Using Digital Technologies to Support Inclusion in the Mainstream Classroom

This article presents an account of an action research project I undertook as part of the final year of my Bachelor of Education (B.Ed.) degree. Using Universal Design for Learning (UDL) (http://www.cast.org/our-work/about-udl.html#.XKuBFtL0nIU) as a guiding framework, I explored how digital technologies can be used to support inclusion in the mainstream classroom by providing multiple means of representation, action and expression. The starting point to the research entailed a review of literature relating to UDL and the use of digital technologies to support UDL. From this, I extracted a set of seven codes which were subsequently used as a tool to analyse a set of planning documents from a previous school placement. Building on the findings of the analysis and guided by the UDL framework, I redesigned my main planning document (progressional scheme) to ensure a more inclusive practice. A range of online resources was embedded throughout the scheme to support inclusion.

Keywords: inclusion, Universal Design for Learning, UDL, digital technologies

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INTRODUCTION

As part of my Bachelor of Education (B.Ed.) degree, I (first author) completed a major specialism in special and inclusive education. In this specialism, I explored inclusive pedagogical approaches along with the goals and challenges of inclusive education. One of the activities I undertook was an informal reflection on my third year school placement (SP3), in which I examined how I responded to difference in the classroom setting. In this reflection, I asked questions such as: did I create difference? Did I focus on providing meaningful learning opportunities for some/most learners or for *all* learners? Did I plan for various learning styles and plan

for the use of multimodal learning? I found that although I had some strength in my planning and teaching, I had significant challenges in including all learners. One gap was my lack of use of digital technologies for learning. For this reason, I decided to focus my final year research project on how digital technologies can be used to support inclusion in the mainstream classroom. Using the framework of Universal Design for Learning (UDL) as a lens, I investigated how digital technologies can be used to support the various learning styles of all students.

REVIEW OF LITERATURE

Use of Digital Technologies for Learning and Teaching
Reports on the use of digital technologies in Irish schools unequivocally assert that the potential for digital technologies to transform teaching and learning in schools in Ireland is not currently being realised (Cosgrove et al., 2014; DES, 2008). Instead, digital technologies are often used to replace older technologies, such as books or whiteboards, and the role of the teacher and the learner remains largely unchanged (DES, 2015). The most common uses of digital technologies reported in Irish schools are thus consistent with "group-based didactic teaching approaches" (Cosgrove et al., 2014, p.24). Usage is mainly by teachers as presentation tools or for preparing lesson resources. Students are provided with few occasions to use digital technologies in school and when they do use them, it is generally to retrieve information online or practice routine skills (Butler et al., 2013).

The introduction of the Digital Strategy for Schools (DES, 2015) highlights the potential of technology to not only empower teaching and learning in schools but also its potential to support inclusion; stating that "ICT plays an important role in supporting inclusion and diversity for all learners by enhancing learning opportunities for all students" (p.8). Despite this, little guidance is provided about how to use digital technologies to promote inclusive practice. Having been introduced to the Universal Design for Learning (UDL) framework as part of my major specialism, I decided to use this as a guide for my research.

Universal Design for Learning
Universal Design for Learning (UDL) is a concept that originated in architecture and which considers "from the beginning, the access needs of the broadest possible range of users" (Pisha & Coyne, 2001, p.198). Its central premise is that by identifying and providing for the needs of one person, much of the population will benefit, e.g. a curb cut for a person in a wheelchair will benefit people on bikes

or with buggies. In education, the goal of UDL is to remove curricular barriers in large class settings so that all students can be empowered to take responsibility for their own learning (Dean, Lee-Post, & Hapke, 2016; Hall, Meyer, & Rose, 2012). It is asserted that the practicing of UDL guidelines leads to the development of resourceful, goal-directed and purposeful learners, with or without special educational needs. As stated by Heelan (2015, p.7) "more than anything else, UDL is about developing truly inclusive education provision".

UDL has three guiding principles:

1. To provide multiple means of representation; give learners various ways of acquiring information and knowledge

2. To provide multiple means of action and expression; provide learners with alternatives for demonstrating what they know

3. To provide multiple means of engagement; to tap into learners' interests, offer appropriate challenges and increase motivation to learn (http://www.cast.org/)

For the purpose of this research, I focused on principle 1 (P1) (Figure 1) and principle 2 (P2) (Figure 2). Each principle is comprised of a set of guidelines that educators use as a guide in the promotion of inclusion.

Principle 1: Provide Multiple Means of Representation (P1)
P1 (Figure 1) supports educators in presenting information and content in a variety of ways to support understanding by students with different learning styles and abilities (CAST, 2018). By giving students alternatives to listen, watch, read, view, and study content, it provides options for perception, language and symbols, and comprehension (Dean, Lee-Post, & Hapke, 2016; Trostle Brand, Favazza, & Dalton, 2012). This multi-sensory approach can assist educators in exhibiting "information so that it can be optimally presented to each individual student" (Pisha & Coyne, 2001, p.200). It also avoids a 'one-size-fits-all' approach which, as asserted by Pisha and Coyne (2001), culminates in failure for some students. They argue that traditional textbooks and printed text alone are not sufficient to meet the various needs of learners and that they can "lock out thousands of students who cannot, for one reason or another, learn from them" (p.203).

Figure 1: UDL Guidelines Principle 1: Provide Multiple Means of Representation (CAST, 2018, http://udlguidelines.cast.org/binaries/content/assets/udlguidelines/udlg-v2-2/udlg_graphicorganizer_v2-2_numbers-no.pdf**)**

Provide Multiple Means of Representation
1.   Provide options for perception
1.1   Offer ways of customising the display of information
1.2   Offer alternatives for auditory information
1.3   Offer alternatives for visual information
2.   Provide options for language, mathematical expressions, and symbols
2.1   Clarify vocabulary and symbols
2.2   Clarify syntax and structure
2.3   Support decoding of text, mathematical notation and symbols
2.4   Provide understanding across languages
2.5   Illustrate through multiple media
3.   Provide options for comprehension
3.1   Activate or supply background knowledge
3.2   Highlight patterns, critical features, big ideas, and relationships
3.3   Guide information processing, visualisation and manipulation
3.4   Maximise transfer and generalisation
Resourceful, knowledgeable learners

Using digital technologies as tools to provide multiple means of representation can help address the different learning styles and abilities of students (Collins & Halverson, 2009). Trostle Brand, Favazza & Dalton (2012) stress that educators must present information in a variety of formats including "Powerpoint presentations, SMART Boards…[and] interactive graphic organizers" in order to cater for diversity in the classroom (p.135). Similarly, Pisha & Coyne (2001) highlight the immense value of displaying information in "nontextual forms", such as images, sound and video to appeal to various learning approaches (p.199). In a UDL environment, an absence of digital technologies would offer limited modes of representation for the educator to employ to students. On the other hand, the presence of digital technologies opens up an abundant array of dynamic

options for the presentation and customisation of information, including screen, speech, graphic images, video, animation, simulations and any combinations of these (Rose, Gavel, & Domings, 2010).

Principle 2: Multiple Means of Action and Expression (P2)
P2 (Figure 2) (CAST, 2018) prompts educators to provide options for "physical action, expressive skills and fluency, and executive functions" and to provide students with "alternative expectations for physical response, timing, and materials" (Trostle Brand, Favazza, & Dalton, 2012, p.138). This implies that educators should plan their lessons to include alternative methods in which the learners can demonstrate what they know. P2 also invites the establishment of a scaffolded learning environment in which the students are prompted to develop strategies, monitor their progress and set appropriate goals. A range of flexible materials provide learners with the opportunity to express their knowledge in the best way that they can.

Figure 2: UDL Principle 2: Provide Multiple Means of Action and Expression (CAST, 2018 http://udlguidelines.cast.org/binaries/content/assets/udlguidelines/udlg-v2-2/udlg_graphicorganizer_v2-2_numbers-no.pdf**)**

Provide Multiple Means of Action and Expression
4.   Provide options for physical action
4.1   Vary the methods of response and navigation
4.2   Optimise access to tools and assistive technologies
5.   Provide options for expression and communication
5.1   Use multiple media for communication
5.2   Use multiple tools for construction and composition
5.3   Build fluencies with graduated levels of support for practice and performance
6.   Provide options for executive function
6.1   Guide appropriate goal-setting
6.2   Support planning and strategy development
6.3   Facilitate managing information and resources
6.4   Enhance capacity for monitoring progress
Strategic, goal-directed learners

The provision of P2, through a range of digital tools for students to communicate their learning, promotes an environment laden with choice and trust. This, in turn, increases their "autonomy and confidence…as they rely less on their teacher and more on their own initiative for knowledge-creation" (Adams & Burns, 1999, p.27). Equipping the children with "multimedia technologies allows students to construct, monitor, demonstrate, and communicate their own learning" (Pisha & Coyne, 2001, p.199). Offering choice in formats and modalities can enable each individual to express their learning in ways most suited to their own strengths.

The use of digital technologies as part of a UDL approach has the capacity to provide greater assistance to learners with various needs. In particular, the flexibility and choice that digital technologies offer provide educators with the opportunity to design curricula with customised learning experiences, thus creating inclusive learning environments. According to Pisha and Coyne (2001, p.202), digital technologies "play a key role in making the mainstream curriculum more accessible to all". This is not to say that they should be an 'add-on' or merely used for curriculum reinforcement but rather should be combined with effective pedagogy (King-Sears, 2009). Multiple resources, both technological and non-technological, should be implemented in order to meet the needs of various learners (Adams & Burns, 1999).

RESEARCH PLAN

The research methodology in this research was Action Research (AR). AR is characterised as a process of continuous reflection and planning that has a solution-oriented focus. It is a scholarly approach that allows teachers to reflect upon and critically evaluate their planning and practice by means of a cyclical, systematic process of self-study (Somekh & Zeichner, 2009). This approach is in accordance with Teaching Council guidelines which advocates that teachers must "take personal responsibility for sustaining and improving the quality of their professional practice by reflecting on and critically evaluating their professional practice, in light of their professional knowledge base" (2016, p.8).

In this research, I completed one AR cycle in which I followed a four-step process (Table 1), which entailed: selecting a focus, collecting data, analysing and interpreting data, and taking action (Alberta Teachers' Association, 2000).

Table 1: Research Process

Select Focus	Having identified my research interest, I researched and completed a first draft of my literature review.
Collect Data	I then identified a data set. This was a set of planning documents from a previous school placement, SP3. It included a progressional scheme for geography, along with associated geography lesson plans (5), resources and reflections.
Analyse & Interpret Data	A deductive approach was employed towards analysis. As a starting point, I listed the key themes (KTs) from the literature review and devised a set of seven codes based on these themes (Table 2). These were used as a lens in which to interrogate my data set. Following a careful process of analysis, three main areas emerged which served to highlight the strengths and weaknesses of my planning, in relation to both inclusion and the use of digital technologies to support inclusion in my practice.
Take Action	Based on what I learned from the analysis, I redesigned the progressional scheme I created for SP3. A range of digital presentation tools was embedded throughout this plan. To ensure the digital tools used supported inclusion, I devised a framework for evaluating digital presentation tools (Table 6). Using this framework, I searched for, evaluated and selected a range of suitable online resources. As a final action, I reflected on the research and its implications for my future practice.

FINDINGS

Three areas emerged from the analysis process which highlighted the strengths and weaknesses in my planning, in relation to both inclusion and the use of digital technologies to support inclusion in my practice. These were the use of (i) multiple means of representation, (ii) multiple means of action and expression, and (iii) use of digital technologies. Each area contained a number of key themes (KTs), as outlined in Table 2.

Table 2: Key Themes and Codes

Key Themes from the Research				Code
(1)	**Multiple Means of Representation**	**KT1**	Provide options for perception	P
		KT2	Provide options for language, mathematical expressions, and symbols	LMS
		KT3	Provide options for comprehension	C
(2)	**Multiple Means of Action and Expression**	**KT4**	Provide options for physical action	PA
		KT5	Provide options for expression and communication	EC
		KT6	Provide options for executive functions	EF
(3)	**Use of Digital Technologies**	**KT7**	Learners using digital technologies	LU
			Teacher using digital technologies as a presentation tool	PT
			Teacher using digital technologies in planning or preparation of lessons	TP
			Using digital technologies for formative/ summative assessment	A

(1) Use of Multiple Means of Representation

The need to provide multiple means of representation relates to the first principle of UDL. It includes the provision of options for perception (KT1), for language and symbols (KT2), and for comprehension (KT3). Analysis of my planning documents highlighted that I did not provide for KT1 and KT2 in my planning. Hence, there was an absence of options for perception, language, mathematical expressions, and symbols (Table 3).

Table 3: Examples of Analysis of KT1 and KT2 in my Lesson Plans

In Lesson 1, I facilitated the children in activating their background knowledge about Poland, through discussion and making connections. However, the information was presented in one format only, i.e. on laminated paper. The ability of the children to customise how they viewed the images was absent.	**Lesson 1** The children will look at images of a country (Poland) and act as detectives to figure out what country the images they have depict. **(C)** A spokesperson from each group will share their observations and findings with the class and I will note these on the board. I will reveal that the country is Poland. We will look at the same images on the board and I will give a brief description as to what it is/its name. **(TP)**

Table 3: *Examples of Analysis of KT1 and KT2 in my Lesson Plans (continued)*

In the introduction of Lesson 2, I planned to develop the children's map skills. This was to discover the location of Kraków, as this was the setting of the Polish legend we would learn about in the development of the lesson. I neglected to provide alternatives in how the information was presented (illustrating through multiple media).	**Lesson 2** I will show the children a map of Europe on Google Maps on the board. **(PT)** We will see where Ireland and Poland is. We will identify the capital of Poland and the size of it compared to Ireland. I will show them where Kraków is in Poland. I will explain to the class that we will watch a video of a legend from Krakow called the legend of Krakus and Smok. **(C)** *Key Questions* • Can someone point out Ireland on the map • What other countries can you see? • Can you point out Poland on the board? • Which country is bigger, Poland or Ireland? • Why do you think the word Dublin is written on Ireland? • What could be the capital of Poland then?

There was, however, significant evidence of KT3. In fact, the prominence of this code in my data suggests that I have strength in planning for learners' comprehension; this includes activating background knowledge, highlighting big ideas and guiding information processing and generalisation (Table 3).

Table 4: Examples of KT3 in my Lesson Plans

In Lesson 3, I guided the children's information processing and allowed their thoughts to direct the learning, through subsequently designing stations based on their KWL charts and enquiry questions.	**Lesson 3** I will share with the children that we will have five stations in today's lesson learning about Poland. I will say that the stations were based on their questions from their KWL charts and show them their questions typed up together on the board **(C)** and that they will be finding out the answers by looking through the bag of evidence at each table and filling in their findings in their booklet. **(TP)**

(2) Multiple Means of Action and Expression

The provision of multiple means of action and expression concerns the second principle of UDL. It includes providing options for physical action (KT4), for expression and communication (KT5), and for executive functions (KT6). Analysis highlighted a weakness in relation to KT4 and KT6 across my planning in that there was limited evidence of both. In fact, I found I was implementing a "one version or size must fit all" approach (Pisha & Coyne, 2001, p.199), whereby the children responded in written format, observed printed images and read from physical paper.

In contrast, KT5 was widely evident in my data set (Table 5). I planned opportunities to express and communicate the children's responses and ideas in multiple ways. Throughout the set of lessons, the children were supported in expressing themselves through an active mapping activity, an online annotatable map (www.scribblemaps.com), printed written and photographic evidence at stations, and an artistic response.

Table 5: Examples of KT5 in my Lesson Plans

| In Lesson 4, the children were supported in expressing themselves through an active mapping activity about Poland. | **Lesson 4**
To introduce the lesson, the children will complete the 'mad mapping' game. The children will be in pairs, where one child is 'A' and the second child is 'B'. The A's will be the go-fors and the B's will be the mappers. The go-fors job is to go to the top of the classroom and examine a map of Poland for twenty seconds, and go back to their partner and describe the shape and geographical features of Poland to them. The B's job is to draw what the A's are describing. **(PA)** This will be repeated five to six times and the children will have to include the following criteria: shape of country, bordering countries, surrounding seas/oceans, major cities, major rivers. **(EC) (TP)** |

Table 5: *Examples of KT5 in my Lesson Plans (continued)*

Also in Lesson 4, the children were supported in expressing themselves through an online annotatable map.	**Lesson 4** We will build on the knowledge that the children have gained from this activity by inviting the mappers to come up to the front of the classroom to show the class their sketch and to briefly discuss both the process and the product. **(EF)** The children will return to their seats and will further their knowledge of the location and features of Poland through discussion based on ScribbleMap. **(EC) (PT)** This will include a study of the map of Europe, pointing out the location of Poland in relation to Ireland and the other European countries. The children may finish their map now by using the map on the board to help them make theirs more accurate.
In Lesson 3, the children were also supported in expressing themselves through printed written and photographic evidence at stations.	**Lesson 3** The children will move from station to station upon my instruction. There is a page in the booklet to be filled out at each station. **(EC)** I will circulate each station but especially linger at Station 2 with the maps. There will be a ten minute timer for each station on the board. **(EF) (PT)** Each group will have a Materials Manager, Time Keeper and Volume Controller. **(EF)**
In Lesson 2, the children supported in expressing themselves through an artistic response.	**Lesson 2** The children will respond artistically to the legend by drawing a picture based on the legend. **(EC)** While the children work, I will play some traditional Polish music as we are learning about Poland this week and next. **(PT)**

(3) Use of Digital Technologies

My use of digital technologies mirrored the findings of national reports (e.g. Cosgrove et al, 2014). Digital technologies were used solely by the teacher in planning and preparation of lessons and as presentation tools (Tables 3-5). I used the internet for research purposes, i.e. to learn about Poland myself, and to prepare a range of resources to support the enquiry-based approach I had adopted towards

teaching and learning. Presentation tools used included www.scribblemaps.com, Youtube videos, a Powerpoint presentation and a word document. These digital tools presented relevant information to the children on the interactive whiteboard, as a whole class.

Summary of Findings: Inclusive Practices in My Teaching and Learning
As a result of this analysis, I realised that I had not been effectively planning to include all learners, despite thinking so. Instead, I discovered that I had distinct strengths and weaknesses. I had strengths in the way I supported the development of comprehension (KT3) and in how I supported expression and communication (KT5). In contrast, I had weaknesses in providing options for perception (KT1), language and symbols (KT2), physical action (KT5) and executive functions (KT6). Although activities based on KTs were found, they were often stand-alone activities which did not provide the children with choice, therefore inhibiting their growth as autonomous learners. Autonomous or student-centred learning focuses on "learner activity rather than passivity" (O'Neill & McMahon, 2005, p.31). I needed to ensure my plans facilitated active learning through choice. Finally, my use of digital technologies to support inclusion was non-existent other than for the presentation of information. It was clear that I needed to plan to include a wider range of "multimedia technologies" so that a wider range of learning styles would be catered for (Pisha & Coyne, 2001).

USE OF FINDINGS TO REDESIGN MY PROGRESSIONAL SCHEME

Having analysed my planning, my next task was to redesign my progressional scheme. In doing so, I found that while the content of the scheme and the enquiry-based approach adopted remained largely similar; the methodologies, skills and tools employed greatly differed. In redesigning the scheme, I ensured to embed all six KTs of P1 and P2 of UDL and I particularly focused on those that were not very evident in my previous planning. I also ensured to make use of a range of digital presentation tools, as per KT7.

Collins and Halverson (2010) stress the need to find and use suitable digital resources in the classroom. In order to redraft a scheme that catered for the various needs of all learners, I began by considering how the integration of digital technologies could promote accessibility to learning. I needed to ensure I planned to offer alternative tools for presenting information to various types of learners. Therefore, I researched a range of digital presentation tools and devised a list of 14 possible resources that I could use. Some of these resources were known to me already, however I was unfamiliar with many of them.

It was critical that I had a robust method with which to evaluate these digital presentation tools for their potential of promoting inclusion in the classroom. Consequently, I devised an evaluation framework containing eight descriptors (Table 6). The descriptors were based on the UDL key themes and an evaluation framework for digital resources for primary mathematics that had been provided as part of my B.Ed. coursework. It was my intention that this table would become a working document that would support the evaluation of other digital presentation tools in the future. Following this process, I selected seven of these to implement in my scheme.

Table 6: Framework for Evaluation of Digital Presentation tools

	1. Offers ways of customizing the display of information, e.g. text size	2. Offers alternatives for auditory information, e.g. subtitles, images, video	3. Offers alternatives for visual information, e.g. audio clips	4. Clarifies vocabulary, e.g. hyperlinks, built in dictionary	5. Presents a clear web layout that can be easily navigated	6. Supplies content, such as photographs or animated icons	(1) Free resource (2) Cost involved (3) Trial available (4) Must register in order to create or save work	(1) Desktop or laptop computer (2) Mobile device (iPad, tablet, phone, other)
Storyjumper *(Make a story book)*	✔	✔	✔		✔	✔	(1) (4)	(1)[1]
Kizoa *(Make a movie using photos)*	✔	✔			✔	✔ [2]	(1) (4)	(1)
Adobe Spark *(Make a video)*	✔ [2]	✔	✔		✔	✔	(1) (4)	(1) (2)[4]
ActivInspire *(Make an inter-active display)*	✔	✔	✔ [5]			✔	(2)	(1)
Microsoft Pow-erpoint *(Make a Power-point)*	✔	✔	✔	✔			(2)	(1) (2)
Powtoon *(Make a video or presentation)*	✔	✔	✔	✔	✔	✔	(1) (4)	(1)

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[1]   Story books can be viewed on mobile devices.
[2]   Photo files from the device are required in order to create a movie, but animated icons and music clips are provided.
[3]   Text cannot be customized.
[4]   App required for mobile devices.
[5]   Audio files can only be uploaded from the computer. They cannot be recorded live.

Table 6: *Framework for Evaluation of Digital Presentation tools (continued)*

Voicethread *(Make a collaborative, multi-media slideshow)*	✔	✔	✔		✔		(1) (4)	(1) (2)[6]
Museumbox *(Create a virtual cube display)*	✔	✔	✔		✔	✔	(2) (3) (4)	(1)
Voki *(Create a customizable speaking avatar)*	✔	✔	✔		✔ [7]	✔	(1) (2)[8]	(1) (2)
Emaze *(Create a customized presentation)*	✔	✔	✔	✔	✔	✔	(1) (4)	(1) (2)
Thinglink *(Create anno-tated images, videos and 360° images)*	✔	✔	✔	✔	✔	✔ [9]	(1)[10] (2)[11] (4)	(1) (2)
Shadow Puppet edu *(Create a video in the classroom)*	✔	✔	✔		✔	✔	(1)	(2)[12]
Kahoot *(A game-based learning plat-form)*	✔	✔	✔		✔	✔	(1) (4)[13]	(1) (2)
Padlet *(A collaborative post-it note platform)*	✔ [14]	✔		✔	✔		(1) (4)	(1) (2)

Redesign of Progressional Scheme

In redesigning my progressional scheme, I reworked it one section at a time. There were five sections in total, three of which are presented here.

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[6]   App required for mobile devices.
[7]   The app has a clearer layout than the website.
[8]   There is a cost involved to unlock most design features.
[9]   Photo files from a computer are required in order to annotate an image. Video and music content from other sources is provided.
[10]   Images can be annotated for free.
[11]   Annotations can be created on 360° images and video at a cost.
[12]   App required for mobile devices.
[13]   Registration only required to create a Kahoot. Taking part does not require registration, only an access code.
[14]   Font size cannot be changed.

Section 1: Acting as Detectives

The first planned activity in the progressional scheme (Figure 3) entailed the children acting as detectives to identify the country they were about to study. In the original scheme, the children were asked to observe images of Poland, fill in a KWL chart and identify enquiry questions as a class. However, no choice was provided to the children and their different learning styles. In contrast, the redesign enhances the inclusion of learners as it offers choice in relation to the physical and digital images of Poland (KT1, KT7). It also offers choice regarding the communication of enquiry questions in physical post-it notes or digital post-it notes on Padlet (www.padlet.com) (KT5, KT7). Furthermore, it accommodates learners who may not have prior knowledge of Poland by providing physical and digital aids to support their KWL charts (KT2, KT6, KT7).

Figure 3: First Section in Original and Redesigned Progressional Schemes

Orig-inal PS	**Acting as detectives:**
	1. The children will look at images of a country (Poland) and act as detectives to figure out what country the images they have depict. **(C)** A spokesperson from each group will share their observations and findings with the class and I will note these on the board. I will reveal that the country is Poland. We will look at the same images on the board and I will give a brief description as to what it is/its name. **(TP)**
	2. I will ask the children what they know about Poland. The children will fill in a KWL chart individually. **(C)** Then I will take examples of what the children have written down in the K and W sections and write some of these on the board. **(PT)** We will develop enquiry questions together.
Rede-signed PS	**Acting as detectives:**
	1. The children will look at images of a country (Poland) and act as detectives to figure out what country/countries the images they have depict. There will be laminated images to appeal to those who like a physical resource. There will also be iPads available with the images on them for those who would prefer a touchscreen device and the features, such as zooming, it can offer. A spokes-person from each group will share their observations and findings with the class. I will reveal to the children that the images were taken in one country. They will confer again and each group will decide on one country. We will hear each group's thoughts. I will reveal that the country is Poland. We will look at the same images on the board and I will give a brief description as to what it is/its name. **(P) (LMS) (C) (PA) (LU) (TP)**

Figure 3: First Section in Original and Redesigned Progressional Schemes

Rede-signed PS (contd.)	2. I will ask the children about what they know about Poland. The children will fill in the K and W columns of a KWL chart individually. Those who do not know much about Poland will be supported in using the images on the table to write down something they now know about the country. I will take examples of what the children have written down in these sections. Later on, I will compile all the children's K and W columns into a word document to inform my future planning.
	3. We will develop enquiry questions together about Poland. I will invite the children to log on to Padlet.com. Each child will type in one question they have about Poland in a post-it note. These anonymous post-it notes will be compiled together to be viewed on the interactive whiteboard. Those who do not wish to type a question may write a question on a real post-it note and stick it on the board. **(C) (PA) (EC) (EF) (LU) (PT) (TP) (A)**

Section 2: Legend

The second activity in the progressional scheme (Figure 4) comprised exploring the Polish legend about Krakus and Smok. In the original progressional scheme, the children passively observed and identified Poland using www.scribblemaps.com on the interactive whiteboard, as a whole class. In contrast, in the redesign, the children actively and collaboratively identify and explore the location of Poland, on www.scribblemaps.com on iPads, in pairs. The content is similar in both schemes of work, yet differences are evident in the role of the child and in the skills that they use (KT1, KT3, KT4, KT5, KT7). In the original progressional scheme, the children then watched a Youtube video of the legend on the interactive whiteboard and drew a picture of their response to the legend. The redesigned scheme offers the students choices in how they access this material. They can watch a Youtube video of the stop-go animation while reading the subtitles (manually switched on) and they can watch the animation and/or listen to the narration (KT1, KT4, KT7). It also offers choice in how the children respond to the legend, by drawing, acting, or making puppets and recording a voice narration on iPads, in small groups (KT1, KT3, KT4, KT5, KT6, KT7). The teacher's role in the redesign is to facilitate the children to work collaboratively, as autonomous learners, particularly in regards to the checklist and self-monitoring duties, such as *Stop and Think* (KT6).

Figure 4: Second Section in Original and Redesigned Progressional Schemes

Original PS	**Legend:**
	1. The children will explore the Polish legend of Krakus and Smok. To introduce the lesson, I will show the children a map of Europe and ask the class if they can point out Poland. **(C) (PT)** I will show them were Kraków is as this is the setting of the legend. I will show the class a video of a stop-go animation of the legend. **(EC) (PT)** They will be kept on task by answering some guiding questions as they watch it.
	2. After the video, we will discuss the legend. I will draw three columns on the board and write their suggestions as to what happened in the beginning, middle and end of the legend. Then the children will be invited to artistically record the legend on paper, of a scene they particularly like. **(EC)**
Redesigned PS	**Legend:**
	1. The children will explore the Polish legend of Krakus and Smok. To introduce the lesson, we will discover where Poland is in relation to Ireland on a map. The children will work in pairs with an iPad with scribblemap.com opened in the browser. I will have this displayed on the board and I will model each direction I give the children. I will invite them to identify where Europe is and zoom in. I will then invite them to identify where Ireland is. I will model how to select the scribble pen feature and draw a circle around Ireland. I will then ask the class to show me where Poland is by drawing a circle around it. We will engage in some tasks that are listed below, in order to highlight the relationship between the location of Ireland and Poland on a map of Europe and to discover the setting of the legend. I will invite some children up to the board to demonstrate how to use the pen function and draw a circle around a country. **(P) (C) (PA) (EC) (LU) (PT)**
	a. I wonder can someone point out where Ireland is on your map. On this special map on the iPad, we can draw lines and scribbles on top of the map with a pen feature. I wonder would anyone like to guess how we could do that? Let me show you how to select the pen feature. Draw a circle around Ireland.
	b. Can anyone remember the name of the country we are learning about? Can you find this country on your map? Draw a circle around it.
	c. Draw a line that links Ireland and Poland.
	d. I would like to change my pen colour. Let me show you how to do this. With a different colour, can you underline all the countries *in between* Ireland and Poland?
	e. I wonder has anyone gone on holidays in Europe before? Let's draw another circle around Spain. Draw a line that connects Spain and Poland.
	f. Let's zoom into Poland. I'm very interested in Poland because we are going to be learning about a legend that comes from a place called Kraków (written on board) in Poland. Can you find where Kraków is?

Figure 4: *Second Section in Original and Redesigned Progressional Schemes (continued)*

Rede-signed PS *(contd.)*	2.	The children will watch a Youtube video of the legend of Krakus and Smok. We will watch this on the board as a class, with subtitles turned on, lights off and blinds pulled down. The children will be kept on task by these guiding questions: Who is Smok? Who is Krakus? **(P) (C) (EC) (PT)**
	3.	After the video, we will discuss and sequence the legend. I will draw three columns on the board and write their suggestions as to what happened in the beginning, middle and end. The children may Think-Pair-Share their ideas.
	4.	The children will respond to the legend. They will work in mixed ability groups to create a response to the legend that will be recorded on Shadow Puppet edu app. This app compiles images and voice recordings simply and effectively. The children will work with an iPad per group and respond to the legend from the listed options below. Throughout the process, the children will be invited to *Show and Explain* their work and to *Stop and Think* at any point to guide them in monitoring their progress. The children may have access to the video of the legend on Youtube if desired. A WILF (What I am Looking For) checklist will be given to the children at the beginning so that they may assess their work and plan accordingly. **(P) (C) (PA) (EC) (EF) (LU) (A)**
		a. Draw key moments of the legend and create a voice recording of the narration.
		b. Act out the key moments of the legend and create a voice recording of the narration.
		c. Create simple puppets (drawing of a character stuck onto a lollipop stick) to act out the legend and create a voice recording of the narration.

Section 3: Stations

The third activity of the progressional scheme (Figure 5) was centred on five stations, each exploring a different aspect of Poland; fast facts, map work, traditional Polish food, Easter traditions and landmarks in Kraków. In the original scheme, the children observed and read laminated flashcards, maps and photographs at each station in order to fill out a booklet. The redesigned progressional scheme promotes more effective use of digital presentation tools in order for the children to actively learn about Poland in an enquiry-based approach. The booklet to be filled out by the children remains the same. However, each station in the redesign offers alternative modes of presentation for various learning styles in order to enhance inclusive practice. These alternatives generate choice and promote accessibility to the intended learning; for example, Station 4 Easter Traditions supports those

learners who prefer to read facts off laminated flashcards, those who prefer to listen to a Voki animation (a speaking avatar created on www.voki.com), reading the facts aloud on an iPad or those who prefer to discover, visually, the facts on an Emaze presentation (a customizable presentation tool created on www.emaze.com) (KT1, KT2, KT3, KT4, KT5, KT6, KT7).

Figure 5: Third Section in Original and Redesigned Progressional Schemes

Orig-inal PS	**Stations:** 1. Depending on the children's enquiry questions and KWL charts, each group will be given a bag of evidence/artefacts about Poland to explore in groups, **(EC)** such as Polish food (with real Polish food packets, images, labels, menu etc.), significant landmarks in Poland (images, maps), traditions in Poland, weather in Poland (comparing it to Ireland) etc. **(TP)** The children will work in groups to find out as much as they can about the evidence they have and compile it together and present it back to the whole class at a final share session. **(C)** Each group will be compare the aspect they have with Ireland.
Rede-signed PS	**Stations:** 1. Depending on the children's enquiry questions and KWL charts, each group will be given a bag of evidence/artefacts about Poland to explore in groups. The children will work in groups to find out as much as they can about the evidence they have at their tables. There will be an online timer on the board so that they children may regulate and monitor their work at each station. Similarly, each group will have the following role cards: Materials Manager, Time Keeper and Volume Controller. **(P) (LMS) (C) (PA) (EC) (EF) (LU) (PT) (A)** a. **Station 1:** Fast Facts about Poland. The children will explore fact files, weather and real zloty money and fill their findings in their booklets. There will be concrete resources of the above and real currency. There also will be an iPad for each pair at the table displaying an Emaze presentation about facts about Poland of which they children can sift through to discover the information they need to fill in in their booklets. b. **Station 2:** Where is Poland? The children will observe a map of Europe to find countries touching and in between Poland and Ireland, and label places on a map outline of Poland in their booklets. I will ensure that the children have support when drawing on their maps at this station. There will be an iPad for each pair displaying scribblemap.com in which the children can use alongside the concrete materials to discover the information they need to complete the relevant page in their booklets.

Figure 5: *Third Section in Original and Redesigned Progressional Schemes (continued)*

Rede-signed PS *(contd.)*	**c. Station 3:** Traditional Polish Food. The children will explore four traditional foods from Poland and write a menu in their booklets. There will be images on flashcards on the table and iPads displaying recipe videos and compilations of images of the following foods: pierogi, zurek, makowiec, paczki.
	d. Station 4: Easter Traditions in Poland. The children will explore Easter traditions in Poland. Auditory learners will have the opportunity to listen to facts about these traditions read out by a Voki animation. Visual learners may read facts on laminated sheets or read off an Emaze presentation. The Emaze presentation will have hyperlinks on words I predict may cause difficulty to some children's comprehension. In this case, they will click on the hyperlinked word (in blue) and be brought to the definition of the word. I will request that before leaving for the next station that the Materials Manager will slide the circle at the bottom of the presentation to bring it back to the first slide for the next group.
	e. Station 5: Landmarks in Poland. The children will look at the four landmarks we looked at in the first lesson on Poland and find out what they are. iPads will display an annotated image on Thinglink of a map of Kraków. The map will be annotated with four landmarks in Kraków: The Main Square, The Head Sculpture, Wawel Castle, The Barbican. Text and images will be at each landmark on this map, available for the children to click into and read in order to fill out their booklets. There will also be images and descriptions of landmarks on laminated flashcards to appeal to different types of learners.

CONCLUSIONS

Throughout the AR process, I have learned of the importance of providing multiple means of representation (UDL P1) and providing multiple means of action and expression (UDL P2) in order to establish the development of resourceful and strategic learners. Prior to engaging in this process, I had been directing my planning around one type of learner in a learning environment based on handwriting, reading printed text and observing the interactive whiteboard in whole class activities. This implied that even before I taught a lesson, I was already excluding some learners. Use of the UDL framework in this research, both as an analytical tool to reflect on my planning and a guiding tool, enabled me not only to identify my own strengths and weaknesses but also to ensure that I planned towards a more inclusive practice.

In addition, redesigning my progressional scheme deepened my understanding of how digital technologies form an integral part of supporting an inclusive classroom. I found throughout the redesign process that the use of specific digital technologies provided the solution to meeting the needs of various learners. However and most significantly, what also became imperative was the need to carefully evaluate each of the digital resources used for its potential in promoting inclusion in the classroom. In the absence of an existing evaluation framework and drawing on UDL guidelines, I therefore devised an evaluation framework containing eight descriptors (Table 6) which I used to select each of the digital resources included in the scheme.

In conclusion, throughout this AR process, I have not only become aware of the value of UDL guidelines in accommodating different learning styles, but also how inclusive practice can be made easier by the flexibility and accessibility that digital technologies offer. The overall process was at times, challenging and time-consuming. However, the cyclical nature of action research imparts the understanding that further self-study and reflective practice will stem from this. It is balanced by the awareness that this piece of action research may extend and lead onto a new focus about my practice. By following the UDL framework and making use of digital technologies, I can now critically evaluate my lessons and promote accessibility to the intended learning amongst all types of learners. I have also become acutely aware that despite the ability of UDL and digital technologies to work as divorced entities in the classroom, it is the synchrony and intersections of the two that promote, most effectively, inclusive practice.

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