class with the exception of the state examination which would be the only summative assessment, so every assessment that we do I try to use as an opportunity for formative assessment.” S2: FT

“I think we’ve become better at AFL it in recent years because many of the CPD programmes would be centered around that kind of active learning and allowing us to assess the students in a different format....there’s a lot more project work and the classroom based assessments (Junior Cycle reform) as well lend themselves more to AFL and so in general I think the trend in teaching is changing in the classroom...” S4: ST

“I would use AFL quite a bit because the students here have to do assessment journals...we have like an assessment for learning page, so when the students do their little bits of assessment in class they record and track their learning in terms of how they’ve done.” S1: FT

However despite these positive developments/comments, there was a slightly more mixed response to a further series of questions where teachers were asked to rank the importance of assessment for learning approaches/techniques in their own practice, using a scale of 0 to 5, where 5 indicated highly important.

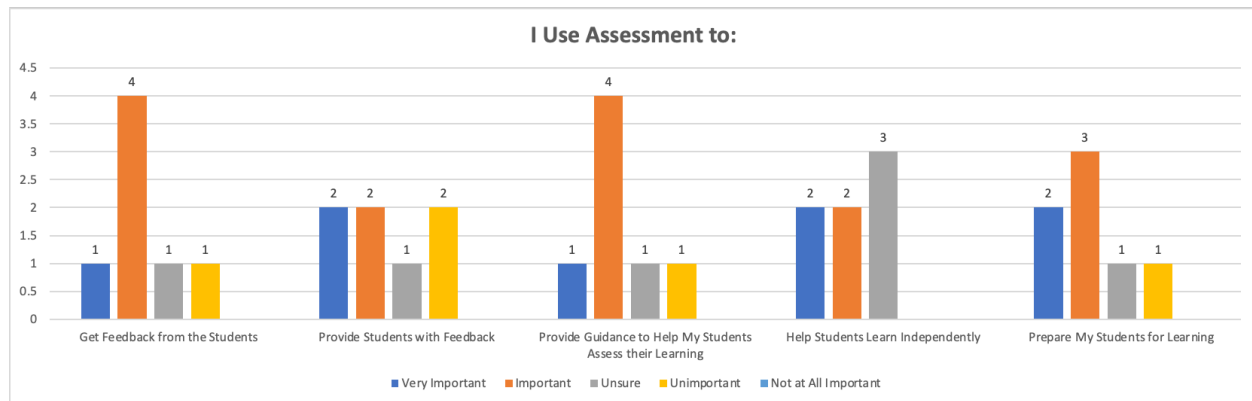


Figure 5.5 I Use Assessment to:

While four teachers gave a high importance rating of between 4 and 5 to the following three statements “I use assessment to provide students with feedback; “to provide guidance to help my students assess their own work”; and “to help students learn independently”, three teachers gave them a low rating of between 2 and 3. Similarly four teachers also gave a high importance rating to the statement “I use assessment to help me plan my lessons”, with three teachers giving it a lower rating of between 1 and 3. This would suggest that for some teachers there is a gap between their understanding and appreciation of the Assessment for Learning process and the deployment of same in terms of their own practice.

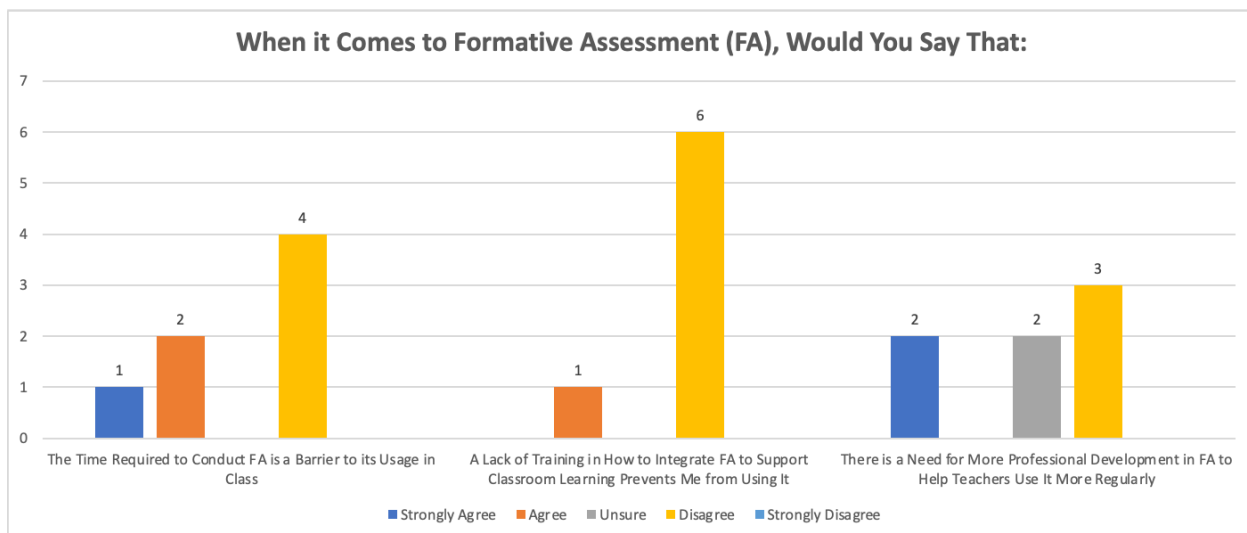


Figure 5.6 When it Comes to Formative Assessment (FA), Would You Say that:

Questions on perceived barriers to the use of formative assessment also yielded varied responses. Almost half of respondents (3) felt that the time required to conduct AFL acted as a barrier to classroom usage with the remainder disagreeing. Opinions were more mixed around the need for



further professional development on formative assessment, with two teachers strongly agreeing with the statement and a further two indicating they were unsure if this was the case or not. Yet in almost contradictory fashion, most teachers (6) disagreed with the statement that a lack of training in how to support classroom learning prevented them from using formative assessment.

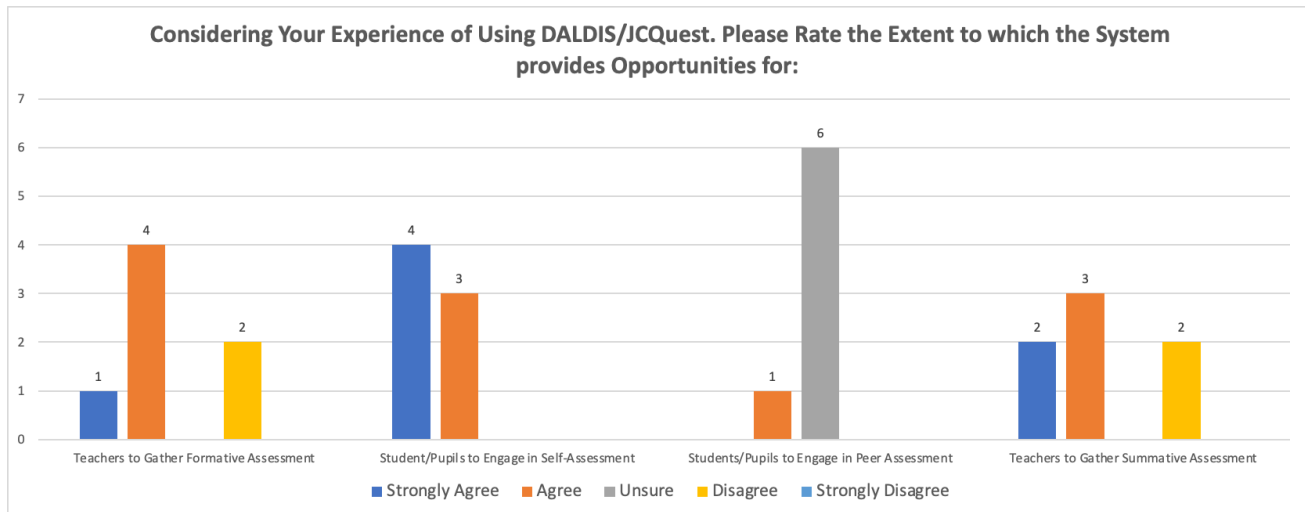


Figure 5.7 ... Please Rate the Extent to which the System Provides Opportunities for:

Teachers’ perceptions of the benefit of technology and assessment was also explored. There was unanimous agreement that the use of technology for assessment saves teacher time, helps to monitor student progress and supports assessment outside the classroom. However, most teachers (6) felt that the use of technology for assessment requires technical skills while almost half (4) felt that technology was more suited to summative assessment with the remainder (3) being unsure. This could explain why the majority of teachers (5) in a separate question said that they did not use technology regularly for assessment prior to DALDIS. These varied responses would therefore suggest a mis-match between teachers’ understanding and appreciation of the value technology can bring to the assessment process and the actual use of technology in practice. Undoubtedly some (but not all) of this gap is likely attributable to infrastructural issues and difficulties in schools which will now be discussed in the next section.

Digital Competence, Devices, and Technology Infrastructure

Both the survey and teacher interviews data contained a series of questions designed to ascertain teachers’ digital competences, as well as school-based infrastructural support structures in terms of device availability, school policy etc. While the survey data was overwhelmingly positive and



certainly indicated that teachers were encouraged to use IT for teaching, the research interviews revealed a more challenging environment for the successful implementation of IT in everyday classroom learning.

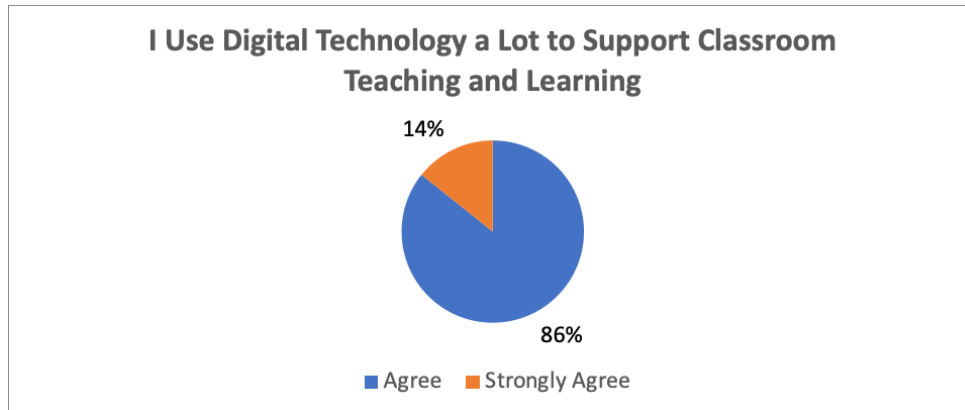


Figure 5.8 Use of Digital Technology to Support Teaching and Learning

Teachers’ Own Use of Technology Encouragingly most teachers rated their own technological competence quite highly. Just one teacher declared being not comfortable using technology. There was unanimous agreement that they used technology a lot to support teaching and learning with almost all (6) declaring that they were quite comfortable using technology in teaching and learning as well as in their personal lives. The majority (5) also agreed that their peers viewed them as technologically competent with one disagreeing and another unsure.

This confidence in their IT know-how was further substantiated by a series of questions where nearly all respondents indicated they were willing to use new technology without prior training or help from others and were comfortable using manuals or online help tools to navigate new technology. As one teacher commented:

“ ...maybe it’s because I do a lot of things online anyway, but I find I just want to get going without having to spend maybe an hour or two on training beforehand..it’s a bit like playing a card game where you have the rules that you don’t really understand them it’s like let’s start playing it and you’ll get it [sic understand how it works] ...I much prefer to learn that way.”

S3: ST

Similarly a teacher in another school observed:

“It’s been an interesting 10 years in teaching. For the first few years I was teaching there weren’t computers in classrooms but we’re an iPad school and it’s all technology now and the young people have changed a lot as well so we need to keep up to date with all of that”.

S4: FT



Interestingly, while all respondents (7) agreed that they used digital technology a lot to support classroom teaching a significant majority (71%) stated they did not regularly use technology for assessment prior to the DALDIS project.

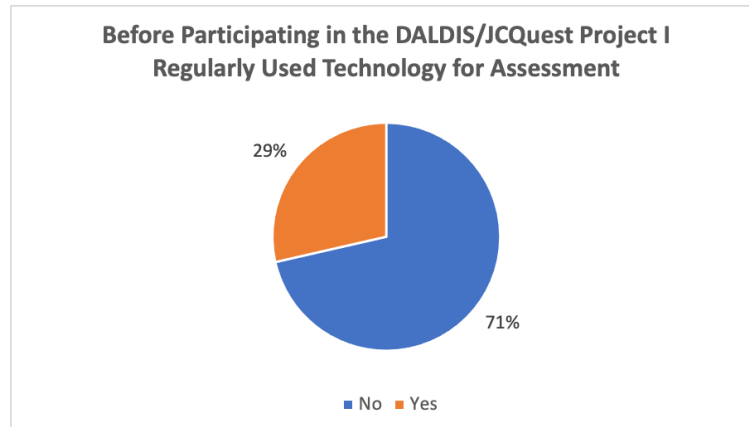


Figure 5.9 Assessment and Technology

In terms of school devices, the majority of teachers (4) reported that students were required to share devices in school; the exception being teachers from the iPad school which operated on a 1:1 device basis. Despite having to share devices the majority of teachers (5) agreed that technology in their school was well resourced and supported, which is somewhat contradictory.

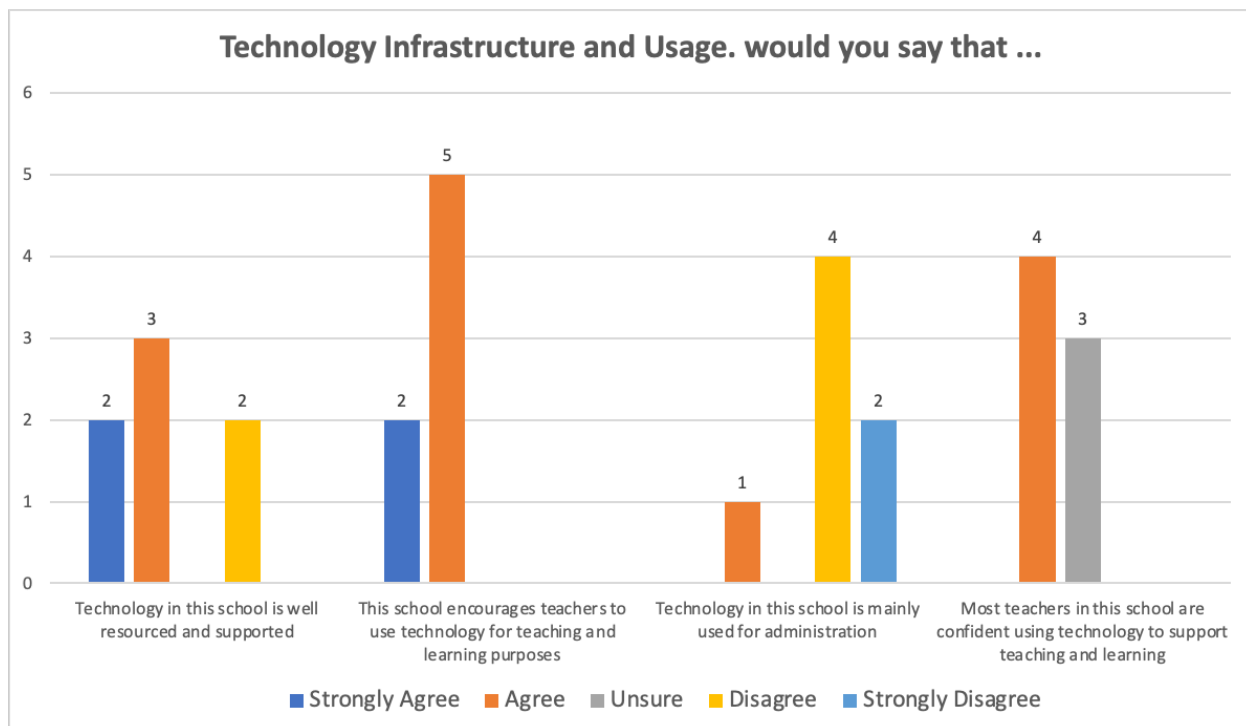


Figure 5.10 Technology Infrastructure and Usage in School



The contradictory nature of this agreement was further exposed through the research interviews where most teachers, apart from those from the iPad school, spoke about the difficulties they experienced with school IT, technical support and access to computer facilities. When asked to identify any factors that might hinder the greater use of DALDIS/JCQuest school wide, one teacher had this to say:

“I would say our limited access to IT might be a factor. We only have one computer room and it’s often booked particularly as so many assessments for the Junior Cycle are computer based and also Leaving Cert students doing their CAO applications as well, so they take priority when it comes to the computer room. We do have a laptop trolley and for doing the student surveys for the DALDIS project I was very brave and got the trolley out but it was such an ordeal trying to find a room where they could be plugged into, finding laptops that were actually charged rather than left uncharged, then getting the computers out, booting them up, it was such an ordeal..and so I think for our school limited access to IT is a huge barrier”

S3: ST

Similar problems were also recorded in another school where one teacher when asked about her continued use of DALDIS/JCQuest observed:

“I would but it’s all got to do with access to a computer room as I don’t like students having their phones in class as there are issues around them that I’d rather keep out of class...And even the length of time it takes for students to log onto the devices is an issue as unfortunately they are aging computers. And as well there’s only a limited number of computers for such a large school and with computer science now on the curriculum, that tends to get prioritized for the computer room.. So yes all things being equal if I had more access to IT I would use it certainly as I think it’s a great resource.”

S2: GT

Elsewhere, in school one, one of the teachers indicated that because the school had just one computer room for 400 students and limited access to mobile laptops and a few iPads, they encouraged students, under teacher supervision, to use their phones instead. The situation was summed up by one of his colleagues as follows:

“We have a trolley of mobile laptops but I don’t really use them because we have 40 minute lesson so the mobile laptops are more hassle than they’re worth sometimes because by the time you take them out, log them on, you know some people are logged on, some people aren’t, and there’s always a half dozen that can’t get on for whatever reason...so you could be 20 minutes sorting all that out...So I find the phones are fine for most things.”

S1:ST



Not all teachers, as the Geography teacher from S2 above indicates, were as relaxed about mobile phone usage. The cautiousness around using mobile phones in class sometimes stemmed from school policy and sometimes from teachers own preferences.

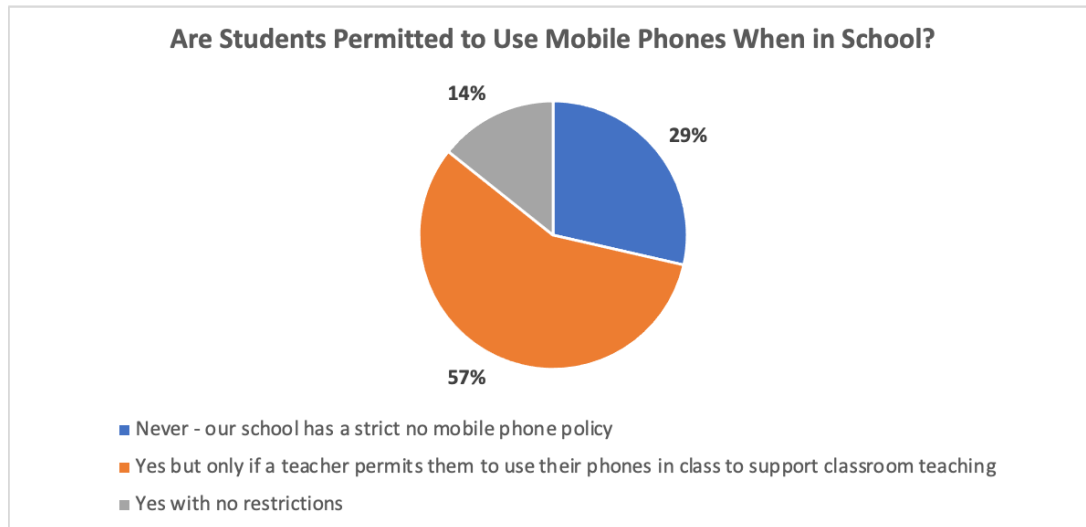


Figure 5.11 Student Mobile Phone usage in School?

In this respect the questionnaire provided useful additional insights into school policy in relation to mobile phones and the constraints under which some teachers were operating. For example, just one teacher declared that their school operated a no restrictions policy on their use with the majority (4) indicating that mobile phone use was discretionary i.e. it could be used to support classroom teaching if a teacher allowed, and a further two teachers indicating a school-wide, no mobile phone policy. As one teacher commented *“No, definitely not in class as we have a strict no mobile phone policy”* while a teacher in another school explained the challenges that mobile phone use brought:

“It’s controversial because there’s so many issues with phones so we have a very strict policy about phones in school. Before Covid it used to be the case of phones should be in their lockers unless teachers have asked for them to be out but with them not being able to use their lockers since Covid they have them in their pockets and when they’re in their pockets they’re running to the toilets to text and what’s app and God knows what else ...Instagram... so that’s been a big problem.. So I think people are unwilling to allow complete freedom with them because we have had issues with bullying....So yeah like every other school as you can imagine we’re trying to balance the educational uses and advantages of the phones against the problems phones bring. I wouldn’t say we’ve nailed that yet. I’d say it’s a work in progress.”

S1: ST

That all but one of the PSP schools appeared to be under resourced with limited access to computer equipment, combined with restrictions around mobile phone usage, largely explains why the majority of PSP teachers said that they did not regularly use technology for assessment purposes prior to the



DALDIS project even though they reported that they themselves were comfortable using technology for teaching and learning.

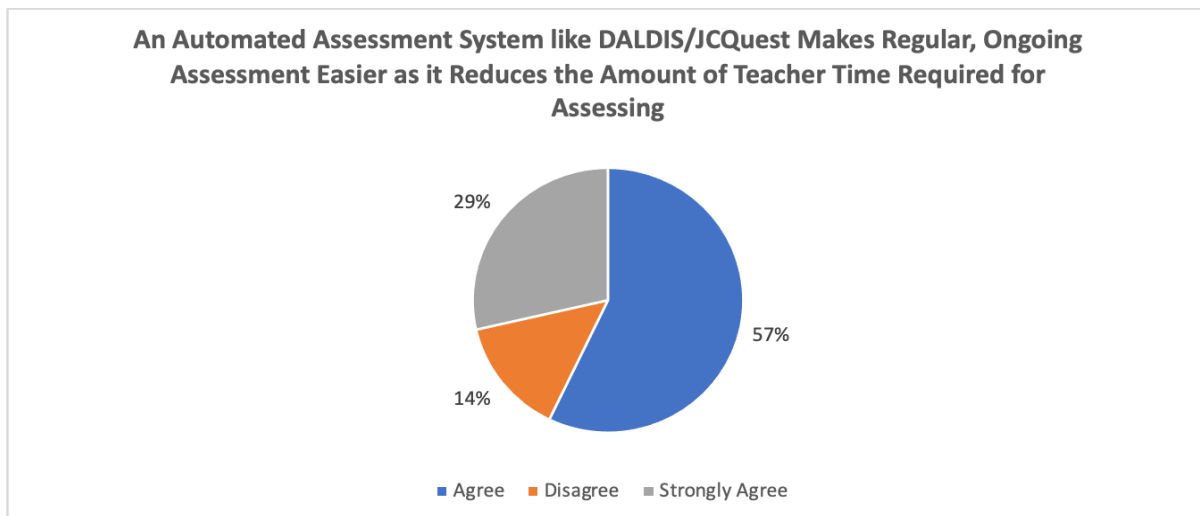


Figure 5.12 Assessment, Technology and Time

Furthermore, although most teachers (6) appreciated the time-saving benefits of an automated assessment system like DALDIS/JCQuest, almost half (3) said they did not feel more confident about using technology to support student assessment or have a greater appreciation of the potential benefits of e-Assessment as a result of using the resource. Undoubtedly this latter finding was in large part due to the lack of teacher engagement with the system’s dashboard. Disappointingly, a majority of teachers (4) said they did not make good use of the Dashboard to check on student progress.

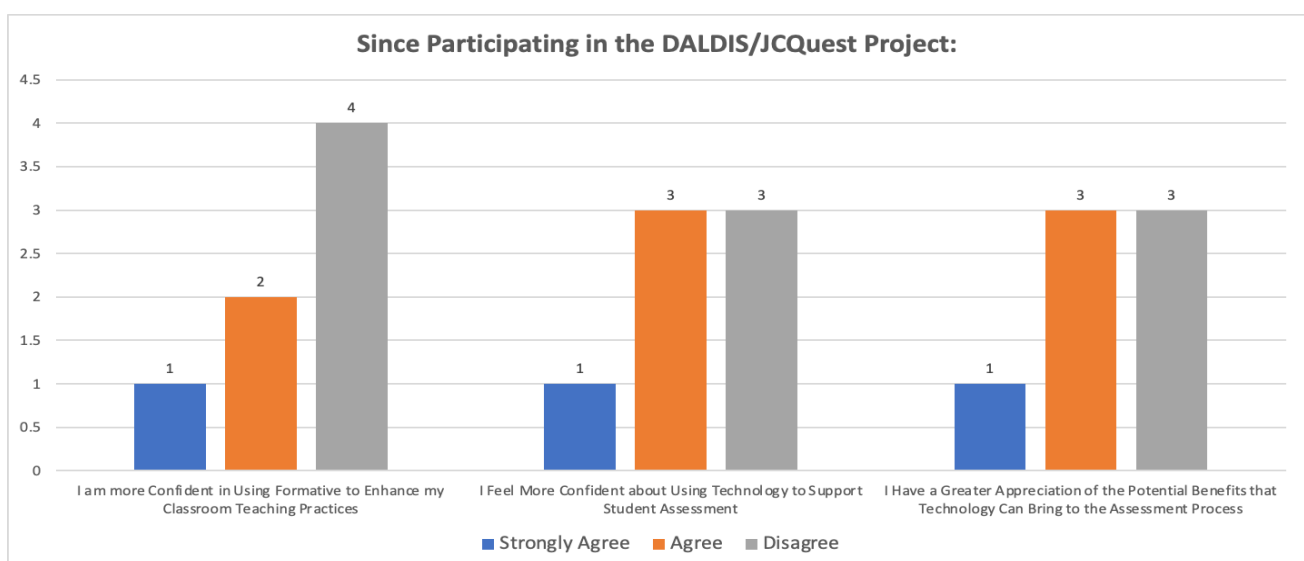


Figure 5.13 Would you say that...



This finding was also supported in the research interviews where just two teachers in two separate schools reported regularly using the dashboard, a feature which both rated highly:

“It definitely cuts down on marking time which is so time consuming and sometimes the last thing you want to do in the evening is to look at class tests...I mean the amount of time and effort it takes to through each question, each student, each class ..so when you’re presented with the end result that can be automated by a computer, it’s so much easier at the end of the day especially when the data and the results mean something like whether they got it right or wrong, without you having to work that out.”

S3:ST

“Absolutely it is a time saver that benefits formative assessment because the big challenge with formative assessment is time...time to go back over the assessment, to reflect on the learning and also for the teacher to track and monitor and then tailor lessons to meet the needs of students. So I think DALDIS cuts out that tracking time for teachers....I don’t have to do it because it gives the feedback directly to the students there and then automatically ...which again is another [AFL] barrier removed because it saves the teacher from having to do it, so I think it has huge potential”

S2: TF

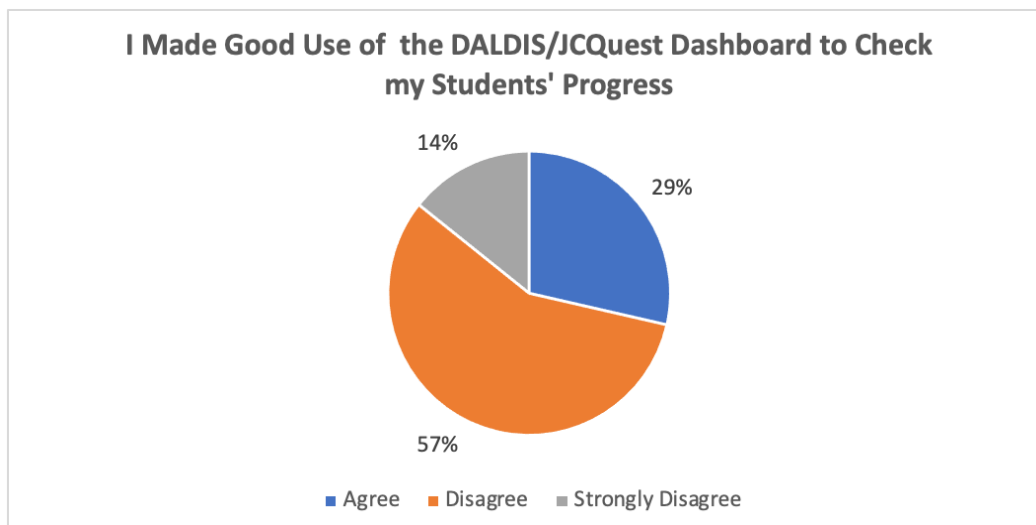


Figure 5.14 Use of the Teacher Dashboard

Use of DALDIS/JCQuest as a Teaching and Learning Resource

As with students, teachers were also surveyed and interviewed to investigate how they used DALDIS/JCQuest to support learning, how beneficial they found it, as well as any issues or challenges encountered. The teacher data confirmed that they used the resource with all three Junior Cycle year groups with second year students representing the biggest cohort of users. When it came to class use, teachers tended to report less regular use of the materials than their students. While almost 29% of teachers reported regularly using the resource (defined as daily, twice weekly and once a fortnight usage) this was lower than similar claims from students where 33%, claimed this to



be the case, as we saw earlier. Similarly, less regular usage (i.e. once a month or once a term) amounted to 43% according to teachers and 34% according to students. Figures on the use of the materials for revision purposes to help students prepare for upcoming tests were more closely aligned with just under 29% of teachers claiming this was the case compared to 26% of students. Most teachers (6) reported that students mainly used the resource at school rather than at home.

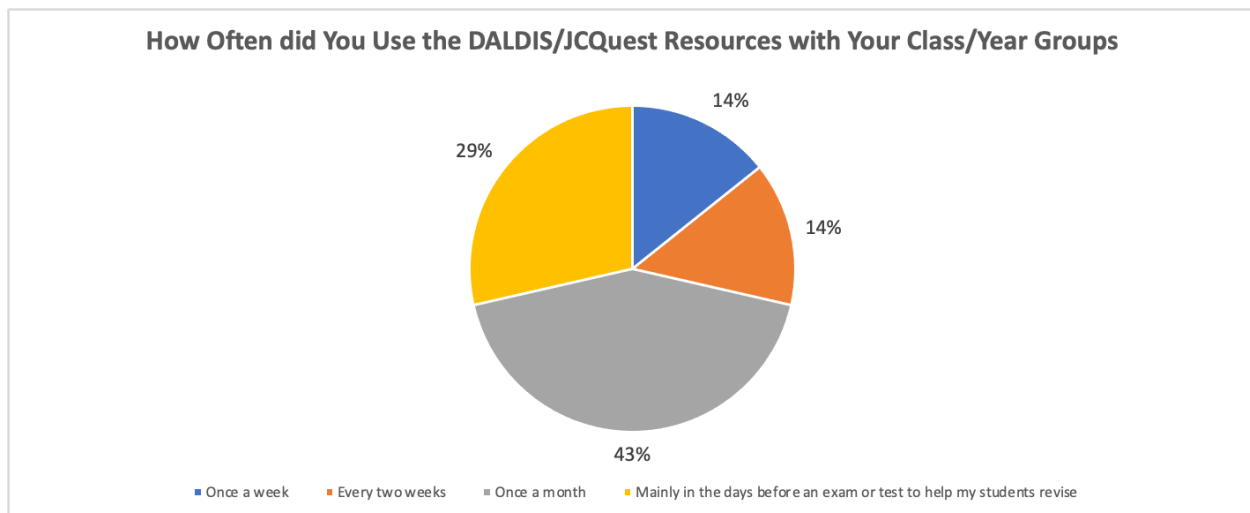


Figure 5.15 Frequency of Use

Ease of Use and Enjoyment

The survey data also indicates that most teachers (6) found DALDIS/JCQuest easy to use with the majority (5) also stating that they found it easy to integrate into their assessment practices and agreeing that it is a resource they envisage using frequently. The ease with which they could enrol their class onto the system and register students was particularly welcome, as this teacher noted: *“Like all systems it needs to be user friendly and I’d say that’s one of the benefits of DALDIS as it didn’t take long at all to be able to sign up and access it”*. Elsewhere another teacher observed: *“On the very first day I introduced it and asked them to sign up I thought it might take a class for me to explain it but it only took 5 minutes. It’s really self-explanatory, very user friendly”*.

Such responses suggest that teachers found the system quite intuitive with the majority (5) agreeing that their peers would find it easy to use and just two out of seven respondents saying that training would be required to use the system. Nonetheless, a small majority (if the one teacher who expressed uncertainty is factored in) felt that using the system required some level of technical support, no doubt prompted by their experiences of using it with their students where issues did emerge from time to time:



“I think from a technical point of view, there were issues with drag and drop and some of my students were not able to do it. On some phones it worked perfectly when they had to match the English and French but for others and they showed me and I even tried it for myself and I was unable to drag the correct answer, it just wasn’t accepting the answer or the layout was all off. I think it was due to their phones as some of them had older devices that were not quite up to scratch so it just didn’t display properly or work properly for them.” S1: TF

“I think there was a point at one stage in the year where we realised there was a problem with drag and drop...Not all the tabs worked, so students were trying to select an answer but they weren’t able to do so and then it [the system] wouldn’t move on for them [to the next section] so there was a couple of things, just technical thing, little technicalities. Now it was a temporary blip and I know that was subsequently fixed but it is something to bear in mind as well because those little technical hiccups can cause an issue if you as a teacher want to use it as a recording assessment tool”. S2: TG

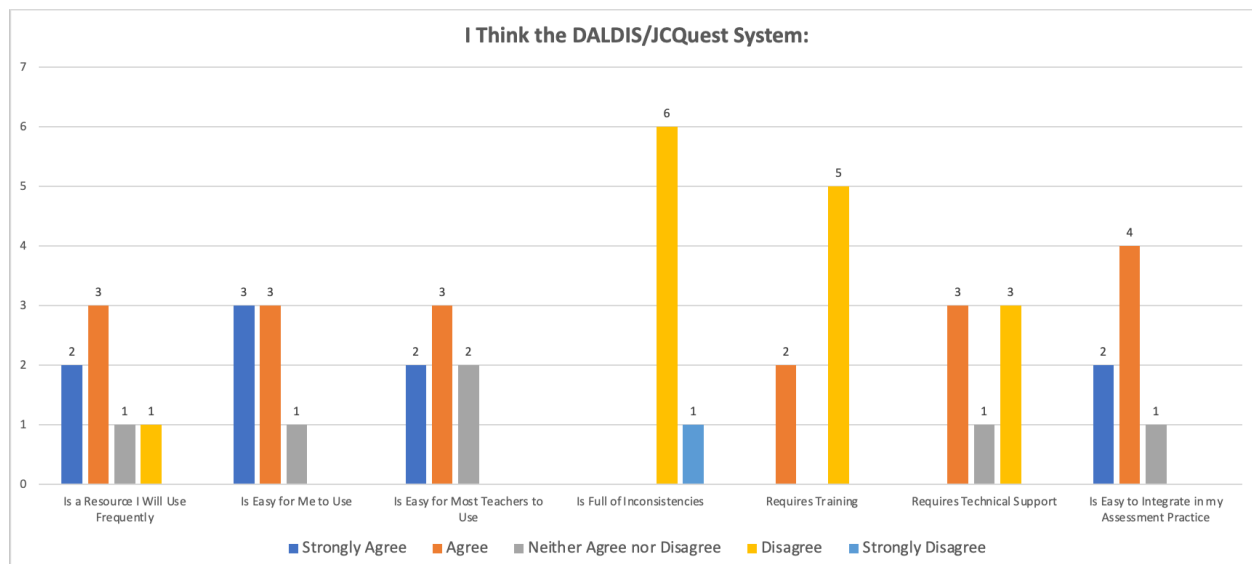


Figure 5.16 *I Think the DALDIS/JCQuest System: ...*

From a pedagogical perspective the majority of teachers identified a number of positive benefits that DALDIS brought to the teaching and learning process. These included improved student learning and engagement, the use of feedback to assist students understand and correct their mistakes and the development of independent learning skills.

Interviews with teacher provided additional insight into these key benefits:

“I thought the feedback was very clear and it showed what they got wrong. It was also concise and the use of bold on keywords also helped. I mean that’s what feedback should be. It should be quick and clear and so it was great, very efficient.” S3: ST



“It’s encouraged independent learning for sure and so that was great, and then when they could assess themselves with little quizzes at the end and then I was able to see who had actually done the quiz and how they got on, I found that very useful.” S4: ST

“Well I would have noticed that students are more engaged, especially at home on JCQuest, so any tasks that I would set on it I could see through the tracking that it’s probably more appealing to them than the textbook. As digital natives they really are more tempted to go on to their devices in the evening and to do all the bits and pieces rather than use a traditional textbook. I think for all learners it’s beneficial because it is so differentiated for each and every learner,,...and they’re choosing their own pathways, so it’s putting choice in the hands of the students which is really important now for MFL... so they’re choosing which things they personally feel they need to revise and DALDIS gives them that choice which is very valuable”. S2: FT

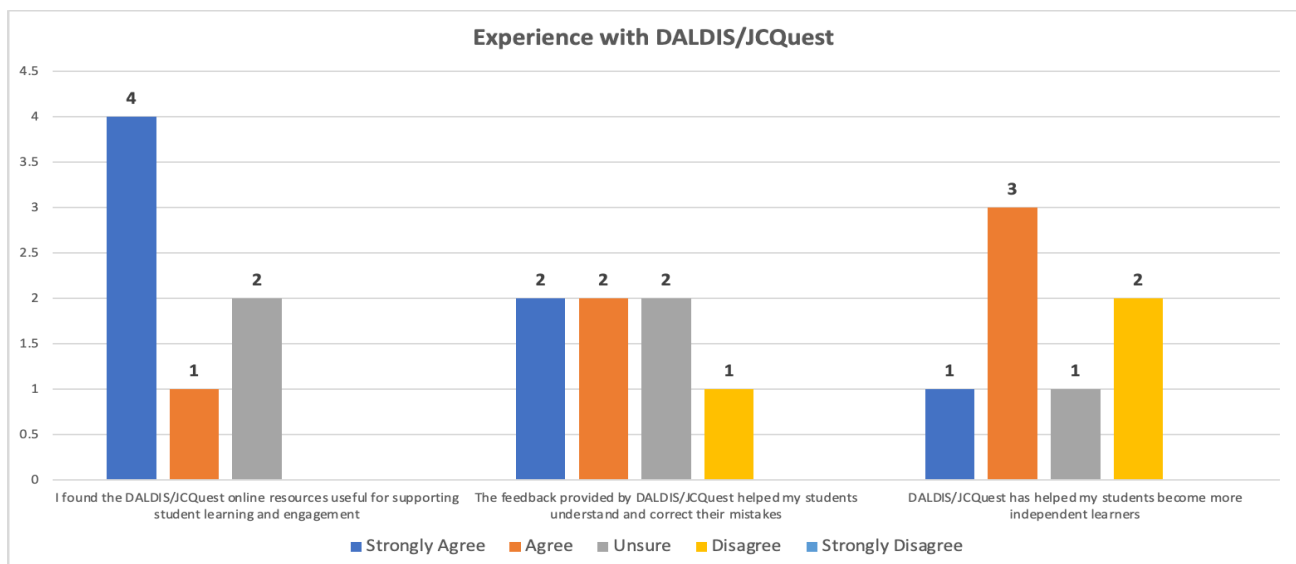


Figure 5.17 Experience with DALDIS/JCQuest

As a curriculum support resource teachers rated DALDIS/JCQuest highly. There was unanimous (100%) agreement that the materials were very well aligned with the Junior Cycle curriculum. This added an extra impetus to their utilisation of the resource, both in a formative way with students in class and in a summative capacity as a revision tool.

“I think that having a resource like DALDIS, that’s relevant to the topic they’re doing at a particular time is very beneficial. I have to say all the little lessons were fantastic, especially with all the different options which were almost like a trial test and I found it very useful for revision at the end of a topic as well. I was very happy with the resource and would love to still have access to it for next year.” S4: ST



“It’s completely aligned with CFR [the Council of Europe Framework of References] which is the standard of languages that students should have achieved by third year [of the Junior Cycle curriculum]. So the fact that it was aligned specifically with CFR A1 and A2 levels really motivated me to use it because that is Junior Cycle French. So it’s fantastic because it ties in directly with the curriculum.”

S2: FT

“I really like it. I think it was very focussed on the kinds of things that would want a learning tool to be focussed on. I mean if I compare it something like Kahoot for example, that’s more focussed on the entertainment side of things, like moving graphics around, the sound, and the emphasis on the countdown and the competition and stuff like that, whereas JCQuest is more about the student and each student’s learning. So it felt more like an education tool, like a learning tool and yeah I really liked it.”

S3: ST

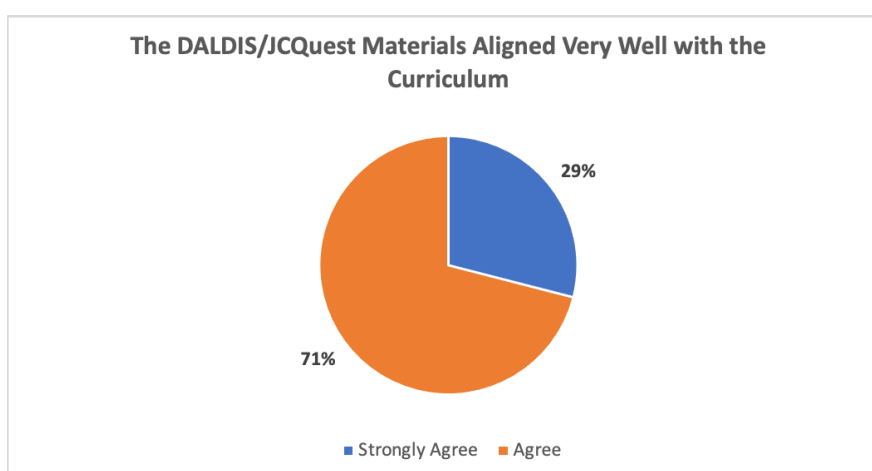


Figure 5.18 DALDIS/JCQuest and Curriculum Alignment

Based on their experiences of using the resource most teachers appreciated both the variety and quality of the questions and the added advantage of having a fully aligned curriculum focussed AFL system when compared to more general, “open’ apps like Kahoot and Duolingo:

“Certainly from the point of view of the Junior Cycle AFL structure DALDIS is definitely better than Kahoot. With Kahoot unless you’re making your own questions, the questions are very much hit and miss which means they’re not going to match the curriculum and we often find that. But I suppose I would use kahoot for the last couple of minutes [of class], just as a bit of a quiz, and so maybe from an AFL point of view that’s not so good.”

S1: ST

“I really like all the different questions as that kind of caters for all the difference types of learners in the class. There are good interactive resources out there, like Folens has quite a good online hub that you can do quizzes and things on, but this was better..and while I would have always encouraged them to use apps like Duolingo as well, I think this was a bit more user friendly because of the way it was structured, topic-wise. It was very curriculum focussed whereas with Duolingo you don’t really know what they’re doing [sic students]



because it's all self driven, so you can more confidently embed it [DALDIS/JCQuest] into your lesson plans."

S4: FT

Teachers also praised the quality of the system's visuals and its role in catering for different learner types:

"I loved the visual aspect, the colourful nature of it..., the presentation quality , I thought it was a nice variety because you have such a diversity in any classroom, and while for the better child it was easy there are other students who would find it more challenging, but I think there was something there for everyone to be fair,"

S2: GT

The use of visuals definitely was very important, very useful for students as sometimes when they see the word in French and see the picture with it, it jogs their memories and I would introduce a lot of vocabulary using images so I found that useful."

S1: FT

Nonetheless, on a more critical note, some issues and areas for improvement were also highlighted by teachers, most notably in relation to the need for DALDIS to expand its question sets to incorporate a broader range of features, particularly in relation to language learning.

"I don't know if the students minded this too much but I found there were too many MCQ (multiple choice questions) style questions. I know there was a few different styles of questions like drag and drop and fill in the blanks but with so many MCQ style questions I found it a bit repetitive after a while especially compared to something like 'language gym' which we subscribe to which has a huge variety of different types of games and activities that you can do. So I found it [DALDIS/JCQuest] too repetitive, it needs more variety, so I think that's something that could be improved on."

S1: FT

"I think the multiple-choice questions were great but probably better for first years even though my 3rd year students actually really liked them at the beginning, but unfortunately that type of question won't translate into the best preparation for exams down the road. While I know we don't want to have the assessment tail wagging the dog almost all the time but there weren't many opportunities for open-ended kind of questions where students could contribute their own little creative piece that they would have in an exam situation. And then the listening piece as well. Unit 3 has listening comprehension which is great but there are only three sections of that type, so more of that is needed especially when you think that the exam weighting for listening is 140 out of 400 marks. I think if you had more of this that would be hugely advantages and it would make teachers even more receptive to the program [sic DALDIS/JCQuest]."

S2: FT

Science teachers also felt that some of the material covered went beyond what they themselves covered in class and were concerned that this might overly complicate things for students.

Nonetheless they recognised that this was partly due to the structure of the new Junior Cycle Curriculum and the choice it gave to teachers in interpreting what to cover:



“It mostly aligned with the curriculum but there were a few extras as well.... but you see this is because a lot of the Junior Cycle is open to interpretation, so some teachers might say it was more aligned with their teaching than other teachers. If I just look at one example, like cells, there was a specific type of cell that we wouldn’t have covered, and when it came up in the quiz they [i.e. students] wouldn’t have known about it...And then maybe the unit on Space, I think it went into a bit more detail than I would have, but then if they had had a teacher who was into space or more into physics, they probably would have learned about that, you know what I mean, it’s just one of those things but the majority of it was aligned with my teaching.”

S3: ST

“I found that there were aspects to some of the topics that were a little bit more difficult than the work they would have been doing in class...While I don’t mind that because it’s a bit of a challenge for them and it’s wonderful that they might learn something extra, but you know there are little areas in science where it was a little bit more complicated, or there was a little bit more detail than they would need, but I still think it’s a great resource.”

S4: ST

While clearly there are still areas for improvement to the DALDIS/JCQuest content as these observations indicate, the majority of PSP teachers, like their students expressed a desire to continue using the system beyond the pilot testing phase, which is a good sign.

Furthermore, during the research interviews a number of teachers indicated that they were looking forward to expanding the use of DALDIS within their schools post pilot and expressed their gratitude for the opportunity to have been involved in piloting the resource and the opportunity it gave their students:

“I have already recommended that my fellow French teacher use it and next year I would be pushing for us to use it together with our classes ..you know normally it might be two similar year groups that we both teach French to.... because I found it really great using it with my classes this year,”

S4: FT

“Just yesterday at our end of year MFL department meeting when I went through it [DALDIS/JCQuest] with them [fellow teachers] they were like “Oh my God this is fantastic”, so I think teachers are actually crying out for something like this in languages because I do think there are so many benefits...So thanks for involving us. I’ve had a great experience with it. Thanks so much for contacting our school and for involving myself and my students in this. I’m so delighted we took part because we got so much from it.”

S2: FT



Chapter Five

Discussion and Concluding Remarks

Discussion

This case study highlights a number of encouraging practices as well as some challenging issues in relation to the implementation and use of an innovative e-Assessment solution in Irish schools. While illustrating the potential of feedback and data analytics in formative assessment design, somewhat unexpectedly, it also provided an insight into how technology performed a vital function during the Covid-19 crisis when schools were shut but appeared to wane once reopened. This, combined with some of the data provided by the PSP teachers on their use of technology generally as well as for assessment specifically, highlights the power of face-to-face teaching and the challenges that new educational innovations face as they encounter what Cuban (1993) calls the crucible of classroom experience. It also raises some questions about the adequacy of schools' infrastructure to support technology-based innovation.

The PSP survey data reveals that schools found DALDIS/JCQuest easy to use and enjoyed using the system. This was further supported by the research interviews with teachers and students who reported very few technical impediments and glitches, and certainly none that could not be easily overcome. From a design and development perspective, this is important as poorly designed, or difficult-to-use systems can be a barrier to technology adoption in schools.

The data also illustrated the valuable role that feedback plays in assessment for learning, with the majority of students and teachers indicating that the feedback they received from DALDIS /JCQuest was beneficial in helping students learn more, understand their mistakes and become independent learners.

That the majority of teachers and students expressed a desire to continue using DALDIS/JCQuest, indicates that the resource is addressing important teaching and learning needs relevant to the Junior Cycle (JC) assessment outcomes. These findings, along with teachers' very positive endorsement of the resource's alignment with the curriculum, indicate the extent to which the question sets closely match curriculum learning outcomes and assessment criteria.



Nonetheless, the data also reveals that the implementation and adoption of DALDIS/JCQuest has unearthed several challenges in relation to formative assessment and digital technology. The evident uptake in usage of the resource around key assessment times, as evidenced from the OU analytics data, while understandable at one level, appears to indicate that the resource was often used in a summative capacity for exam revision purposes. This lack of access to computers in schools which as most of the PSP schools revealed to be the case is partially responsible for this as it restricted the extent to which the resource could be used regularly in class. However non-use of the teacher dashboard by most teachers suggest that there are other contributory factors at play here, which are most likely due to what researchers have identified as a deficit in teachers' assessment competencies (Tomasik, Berger & Moser, 2018).

Assessment literacy refers to the knowledge and skills teachers need to gather, analyse and interpret the evidence provided by assessment and modify or adapt their teaching in accordance with these findings (Lee, Feldman & Beatty, 2012; Bryand and Carless, 2010). Unfortunately, assessment is an under developed skill in teaching, and many teachers feel unprepared for assessment in schools (Herppich et al., 2018; DeLuca & Klinger, 2010). However, as sophisticated computer assessment resources like DALDIS/JCQUEST, capable of gathering this evidence from large data sets, become more readily available in education, teachers need professional development to build their assessment competencies in order to fully exploit this data and the opportunities for educational measurement and assessment innovations like this open up. Arguably, assessment for learning in its entirety will not become a reality until this deficit is fully addressed.

Concluding Remarks

This case study has discussed the development and implementation of an innovative e-Assessment project (DALDIS) as it evolved in an Irish context. Within the DALDIS partnership Ireland was the first country to roll out the project and trial it in schools, and therefore offered a more longitudinal perspective on the project's implementation. Somewhat fortuitously, the initial rollout of the project in Ireland coincided with the coronavirus outbreak when schools closed, and teaching moved online. This provided an unexpected opportunity to view the utilisation of this innovative e-Assessment for Learning resource during a unique period for education and schooling not just in Ireland, but worldwide. Although DALDIS was conceived and initiated in a pre-pandemic era and was primarily designed to support classroom assessment practices in the context of face-to-face teaching, it became a lens through which online activity during the pandemic could be viewed as a number of schools



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utilised the resource to support remote learning. This was an unexpected bonus which added greatly to the richness of this study's findings



References

- 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
- 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.
- Herppich, S., Praetorius, A., Forster, N., Glogger-Frey, I., Karst, K., Leutner, D., Behrmann L., Bohmer, M., Ufer, S., Klug, J., Hetmanek, A., Ohle, A., Bohment, I., Karing, C., Kaiser, J., & Südkamp, A. (2018). Teachers' assessment competence: integrating knowledge-, process-, and product-oriented approaches into a competence-oriented conceptual model. *Teacher Education* (76), 181–193.
- 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>
- Kay, R., & Knaack, L. (2009). Exploring the use of audience response systems in secondary school science classrooms. *Journal of Science Education and Technology*, 18, 382-392. <https://doi.org/10.1007/s10956-009-9153-7>



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.

Marshall, Bethan & Drummond, Mary. (2006). How teachers engage with Assessment for Learning: lessons from the classroom. *Research Papers in Education*. 21. 133-149. <https://doi.org/10.1080/02671520600615638>.

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.

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.

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>

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

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



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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 (www.study-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



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