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Affordances of coastal environments to support teaching and learning: outdoor learning at the beach in Scotland

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ABSTRACT

Outdoor and natural environments have been steadily recognised as conducive to learning and social development. Most practice and research in this field has mostly focused on green spaces, such as forests and parks, and practices such as forest school. This particular paper looks at outdoor learning in a coastal environment, which has not received as much attention. Through the lens of affordance theory, we examine the possibilities for practice in such a space. Interviews with experienced early years and primary-school practitioners provide a rich narrative of ways that the beach environment can support and extend teaching and learning. Findings suggest that space, natural resources and the elements provide a wealth of opportunities for different types of pedagogical approaches and self-directed learning and play. We examine the potential for beach environments to be used more widely for learning in primary settings.

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Introduction

Outdoor learning has previously been defined by Phyllis (1986, 26) as ‘education in, about, and for the out-of-doors.’ This simple definition delineates where the teaching and learning takes place and often what the reason behind the learning activity is. There is a lack of agreement in the literature as to what outdoor learning is and the various concepts of outdoor learning, such as ‘learning outdoors’ and ‘Outdoor Learning’ (Higgins 2002; Rickinson et al. 2004). Despite this varied range of what outdoor learning is, it is a compelling and valuable feature of education in the United Kingdom as well as internationally. In Scotland, outdoor learning forms part of the principles for teaching and learning (Education Scotland 2011). England and Wales both have respective outdoor learning policies and guidance in place; (Department for Education and Skills 2006; Educational visits and Outdoor Learning | GOV.WALES, 2021). On these national levels, it is clear that learning outdoors, beyond the classroom and in nature is a meaningful part of their curricula and education policies, and that curriculum-based learning can and does take place outside of the classroom.

Consistently, studies highlight the overall positive benefits that outdoor learning provides in terms of pupil self-confidence levels and academic attainment through experiential learning and nature connection (Barrable and Booth 2020; Kuo, Barnes, and Jordan 2019; Mannion, Mattu, and Wilson 2015). The focus on most previous research, however, have been green spaces, such as parks, forests and gardens. Coastal environments have seldom been explored by research, with a

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notable exceptions Margaret Mackintosh's chapter on beach schools in a volume edited by Stephen Pickering on *Teaching Outdoors Creatively* (Mackintosh 2017).

Coastal environments

Traditionally outdoor learning most often takes place in green spaces, parks, school playgrounds and gardens (Bentsen et al. 2019) with a variety of physical and mental health benefits reported (McCormick 2017). Moreover, such green environments have been shown to have an effect on some cognitive skills (Faber Taylor and Kuo 2011;). Unlike green spaces, coastal and other blue spaces have not been studied as much, despite the fact that the beach can provide opportunities for hands-on learning through exploration and discovery. In general, outdoor settings, allow learners to use their imagination, tackle problems and build confidence, independence, and teamwork, all whilst in a natural setting, but also going beyond what happens in the indoor classroom (Rea and Waite 2009). Both green and blue spaces can be ideal environments for learners to engage with both collaborative and independent learning and can have an important role in supporting mental health and behaviour (Amoly et al. 2014). In addition, the importance of spending time outdoors in nature for learners is important for child development (Clements 2004; Louv 2005). A Norwegian study has found a strong positive link between learners' well-being and their self-esteem with spending time in natural environments (Fjørtoft 2004). For many learners, the beach setting brings a new, exciting dynamic to learning. Fjørtoft's study also investigated the impacts of playing in a natural environment on motor development in learners (2004). The study's findings indicate that landscape features influence physical activity play and motor development in learners. To do this, they used Global Positioning Systems (GPS) to analyse and compare learners playing in a natural environment and in a more traditional playground. When provided with a natural landscape in which to play, learners showed a statistically significant increase in motor fitness. Learning outdoors and in a coastal environment context is not all about wellbeing and movement, learning in traditional indoor settings devoid of natural elements, can result in directed attention fatigue that reduces learners' concentration, inhibitory control and learning gratification (Schutte, Torquati, and Beattie 2017).

A key aspect of learning in nature, is the element of nature connection and the understanding for learners of how we impact the environment through our actions (e.g. Barrable and Arvanitis 2019). Learning at the beach can support the development of a respectful relationship between learners and nature which encourages learners to feel safe and comfortable in nature and empowers learners through knowledge about ways to protect the natural world (Omidvar et al. 2019). Moreover, the beach environment can support and extend creative pedagogies (Mackintosh 2017).

The present study

Theoretical framework

The importance of a clearly articulated theoretical framework in qualitative research has been explored by a number of qualitative methodologists (Anfara and Mertz 2015; Collins and Stockton 2018). The roles the theoretical framework plays are multiple, but include decisions about methodology and a lens for analysis (Collins and Stockton 2018). In this instance Gibson's affordance theory (1979) informs the analysis and interpretation of findings.

Gibson, who was a biologist and ecologist, came up with the term affordance to describe 'the affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill' (Gibson 1979, 127). As such affordances describe the interaction between the actor (the child in this instance) and the environment, and are unique to each child, depending on their abilities and perceptions. Affordance theory has been used extensively to explore outdoor learning and outdoor play (Barrable and Arvanitis 2019; Leather and Gibson 2019; Waters 2017).

Previous research has examined the affordances of natural environments for play and learning in the context of preschool or outdoor learning in primary settings (Fjørtoft 2001; Zamani and Moore

2013). Fjørtoft talks of unparalleled opportunities for learners to engage with natural elements, although her context is green spaces such as parks and forests (2001). In this paper, however, we are exploring the affordances in a coastal environment context.

Research questions

The general question and objective of this investigation is to gain an understanding of the ways the beach environment is used by teachers to support teaching and learning across the primary school.

Within that, the specific research questions are:

- (1) What are teachers' perspectives on the affordances of the beach environment and how does that environment support different types of teaching and learning?
- (2) What pedagogical practises are used by teachers when teaching outdoors within a beach context?

Methodology

This is a qualitative project that seeks to explore practitioners' experiences of teaching and learning in a beach school context. Qualitative research is a 'valuable paradigm of enquiry' (1) and can provide rigorous and deep insights into practice (Nowell et al. 2017). In qualitative research the researcher 'endeavours to understand the world of the participant by situating the researcher with all their values and assumptions in that world' (Morcom 2014, 21). Qualitative research is also suited well to combining an interpretative framework, in this instance Gibson's affordance theory, alongside using qualitative methods, such as participant interviews, as in this case (Vulliamy 1990).

Ethics

Ethical approval was sought and granted through the University of Dundee, School of Education and Social Work Ethics Committee (application number E2021 –87). All participants in this research were over 18, were openly invited to participate in the research and given full and informed consent through the participant information form, and a consent form. Moreover, they were asked verbally at the beginning of each interview as to the consent they had provided and reminded that they could terminate the interview at any time or not answer any questions if they so wished. All personal data are pseudonymised.

Participants

All teachers were recruited from a single, fee-paying school, located in an area of low deprivation, indicatively in the 7th decile as per Scottish Index of Multiple Deprivation (SIMD 2020). Six teachers, all women, from the same setting were interviewed. Their experience in teaching within primary schools ranged from 9 to 28 years of teaching, while all of them had been teaching at the beach for a minimum of two years, with some of them having taught for the full time the programme had been running (i.e. four years). The participants taught across the whole primary age range, including three in early years and three in upper primary.

Purposive sampling was used in this instance, in order to ensure that there was representation from teachers with varied years of experience and from the whole of the primary age-range. It is common for purposive sampling to be used in qualitative research in order to provide the researchers with participants who are able to share in-depth information. It is also used when 'the research does not aim to generate results that will be used to create generalisations pertaining to the entire population' (Etikan, Musa, and Alkassim 2016, 2) as in this case. In this instance the researchers wanted to include teachers who had substantial experience of beach school across the age range within the primary school.

Data collection

In-depth-interviews (IDI) were the primary mode of collection for this investigation. IDIs are seen as a valuable method for gaining useful information on thoughts and behaviours, including motivations (Boyce and Neale 2006). The interviews were semi-structured, meaning that the lead researcher prepared a range of skeleton questions, but also allow open line of conversations to develop during the interview (Brown and Danaher 2019). Moreover, during the interviews teachers were asked to bring previous planning on Beach school, to use as a prompt and reminder of pedagogical approaches and topics taught at the beach (Jiménez & Orozco, 021). Four of the six teachers opted to use such plans, and they shared them with the interviewer. Interviews were undertaken using Microsoft Teams and, in all instances, participants gave permission for the interview to be recorded and automatically transcribed.

The interviews focused on questions around their affective experience, decisions on planning and pedagogy, questions on the features of the environment that facilitated learning and finally the social experience of learning in that environment, including grouping and support. All interviews lasted less than an hour, with the shortest one being 32 mins and the longest 47 mins.

Analysis

Analysis was undertaken based on thematic analysis (Braun and Clarke 2006; Nowell et al. 2017). As noted by Kiger and Varpio (2020) thematic analysis can be appropriate when looking to understand experiences and behaviours within the collected data. Thematic analysis is one of the most flexible methods of analysis in qualitative methodologies, partly because it allows the researcher(s) to determine themes in both inductive and deductive ways (Nowell et al. 2017). Moreover, for the novice researcher it can be helpful to use an analysis method with previously outlined step-by-step guides (for example Braun and Clarke 2006; Kiger and Varpio 2020).

In this particular piece of research, the decision was made to use deductive thematic analysis. This is a valid choice that relies upon the use of a set theoretical framework, in this instance based on Gibson's Affordance theory as highlighted above (Braun and Clarke 2006, 2012). The analysis itself took shape using the following steps, as per Braun and Clarke's influential paper (2006). At the start the research needs to familiarise themselves with the data – this commonly happens during transcription as well. Step 2 aims to generate some initial codes, while steps 3 and 4 are focusing on themes, initially to search and then refine. In step 5 the researcher reviews the themes, prior to writing up in step 6. It is important to note that the process is often not linear and iterative, especially between steps 3 and 5, where the researcher can often go back and forth and revise themes according to theory (Maguire and Delahunt 2017).

Findings

The deductive thematic analysis was based on the theoretical framework of Gibson's ecological environments' affordance theory. As such the themes that were located within the data set were focused upon the relationship between teacher, learner and environment. Three themes were identified in the data: Space, Natural resources and Elements. These are presented below to answer both research questions, due to the underlying interaction between environment and pedagogical practices. We found that these were so closely linked both in practice, but also in the teachers' narrative and answers throughout the interviews, and as such, we present the environmental features and affordances, paired with pedagogical practices.

Space

One of the key elements of being on the beach that came across was having more space to work in, which was often seen as a positive, especially when compared to trying to teach STEM subjects in the confines of the classroom:

You know, for example, you know that there's a lot more space. So, there is no worry of making a mess. Or [...] noise in educational class settings. (Melissa)

Niamh, who works in the Upper Primary agrees and feels that the space available on the beach affords an element of autonomy that can help children extend their learning:

When you capture some of these moments on camera and you see actually what these children were doing and how [...] were creating all sorts of images from the objects that we found on the beach it was [...] it's amazing and they led it. They could then lead it to a different level with the space that we have out there. [They can] lead their own learning more and have that space to do so. (Niamh, Upper Primary)

In this way, the space affords opportunities for child-led pedagogies and the children are able to lead their own learning within the ample space of the beach. It also has an effect of the way they work and relate to each other too, as Maeve explains:

It's actually a really great diffuser, isn't it? Being on the beach for children [...]. And because they are [...] in a huge space. You got much more space. (Maeve, Early Years)

Space also facilitates diverse and fluid groupings, often initiated by the children themselves, while children who want to work on their own can choose to do so:

I think, well, I think one of the things that's nice actually is that those children who like to work alone can work alone. It would depend on, you know, the teacher. Sometimes. You know, I tend to let them choose when we're at the beach. I don't sort of put them into pairings or anything like that. But then they can wander across and join and dip in and out of other people's groups. And the groups sometimes, you know, become a bit more fluid. So, you know, a group of two might suddenly join up with another group and become a group of four and you know they kind of naturally start doing that sort of carousel thing that you might do in the classroom. (Mary, Early Years)

This fluidity toward groups in the Upper Primary was also observed by Niamh.

A small group turned into a whole class. Collaboration was really nice and how they were all encouraging. Again, this this lad [...] he just he was getting on with it, digging away. And there's like, oh well, we'll come and help. And then before you knew it [all] 13 of the class all around helping this [lad]. And he was taking control of the situation. (Niamh, Upper Primary)

There is also a strong tendency towards self-organisation within the groups, as Ciara explains here:

[...] when we build something, children gravitate to working in groups. They need to self-organise themselves and in that process, there is always a debate about individual roles. (Ciara, Upper Primary)

Natural resources

Within the theme of natural resources we found an interesting paradox, with some participants mentioning how resource-rich the environment at the beach is, while others mentioned the exact opposite:

The beach is a very good environment for that sort of thing in terms of maths, anything that needs manipulatives, any open-ended resources. The beach is very good for making things and using resources that we find out there. (Catriona, Early Years)

Another teacher talks of the novelty of the kind of materials that you find on the beach, especially when compared to other outdoor environments that are also used more often throughout the school day:

And of course, the materials that we find on the beach are different to the ones we find in the school grounds. (Maeve, Early Years)

The sort of resources that are available seem to dictate the kind of lessons that a teacher chooses to do. Catriona, who works in the early years continues:

I have learned over the past couple of years that there are specific lessons that I take outdoors for example, you know shape and size and measuring anything that has patterns. (Catriona, Early Years)

Others note this paradox and acknowledge it openly:

The beach can sometimes feel very empty in terms of resources or things to use. But at other times it can be very full of whatever has been washed up. (Mary, Early Years)

Sand was singled out as an incredibly novel and useful resource by several of the participants and for a variety of reasons. Melissa, from the upper primary, talks about a particular STEM lesson on the beach that takes advantage of some of the properties of sand:

But I think what we do is we really sort of tailor the STEM lessons to the beach environment. So, if we are looking at friction, for example, we will take down some equipment, like tyres and ropes, in terms of things that wouldn't work well on a grassy field, for example because on a beach we can look for different kinds of surfaces. Wet and dry sand. (Melissa, Upper Primary)

Catriona, who works in the early years, talks of using sand in other ways:

I use the sand a lot as a resource. We use the sand for practising number formations, shapes, and basic geometry. Shapes work well in the sand, you can draw them in 2D and even make them in 3D. Often we will continue a lesson from the class onto the beach and using the sand is a different way of consolidating what we are learning. We sometimes do things like timetables but what we do on the beach can extend to other areas of learning such as literacy as well. (Catriona, Early Years)

For one of the early years' classes, it seemed that sand created whole provocation for deep exploration in the mathematics context of time:

The sand as a resource is very interesting ... it is tactile and easy to shape and build with. Yeah, we did a whole project on that actually. We made sand timers. [...] So that we looked at sand as part of that, we were looking at time in maths and we tuned into our sort of little unit on time by talking about all that they knew about UM, clocks and time and how it was used. And we talked about different modes of telling the time, one of them being sand timers. We also talked about sundials and things like this and the children, this is last year's class, they wanted to have a go at making sand timers. (Mary, Early Years)

The projects grew and brought together other areas of STEM learning, such as physics:

[...] we ended up going down to the beach and collecting sand. We were looking at the properties of sand. So we looked at different areas of the beach and tried to test it for pourability. (Mary, Early Years)

This opportunity for rich learning afforded by the beach had to be a bit more carefully planned in upper primary as some teachers explained. Again, the use of sand as a resource comes through, in a way that is unique to Beach school:

Over the year, we learnt to use the beach well and were able to plan what prompts and activities would suit the beach from a STEM aspect. One activity we used to explore their knowledge of gravity and force was too great a giant marble run down the beach. Usually in a class you can do these experiments on different surfaces and inclines, but what worked really well about doing this activity on the beach was that the learners could change the incline and slope themselves just by how they shaped the course in the sand. They could correct mistakes and improve things to a degree that is impossible in class. It was fascinating to see, it was like they had a blank canvas with the sand. You could hear the learning and the conversations and see, like the realisations that they're having in that process. Take that same activity and put it in the context of another place. I don't know if it would have worked as well. (Ciara, Upper Primary)

The opportunity to dig and shape and manipulate sand at Beach school was a focus of Melissa's explanation of the affordances of the environment:

If you compare different outside spaces again, one big advantage the beach has is that the children are able to manipulate the environment, so if they want to dig or build what they want to do. So, if there are, you know, if they're looking at water, for example like erosion, they could make water courses, they can do marble runs like I've mentioned to, you know, they can smooth sand, they can look to rough up the sand for more friction. (Melissa, Upper Primary)

This is seen as important in the context of STEM:

For STEM learning this is so important – we teach them about testing variables a lot and this is one way they can easily test changes that they make. The feedback is you know ... right there. They can change and correct stuff

on the beach ... which you know isn't the same in the class. It's very hands-on. I think the beach makes children a lot more confident to test things. The sand is a big thing that helps us. (Melissa, Upper Primary)

Sand affords the opportunity for child-led, free play across all year groups. Maeve explains how the opportunities for play at the beach are plentiful, with different teachers making different use of these opportunities, often dictated by the children's age/stage and the lesson or topic explored.

[...]the beach is very much an extension of the classroom, perhaps we have more time where they children can just play. But I mean you know everything they are really doing is learning through play particularly on the beach. (Maeve, Early Years)

In some contexts, free play is added on to the end of the session, after more 'formal' objectives have been met as a great way to extend the learning that has already taken place.

They know that they're gonna get some free time to play as well at the end of the session. This is something that we do quite often. So, they know that as we go out, they've got their objectives to meet, they need to focus on the learning we do and what we're doing. And then there is free play. And I think especially in the early years, that free play is full of opportunities for them to actually further explore the topics that we've been looking at. So, I'll see that quite often when I'm observing [and] notice that they're using the language that we've been using during the lesson, that they may continue or extend what they were doing during the lesson anyway. They'll mix in groups and therefore the groups will interact in different ways during the free play part of the lesson. The beach environment and that additional free play in the beach environment really adds a lot to the lesson to the learning. (Catriona, Early Years)

Melissa also talks of the opportunities for play even in the older, upper primary age range:

Going back to free play, even the older year groups when given the opportunity love to make castles, large holes and cities and towns. It's very imaginative [...] lots of good peer group opportunities to play and discuss things.

The elements

The third theme in relation to the affordances of the beach environment learning and pedagogical approaches was the impact of the elements. There were two main elements that were mentioned, one was the tide – the beach, which is on the East Coast of Scotland has a large tidal range of about 4–5 metres (Mazas and Hamm 2017), while the other was the weather (wind, rain, sunshine, sleet etc.).

Planning with the tide is important, depending on the lesson objectives, as low tide can give access to different environments, such as rock pools:

So, if I know I'm doing certain lessons, I will actually try to go when the tide is out so that we have a lot of space and exposed rocks and rock pools on the low tide line. (Catriona, Early Years)

The tide changes the environment substantially, as well as the atmosphere and space that the class has to work within, as this participant noted:

The tides change it completely. At low tide you have rock pools, seaweed to explore for example. Hightide brings its own differences. Less beach, but more water and ... the water has a different energy to it. So, it's a good time to test things, like structures against the incoming tide. Whereas low tides is way calmer. (Mary, Early Years)

Different weather elements, such as wind, rain, or ice, are mentioned a lot by different participants:

[...]for STEM learning, it [the weather] can definitely help. If it's blowing a gale, it's good fun to look at wind power, which is linked to one of our PYP units. (Mary, Early Years)

Catriona talks about using these creatively and planning around them:

The other thing I guess is the elements. So, if you're doing anything that requires a lot of wind or if it's raining and you want water or ice, you know, anything that we're learning about the environment outside on the beach [...] it brings in a real-life element to the learners. (Catriona, Early Years)

Contrary to what some may think, the wilder weather in winter can actually provide a learning opportunity itself, as Melissa explains when talking about one of his PYP units on Polar Explorers:

That sounds strange but for winter when the beach is cold and windy, it's a great time for some pieces of work. We have a unit of work [...] about whaling and polar explorers ... and you know the bad weather is just great for getting the kids to understand a little how hard it must have been to be an explorer, a polar explorer that is. They feel the cold, the need to build a shelter to get out of the wind ... so it's like real life role play which is...so valuable as a learning experience. They get to understand it all a lot more. [...] we do use the weather. I think we use the beach more when it's nice [...] but equally ... you can use it during winter. (Melissa, Upper Primary)

In this above instance we can also see how the environment provides an opportunity for realistic role play for the children, and being creative with the resources and weather elements you have available on a particular day. Melissa, who teaches in upper primary talks about using wind especially in STEM related subjects, while she also brings in the idea of creative pedagogies:

[When] we're looking at forces and resistance for example, you know, we will be able to take big tarpaulins down and we can test the resistance of or different sizes of tarpaulins you know, we're able to test the difference of surface areas and wind resistance. (Melissa, Upper Primary)

Discussion

The feedback gained from the interviews in this study indicates an overwhelming positive and enjoyable teaching and learning experience by both teachers and staff at this Scottish school. Teachers reported a big change in engagement with lessons in a beach environment. These findings are in line with other research that indicates experiences that are positive in regard to academic and emotional dimensions in the outdoors (Christie, Beames, and Higgins 2016; Fägerstam and Grothérus 2018). There were a variety of reasons that stood out in the interviews as to why this is the case, and these were grouped into themes in the findings section.

Teachers described how the change in environment, from a traditional classroom setting to a large open space, provided learners with a sense of fun and freedom. This physical change had an effect on all the year groups and in different ways from the Early Years to the Upper Primary sections in the school. For the Early Years range, the freedoms of being outdoors on the beach encouraged multi-sensory experiences. Being outdoors on the beach provided the children with greater opportunities to investigate and explore different materials that they come across. Multi-sensory sand and water play on the beach was very valuable and was an obvious benefit from being able to have lessons away from the classroom, which research indicates, supports sensory stimulation (Nel, Joubert, and Hartell 2017). Both Early Years and Upper Primary teachers felt that STEM related lessons were suited to the beach. One aspect was that the children had greater freedom in how they approached the tasks in each lesson. The children were more confident in being able to solve the tasks, were more creative in their approaches, as well as being less concerned with making mistakes, all of which stood in contrast to in-class experiences according to the teachers. Children, in natural spaces are able to lead and direct much of their own learning and act with autonomy (Barrable and Arvanitis 2019; Barrable 2020; Maynard, Waters, and Clement 2013). Learning in an outdoor space offers different opportunities for teachers and learners to interact and co-create the learning space (Harris 2018). Greater pupil engagement through experiential learning is reinforced by research (Edwards-Jones, Waite, and Passy 2018). Teachers in both the Early Years and Upper Primary noted that learning through play was evident when at beach school. For some pupils, outdoor learning can be one of the only natural environments that learners have in which to experience outdoor play (Rickinson et al. 2004).

Teachers noted that children are 'hands-on' natural inquirers and having the opportunity to have playful interactions and nurture relationships with their peers and teachers at the beach was important. Research indicates that experiential learning through inquiry-based pedagogy leads to greater pupil engagement (Edwards-Jones, Waite, and Passy 2018).

Teachers observed that having more space to work in during beach school was seen as a positive, especially when compared to trying to teach STEM subjects in the confines of the classroom. Having more space when compared to the classroom additionally afforded an element of autonomy that can help children extend their learning in their tasks. Barrable (2020) explores the use of space in

forest settings in relation to promoting autonomy in young children – in her work taking ownership of space is very important. Further work with teachers at beach school can highlight the two aspects of space and autonomy and help teachers support the autonomy of their learners.

Learning, according to the teachers in this project, seemed to become a lot more collaborative in a beach environment, as mentioned by several of the participants. This seems to be due to the nature of the beach as a learning space as well as a change in pedagogical approach when outside of the classroom. Some teachers allowed for different groupings to happen during beach learning compared to the class setting. Teachers observed that social skills improved at the beach, with greater collaboration and teamwork on display amongst the children. This effect of learning outdoors on peer relationships is supported by Rickinson et al. (2004). For many children, and this is evident in this setting, beach school is an early opportunity for them to develop team-working skills in ways that are able to be replicated in the classroom. However, compared to learning inside, children worked alongside peers to achieve mutual goals (Coates and Pimlott-Wilson 2019). Moving forward with developing a beach school pedagogy, the group dynamics and fluidity in group work can be a key element of focus.

Pedagogically, the beach as a learning environment was an ideal opportunity for the school to support both child-led and inquiry-based learning. Participants observed that child-led learning which followed the interests of the learner's enquiry seems to be happening more often at the beach. The teachers were more comfortable in taking a step back, which would happen less in a classroom, and allowing the child to direct their learning and effectively fulfilling the role of a co-learner. This links to Vygotsky's work, in how the beach seems to afford opportunities for this collaborative learning to take place, and the learner developing in community with others (Gauvain 2020).

With the school having visited the beach regularly since the outdoor learning programme was initiated, teachers reported that there was a noticeable change in children's awareness of the space, including its changes over the seasons which developed a connection with nature and has promoted a pro-environmental attitude amongst the school children (Ewert, Place, and Sibthorp 2005; Prince 2017). Whilst not discussed in the interviews, it was evident in the lesson planning and unit of inquiry reflections by teachers that outdoor learning, through the use of the beach as a learning space has encouraged children to become environmentally aware (Kollmuss and Agyeman 2002). This environmental awareness by the learners is evidenced by their engagement through service learning in the community and with the John Muir Award (John Muir Trust 2022). Regular beach cleans further allow the children to both explore and connect with the coastal environment.

Strengths and limitations

A clear strength of this study is that it explores the lived experience of several practitioners with varied experience and teaching styles but who are at the forefront of delivery of beach school. The dialectical nature of the data collection through interviews gave the researcher and the participants an opportunity to reflect and delve deeper into their practice, and to articulate pedagogical aspects which may have been automatic. As a study of beach school, it is one of the first in the academic literature and can provide a starting point for closer inspection of the aims, objectives, strengths, and limitations of coastal environments for learning.

There are also a number of limitations to this exploration, most importantly the small sample size of teachers interviewed and the limited scope of their experience in relation to teaching at the beach at a specific school and in a specific location. Further research should seek to elicit the voices of practitioners from different geographic locations, and in different contexts (curricula, age-range etc.), as well as use triangulation through the use of other qualitative or quantitative techniques. As such, the findings cannot be said to be generalisable to all beach learning practice, although they can act in informing and orienting further enquiry and practice, at least within this context.

Conclusion

Participants in this study clearly supported the use of beach environments to support learning and inquiry across the primary school. The benefits identified by the participants not only applied to the teaching of the disciplines that comprise STEM but also extended into literacy and social and emotional learning. The school in this study reported benefits to both teaching staff and the children, across all year groups from early years to the end of upper primary. The findings from the interviews highlighted that learning at the beach had the ability to enthuse both teachers and children and all had an overwhelmingly positive attitude towards learning on the beach. In line with academic research that indicates the benefits of outdoor learning, this study supports the concept of beach school in facilitating improved educational experiences, greater levels of confidence in approaching tasks, less fear of making mistakes in the work, with children showing willingness to take greater risks with the learning, and finally, greater peer collaboration when compared to the classroom.

With the field of outdoor learning gaining significant support from educational authorities across Scotland and the rest of the UK, ranging from outdoor nurseries, forest school and more traditional forms of outdoor education, this study is able to contribute to a gap where coastal environments have received little attention in previous academic work. Results from the study indicate that such environments have a range of affordances that can offer authentic opportunities for children to develop critical thinking skills and social and emotional skills. Teaching at the beach as a regular and integrated all year-round aspect of the curriculum has been successful in promoting learner engagement and other academic and social skills. This model can be used by other schools with easy access to coastal environments.

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