Interdisciplinary Learning: A Study of Practice within Secondary Schools in Glasgow, Scotland

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Abstract

The need for young people to acquire transferrable skills and knowledge by blurring disciplinary boundaries and applying their learning to real life contexts has been a theme of global educational policy in recent years (OECD, 2018a; United Nations, 2015). Within Scotland this is reflected in *Curriculum for Excellence* where Interdisciplinary Learning (IDL) features heavily and is cited as one of four main contexts for learning alongside: Curriculum areas and subjects, Ethos and life of the school, and Opportunities for personal achievement. However, some studies indicate that an implementation gap exists and that IDL is not being fully realised in practice (Graham, 2019; Harvie, 2018). A recent report suggested that "Colleges and universities might consider partnering with practitioners to measure the impact and requirements of quality IDL experiences." (Education Scotland, 2023, p. 7). In line with this, Glasgow City Council and the University of Glasgow partnered to conduct a research study in three secondary schools in Glasgow which were identified as having good practice in IDL. This article presents the findings in relation to approaches participating schools used to plan and implement IDL and the impact this work had on pupils and the wider school community.

Keywords: interdisciplinary learning (IDL), secondary schools, collaboration, structured time

Introduction

Scotland's recent growth of consultations and reports on education and assessment (Scottish Government, 2022, 2023a, 2023b, 2023c), reflect the fact that there is growing international concern that educational systems across the globe need to change. There is increasing recognition that traditional, disciplinary based structures and approaches are not adequately preparing young people to face the many diverse and complex challenges of today's world and allow them to survive and thrive (Rincón-Gallardo, 2020). In fact, many scholars have been contending this for years (Mehta et al., 2012; Morin, 1999). In a report for UNESCO in 1999, for example, Morin wrote,

> Humans are physical, biological, psychological, cultural, social, historical beings. This complex unity of human nature has been so thoroughly disintegrated by education divided into disciplines, that we can no longer learn what human being means. This awareness should be restored so that every person, wherever [they] might be, can become aware of both [their] complex identity and shared identity with all other human beings. (Morin, 1999, p. 2).

Factors which have made arguments for more integrated approaches to education even more compelling include the rate of technological advances, the rise in artificial intelligence, inequalities, threats of violence and war, economic instability and the effects of what has come to be known as the Anthropocene. The Anthropocene denotes the most recent period in the history of the Earth in which human activity has begun to have a visible impact on the climate, environment and ecology of the planet (Fazio, 2022). It could be said that in preparing students to face the myriad of uncertainties which exist in the future, the "what" that students require to know has now changed (Virtue et al., 2019). To face these complex challenges, students need to learn to problem solve, think creatively and gain access to different forms of knowledge, both propositional (knowing "that" i.e. learning facts and figures), and procedural (knowing "how" i.e. developing skills of applying knowledge in practice) (Priestley & Nieveen, 2020). This uncertainty and unpredictability of the future is discussed in reports such as the OECD 2018 position paper *Future of Education and Skills 2030* (OECD, 2018b) which highlights the need for opportunities and solutions when society is changing rapidly. It suggests that when the world feels volatile, uncertain, complex and ambiguous, education can make a difference and help people to embrace the challenges they are confronted with, and that curriculum and more radical curriculum approaches should continue to evolve.

This article reflects on the context of interdisciplinarity with the Scottish curriculum and considers the nature of IDL using a theoretical framework. It then goes on to present the methods and findings of a qualitative study conducted by Glasgow City Council and the University of Glasgow which considered how three secondary schools in Glasgow planned and implemented IDL projects within their respective establishments, and the impact this had on their students, teachers and the wider school community.

Interdisciplinary Learning

Curriculum for Excellence (Scottish Executive, 2004) features "interdisciplinary learning" (IDL) prominently as one of the four contexts for learning alongside, "Curriculum areas and subjects'" "Ethos and life of the school" and "Opportunities for personal achievement". Within Scottish policy documents there are key themes which can be identified in relation to the practice of IDL. These include: making links between subjects, ensuring contexts for learning are made relevant to pupils, developing knowledge and skills, making room for innovation, creativity, and partnership working. However, it is widely recognised that in relation to interdisciplinary matters there is a lack of conceptual clarity in the policy arena (Graham, 2019; Harvie, 2018; Shelley, 2019). Factors such as providing relevant contexts and developing knowledge and skills, for example, can pertain as much to teaching and learning within discrete disciplines as they do to IDL, so these themes can often make it difficult to determine what is unique about interdisciplinary tasks. Important questions remain unanswered for practitioners such as those raised by Humes (2013) e.g. What should the starting point for teachers be when planning an interdisciplinary lesson?

The Refreshed Narrative on Scotland's Curriculum (Education Scotland, 2019) has maintained a focus on IDL, and the more recent *It's Our Future - Independent Review of Qualifications and Assessment: Report* (Scottish Government, 2023a) has associated IDL with Project Based Learning (Häkkinen et al., 2017), recommending that all students should have access to this type of experience and calling for a broader range of qualifications to recognise wider achievements of young people. However, in May

2024 a report entitled *Evaluation of Curriculum Design in Scotland* (Education Scotland, 2024) stated that "Interdisciplinary learning (IDL) remains an underutilised element of curriculum design across all sectors. There remains lack of clarity regarding high-quality IDL and how it is distinct from other approaches to organising learning." (2024, p. 15). This sentiment was echoed in response to the *It's Our Future* report by the Scottish Government in September 2024 when it concluded that "We are therefore of the view that more work is required if high quality interdisciplinary learning is to essentially become a mandatory part of the Senior Phase curriculum in all secondary schools." (Scottish Government, 2024, p. 9).

Following the recommendations of *It's Our Future*, Education Scotland (2023a) updated their thought paper entitled *Interdisciplinary Learning: Ambitious Learning for an Increasingly Complex World* to provide further guidance for practitioners. This document provides a detailed account of the work done by a national co-design group and their thinking around IDL, particularly how it might be realised in the senior secondary phase. One of the issues raised in this document is that "There is still scepticism about the quality of learning achieved in secondary through IDL experiences." The suggestion is then made that "Colleges and universities might consider partnering with practitioners to measure the impact and requirements of quality IDL experiences." (Education Scotland, 2023, p. 7).

This article outlines a piece of work in line with the suggestion made above where academics and practitioners worked together to consider the practicalities and impact of IDL work in three secondary schools in Glasgow. The study was conducted by staff of Glasgow City Council and the University of Glasgow and explored ways that IDL can be implemented successfully in the secondary sector. A small-scale research study was conducted in the three schools, and focus group discussions were held with members of each school's senior leadership team, class teachers and pupils to investigate their IDL practice and experiences. Participating schools had been identified by the local authority as having undertaken successful IDL pilot projects in the past. The aim of the research was for academics and practitioners to work collaboratively to gain an insight into the ways these secondary schools had planned, implemented, evaluated and assessed the impact of IDL. The theoretical framework outlined below was used to shape the focus group questions and design the study.

Framework for IDL

Repko (2008) draws on a number of definitions of interdisciplinary studies to define IDL in the following way:

> Interdisciplinary studies is a process of answering a question, solving a problem or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline, and draws on disciplinary perspectives and integrates their insights to produce a more comprehensive understanding or cognitive advancement. (Repko, 2008, p. 12).

This definition of interdisciplinary education contains a theme which appears consistently within the academic literature, namely that of students being involved in solving problems or finding solutions to questions which are pertinent to them. Indeed, philosophers such as Augustine (2009) have long seen problems as a source of knowledge creation. Brand and Triplett (2012) highlight problem solving as an important aspect in impelling students to find their own answers, draw their own conclusions, and create their own solutions. Virtue et al. (2019) argue that interdisciplinary lessons can be more efficacious when they are problem based but qualifies this by saying they must also be clearly and deliberately aligned to course material. The interdisciplinary approach then is one which propels students to draw on their existing disciplinary knowledge and skills (from two or more

disciplines), in order to complete a sufficiently challenging activity or problem which they have been set or have set for themselves. So IDL goes further than enabling students to make cross-curricular links, but fosters synthesis, resulting in cognitive advancement in the respective disciplines (Repko, 2008). The starting point must be a relevant problem or issue that students are motivated to address which requires them to draw on their disciplinary insights (from two or more disciplines) and apply their knowledge and skills, resulting in deeper learning.

The Project Based Learning (PBL) approach is an effective way to develop 21st-century capabilities by promoting critical thinking as well as problem-solving, interpersonal communication, information and media literacy, cooperation, leadership and teamwork, innovation, and creativity (Häkkinen et al., 2017).

Figure 1
IDL Framework (Harvie, 2020)

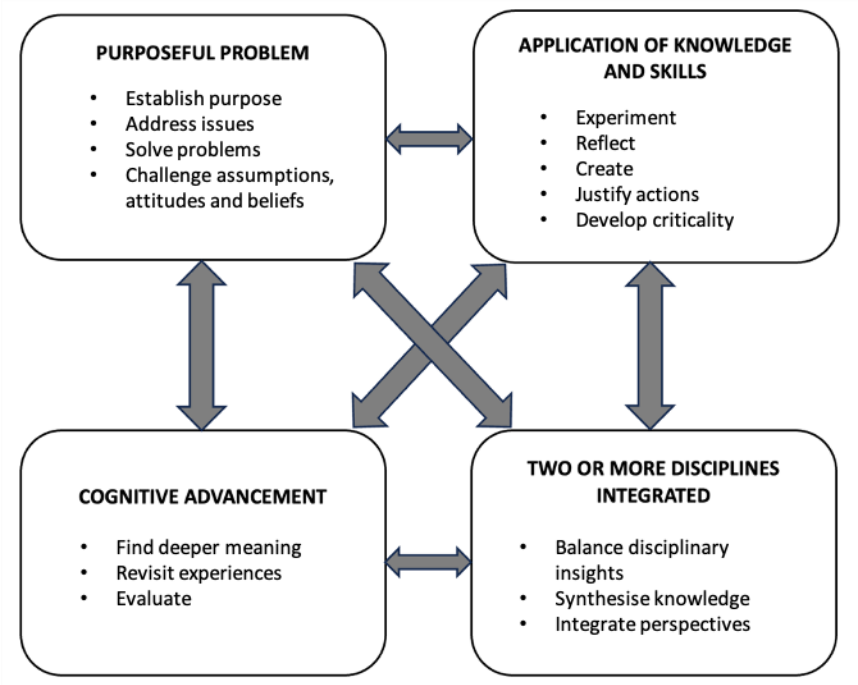

Figure 1 illustrates the purposeful problem as being a major component of IDL, i.e. a question or issue which is meaningful to the learner. Students then apply and integrate knowledge and skills from two or more disciplines to solve or answer it. During the activity pupils engage in exchanging thoughts and ideas and this involves developing criticality, reflecting, justifying their actions, integrating perspectives, revisiting their experiences and evaluating their findings throughout the process as illustrated by the diagram. The arrows indicate that this is not a linear process.

Methodology

This research was conducted as a qualitative study of three secondary schools which had recently carried out successful IDL projects.

Epistemology

A pragmatic constructivist approach (Elgin & Goodman, 1988) was adopted for this research which views the purpose of inquiry as being the advancement of understanding rather than the search for absolute truths. Educational research must be adaptable to individual school contexts and therefore

the pragmatic constructivist paradigm was appropriate in this case as the researchers were concerned with understanding how different schools planned and implemented interdisciplinary approaches in their own unique contexts (Weaver & Frey, 2018).

Focus Groups

Ethical approval for this study was granted by Glasgow City Council. The three participant schools (Table 1) were identified as being of good practice in IDL by the local authority and the headteachers were approached and asked if they would like to volunteer to take part in the study. In each school, three sets of focus group discussions took place and the questions were shaped by the IDL framework (Figure 1) in relation to ascertaining how a purposeful problem was created, how knowledge and skills of pupils were applied in the process, which disciplines were involved and what cognitive advancements were made. One focus group was with the senior leadership team, another was with teachers involved in IDL projects and then the final focus group comprised pupils who had been involved in this work. In total, nine focus group discussions were conducted. These were attended and facilitated by the three researchers who asked the guiding questions, took notes and made audio recordings of the conversations. Each focus group comprised between six and ten people.

Focus groups can be considered as an effective method of collecting qualitative data and involve group discussions which are facilitated and guided to gather insights, opinions, attitudes and emotions of participants on a specific topic. Many professional fields utilise focus groups as opposed to other data collection techniques as they can elicit detailed data in a timely and cost-effective fashion (Morgan, 1996). In discussions, participants can answer questions in an unrestricted manner, using their own words, and facilitators are able to probe certain comments or ideas for further information if they feel this would be useful (Stewart & Shamdasani, 2015). The group dynamic is also conducive to ideas being built on spontaneously and the fostering of natural debate (Nyumba et al., 2018). Although individual interviews may have gleaned more in-depth information from participants, focus groups were considered a more expedient and effective method in this case due to the time pressure of busy professionals working in school and the constraints of the secondary timetable.

Table 1
Study Participants

School	School Roll	% of young people living in the 20% most deprived data zones in Scotland: SIMD Zones 1 and 2, according to the Scottish Index of Multiple Deprivation.[1]	% of young people registered for Free School Meals (FME)
A	**1051**	**76.8%**	**44.6%**
B	**1201**	**34.1%**	**24.3%**
C	**493**	**93.5%**	**62.3 %**

N.B. All data is correct as of census information in 2023.

[1] The Scottish Index of Multiple Deprivation (SIMD) (Scottish Government, 2020) is a tool to identify areas of concentrated deprivation.

Findings

Purposeful Problem

In all of the participating schools, a group of core staff, supported by the senior leadership team (SLT), worked together to plan the IDL projects. The teachers involved spoke strongly about the fact that their starting point was to create purposeful problems by finding relevant, real-life issues and topics that pupils would be interested in and even passionate about. In one school, young people were consulted at the outset about things which mattered most to them. Each school went through a brainstorming phase where ideas were gathered from teachers from different departments, and this meant they were able to provide disciplinary perspectives from their particular area of expertise. It also allowed them to share what pre-existing knowledge and skills pupils already had in the various subjects as well as giving consideration to the practical implications of the topics under discussion.

> We had just taught climate change in science at that point so I knew the children would have the background, the foundational knowledge…to take their studies a wee bit further, more depth.

Teachers spoke about the need for creativity at this stage and adopting a solution focused approach:

> We sat around a table with big sheets of paper and mind mapped, a bit of blue sky thinking, and tried to be creative.

In each school there was a range of IDL projects which ran concurrently and these focused on solving big problems and answering questions related to sustainability such as: "How can we survive the Anthropocene era?"; "Is vegan food better for the climate?"; "How can we create sustainable fashion?"; and "What can we do to address homelessness?". Each IDL group resulted in students producing very different outcomes and these included: creating vegan menus; cooking food; designing sustainable clothes; upcycling clothing; performing dance and live drama; and designing a homeless shelter.

All schools selected specific year groups to be involved in the IDL work (mainly S1 and S2 due to timetabling restrictions for the older pupils). Providing an element of personalisation and choice for young people was highlighted as being important. Two schools allowed the students to choose which IDL group they wanted to be part of and in the other school the SLT reflected that, next time, they would give pupils more say in the initial topic and problem selection.

Application of Knowledge and Skills

Teachers and pupils from all schools indicated that through participating in IDL, pupils were able to demonstrate and develop a range of skills. They indicated that they were very engaged in the project, showing enthusiasm and commitment towards the topic. Teachers highlighted that this led to increased engagement and as a result, greater attendance for some pupils. Teachers and pupils also reported several specific skills that were demonstrated including creativity, improved social and communication skills, teamwork, increased confidence and presentation skills. Greater opportunities for taking on leadership roles and developing leadership skills was also highlighted across all schools by teachers and pupils, with pupils specifically noting that they applied their learning to discussions outside of school with family and friends and felt they could apply this more to real life situations.

> We had moments of like magic that were coming in through the cycle. The buzz, the motivation but also the collaboration that was going on.

In terms of relationship development, the SLT, teachers and pupils across all schools reported that the pupils formed good relationships, and even new relationships, with their peers in the groups during the project. They highlighted that the pupils were supporting each other's learning and encouraging others to take on roles where they felt less confident to help them be included in the learning. Teachers and pupils both reported they were also able to develop stronger, and in some cases new, teacher-pupil relationships, commenting that the learning environment allowed them to build deeper connections and interact with a wider range of pupils/teachers.

> One of the unintended nice parts of the project was I was able to speak with pupils more, I don't normally get to do that…I got to see them at their best…
>
> What was nice for us was the way they were helping each other. Once one had learned it, even if they were in a separate group, they were helping each other.

The SLT, teachers and pupils across all schools reported that IDL created a different learning environment that gave teachers flexibility in approach and pupils more control over their learning. They noted that the environment supported the regulation of behaviour, engagement and participation of most pupils. In particular, the SLT and teachers in two schools indicated that it allowed them to challenge the pupils at certain points, bringing in more advanced concepts of learning. In addition, teachers indicated that IDL gave them further flexibility to use skills and knowledge that they do not require or apply in the teaching of their subject. Pupils across all schools indicated that they felt IDL allowed them to have greater independence and ownership of the process which resulted in more control of and pace of learning. They highlighted that they felt a sense of task completion through IDL, and a sense of pride in the outcome.

> It kind of builds your leadership skills and your confidence in yourself because when you're in classes, you've been told to do this and been taught how to do it. It's not helping you feel independent in your own learning, but when we do IDL, it's like you're taking that extra step and being responsible for your own learning.
>
> We set the bar quite high in terms of quality of work…we threw in National 5 work and they run with it and love it…you were doing things that you maybe wouldn't do with a first year.

The SLT and teachers across all schools indicated that staff knowledge increased and that over time, there was an increase in staff confidence to be flexible and work differently. Teachers across two schools indicated that involvement in IDL increased their knowledge of the topic area which impacted positively on their enthusiasm. They also indicated that the project helped them develop specific skills including a better understanding of curriculum design, leading staff groups and timetabling. In addition, they felt greater flexibility in how they taught concepts that changed their approach within their wider teaching in their subject.

> I had a better understanding of curriculum design and just getting into it a wee bit more rather than just, we are covering this because this is what is in the curriculum…having some choice and being able to link things in a more natural way.

Two or More Disciplines Integrated

In all schools, time for planning projects was prioritised. SLT ensured protected and allocated time for teachers to collaborate. This was key for teachers to meet from different areas in the school and greatly improved the ability to communicate. In two schools, planning took more time than expected, "So what went well was the collaboration between teachers and they really enjoyed it, working together."

In all schools, teachers noted that through IDL they developed a greater understanding and knowledge of other subject areas that allowed them to integrate the disciplines better and identify overlaps. They developed knowledge of the subject and taught skills or concepts that they don't normally teach. In addition, teachers felt they had more flexibility to approach other staff from other subject areas, to get support in skills or learning from their subject area and enjoyed learning concepts from other subject areas and teaching them.

> We were talking about science and I didn't have a clue about that, but then a colleague was explaining stuff so I got a bit of cross department understanding…you learned about other subject areas.

> I think definitely, what I enjoyed most was teaching stuff that I don't normally get to teach, stuff that I've got an interest in …that I'm passionate about but I don't normally get to do that.

Teachers in one school indicated that through the project, pupils were able to show a good level of understanding of the integration of the subject areas and apply skills from multiple disciplines at once.

> I think they (pupils) had a real ability to connect across our subjects well ... just that sort of connection across three or four subjects.

Pupils in one school highlighted that they enjoyed their subjects being integrated and they were able to synthesise knowledge across them. They indicated a pride in their end product and IDL helped them to understand how subjects could integrate to produce that end product.

> I liked that all your subjects, were in like, cohesion, almost so you didn't have different things to worry about and it made sense. All the subjects were working together.

> The final combination of all the events coming together and seeing that, all the work we've done…you didn't think they (the subjects) really related to each other because we had Drama, Food Tech, English and Dance…but it all came together.

Cognitive Advancement

In all schools, teachers and pupils were able to deepen their understanding of certain learning concepts as it applied to a real-life context and became more relevant to them.

> It gives them an opportunity to interpret it in real life…we looked at graphs, normally that's a bit abstract if we are looking in class whereas if they're investigating something and have to interpret it….it gave more chance to do that (increase their understanding).

In two schools, meta-skills were a focus for pre and post self-evaluation. Tools included a coaching wheel and in one school, a meta-skills passport. A range of assessment was employed across all schools including feedback, an end product and group/final presentations which were evaluated by peers and teachers.

In one school, SLT and teachers indicated that for future projects, consideration will be given in relation to linking the learning and skills development to the wider curricular Experiences and Outcomes. Teachers adopted professional judgement through observation, and projects provided a lot of evidence produced by pupils that was used for assessment.

In one school, pupils felt that they were able to take ownership of their learning which led to a great deal of enthusiasm and engagement in the topics, as well as a sense of pride in their work. IDL as an

approach was more enjoyable and allowed pupils to learn in a different way and then apply their learning in a more relevant context.

> I think kind of empowered …it wasn't exactly like we were just doing something and it was the teachers delivering the message, it was our work and through like our words, this message was getting sent round people and it makes me feel proud.

Unintended Outcomes

SLT commented that they were surprised at how teachers from different departments worked so collaboratively to plan and implement the IDL work. They also noted that many of the teachers developed their leadership capacity through the project, even though they held no official leadership position.

> The leadership of staff was very impressive…there was definitely strong teacher leadership and some of the people who emerged as leaders had no formal leadership roles within the school.

Teachers also reported that they had enjoyed the experience of working with colleagues they didn't normally get the chance to work with and that this had given them a better understanding of the work going on in other subject areas and helped develop their own skills, as noted in the comments below.

> I enjoyed working with people I wouldn't normally work with…to see the natural overlaps (between subjects) and also the differences and to have appreciation for what that involved.

> Towards the end of the week everyone was teaching maths…I had to learn how to do that… talking through maths concepts I hadn't done in years.

Another unintended outcome of the IDL projects, as noted above, was that relationships between teachers and pupils were enhanced. Teachers felt the learning environment created through this work allowed them to build stronger relationships and connections with students because there was more time for communication and they were able to interact with a wider range of young people, some they normally did not get to teach. The levels of confidence and creativity in the pupils also surprised teachers. In one school, staff reflected on a student who often presented with challenging behaviour coming into their own during IDL activities and thriving in the process. "We were seeing a different side to young people who can normally struggle."

In addition, teachers highlighted that pupils had developed their social skills and capacity to collaborate and communicate with others through the problem-solving process. They had also developed transferrable skills that could be used within the wider school through their IDL work. "Those kids were able to transfer those skills into getting their Duke of Edinburgh qualification which was good." Pupils themselves also reported that they enjoyed the freedom of working in this way and felt that they had developed not only their knowledge and understanding of the issues they were investigating but also their confidence and social skills.

Conclusion

To conclude, this study outlines some of the factors which promote IDL in schools and the impact of implementing IDL on teachers and pupils in the schools in the study. Collaboration between teachers is seen as a strength of adopting an IDL approach, which supports the integration of multiple disciplines. Structured time for teachers to plan IDL together is required. IDL helps teachers develop a greater understanding of other subject areas and allows them to integrate disciplines, learn and

teach new concepts, and bring in more advanced concepts of learning to challenge pupils as appropriate.

In this study, IDL helped pupils make connections between disciplines and apply their learning to real life relevant contexts, which in turn led to increased pupil enjoyment, engagement and a sense of empowerment and agency. This correlates with previous studies which have noted the importance and necessity for student understanding of how the learning and skills developed within the classroom can be applied to the wider context (Ladson Billings, 1995; Paris & Alim, 2017). Through IDL, the pupils demonstrated a stronger sense of ownership and control over their learning, leading to more opportunities for innovation and creativity within the projects. This aligns with the research on an ecological approach to teacher agency by Priestley et al. (2015) which recognises that people are more motivated and enjoy their work more when they feel ownership and are able to achieve agency in their work. IDL also facilitated the strengthening of current relationships, and development of new ones, leading to greater partnership working, peer support, and pupils and teachers taking on greater leadership roles.

Limitations

While the data obtained in this study included both the pupil perspective and teacher experience of implementing IDL, this was a sample gathered from three establishments in one local authority and from within the secondary sector alone. Therefore, it cannot be stated with certainty whether outcomes described here would be replicated in other establishments adopting an IDL approach. However, generalisation was not the aim of this study but rather a deep understanding of the contexts and practice of the participant schools. It is up to readers to draw their own conclusions and generalisations based on the evidence and the relevance to their own particular circumstances.

Recommendations

Structured time for teachers and pupils to plan IDL was identified to support the understanding of the process and could impact how the process is implemented. During the implementation of the IDL project, protecting time within the timetable may be required to allow for communication and ongoing review and planning of the process. Consultation between teachers and pupils at the outset to agree projects which are of concern for young people and take account of real-life issues may help to ensure relevance to the participants and improve engagement. Setting clear learning outcomes are also recommended to support understanding of the process. Assessment of an end product or a final presentation was highlighted by pupils and staff as an important aspect of IDL to provide a feeling of achievement and is recommended to evaluate project outcomes. However, greater structure in relation to assessment and evaluation is recommended through exploring the use of curricular experiences, outcomes and benchmarks. Clear learning outcomes are necessary.

References

Augustine, S. (2009). *The city of God*. Hendrickson Publishers.

Brand, B., & Triplett, C. (2012). Interdisciplinary curriculum: An abandoned concept? *Teachers and Teaching: Theory and Practice, 18*(3), *381*–393. https://doi.org/10.1080/13540602.2012.629847

Education Scotland. (2019). *Curriculum for Excellence refreshed narrative*. https://education.gov.scot/media/lmybjidt/cferefresh_a5booklet.pdf

Education Scotland. (2023). *Interdisciplinary learning: Ambitious learning for an increasingly complex world*. https://education.gov.scot/media/mkomulen/interdisciplinary-learning-thought-paper.pdf

Education Scotland. (2024). *Evaluation of curriculum design in Scotland*. https://education.gov.scot/inspection-and-review/hm-chief-inspector-reports-and-guidance/national-thematic-inspections/evaluation-of-curriculum-design-in-scotland/

Elgin, C. Z., & Goodman, N. (1988). *Reconceptions in philosophy and other arts and sciences*. Hackett Pub. Co.

Fazio, X. (2022). An introduction to the Anthropocene and education. In *Science Curriculum for the Anthropocene, 1*. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-031-14287-1_1

Graham, C. (2019). Pillars, lintels and foundations: A conference starter paper. *Interdisciplinary learning: Creative thinking for a complex world*, Royal Society of Edinburgh, 30th January 2019, Edinburgh. https://rse.org.uk/wp-content/uploads/2022/11/RSE-IDL_conference_pillars-lintels-foundations_starter-paper-2019.pdf

Häkkinen, P., Järvelä, S., Mäkitalo-Siegl, K., Ahonen, A., Näykki, P., & Valtonen, T. (2017). Preparing teacher-students for twenty-first-century learning practices (PREP 21): A framework for enhancing collaborative problem-solving and strategic learning skills. *Teachers and Teaching,* 23(1), 25–41. https://doi.org/10.1080/13540602.2016.1203772

Harvie, J. (2018). *Interdisciplinary learning: A chimera of Scottish education?.* [Doctoral dissertation, University of Stirling]. https://core.ac.uk/download/pdf/199407861.pdf

Harvie, J. (2020). Interdisciplinary learning: addressing the implementation gap. *Scottish Educational Review*, 52(2): 48–70. https://eprints.gla.ac.uk/227172/3/227172.pdf

Humes, W. (2013). Curriculum for excellence and interdisciplinary learning. *Scottish Educational Review, 45*(1), 82–93.

Ladson-Billings, G. (1995). But that's just good teaching! The case for culturally relevant pedagogy. *Theory Into Practice*, *34*(3), 159–165.https://doi.org/10.1080/00405849509543675

Mehta, J., Schwartz, R. B., & Hess, F. M. (2012). *The futures of school reform*. Harvard Education Press.

Morgan, D. L. (1996). Focus groups. *Annual Review of Sociology, 22*(1), 129–152.

Morin, E. (1999). *Seven complex lessons in education for the future.* (N. Poller, Trans.). UNESCO.

Nyumba, T. O., Wilson, K., Derrick, C. J., & Mukherjee, N. (2018). The use of focus group discussion methodology: Insights from two decades of application in conservation. *Methods in Ecology and Evolution, 9(*1), 20–32. https://doi.org/10.1111/2041-210X.12860

Organisation for Economic Cooperation and Development. (2018a), *Teaching for global competence in a rapidly changing world.* Asia Society/OECD. https://doi.org/10.1787/9789264289024-en

Organisation for Economic Cooperation and Development. (2018b). *Future of education and skills 2030.* https://www.oecd.org/en/about/projects/future-of-education-and-skills-2030.html

Paris, D., & Alim, H. S. (Eds.). (2017). *Culturally sustaining pedagogies: Teaching and learning for justice in a changing world.* Teachers College Press.

Priestley, M., Biesta, G., & Robinson, S. (2015). *Teacher agency: An ecological approach*. Bloomsbury Academic.

Priestley, M. & Nieveen, N. (2020). Understanding curriculum. In Chartered College of Teaching (Ed.) *The early career framework handbook.* (pp. 135–143). Sage.

Repko, A. F. (2008). *Interdisciplinary research: Process and theory.* Sage.

Rincón-Gallardo, S. (2020). Leading school networks to liberate learning: Three leadership roles. *School Leadership & Management*, *40*(2–3): 146–162. https://doi.org/10.1080/13632434.2019.1702015

Scottish Executive (2004). *A curriculum for excellence: The curriculum review group*.

Scottish Government. (2020). *Scottish index of multiple deprivation (SIMD).* https://www.gov.scot/collections/scottish-index-of-multiple-deprivation-2020/

Scottish Government (2022). *Putting learners at the centre: Towards a future vision for Scottish education.* https://www.gov.scot/publications/putting-learners-centre-towards-future-vision-scottish-education/

Scottish Government (2023a). *It's our future - Independent review of qualifications and assessment: Report*. https://www.gov.scot/publications/future-report-independent-review-qualifications-assessment/

Scottish Government (2023b). *All learners in Scotland matter: National discussion on education: Final report.* https://www.gov.scot/publications/learners-scotland-matter-national-discussion-education-final-report/

Scottish Government (2024). *Independent review of qualifications and assessment – final report: Scottish Government response*. https://www.gov.scot/publications/scottish-government-response-final-report-independent-review-qualifications-assessment-future/

Shelley, M. (2019). *Interdisciplinary learning: Creative thinking for a complex world,* Conference Paper, Royal Society of Edinburgh, https://rse.org.uk/event/interdisciplinary-learning-creative-thinking-for-a-complex-world/

Stewart, D. W. & Shamdasani, P. N. (2015). *Focus groups: Theory and practice*. Sage.

The Royal Society of Edinburgh. (2020). *Advice paper: Interdisciplinary learning*. https://rse.org.uk/programme/advice-paper/interdisciplinary-learning-in-schools/

United Nations (2015). *Transforming our world*: *The 2030 Agenda for sustainable development*. https://www.unfpa.org/sites/default/files/resource-pdf/Resolution_A_RES_70_1_EN.pdf

Weaver, K. & Frey, B. B. (2018). Pragmatic paradigm. *The SAGE encyclopedia of educational research, measurement, and evaluation*, *1*(1), 1287–1288.

Virtue, E. E., & Hinnant-Crawford, B. N. (2019). "We're doing things that are meaningful": Student perspectives of Project-Based Learning across the disciplines. *Interdisciplinary Journal of Problem-Based Learning, 13*(2). https://doi.org/10.7771/1541-5015.1809

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