

A people-centred computational approach to inspire Swansea residents to engage in expressive arts

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Declaration

This work has not been previously accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

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Abstract

The work in this thesis represents three months within a larger 3 year project; it focuses on the design and creation of an interactive expressive arts centre (Experience Centre). The objective of the Centre was to provide a digital and physical location for young people in Swansea to participate in expressive arts , as defined in the Curriculum for Wales. The project focuses on young people due to the opportunity presented by the new curriculum. The change will result in expressive arts occupying a more prominent role. A design thinking methodology was used, with the various development stages being revisited over time. The project was human-centred by building it around stakeholder participation and human expertise. Human values were also embedded into the responsible research and innovation frameworks used. The thesis used research from a number of domains including visual art, physical design, digital interaction, pedagogy, and gaming. The research informed two studies which focused on visual arts and dance. Creative writing was left out of the studies as the author had done prior work. The results of the studies led to the design of a Centre which is due for completion in November 2021. The main contribution this thesis makes is in its approach to expressive arts provision for young people. Future development of this work will include an analysis of the usage and feedback from the Centre between its opening and June 2022.

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Contents

1	Introduction	1
1.1	Motivation	2
1.2	Contributions	2
1.3	Author’s Statement	3
1.4	Ethics Statement	3
1.5	Overview	3
2	Literature Review	5
2.1	The Well-being of Future Generations	6
2.2	Placemaking	9
2.3	Curriculum for Wales	10
2.4	Learning and Games.....	14
2.5	Hip Hop, Creative Writing and Improvisation.....	15
2.6	Language and Well-being	19
2.7	Interaction Design	21
2.8	Summary	24
3	Physical Location Research	25
3.1	Museums, Galleries and Retail.....	25
3.2	Summary	31
4	Study Design and Development	33
4.1	Introduction	33
4.2	Responsible Research and Innovation.....	34
4.3	Expert Group and Stakeholder Workshops	35
4.4	Methods and Approach.....	36

4.5	Study One: Visual Art	36
4.6	Study Two: Dance	43
4.7	Summary	48
5	An Expressive Arts Experience Centre	49
5.1	Introduction.....	49
5.2	Method and Approach.....	50
5.3	Summary	56
6	Conclusions and Future Work	57
6.1	Conclusions	57
6.2	Summary of Contributions	57
6.3	Discussion and Future Work	58
	Bibliography	61
	Appendices	72
A	Floor Plans	73
B	Projector Calculations	75

Chapter 1

Introduction

Swansea City is undergoing extensive redevelopment as part of a £1.8bn investment secured by the Swansea Bay City Region for 11 major projects across Pembrokeshire, Carmarthenshire, Swansea and Neath Port Talbot [1, 2, 3]. The *City Deal* funding will enable the development of a digital square as well as the digitisation of a new indoor arena. As well as fulfilling Swansea's socio-cultural aims, the funding is intended to support skills and talent initiatives that will "give local young people a pathway in schools and colleges to access the 10,000 high-quality jobs that will be created over the next 15 years" [2] In its bid to become the UK's City of Culture 2021, Swansea adopted an arts-led *placemaking* approach with a strong emphasis on young people [4, 5]. The Swansea bid document referred to engaging young people through "...immersive and digital projects...re-imagining our city, working with inter-generational groups to understand the context of history...and exploring identity and sense of place, through avatars, augmented and virtual reality" [6]. A powerful economic case for culture was made in the Boundless Creativity report which stated that "before the pandemic, the creative industries were one of the fastest growing parts of the UK economy. They contributed £115.9 billion per year and were growing at more than five times the rate of the overall economy" [7]. One of the implications of this is future employment opportunities and skills development; by engaging young people in expressive arts the UK can diversify and upskill a future cultural workforce. This thesis focuses on the design of a visual arts, dance and lyric based *Experience Centre*. The project defines an Experience Centre as a place where 14-16 year old visitors build creative skills through guided and/or free form games. The games are based on the foundations of hip-hop culture (rap, dance, visual arts, self-knowledge). The physical

space(s) of the Centre will be (re)made with the visitors, to encourage ownership, and to enhance participation. The games will use computational technologies to support novel forms of social interaction. In summary, this document presents a human-centred approach to inspire Swansea residents to engage in expressive arts. The proposals are supported by field research, design studies, and relevant literature.

1.1 Motivation

The motivation for the work described in this thesis was to create prototype digital experiences that inform the design and operation of a physical centre phase one of which will operate between November 2021 - July 2022. Within the constraints of the project, the design motivation was to use PC and mobile experiences to help test the assumptions for a physical location design.

1.2 Contributions

The main contributions of this work are as follows:

- **A method to encourage participation in expressive arts**

The thesis describes the design of a centre to explore expressive arts and the key technologies that underpin it. The operation and effectiveness of the Centre falls outside the scope of the thesis.

- **Design studies blended mobile and location based interaction**

This design approach involved both a physical centre and related services such as mobile.

- **Integration of regeneration, expressive arts and well-being literature**

The thesis synthesized research across the domains of urban planning, arts, health and computer science.

1.3 Author's Statement

The substantial majority of this research was undertaken by the author who acted as principal researcher and interaction designer. User research and requirements gathering was done by the author, with the resulting design and concept of each prototype discussed with collaborators at KOMBAT. The design studies were conceived by the author, and carried out with external experts and collaborators. Any work that is not the author's own has been credited as such throughout the document. .

1.4 Ethics Statement

As Principal Investigator I took responsibility to explain, in appropriate detail, what the research was about to all participants. Participants were given detailed explanations that outlined the purpose of the studies, and how they would be disseminated and used. Participation in the research was voluntary, and verbal informed consent was obtained from all participants.

1.5 Overview

Chapter 1 outlined the document structure and the key contributions of the work. Chapter 2 and 3 provide a review of academic literature and field studies relating to both the physical and digital expressive arts domains. Chapter 5 presents a prototype Centre and its supporting technology. Chapter 6 summarizes the main contributions, project limitations, and implications for future work.

Chapter 2

Literature Review

The thesis motivation is to enable and encourage young people in Swansea to participate in expressive arts . Young people are the focus because of changes they will face in the new Curriculum for Wales between 2023 and 2026 [8]. As the term *young people* can be used to describe anyone up to the age of 25 they are not a homogeneous group [9]. For the project, young people are 14-16 (compulsory school age) rather than 16-25 (post-compulsory) [10]. The reason for this is that between 2023-26 the 14-16 year old age group will have a new curriculum; the planned changes of which provide an enabling environment to test many of the core innovations proposed within this thesis. Furthermore, the new curriculum framework links expressive arts with health and well-being. Longer-term the new curriculum is potentially an opportunity to build a real world evidence base around intersection between arts and health [11, 12].

The project interventions are digitally delivered so that activities can be measured to provide stakeholders research insights that would otherwise be unavailable. Given this aim, it was necessary to approach the literature from a number of research disciplines. Although situated within the Human Computer Interaction (HCI) domain, it was instructive to consider alternative ways to think of concepts such as *experience*, *place* and *expressive arts* in order to arrive at a hybrid view that sees any technological intervention as part of an ecology that people exist within. Rather than being a means in and of itself, the technology is positioned as being in the service of enhancing human experiences.

The project covers a number of overlapping domains that span social sciences, humanities and art as well as branches of computer science. Each of these will be explored in the sections that follow. Where it was instructive to do so, the research domains have

2. Literature Review

been separated e.g if blending research from different fields would be confusing. As far as possible though, the research literature attempts to present multiple disciplines in order to reinforce or clarify the underlying concepts.

Table 2.1: Mapping of research domains to project themes

Research domain	Relevance	Themes
<i>Human geography</i> Creative placemaking Cultural geography Urban design	Well-being of Future Generations Swansea Council objective	Regeneration through arts Cultural participation Vacant building usage
<i>Education</i> Pedagogy English and Welsh languages Arts education English as Second Language	Well-being of Future Generations Swansea Council objective Cultural participation	Learning spaces Self-expression Creative skills development Literacy
<i>Computer Science</i> Machine Learning Computational Linguistics Interaction Design	Visual art Dance Creative writing User Experience	Pattern recognition Pose detection Natural Language Processing Social engagement
<i>Psychology</i> Cognitive Psychology Pyscholingustics Psychology	Creativity Language processing Well-being	Expressive arts Meaning ambiguity Emotion regulation

2.1 The Well-being of Future Generations

Many countries are looking to improve the lives of future generations. However, Wales remains the only country currently who have legislated for the rights of future generations. The Well-being of Future Generations (Wales) Act requires Wales to make provision requiring public bodies to do things in pursuit of the economic, social, environmental and cultural well-being in a way that accords with sustainable development principles. The Act provides legally-binding common well-being goals for national government, local government, local health boards, and other specified public bodies [13]. The purpose of the Act is to be a catalyst for change. As a framework ,the Act provides a guidance to help

public bodies think more about the long-term and work better with people, communities and each other. As a listed body, Swansea Council is governed by the Act. Given this, the Well-being of Future Generations (WFG) sets out the regulatory environment in which the project operates. The WFG is a piece of legislation that helps ensure the project is human-centred from the outset. With respect to arts and culture, the WFG ambition refers to social goals and purposes for both Wales and by extension Swansea Council. A key part of this ambition is for participation within arts and culture. The WFG 2020 report in its vision for Wales in 2050 considers culture as a important way to gain new skills and learn about global issues. It goes on offer a vision for a world where creativity will be recognised as an essential and valuable skill, not only to stimulate productivity but also for the benefit of people's mental health [14].

At a regional level, Swansea Council considers culture as a significant contributor to health, well-being, educational attainment, aspiration and tackling poverty. Its seen as a way to unify people and contribute to the economy through tourism, creative and cultural industries, vibrancy and sense of Place [6, 1]. There is a danger though that the multiple aspirations for culture-led interventions can be to great to deliver upon [15]. Despite these concerns, there is a strong case for linking well-being, educational attainment ,and poverty. The Future Generations Commissioner for Wales's 2020 Report stated that from exposure to the highest levels of air pollution, to being at greatest risk of job losses due to automation, current trends indicate that the gap in well-being between rich and poor is at risk of widening in the future. The report goes on to state that in Wales, around a quarter of people live in poverty, including over 200,000 children, or around 1 in 3 of the total [14].

A challenge in designing cultural interventions is to effectively reach diverse groups of users with differing needs and desires. Technology can be an enabler for this. The initial research domain for the thesis is within human geography and urban planning. The rationale for this is that the problems being explored are deeply human-centred. The objective of applying computational technologies to the problems is to efficiently solve them for humans as individuals, communities and populations. As human development is the goal, the question to consider is what this looks like? By starting with community building, geography and urban planning can provide over a century of research to draw upon. Referring to the role of Geography, Cresswell suggests that it is true that neither culture not society are in any sense completed things they still name important aspects of the ongoingness of the everyday world. His thesis is that the world is marked by

2. Literature Review

inequalities and injustice, the systematically asymmetrical arrangement of power such that things like oppression and exploitation can occur. The kinds of things geographers study - place, landscape, territoriality, mobility - often lie at the heart of the making up of social worlds [16].

Table 2.2: Summarised Well-being of Future Generations (Wales) Act 2015

Goal	Description of the goal
1. A prosperous Wales	Innovative, productive and low carbon society...
2. A resilient Wales.	Maintains and enhances a biodiverse natural environment...
3. A healthier Wales	People's physical and mental well-being is maximised...
4. A more equal Wales	Society that enables people to fulfil their potential...
5. Wales of cohesive communities	Attractive, viable, safe and well-connected communities.
6. Wales of vibrant culture...	Society that promotes and protects culture...
7. Globally responsible Wales	Nation which takes account of global well-being.

Regarding the arts, WFG goal 6 refers to a Wales of vibrant culture and thriving Welsh language. It also speaks of a society that promotes and protects culture, heritage and the Welsh language, and which *encourages people to participate in the arts, and sports and recreation* [13]. Cultural participation is central also to Swansea's vision of itself. In its 2018 City of Culture 2021 bid it asserted that culture is needed to to connect [us] more deeply, and draw on our rich heritage, stories, culture, and sense of Place to create opportunities that may otherwise be unreachable. In the Council's view culture is a bridge to greater equality, engagement and connectivity [6]. The next section explores the role of arts and culture within regeneration.

2.1.1 The City and County of Swansea

Swansea is the economic centre of the wider Swansea Bay City Region, and has a resident population of 240,000. Swansea is the second largest city in Wales. The city is undergoing a major redevelopment as part of the Swansea Bay City Deal, a £1.8 billion initiative that aims to generate almost 10,000 new jobs over the next 15 years [1, 2, 6].

Although Swansea has changed, critics argue that if the regeneration is going to be meaningful benefits must go beyond the city centre [3]. In recent years, the city has suffered from substantial retail decline resulting in empty properties on its high street. The wider economic decline, from an industrial to post-industrial city, has been a factor in the social

inequalities of Swansea. For instance, people living in the least deprived areas of the city can expect to live healthily for nearly 22 years longer than those in the most deprived areas [1].

2.2 Placemaking

Creative placemaking is a practice that uses arts and culture to regenerate the physical and social character of a town, city or region [17]. It is also a powerful tool to activate vacant spaces, abandoned buildings, and bring diverse people together to be inspired [5, 18]. The practice of creative placemaking is not new. For centuries arts have been a key part of how we have built, re-imagined and revitalized cities. For instance, after the 1929 stock market crash, artists were employed to paint spirit-raising murals of America's industriousness [19]. More recently, during the COVID pandemic, the inaugural London Mural Festival (LMF) offered accessible art at a time of social distancing [20]. In Swansea, the council have stated that culture is a significant contributor to health, well-being, educational attainment, and tackling poverty [6].

The Council's aspirations are consistent with the discipline of creative placemaking in terms of being a catalyst for personal memories, cultural histories, imagination, and feelings to enliven the sense of 'belonging' through human and spacial relationships. [21]. As Courage and Mckeown suggest in referring to the social changes that successful place making can result in, "every living person becomes a creator, a sculptor, or architect of the social organism" [17]. The importance of participation is stressed throughout placemaking literature in social, cultural and political dimensions. Borrup refers to how it builds on the local human, physical and cultural assets to enhance social and civic fabric. In this sense, placemaking builds distinctive local character and story [21]. He goes on to say that accounting for *lived experiences* is central to good placemaking. In this context textit experiences take the form of stories that define places. A core placemaking function is therefore to seek out stories and storytellers to help make shared social narratives [21]. Swansea's City of Culture 2021 bid started that "we need Culture to connect us more deeply with this new Swansea, drawing on our rich heritage, stories, culture, and sense of Place to create opportunities that may otherwise be unreachable. From urban deprivation, poverty and low aspiration in the east, to rural isolation, ageing populations and lack of infrastructure in the west, we believe that culture is our bridge to greater equality, engagement and connectivity" [6, 1]. The role of storytelling within an emergent Swansea is recognised as key to a new sense of place for the city's residents. The city already

has a rich history to share. The challenge is for the story to be regathered and told in a new way [22]. One way arts participation can help is that it can support individuals, groups, and communities to use forms of expression beyond words to address their emotions, dreams and visions [21].



Public Display of Community Artwork commissioned by the Glynn Vivian Gallery

Figure 2.1: Artwork displayed on hoardings near the new build at St. David's, Swansea. Artwork displayed in Swansea City central redevelopment. The works were created by community groups supported by the Glynn Vivian Gallery through their community and education teams.

Ultimately, part of the ambition of creative placemaking is to advance the intrinsic values and impact of the arts. It should broaden arts participation, improve the quality of arts offerings, and produce both beauty and critical perspectives on society [17]. In order to achieve this, arts participation requires a informed citizens - at least to the extent that residents recognise the value of art ,and are willing to participate in its co-creation or consumption. Education therefore is an important enabler. The next section explores recent changes Wales has made to its curriculum in relation to arts.

2.3 Curriculum for Wales

The Welsh education system in recent years has encouraged a culture where teaching creativity has been diminished and the professional contribution of the workforce under-developed. To rectify this, and prepare learners for the future, there is a need to empower schools and teachers by moving away from a narrow and inflexible curriculum [23]. From

2022, schools in Wales will adopt a new national curriculum framework, co-designed with teachers, education experts, national and international organisations from Wales, and the OECD. The Curriculum for Wales guidance forms part of the Curriculum for Wales Framework (Framework). The Framework includes legislative curriculum requirements, as well as supporting guidance. A key feature of the Framework is that it requires schools to design their own curriculum and assessment arrangements. The supporting Framework guidance documents are intended to ensure there is consistency of standards across the country.

The curriculum framework includes six areas of learning and experience, which replace named subjects. :

- Expressive Arts
- Health and Well-being
- Humanities
- Languages, Literacy and Communication
- Mathematics and Numeracy
- Science and Technology

The six areas have been constructed so that that there are strong links across different disciplines; this in turn should enable learners to build connections across their learning and combine different experiences, knowledge, and skills [8, 23, 24]. The next section looks at expressive arts, the main interest of the thesis.

2.3.1 Expressive Arts

The Expressive Arts Area of Learning and Experience (Area) covers five disciplines: art, dance, drama, film and digital media and music. Although each discipline has its own body of knowledge and skills, there is a commonality that they all share in the creative process; this is the means by which creativity is used to make works. Creativity can be defined as the ability to come up with ideas or artefacts that are new, surprising, and valuable [25, 26]. Creativity has two main components, convergent thinking (evaluation of novelty) and divergent thinking (generation of the novelty), which work together when generating

creative output [27, 28, 29, 30]. In convergent thinking, knowledge is of particular importance as a constraint on viable solutions and their effectiveness. Divergent thinking on the other is more concerned with originality. Psychometric research suggests that tests of divergent thinking are good indicators of future creative performance [31, 30, 29].

Boden considers creativity a general aspect of human intelligence and grounded in everyday abilities such as conceptual thinking, perception, memory, and reflective self-criticism [25]. While the precise nature of creativity is beyond the scope of this thesis, the definitions and concepts are useful in terms of building a high level understanding of creativity its relationship to learning. They will be used to consider what being creative *is*, how this relates to learning to *be* creative, and what this might *feel* like. In this way, the aim is to link creativity, expressive arts, and well-being.

2.3.2 Visual Art

According to Berger, making sense of the world is largely through what we see. In this view, people define their experiences more precisely in areas where words are inadequate. This includes both personal as well as historical experience [32]. Although writing decades before mobile phones and digital apps, the idea of visual sense making is now part of mainstream culture as demonstrated by the success of services such as Instagram and TikTok [33, 34]. Dewey, writing in the 1930s, made the following point, "when artistic objects are separated from both conditions of origin and operation in experience, a wall is built around them that renders almost opaque their general significance...art is remitted to a separate realm, where it is cut off from that association with the materials and aims of every other form of human effort, undergoing, and achievement" [35]. Within the new curriculum, visual arts is thought of as being about experimentation and development with resources, materials, techniques and processes in order to develop a range of a range outcomes that demonstrate a personal and creative response [36]. There is a belief that experiencing and participating in visual arts can help learners understand and appreciate different culture; by extension, understanding other cultures can enable Welsh learners to better appreciate Wales [13, 37]. The curriculum goal is to make art a living thing that is *experienced* by the learner.

2.3.3 Dance

Schools are frequently challenged to offer physical education that is meaningful and relevant. Too often, the focus has been on a narrow range of competitive team sports. Recently there has been a wider societal move towards lifestyle physical activity [38]. To have impact, physical activities must meet the needs of young people, and be delivered in a way that promotes longer term participation. In Wales in particular, this is important due to the relatively high percentage of 11-16 years olds exhibiting sedentary behaviours [39]. Dance can fulfil these criteria. Firstly, dance can serve as a physical activity that helps learners to develop gross motor movements and fine motor movements [36]. Additionally, dance is popular with young people via apps such as TikTok [40]. The popularity of dance with young people is likely to increase as a result the inclusion of breaking (a hip hop based dance form) in the Paris 2024 Olympics [41]. Finally, as a discipline dance combines creative and physical elements that go from from the easier (e.g. unstructured social dancing), to the physically challenging (e.g. breaking); through its various forms dance presents opportunities for a range of skill levels and physical abilities.

2.3.4 Creative Writing

Creative writing is a part of expressive arts within multiple dimensions including drama, film and digital media, and music. It is also central to the *languages, literacy and communication* area of learning which aims to give learners "opportunities to experience spoken and written language, as well as images, in a range of forms and genres [42]. The creative writing the curriculum refers to is positioned as a multi-sensory *experience* that includes written word, spoken word, voice and images. This is important for a number of reasons. National Literacy Trust data shows links between reading and writing in terms of enjoyment, behaviour and attitudes [43]. Becoming better readers helps learners to become better writers. Approaching creative writing from a range of formats (audio-visual, poetic, musical) there is an opportunity to engage learners in multiple ways. For instance, songs and poetry have been used across a number of studies as effective materials for teaching reading and reading fluency [44, 45, 46]. Within the thesis, songs and poetry are the creative writing formats. More detailed reasons for this, and their limitations, will be explored in later sections. The sections that follow explore learning through the social and cultural lenses of gaming and hip hop. Together, these provide the foundation for studies in chapter 4.

2.4 Learning and Games

Games can be considered as well designed learning experiences the aim of which is to equip players with the skills needed to progress through the game while providing new problems such that the game remains sufficiently challenging[47, 48].

Table 2.3: Gee’s Situated Learning Matrix

Domain	Experiences	Rationale
Future problem solving	Structured by specific goals how they worked out	Stored in terms of goals and
Future problem solving	Interpreted	Lessons learned and usefulness
Feedback	Immediate so errors can be assessed	See where expectations have failed
Previous experiences	Opportunities to apply interpreted prior experiences	Improve and generalize interpretations
Learning	Explaining to peers and/or experts	Social interaction with peers, experts and mentors

In successful games, models are central to game play. This is important in pedagogy terms because, while people learn from interpreted experiences, models allow specific aspects of experience to be used for more generalized problem solving; they lead from concreteness to abstraction. Good games confront players in the initial game levels with problems that are specifically designed to allow players to form generalizations about what will work well later when they face more complex problems [47]. Game-based learning is grounded in the idea of play as an intrinsically motivating experience, and an extension of Problem Based Learning (PBL) [49]. Games also provide a location for social interaction and relationships acting as a *third place* for informal sociability much like the pubs, coffee shops, and other physical spaces [50]. To achieve the goals of expressive arts participation, there are a number of reasons to explore games as framework for service design.

- **Engagement:** well designed games are learning machines [48].
- **Ubiquity:** over 80 percent of UK teenagers play games on mobile and/or other devices [51].

- **Affinity with arts:** game-like approaches are already used within the professional expressive arts; for instance, improvisation is widely used in creative writing, drama and music [52].
- **Co-creation:** games allow people to be creators not just producers. Along with the designer, the player's actions co-create the game world [47].

2.5 Hip Hop, Creative Writing and Improvisation

2.5.1 Hip Hop as a Community of Practice

Good learning does not exist within a social vacuum. Elements of learning experiences (e.g. goals, interpretations, explanations, and feedback) usually flow from participation in, or apprenticeship to, a social group which is sometimes called a *community of practice*. It is from participating within such groups that *social identity* is developed [48]. This section will explore the culture of hip hop as a community of practice. This community is then used to re-frame ideas around expressive arts education and participation.

Hip hop is a culture and art movement created in the Bronx, New York City in the 1970s. The term hip hop is often used to refer exclusively to hip hop music. To its community however, hip hop consists of four main elements. Additional elements sometimes included are; historical knowledge of the movement, beatboxing, and fashion [53].

Table 2.4: The Elements of Hip Hop Culture

Element	Description	Expressive Art
Rapping (<i>MCing</i>)	Rhythmic vocal rhyming	Creative writing/poetry
DJing	Making music with turntables and mixers	Music
Breaking	Competitive form of athletic street dance	Movement/Dance
Graffiti	Writing/drawings made on a walls or other surfaces	Visual art

Hip-Hop music has had substantial impact in western society, especially among the young. It is the most dominant musical genre according to a Spotify global analysis of 20 billion tracks, as well as accounting for nearly a third of all music and video streams in the United States [54, 55, 56]. Hip hop is also the inspiration behind streetwear, which has evolved into a multi-billion dollar retail fashion market estimated at 185 billion USD in annual sales [57]. Returning to communities of practice, the central idea is that learning takes place in a social environment. Communities of practice are groups of people who

share an interest for something they do, and learn how to do it better as they interact regularly. Wenger proposes they have three important characteristics [58]

1. *The domain*: a community of practice has an identity defined by the shared domain of interest. Membership implies a commitment to the domain, and a shared competence that distinguishes the members from other people. The domain does not necessarily have to be something recognized as *expertise* outside the community. For instance, graffiti artists or rappers in 1970s New York would most likely have had expertise not recognized as such outside of their immediate communities.

2. *The community*: members engage in joint activities and discussions, help each other, and share knowledge. Their social relationships help them to learn from each other. This is what Gee refers to when talking about *learning experiences through social interaction with peers, experts and mentors* (figure 2.3) [48]. As storytellers, MCs for instance, used meetings at block parties to exchange vocal techniques and wordplay. These interactions made them a community of practice even though they often created their work individually.

3. *The practice*: members of a community of practice are active practitioners. They develop a shared repertoire of resources: experiences, stories, tools and ways of addressing recurring problems. They have a shared practice which takes time, effort, and sustained interaction.

According to Wenger's criteria, hip hop can be defined as a community of practice concerned with artistic expression through visual art, dance, spoken word, and music. Artists within this community learn in a self-directed way supported by peers. There are no formal canons on which structured courses and tuition are built. This is not to say that structured learning does not take place; it is that the learning is not via organisations such as schools or universities. In contrast, there are a variety of institutions that surround arts such as classical music, dance, film or creative writing for fiction/non-fiction. Each of these has schools, colleges and university courses with a range of accredited qualifications. The informal nature of instruction in hip hop might be a factor in the culture's emphasis on innovation and improvisation. Within hip hop, developing a unique artistic voice or style is considered the pinnacle of the art form. This is the goal of the artist; to create a voice distinct from others that have gone before [59]. This creative emphasis in hip hop is consistent with the New Curriculum for Wales's *Expressive Arts Statement of what matters* which says, "By exploring forms and disciplines in the expressive arts, whether through experimentation, play or formal research and inquiry, learners can...develop their

imagination and draw upon their own experiences, skills and talents" [11]. The next sections explore creative writing improvisation through lyric writing and rapping. These are examples of the creative process, some aspects of which will also be relevant to visual arts and dance. Chapter 4 goes into more detail about specific expressive arts.

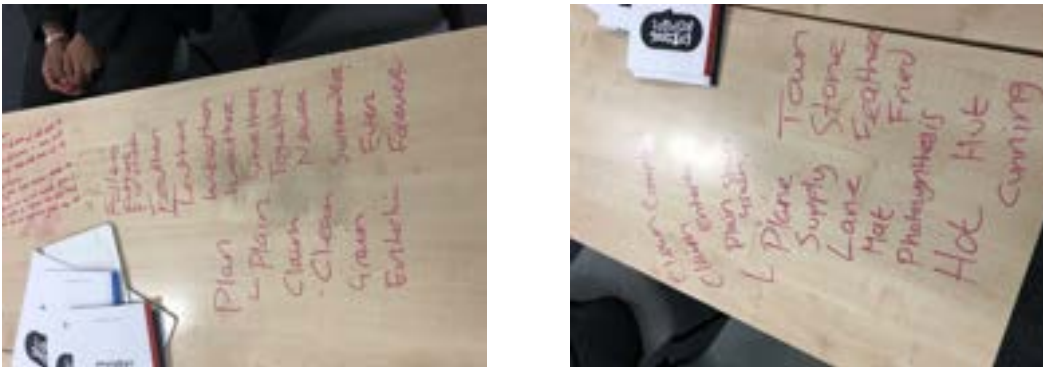
2.5.2 Creative writing and Improvisation

Writing rap lyrics requires the development of an extensive vocabulary, lyrical skills to produce complex rhyme patterns, and general knowledge of enough subjects about the world to be able to tell interesting stories about a range of contemporary topics [44, 60]. Rapping can be thought of as storytelling or poetry that combines words with a sensibility that complement a musical rhythm epitomised by the *beat* [59]. Within rap the improvised creation of lyrics, known as freestyle, is considered the hardest skill to master [61]. An fMRI study of freestyle rap highlighted the importance of superior linguistic skills that require rapid online formulation of meaningful, rhyming words and phrases within a prescribed tempo and rhythm [61]. Spontaneous improvisation is a complex cognitive process that shares features with what has been characterized as a 'flow' state [61]. Csíkszentmihályi described flow as "an almost effortless yet highly focused state of consciousness" which he referred to as the optimal experience [62]. Flow states are most often entered during activities with clear goals and immediate feedback. Flow and creativity are intimately connected with improvisation. Studies have shown that the degree of flow experienced when improvising is correlated with how creative the result is and the personal significance attached to the experience [62, 63] Furthermore, research suggests the neural mechanisms can be generalized to explain the cognitive processes of other spontaneous artistic forms [62].

In educational terms, freestyle rap improvisation can be framed as a game that requires complex cognitive processing, and a flow state, for learners to achieve their optimal creative output. The author's experience in using freestyle games in schools suggests this is only possible if certain prerequisites are met. Learners have to possess sufficient language competence. Freestyle requires a knowledge and understanding of rhyme and sound pattern without which the challenges of lyrical improvisation are probably too great [64]. For instance, a study of lyrical improvisation reported subjects' scores on verbal fluency tests as above the 80th percentile.

2. Literature Review

The author’s findings via studies were that rhyme detection is a strong indicator and predictor for success in lyrical improvisation. Learners who were unable to identify rhyme patterns within lyrics usually struggled to create freestyles; where they could produce freestyles, rhyme patterns were less sophisticated than peers who scored better in rhyme detection tasks [64, 65, ?]. In the cited study, further work by the author appeared to confirm a correlation between skill in rhyme detection and improvised freestyle (rhyme production); this led to a redesign of lyrical games from individual to group based. The rationale being that members within the group could play different roles to help achieve the overall goal of creating a freestyle.



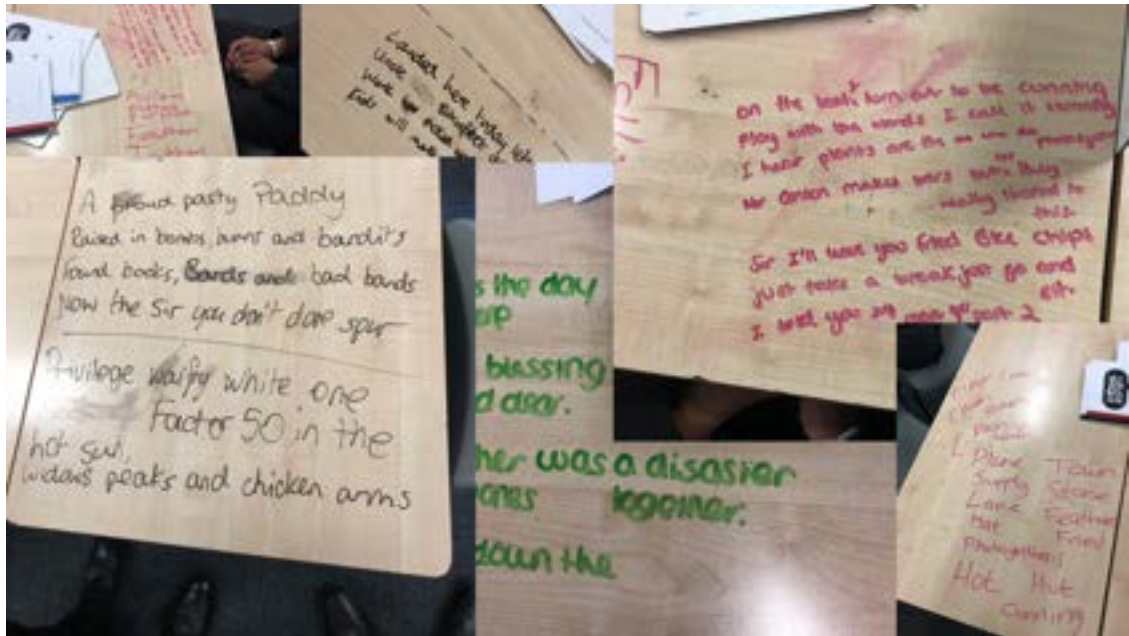
a) Keywords and group 1 work-in-progress.

b) Group 2 keywords

Figure 2.2: Work in progress for verse improvisation game played by two groups. The groups were produced a list of keywords, the objective of the game was to create a rhyme with as many using as many of the words as possible. Additional artistic credit was given for using the keywords as the rhymes.

As an example, less confident group members could suggest words to use in the freestyles, or listen and provide feedback on the completed work. In the study, improvisational games were played in teams of 3-4 people. Learners appeared to have higher motivation levels if their class teacher also took part in the games *as a player* rather than in an instructional capacity. Interestingly, teachers suggested that learners were able to work better on creative activities when they were able to write on tables rather than paper or notebooks. This was the reason the school used the table in the manner shown in figure 2.2. Although referring to digital tools, the use of the table in this way is an example of Shneiderman’s observation that "good tools should also have a wide range of functionality so that many

different services are provided" [66]. While the thesis is concerned with digital technology, the flexibility afforded by the table is nevertheless instructive in design terms.



Improvisational verse game results

Figure 2.3: Results of the improvisation game played by multiple groups. The groups were all able to produce verses that contained the keywords. The verses were performed and as well as performing, each group offered a critique of the verses of their peers.

2.5.3 LYRICAL KOMBAT

Through a lyric improvisational game, the LYRICAL KOMBAT application that helps users to build phonological awareness of English [67]. Identifying rhyming words involves vocabulary, phonological awareness and lexical retrieval [45]. Phonological awareness is central to rap freestyle as the artistic form is based on verbal innovation of words, sounds and multiple meanings [59, 61]. The work in figures 2.2 and 2.3 is based on LYRICAL KOMBAT.

2.6 Language and Well-being

The new Curriculum for Wales positions literature and communication as fundamental to well-being. The guidance document describes the importance of learners being able

to understand their feelings and goes on to say "communication in expressing emotions is fundamental...literature has significant potential to support learners' empathy, mental health and emotional well-being" [12]. Mental ill health is the single largest cause of disability in the UK, contributing up to a twenty percent of the total burden compared. Everyone experiences emotional distress at some point in their childhood or adolescence as a normal part of life [68]. However, as half of lifetime mental ill health is already present by the age of 14, prevention targeted at younger people can result in greater personal, social and economic benefits than intervention at any other times. Mental illness during childhood and adolescence results in UK costs of £11,000 - £59,000 annually per child [69]. U.S studies found that low self-esteem, low academic success, and negative life circumstances are challenges for at-risk adolescents and can contribute towards high school dropout. Not providing intervention for at-risk youth leads to negative coping skills, emergent negative behaviours, and difficulty managing emotions appropriately. Long-term risks of allowing at-risk youth to fail include economic and well-being issues [70]

Research shows that resilience is a key individual characteristic in the well-being of individuals. Resilience refers to the ability of individuals to face and overcome adversity adaptively and, more specifically, to the implementation by individuals of adaptation strategies to cope with discomfort and adversity and transform critical experiences into opportunities for personal growth. Positive psychology involves resource promotion and the study of well-being, distinguishes between hedonic well-being (HWB) and Eudaimonic well-being (EWB) The hedonic approach defines well-being in terms of pleasure attainment and pain avoidance. [71]. According to Ryff, eudaimonic well-being asserts that well-being and personal growth, involving the capacity to realize one's talent and potential, often involves encounters with obstacles, failure and disappointment. These experiences require finding inner strengths and resources of renewal [72, 73].

Arts participation has positive impact for at-risk students , especially those with low socioeconomic status. Arts participation is related to better academic outcomes for at-risk youth, providing them an opportunity to regulate emotions, relate to peers, and engage in expressive activities [70]. New therapies that use hip-hop as a cathartic and expressive tool for young people have also appeared in major U.S cities [74, 75]. In the UK, Hip Hop Psych has used hip hop lyrics to open dialogues in mental health. In one study, the lyrics from Eminem's critically acclaimed song *Stan* were analyzed with a bio-psycho-social model to explore factors leading to the decline of the central character's mental state,

actions, and adverse life experiences [76]. A further study used Kendrick Lamar's lyrics, which feature several psychiatric themes around addiction, depression vulnerability, and resilience against stress and depression. The study concluded that rap lyrics "might help young people to understand and consider their own vulnerability, resilience, and life choices in a relevant and accessible manner" [77]. Writing, performing or listening to rap lyrics can all benefit have the well-being benefits of young people; each involves cognitive processing as well as emotional reflection.

2.6.1 Lyrics and Well-being

It is known that music can induce different ranges of emotion [78]. For example, studies have found that heart rate, blood pressure, and respiration rate increase with arousing music as opposed to calm music [79]. Research studies also indicate that listening to, or writing song lyrics, can influence the emotional state of the listener or writer [79, 70]. The specific aspects and mechanism of songs that arouse emotions are not yet fully understood [80]; some songs are lyric heavy with complex beats while others feature only instrumental melodies. It is not yet known which aspects of music have the largest effect on emotional response. A few studies have found that lyrics detract from emotional response to happy music, and enhance that to sad music. The results are mixed however [79]

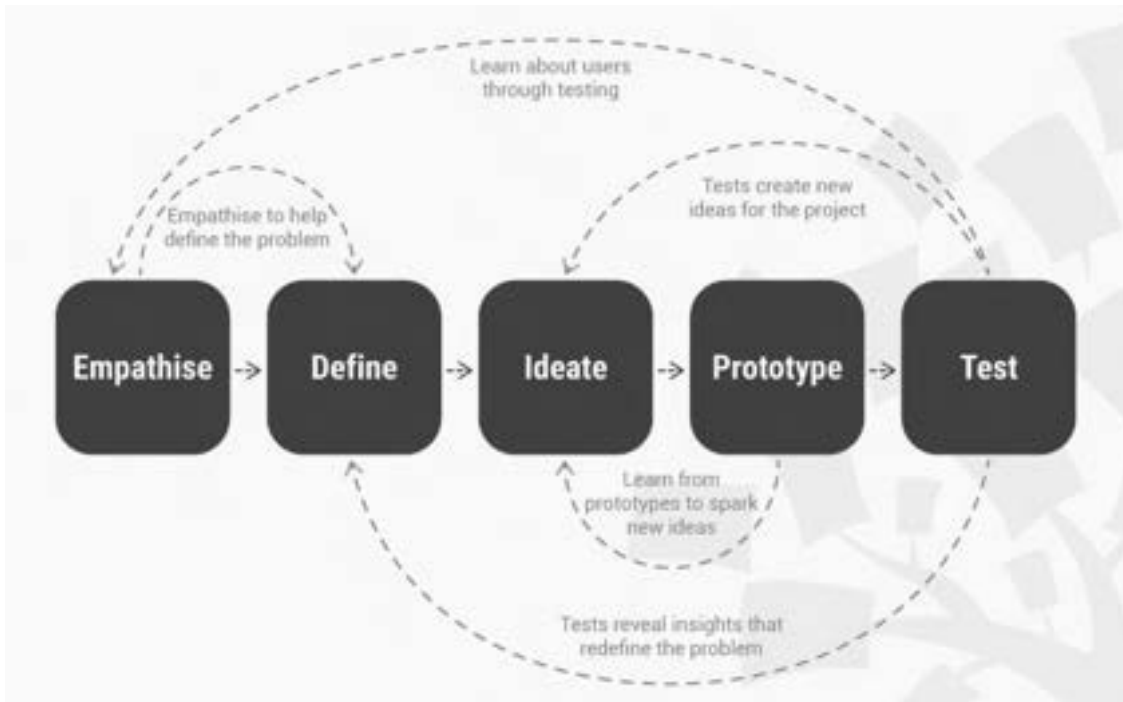
Using expressive arts to improve well-being is referred to in the new Curriculum for Wales. Given some of the uncertainties around the research, at this point in time well-being impact is perhaps most consistently measured by subjective self-reporting [81].

2.7 Interaction Design

Interaction design is the term used to describe the methods, theories and approaches for "creating user experiences that enhance the way people work, communicate and interact" [82]. Interaction design is an aspect of a many academic disciplines concerned with both computer based systems as well as non-computer mediated human interactions. *Design thinking* is an ideology which asserts that a hands-on, human-centred approach to problem solving can best lead to innovation. This hands-on, human-centred approach is defined by the design thinking process, which comprises distinct phases, as illustrated in figure 2.4.

In practical terms, design thinking uses brainstorming sessions, workshops, prototyping and testing as tools to help solve ill-defined, complex problems. Although each phases is

distinct they are not linear, and some might be repeated [83, 84]. A benefit of design thinking is the hands use of low-fidelity experiments and workable prototype not necessarily to provide the solution, but to better understand the problem(s) [84, 85].



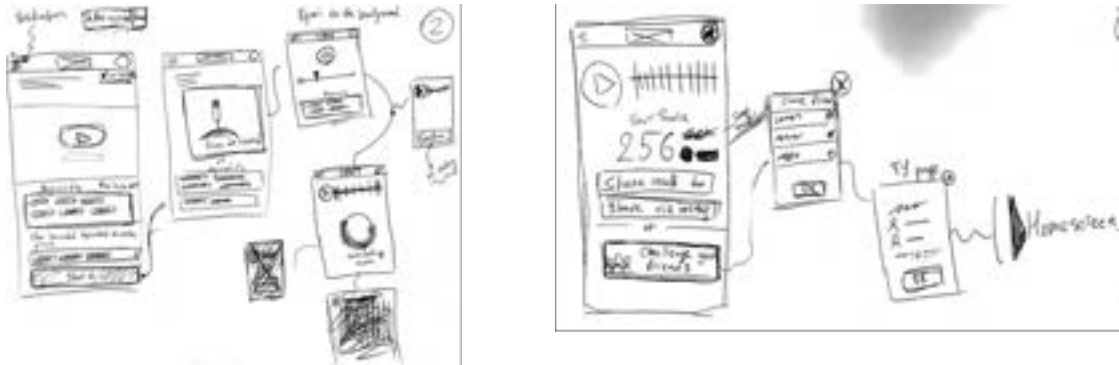
Design Thinking Process

Figure 2.4: The five stages are not always sequential – they do not have to follow any specific order and they can often occur in parallel and be repeated iteratively. The stages should be understood as different modes that contribute to a project, rather than sequential steps. Copyright Teo Yu Siang and Interaction Design Foundation. [83]

The next section is an examination of the process stages, using the application LYRICAL KOMBAT. The application forms part of the author's work in creative writing education [67].

1. *Empathise*: empathy allows design thinkers gain insight into users and their needs. Methods such as ethnographic studies, interviews and workshops can all contribute to this. In this particular study, firsthand experience of being users was also employed. This is discussed in more detail in 4.4.
2. *Define*: in this stage observations are synthesised to define the core problems as problem statements.

3. *Ideate*: this involves generating numerous potential ways to address the problem statements. During this stage, even potentially unworkable ideas should be documented as the objective, within constraints, is to have as many ideas as possible.



Low Fidelity Sketch: used to visualize and discuss ideas

Figure 2.5:

4. *Prototype*: an experimental phase the aim of which is to identify the best possible solutions for each of the problems identified during the earlier stages.



Wireframes; used to explore application functionality prior to development

Figure 2.6:

2. Literature Review

5. *Test*: this is the final stage in a linear 5 stage-model, but in an iterative process, the results generated during the testing phase are used to redefine one or more of the earlier stages. With LYRICAL KOMBAT the final stage of the user focused design process was creating high fidelity screens with the look and feel user would see. High fidelity screens can be shared with as basic prototypes to get feedback. This is useful in cases where there are design and usability questions to resolve. Changes at this stage are still relatively low cost compared to once development is underway.



High Fidelity Screens: used towards the end of design and represent the application as it should look and feel to a user

Figure 2.7:

2.8 Summary

Design thinking literature informs the project due to its experimental nature. As the project includes physical space, placemaking literature has also been used. Finally, as the physical space includes digital technology, much of the literature on interaction design is relevant. Chapter 3 looks at physical spaces and the digital interaction within buildings.

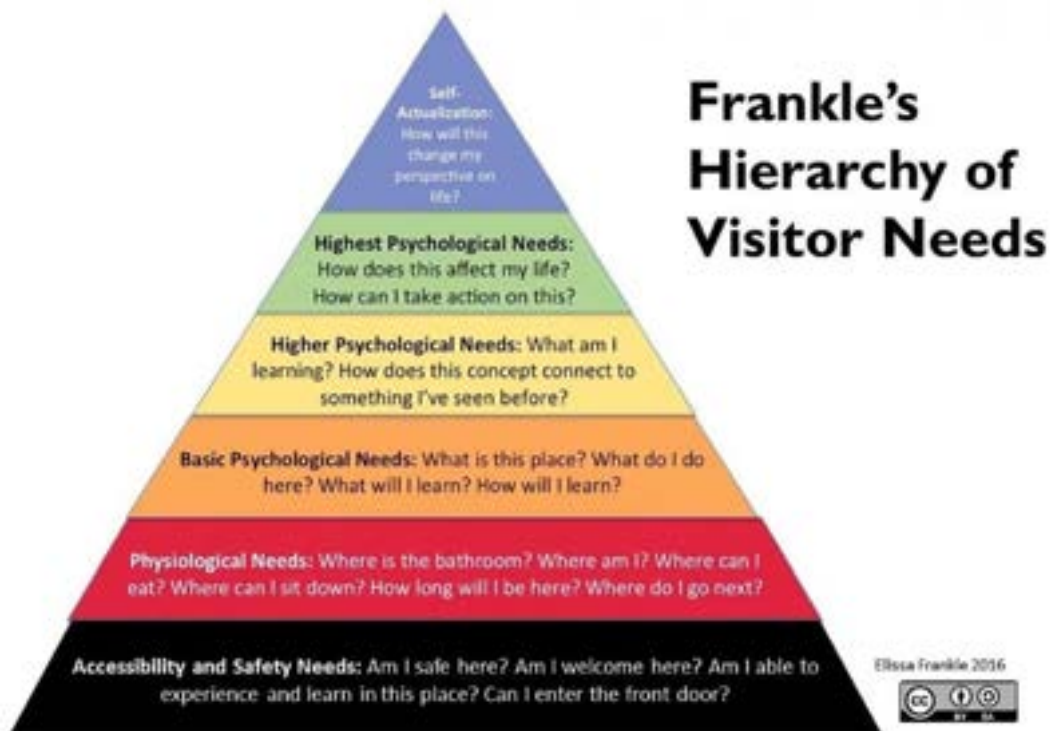
Chapter 3

Physical Location Research

3.1 Museums, Galleries and Retail

It is worth briefly clarifying a number of terms and positions at the outset of this chapter to aid clarity. Museums, galleries and retail are all spaces concerned with human visitors (mainly) but there are distinctions in the way each considers them and the vocabulary they use. The thesis refers to "visitors" in this section rather than "users" (an interaction design term) or "customers" (retail industry term). Following on from this, a visitor experience is defined as "the everyday actions, interactions and transactions that have an impact on the quality of visitors' experiences at a given location, and on their overall impression of the location as a trusted, quality brand" [86]. The starting assumption is that each museum, gallery or retail store seeks provide the optimal visitor experience it is capable of; this is illustrated in the Hierarchy of Visitor Needs, figure 3.1.

Interaction is increasingly a public affair, taking place in theatres, galleries, museums, exhibitions and on city streets [87]. Between June - August 2021, the author visited a number of physical locations summarized in table 3.1. As a result of COVID-19 restrictions, it is arguable that many of the locations were not operating as normal. For instance, in the retail spaces the low numbers of shoppers (relative to historical averages) might actually cause a less enjoyable experience overall [88]. As retail expert Ian Shepherd argues, "the busier a store is, the more people want to come inside...this insight explains why a good restaurant will always seat customers in the window first to create the sense that you are missing out by not being in there yourself" [89]. Some location experiences are designed for high numbers of people in order to work effectively (e.g a stadium).



Hierarchy of Visitor Needs. (c) Elissa (Frankle) Olinsky. Used under creative commons license

Figure 3.1: Hierarchy of visitor needs as a re-framed Maslow hierarchy. Model is a re-framing of Maslow's hierarchy of needs within a museum or other location based experience; it posits that without basic physical and psychological needs being address, the the design of the experience, that visitors cannot attend the core purpose the experience designers hope to achieve. [86] [90]

The purpose of the location research was to generate ideas and questions to inform the Centre design, described in chapter 5. As well as an end in itself, physically oriented thinking is also an advantage in designing digital services [91]. The longer-term vision of the project (as opposed to this thesis) is for the kind of rich visuals present in the work of an artist such as Refik Anadol [92]. This type of work is concerned with scale far beyond consumer devices such as TVs, laptops and mobile screens. Scale in fact is one of the key themes that emerged from the location research. Beyond large digital screen formats, there are also questions around creating displays from walls, floors, or ceilings, and how these can be used to enhance public place with user generated content (see figure 2.1). Bongers, argues for a juxtaposition of physical and digital elements to create narratives between the environment and the content on people's devices. Referring to

the balance images we take from our environment, but do not return. He makes the case for addressing the urban space and the natural environment with audiovisual material, responding to and reflecting on the context [93].

Creating interaction for public settings potentially shifts design away from an individual's private dialogue with their interface to also consider the ways in which interaction affects and is affected by spectators. Reeves describes "manipulations carried out by the primary user of an interface who we shall refer to as the 'performer'" [87]. In this sense, a visitor who interacts with display or an installation at gallery can be considered a performer. In thinking about how people create media as a performance (both public or private), Robinson poses the challenge that "If walls, display cases, furniture, posters, and even another human's skin can be augmented with haptics, what sorts of performance might we imagine?" [91, 94]

Table 3.1: Taxonomy of Public Interface Interactions

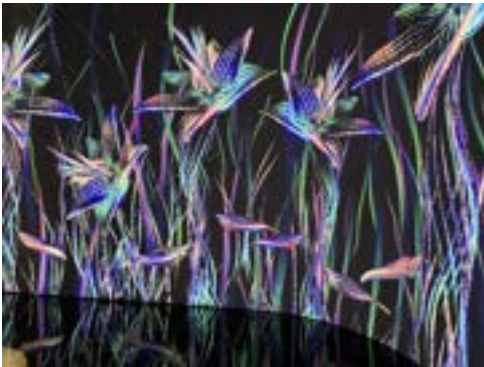
Performance Type	Description
Secretive	Manipulations and effects are hidden to bystanders. Example: an instant message
Expressive	Manipulations and effects are exposed to bystanders. Example: a ring tone
Magical	Interaction is hidden but the results are public. Example: playing a Spotify playlist via a loudspeaker
Suspenseful	Interaction is visible but the result is not seen. Example: using a throwing gesture to leave geo-tag audio comment in a physical location

Describing interaction in public spaces, Reeves makes an important point about people disengaging in order to rest or re-position themselves; this has implications for passive user design which we will return to in chapter 5 [95].

The primary method used for location research was field visits. The rationale for this was that goal of the thesis calls for the (co)design of digital interaction within a specific physical location. There is knowledge that can be elicited by looking at the design of spaces such as galleries and museums. Additionally, as the focus is young people, branded retail stores were also visited. Physical retail is relevant because leading consumer brands, particular in streetwear, play an important role in shaping global youth culture. As well

3. Physical Location Research

as the brands being present through fashion, they are featured in hip hop culture directly via song lyrics as well as sponsorship deals with artists [57]. The combination of these factors means that to understand how young people might behave or interact in public, there is merit in visiting the types of retail stores they visit.



a) Digital: immersive/artistic display



b) Textile: artistic display



c) Digital: navigation display



d) Digital: information display

Figure 3.2: Use of display screens in selected museums. The display use a range of material and formats but share the common feature of being one-way; the users presence makes no difference to the output

In the museum's visited the most prominent observation was the extensive use of large display screens as shown in figure 3.2. The screens were used for a number of purposes: as an immersive experience (a); for artistic effect (b); as navigation interface that complemented the landscape being looked at (c), and a more formal information display screen (d). Most likely as a result of the cost, projectors were used in all the museums

to display large or irregular images. Other display technologies were limited either to navigation interfaces, or for viewing where the visitor is in close proximity to the screen.

Table 3.2: Physical experience field visits June - August 2021.

Location	Category	Interactivity
National Waterfront Museum	Museum	Touch (digital)
Glynn Vivian Gallery	Gallery	Exhibition dependent
Oriel Science Centre	Centre	Touch (physical and digital)
Tate Modern	Gallery	Exhibition dependent
Science Museum	Museum	Touch (physical and digital)
Design Museum	Museum	Exhibition dependent
V and A	Museum	Exhibition Dependent
Apple Store	Retail	Touch (digital)
Nike Town	Retail	Touch (physical)
adidas Champs-Elysées	Retail	Touch (physical)
Footlocker Champs-Elysées	Retail	Touch (physical)

People visit retail to achieve something that they could not do in a purely digital environment. Some products sell better when people can see, touch, smell or otherwise experience them firsthand. For instance, the cosmetic brand Lush has stores are filled with sinks so that visitors can unwrap, feel and smell products [89]. This would be almost impossible to do in anything but an online environment. The most successful retail goes beyond simply shopping for things; in the case of Nike Town and Apple visitors are able to learn new skills or develop existing ones at the stores. Apple offers photography, video editing, music production art and design and coding sessions. At Nike Town, visitors can learn to repair, customise and how best to look after their trainers or apparel; training sessions can be booked with coaches to help visitors design their own fitness program, and in some stores individual foot scanning technology is used offer more accurate fitting shoes [96, 97]. Lush and Apple share the feature of being human-centred in that both stores have knowledgeable staff who engage with visitors. During the retail visits it appeared that Apple Stores had a higher staff to customer ratio than comparable retailers. There is an argument that some retail experiences can be effective communities of practice. In this way, they share features with museums such as the Tate who see themselves as "an alternative learning environment...offering an experience different to formal education " [98]. Wenger also refers to alternative learning spaces, a point revisited in Chapter 6 [58].

3. Physical Location Research



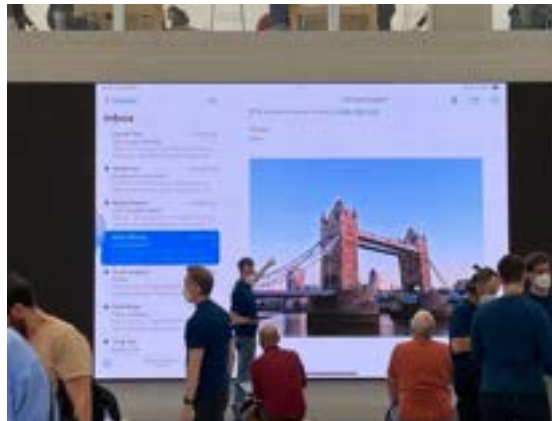
a) Digital: information display



b) Digital: entertainment display



c) Digital: entertainment/advertising display



d) Digital: education display

Figure 3.3: Use of display screens in selected retail stores. The display serves a range of purposes from information, entertainment, or visual spectacle. In all cases, as for the museum screens in figure xx, user presence makes no difference to the output

The display screens at the retail locations were LED video walls. LED displays typically perform better than projector screens in brighter lit environments. However, they are more expensive than projecting onto a screen, with costs between £13,000 - £20,000 per square metre [99, 100]. The retail locations above used their displays and accompanying sound in a number of ways.

a) Footlocker, Paris: large scale display featured text only. Loud music played throughout the location. The music was (to the author) loud enough that it was overwhelming.

b) Adidas Store, Paris: large scale display featured full frame video. Music played throughout at a volume that seemed reasonable (compared to Footlocker).

c) Nike Town, London: multiple displays the most prominent of which displayed video though not full frame. Smaller displays featured scrolling text. A live DJ played hip hop music at reasonable volume.

d) Apple Store, London: large central display used for education (e.g. how to use software packages) and information (e.g. the times of events taking place in store that day). Above the display screen, was an atrium that hosted workshops and instructional sessions.

3.2 Summary

The chapter reviews the findings of field trips to a range of museums, galleries and retail locations. The locations are all concerned with creating in person visitor experiences. Most of the locations featured large display screens. The technologies used varied but the displays were all used the same way; they broadcast to visitors. There was no option for two way interaction.

Chapter 4

Study Design and Development

4.1 Introduction

The project was concerned with developing a Centre to encourage young people to participate in the expressive arts which, as well as their cognitive benefits, can have a positive well-being impact [12, 70]. Within the project, expressive arts were defined as visual art, dance, and creative writing. Creative writing was limited to lyrics. The Centre included the design of both a physical location and supporting computational technologies. Activities in the Centre were constructed as games. In order to understand the types of games and their technology requirements, two studies were conducted. The objectives of the studies were to:

- explore and test expressive art game concepts
- explore and test technical feasibility of the games
- use the games to inform the design of the Centre

Expressive arts and well-being was discussed in section 2.1. For this project well-being was excluded as a consequence of the following:

- *Practicality*: it was unrealistic to design games, implement them, and assess any well-being impact within the time constraints.
- *Study design limitations*: the design approach we used was not appropriate for assessing well-being impact. It was considered with respect to creative writing but falls outside of this thesis.

4.2 Responsible Research and Innovation

As far as possible, the project applied ESPRC's AREA framework over its research and innovation [101]. The AREA framework proposed that responsible research should continuously seek to do the following:

Anticipate: the project analysed potential impacts on an ongoing basis. For instance, in working with Swansea schools it was anticipated that travel to the Centre might disadvantage some schools and students. To mitigate this, the Council are discussing transport funding.

Reflect: this has involved reflecting on the motivations for, and potential implications of the research. Weekly meetings with academic supervisors and stakeholder have provided opportunities to reflect

Engage: the project has started dialogues, and debates with diverse community. There is also a plan to hold regular events within the Centre to help ensure that the activities reflect the needs and desires of visitors.

Act: the Cranes building will be used as the Centre until June 2022. Beyond this date, the intention is to find a new space to continue the research. The future research trajectory will be strongly influenced by the actions the first phase.

As well as ESPRC's AREA, there are two other frameworks that have applied to research innovation.

1. The European Union's Six Keys, which is in some respects a research policy approach. It is not only applicable but also complements the aims of the key stakeholder, Swansea Council. This is illustrated in table 4.2.

2. Swansea Council, as the key stakeholder, have been involved key decision making. Additional to having an external oversight role, their involvement provided further research accountability through the WFG Act; the Act is ultimately what the Council will report the project outcomes against [13].

A proportion of the research funding also comes from Creative Wales; this funding had the effect of placing additional public use, engagement, and knowledge transfer

requirements upon the research. The diversity of the stakeholders therefore is one of the ways that have ensured the research is both responsibly designed and human-centred.

Table 4.1: The Six Keys of Responsible Research and Innovation

Key	Example
Research Ethics	Work in adherence with and reporting against Wales's WFG Act
Science Education	Arts to promote Computational Thinking. Modules for teachers and schools.
Gender Equality	Created balanced research team Designed activities for all genders
Open Access	Intention to publish in open repositories and journals.
Governance	Multiple public stakeholders. including community groups.
Public Engagement	Computational Thinking via arts Showcases, presentations and debates.

The stakeholders and expert groups are discussed more in the following section.

4.3 Expert Group and Stakeholder Workshops

The research development process was informed by the experts and key stakeholders at various stages as follows:

Literature review: involved academic supervisors from the university primarily.

Workshops: Swansea Council were the principal stakeholder. Later within the project, Creative Wales partially funded the Cranes building redevelopment. For this reason, Creative Wales are a stakeholder with respect to reporting, public engagement, and other Key Performance Indicators (KPIs).

4.4 Methods and Approach

Initially, an attempt was made to combine multiple expressive arts into a unified gaming experience. The grounds for this were that it could result in novel forms of interaction and expression. However, there was a scarcity of applicable research to draw upon. Also, the expert group consulted at the design stage articulated reservations about combining the artistic disciplines. They felt it might not feel authentic with respect to the individual expressive arts. The study approach used the following methods.

One-on-one meetings and workshops: used to explore and test ideas. The outcomes of these included sketches, mockups and other physical artefacts. These were shared through the stakeholder group. The meetings and workshops took place via Zoom.

Software test: after the meetings and workshops, concepts and outcomes were translated into game proposals. Software tests were then undertaken to explore key underlying technical approaches and whether or not they were feasible. Tests were done on mobile and/or PC devices on the basis of their availability. There was a risk that as the final design is for larger screen displays some test results might not be valid.

Table 4.2: Summary of Study Methods.

Expressive Art	Method	Purpose
Visual Art	Workshop Software test	Concept development Technical and aesthetic feasibility
Dance	Workshop Software test	Concept development Technical feasibility
Creative Writing	Workshop Software test	Well-being design Technical feasibility

4.5 Study One: Visual Art

The purpose of the visual arts study was to design activities that would be suitable for inexperienced visitors. The project worked with a visual art expert, who had over a 15

year period led hundreds of classes and workshops across a wide ability and age range. The workshops involved discussing and practically exploring game ideas that had the following criteria: *Simple* so that all visitors could play them; *modular* in that individuals or groups could both do them; and, *short*, playable in under 15 minutes, but also capable of more extended use. The design method was kept deliberately simple in order to separate conceptual ideas from technology. The benefit of this was that it was possible to play and evaluate the outcome of games through analogue prototypes.

4.5.1 Visual Art: Method and Approach

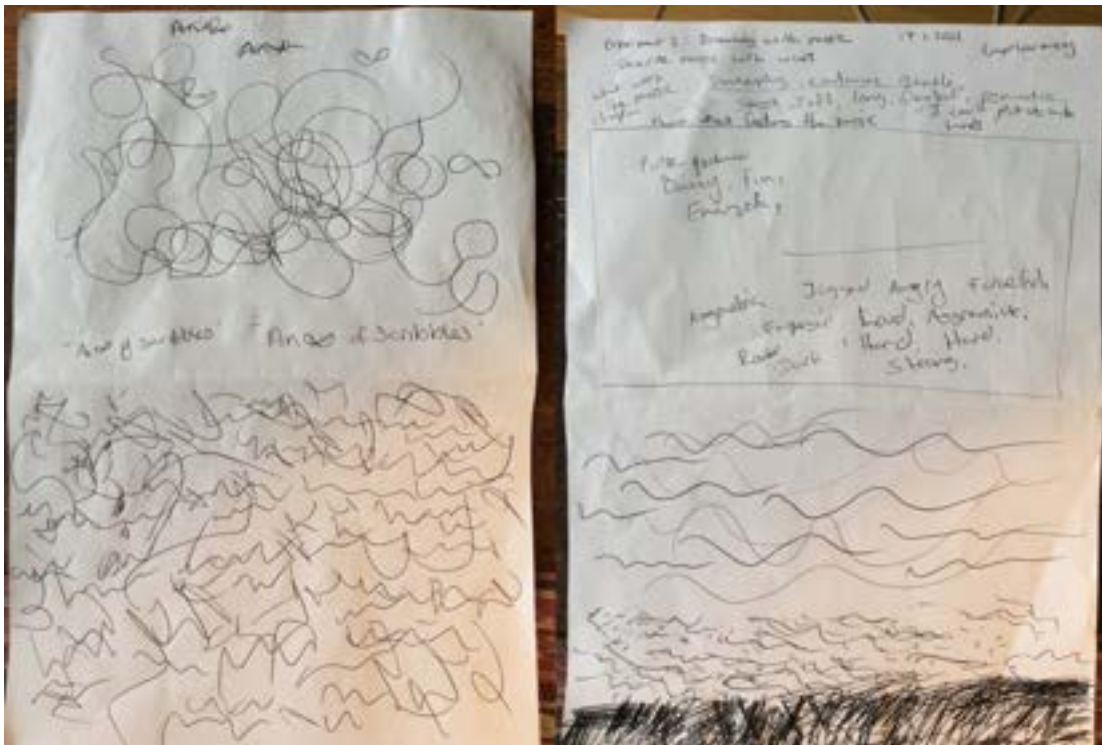
The visual art game concepts were developed with pencil and paper materials and conducted over Zoom. The sessions were led by the visual art expert. The games were essentially time bound improvisational tasks that followed the structure below in table 4.3.

Table 4.3: Visual Art Games Structure

Action	Description
Introduction	Rules were explained verbally
Set up	Reference visual material was presented
Task I	Artistic task attempt within a time limit of 1 1/2 minutes
Evaluation I	Result shared and briefly discussed
Feedback	Instruction given on alternative way to do task
Task II	Task attempt with expert guidance alongside
Evaluation II	Result shared and discussed

Scribble Game: the scribble game was used both as a warm up, and to explore different kinds of mark marking. The game involved dividing a piece of paper into three regions and, within a specified time limit, drawing on within the regions. Before making marks ("scribbles") three short 30 second pieces of music were played. Music was used to invoke a mood prior to creating the marks. It is known that music modulates activity in brain regions connected to emotion-related processing. However, less well known is how music evokes feelings in listeners, and a corresponding taxonomy [78, 102]. At a rudimentary level the purpose of using music was to attempt to trigger specific types of scribble, categorized as *flowing*, *energetic*, and *angry* or *violent*. A critique of the cognitive basis of this approach is beyond the current study; it does have implications for the design of the Centre, which chapters 5 and 6 will address.

4. Study Design and Development



Visual Arts: Scribble Game

Figure 4.1: The scribble game was used as a warm up and to create unrestricted marks. One of the principles of this kind of mark marking is that it is highly accessible and requires little prior knowledge or skill. The marks were made to music and of different types: light flowing marks at the top of the page and darker, heavier marks at the bottom.



Visual Arts: Scribble Game Result

Figure 4.2: The scribbles can be combined to form a landscape image. The marks on the various layers can be re-imagined or re-read by standing at a distance from the image.

Scribble Game Result: the scribble game was designed as a very simple way to get started with visual arts mark making. Despite their simplicity however scribbles have been used in the work of artists such as Twombly and Pollock [103] [104]. Scribbles are also unique to each person. Finally, mark making is part of the Curriculum for Wales which for visual arts refers to skills learners should experience and develop that include: line, shape, texture, colour, design, pattern, tone, shading, space, contrast, proportion, composition, scale and perspective [36]. The scribble game can provide learners with a number of these challenges as the results demonstrate. The scribbles, when viewed from a different perspective, can resemble a landscape; the heavier, dark marks appear to be in the foreground, while the lighter flowing marks are read as being sky or sea. At the point of creating the marks it would not be the intention of the player to produce a useful output. The change in perspective and visual reveal therefore comes as a pleasant surprise. This

has the potential in Reeve's taxonomy for a suspenseful interaction [87].

Landscape Game: the task for the landscape game was to look at a picture of Hobbema's *The Avenue at Middelharnis* for 90 seconds. A verbal prompt was provided to try to "focus on where things are in relation to each other". After 90 seconds the picture was removed from view. Using a pencil and paper, the task was to reproduce the picture as accurately as possible within 90 seconds.



The Avenue at Middelharnis by Meindert Hobbema. (c) The National Gallery

Figure 4.3: Hobbema creates a visual effect, using the trees to funnel the view directly into the heart of the picture and as strong verticals to take the eye upwards. The viewer's gaze is also drawn sideways into the landscape, through the track that turns off to the right and the strong lateral lines of the paths and fields on the left. The combination of these effects is a landscape that almost has multiple vanishing points. This was, at the time, an innovative composition that has had an influence on artists from Van Gogh to Hockney.

Landscape Game Results: the first attempt (a) does not contain an structure in that the cognitive overload of the task resulted in an image with few of the visual features of

the original. The second attempt (b) begins to capture the key features of the original. Most importantly there is a vanishing point as well as a sense of the proportions of the trees, and where other objects are in relation to the trees.



a) Author's first attempt.



b) Author's second attempt.

Figure 4.4: The first attempt was too difficult due in part of lack of understanding how to visualise or *read* the image. This resulted in a rushed attempt to get as much information as possible such as that there are trees, a skyline, a field etc. However, the relative positioning of the details was missing. With some support, the second attempt was able to capture much more accurately both the relative positions and sizes of the key objects. This resulted in a substantially more accurate result.

4.5.2 Visual Art: Results

The result of the visual arts games was a test to establish the feasibility of creating a digital canvas. The first part of the test was to research and decide on candidate software frameworks within the constraints of ease of development, deployment time, speed, and performance for different form factors. Following conversations with colleagues, the software chosen was Phaser. Phaser is an open source framework for making HTML5 games for desktop and mobile browsers [105] Phaser has the advantages of being relatively fast, lightweight and it supports Canvas and WebGL rendering. In principle, Phaser could support visual display at the Centre onsite, as well as mobile or other displays off-site. The canvas software test was conducted on a PC.

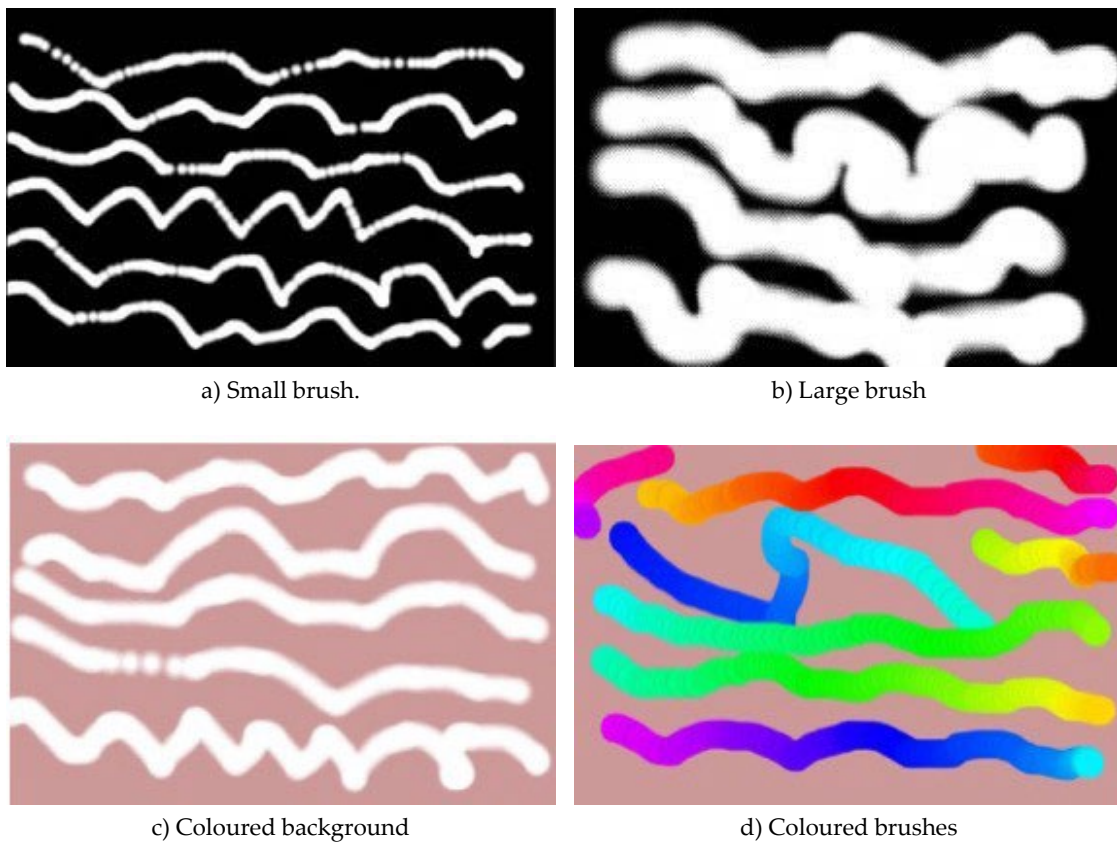


Figure 4.5: Proof-of-concept test with Blender HTML5 game engine. Tests were used to assess the feasibility of converting mark making workshop activities into a digital method

4.5.3 Visual Art: Study Limitations

The visual arts games were mostly restricted to concept testing in order to develop potential game activities for the Centre. Computationally, only rudimentary feasibility testing of Phaser was done. This was limited to looking at Phaser as means to display marks in line with the scribble game. More fine detailed line and mark making was not tested. Also, the scribble game does not have any evaluation criteria beyond the subjectivity of the player(s). The landscape game could in theory be evaluated on the accuracy of the player attempt relative to the reference artwork. However, this could be demotivating for players without formal art training. As the purpose of the game is to develop creativity it could be that departing from the reference artwork is creatively worthwhile for the player. Finally, no work was undertaken to examine how and if computationally a system could read images

in a similar way to the art expert; this is important in pedagogy terms as the art expert's feedback provided a key part of what Gee calls the learning experience [47]. This made the landscape game more rewarding and resulted in the difference between the attempts in figure 4.4. Chapter 6 discusses future developments for visual arts games in more detail.

4.6 Study Two: Dance

Dance offers a variety of experiences that can appeal to young people who have become disinterested in team sports and games. Despite this, there is often a limited dance element in schools' physical education curricula [38]. Given the benefits of movement to physical and mental well-being, perhaps dance has a unique opportunity to impact the lives of high volumes of young people. For example, dance challenges are one of the most popular categories on TikTok, a social network that recently hit 1 billion users [34]. In a study, TikTok's users say they are motivated to participate in dance challenges to build on existing or learn new ones dance skills [40]. As one of the foundations of hip hop, it was important to design an accessible dance game . The method described is from a technical as opposed to artistic or creative perspective. The reason for this that hip hop has many alternative dance forms .e Each has its own culture, style and practice. Rather than focus on particular dance form, a more general approach was investigated which could be adapted to multiple forms.

4.6.1 Dance: Method and Approach

The dance game concept developed with an expert dancer , and one to one meetings and workshops took place mostly over Zoom. The expert specialised in popping, which has a focus on fine muscle movements and control [106]. The game developed was a tutorial and freestyle similar to the kinds of challenges found on TikTok. The rationale for this was that tutorials are important for novice dancers in order for them to approach to understand the key principles of the dance form. The Curriculum for Wales refers to principles in its *discipline specific considerations*, which for dance includes:

movement framework (body actions, space, dynamics, relationships), time (rhythm and phrasing), improvisation, character, motifs/phrases; *performance/refinement* including physical elements (actions, posture, alignment, balance, coordination, control, flexibility, mobility,

strength, stamina, extension, isolation); *expression* (projection, spatial awareness, musicality, phrasing, facial expression, interpretation, communication) and *technical considerations* (timing, reproduction of movement in a stylistically accurate way) [36]

The goal of the sessions was to achieve the following:

1. Co-design a movement vocabulary that had authenticity and relevance in the the dance expert's community.
2. Establish dance moves applicable for novice dancers.
3. Ensure, where possible, that movements could be adapted for participation by people with physical disabilities.
4. Provide sufficient difficulty levels for more able or confident dancers to express themselves.
5. Research and understand the technical constraints around automatically evaluating the dance moves with software.

4.6.2 Dance: Results

The expressive arts experiences should function as games for single or group use without specialist instruction. In the case of dance, this required the exploration of suitable approaches for detecting and evaluating dance and human body positions. Before looking at software, a literature review was undertaken to become familiar with the known challenges for the type of task. Kim has written a number of papers on dance performance and evaluation in South Korea [107, 108]. This was instructive because some of the forms described (K-pop) include similar movements to popping.

After the literature review two approaches stood out. First was PoseNet, which offered real-time pose detection in the browser. PoseNet captures 17 key body positions (keypoints) and is reasonably fast and low on CPU processing [109, 110]. A test was conducted with with the dance expert via a mobile phone. The dancer performed a number of moves in multiple locations and took screenshots of the results. The main goal of the PoseNet test was to see how accurately software was able to estimate human poses and match the dancer's moves. Secondary goals were to also see if the location made a difference (e.g outside vs inside) and if the body position affected the accuracy of the estimation. The final point was important because popping is a dance form that uses fine body movements;

if the model was only able to accurately evaluate gross motor movements then it would not be suitable. PoseNet results are shown in figure 4.6

Although PoseNet was fast it was not accurate. For instance, it was not able to recognise twists for instance, as shown in (c) and (d) in figure 4.6. It was also not reliably able to estimate face or head position, as shown in image (d).

Following the tests with PoseNet, a more advanced model was tried. BlazePose, is a state of the art convolutional neural network (CNN) that produces 33 body keypoints for a single person and runs at over 30 frames per second. In contrast to PoseNet, it focuses on detecting the face on the basis that the face provides the strongest signal to the neural network about the position of the rest of the body. This means a fast on-device face detector can be used as a proxy for a person. The face detector then predicts additional person specific alignment parameters [111]

The results of the BlazePose tests were more promising than PoseNet. At a technical level, BlazePose was more accurate. Figure 4.7 shows the estimated poses as a white skeletal frame. Compared to PoseNet, the estimations are superior in capturing the key aspects of the anatomy such as joints and articulation of elbows, or the lower leg., In addition, the pose estimation is able to handle twisting in image (d) unlike PoseNet. This offers the possibility for dance evaluation to be designed around more than simply front on moves. The most recent evolution of BlazePose (BlazePose GHUM) is able to calculate x, y, and z co-ordinates which allows 3D pose detection. This would allow twists and turns to be included within evaluated dance routines [112].

4.6.3 Dance: Study Limitations

Both PoseNet and BlazePose were tested on a single person. The Center design is based on groups whereby a class of up to 10 or more people could dance together, subject to other technical constraints. While PoseNet does have a multi-person feature this was not the case at the time of writing for BlazePose. As BlazePose is open source it is possible a multi-person feature will be developed. It is beyond the scope of the project to undertake this work however. Another limitation was that dance evaluation measures were not tested. As a counter to this though some ground principles can be ascertained from the research carried out by Kim [107, 108].

4. Study Design and Development



a) Dance experiment indoor location



b) Experiment with dance in new location



c) Dance in outside location



d) Dance new location and move

Figure 4.6: Dance demonstration using PoseNet. Between (a) to (d) are dance positions and the pose estimate of the PoseNet model in white. Images used with permission. .

4.6. Study Two: Dance



a) Dance experiment indoor location



b) Experiment with dance in new location



c) Dance in outside location



d) Dance new location and move

Figure 4.7: Dance demonstration using BlazePose. Between (a) and (d) are dance poses in a number of positions including at (d) a twisting movement. Images used with permission.

4. Study Design and Development

4.7 Summary

The chapter described expressive arts studies undertaken with a visual arts and dance expert. Each study explored the artistic aspects of designing a game around the respective expressive art. The visual arts game designed is described in detail. The dance game focuses on the technology study instead. The results of the studies were used as key elements in the Centre design, chapter 5, after which is the conclusion.

Chapter 5

An Expressive Arts Experience Centre

5.1 Introduction

The studies described in the previous chapter were the basis for the design of the physical Experience Centre; a building refurbished to deliver expressive arts via games and interactive installations.



Former Cranes Music Shop Building.

Figure 5.1: The former Cranes music shop at the start of the project. The shop, which had been in operation in Swansea for over 30 years, closed in 2018. Since then the building has been empty.

5.2 Method and Approach

The Experience Centre is both an experiment, and a means to realise a part of the City of Culture vision to re imagine the city as a landscape using arts and creativity in a structured, playful and collaborative way. [6] Following discussions with Swansea Council, a location was identified for a test Centre. The Cranes building, figure 5.1 was granted *meanwhile usage* planning permission, and has been made available until June 2022. After this period, it will be redeveloped for commercial use as part of the Council's regeneration planning. The building was considered suitable for the project because it is large (a total of three retail shopping units), central, and has some outdoor space. The building also has a large window area and walkway which offers an opportunity to engage passers-by with visual artwork (see below).



a) Artist impression of building exterior

b) View towards the front of the building

Figure 5.2: Artistic visualisations of the Cranes building exterior. Images Gayna Pelham and Doug Lapsley. Used with permission.

After having developed and tested concepts (chapter 4, the next stage was to apply design thinking to the Cranes building. 'The process and some of the outcomes are described below.

1. *Empathise*: it was important to be aware of and respect the various multi-stakeholder objectives. Swansea Council's requirement was to create a destination for young people, and also for the Centre to serve as a hub for south west Wales artists. The latter requirement was as a consequence of funding from Creative Wales.

2. *Define*: the building activities and space uses will define the visitor experiences; this in turn, defines the narrative as to what the building is. This is important as a key part of successful placemaking is telling a compelling story. The project attempted to define the Centre through sketches, plans, concepts and visualizations. The software tests (chapter 4) were also used to define the visitor experiences.
3. *Ideate*: ideas and concept development materials were shared with the key stakeholder in order to ensure their views and opinions were reflected in the designs proposed. A challenge with the ideation stage that a number of stakeholder's expressed, was that it was too abstract. This resulted in it being difficult for people to contribute their ideas. To mitigate against this, sketches were used to help people better visualize what was being proposed.



Ideation Mood Board .

Figure 5.3: Mood board used to develop project ideas. The mood board was used to aid discussions with stakeholder and well as clarify ideas and concepts. Some elements were later removed such as streetwear and physical printing.

4. *Prototype*: it was a not possible to prototype the *building* due to time and resource constraints. Instead, aspects of the *experience* of being in the building were explored via visual arts and dance workshops. The workshops built upon the studies in

5. An Expressive Arts Experience Centre

chapter 4. What the workshops did is give a sense of what *being* in the Centre might feel like. The idea was for this to be a way for people to use their bodies first, then afterwards have a better chance to imagine the Centre via sketches in figure 5.4. Key members of Swansea Council took part in workshops though due to timing this was in advance of the formal project start. Nevertheless, participants spoke enthusiastically about the workshops months later during stakeholder meetings.



a) Dance space.



b) Immersive cube space



c) Example of triggering a game experience



d) Relaxing space

Figure 5.4: Sketches of the initial proposed space uses within the building. (a) dance space based on the ideas and technology described in the dance study. (b) concept for an immersive cube to display visual arts created with a Blender HTML5 application that will located in the Centre. (c) display screen to select from artistic games. (d) space for visitors to relax between activities. Note: the sketches were used to illustrate key ideas and not all aspects were taken forward into final designs. Sketches by Doug Lapsley. Used with permission.

5. *Test*: the testing stage was limited to testing concepts. It was not possible to do more than this as, at the time of writing, the building was not sufficiently ready. More detailed plans for testing are discussed in chapter 6.

5.2.1 Physical Location Design: Results

The final stages of the design process took place once the building had been cleared. At this point it was possible to take more detailed photographs and map these onto floor plans which were provided by Swansea Council as a digital file.



a) View towards the back before refurbishment.



b) View towards the front before refurbishment



c) View to back partial refurbishment



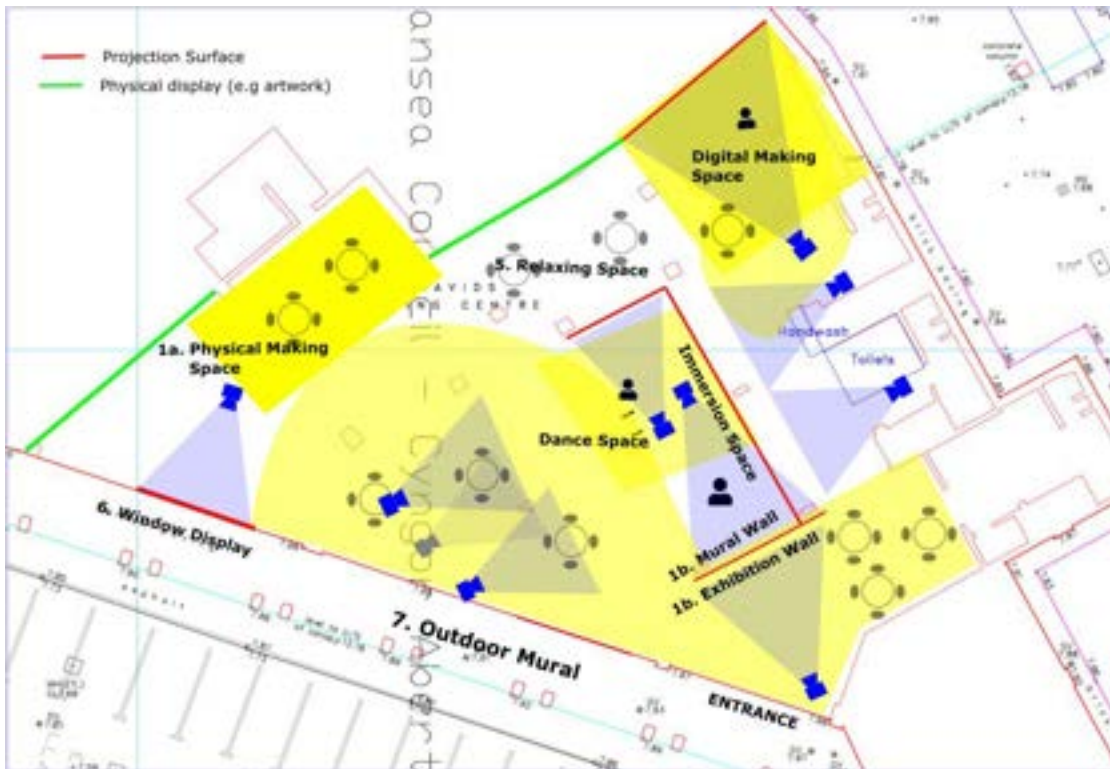
d) View to front partial refurbishment

Figure 5.5: (a) and (b) Cranes building in May prior to refurbishment. Building work was undertaken provide a shell space for the project. This included health and safety work, removing a false ceiling, adding a toilet and sinks for visual arts workshops. The ceiling in (c) and (d) is approximately 1 1/2 metres higher than in the earlier photos from May. Utilities such as electricity, water, and high speed broadband were planned for late September or early October.

The floor plans were used to create a multiple layout plans which attempted to situate the expressive arts experiences. At the request of Swansea Council, a music space was added. As music is also part of the new Curriculum for Wales its addition was seen as

5. An Expressive Arts Experience Centre

an opportunity. The building as a whole should provide "secretive, expressive, magical and suspenseful interactions" [87]. The individual spaces within the building each offer different interaction with the expressive arts.



Experience Centre Floor Layout

Figure 5.6: Layout is build around a large central three-sided display. The display functions as an environment for visual arts and dance via front and rear projection. .

One of the key elements of Centre was large display screens. As well as facilitating visitor interaction, the displays are a visual statement. They are designed to encourage visitors to stop, look and wonder. To achieve this the displays need to have both scale and the images presented on them must be compelling. An example of this is Salesforce's 108 feet long display in their office building in San Francisco [113]. An online projector distance calculator tool was then used to assess possible locations for ceiling mounted projectors [114]. Measurements were not exact to the nearest millimetre. When combined with the floor plans (figure A.1) the projection estimates led to workable layout configurations. Earlier layout concepts had an immersive cube (figure 5.4b) as the focal point of the Centre. This was changed after the refurbishment of the building. Once inside the refurbished

building, it was felt that the immersive cube did not take advantage of the scale of the raised ceilings. Instead, a new design sought to use the increased ceiling height through a larger scale three-sided display. Figure 5.6 (above) shows the proposed layout.



Experience Centre Visualization

Figure 5.7: 3D Model of Experience Center focused on large immersive display screen. The screen serves as the foundation for visual arts and dance. Image created by Doug Lapsley. Used with permission. .

After discussion with the stakeholder, the layout was used to create a 3D model. The model allowed a virtual walk through of the building. As the project involves multiple stakeholders, a shared visualization of the building has been invaluable. It has helped the stakeholder's get a clearer understanding of how the space could function. Additionally, the 3D model has helped decision making on design elements such as colours, the size of position of the Centre activities, and set up of lighting grids. The project has thrown up a number of challenges, many of which require *seeing* what it is that is being talked about. The 3D visualization enabled richer and more rewarding dialogue between all the stakeholders.

5.3 Summary

The chapter described how the studies in chapter 4 were used to construct design concepts and layouts for the Centre. The chapter also examined some of the key technical and artistic challenges in designing the Centre. Finally, the chapter ended with a visual overview of Centre and its key elements.

Chapter 6

Conclusions and Future Work

6.1 Conclusions

The project explored the use placemaking and computational technology to create an *Experience Centre* in Swansea where 14-16 year olds can participate in visual arts, dance, and creative writing. Within the thesis, a prototype design for the Centre was developed for deployment in Swansea city centre. The design was created using a design thinking methodology in collaboration with the main stakeholder, Swansea Council and artistic domain experts.

6.2 Summary of Contributions

The main contributions of this work can be summarised as follows:

- **Design of a technology-based Experience Centre based on the new Curriculum for Wales**

The design of the Centre was based on a combination of placemaking, technology interaction, and hip hop culture. The Centre supports the Curriculum for Wales and offers new ways to learn and explore the expressive arts. From the author's research, the Centre will be unique within the United Kingdom.

- **Visual art and dance informed software and building design**

The Centre software design concept was been developed as part of studies with visual arts and dance experts. The literature review suggests this is novel, as most

software approaches in dance and visual arts do not have artists in a prominent role. Furthermore, visual arts and dance were also the basis for the building's layout.

- **A review of literature integrating placemaking, expressive arts, and well-being**

The project literature review connects ideas and concepts from placemaking, expressive arts, gaming, creativity, and computational technology.

- **Cultural development of hip hop as a Community of Practice**

The project has built upon the original elements of hip hop culture through both physical space and software design.

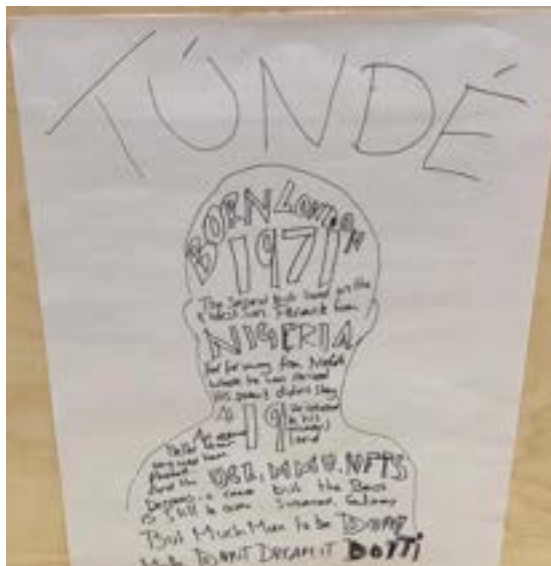
6.3 Discussion and Future Work

Hassenzahl refers to experience design being about a negotiation between the designer and user. He suggests that designers have a right to be present in their work and should not be beholden to the idea of objectivity [115]. This approach describes how this thesis was developed. A number of ideas were proposed and explored as a way to consider what an interactive learning and play space *could look like*. The thesis is also very much concerned with the expressive arts as a way of thinking within education. As Wenger argues, the school is part of a broader learning system and of which life is the main learning event. Schools and classrooms have an important role to play, but they have to be in the service of the learning that happens in the world [58]. The thesis argues that in creating new types of space to develop expressive arts skills, learners will be able to use more aspects of their lived experience. The learners favourite music artist, film, or something they have seen in a dance video - these would form part of a creative experience they have which is linked to a curriculum but not constrained by it. The thesis is part of a multi-year journey. In early 2022 the Centre will open to the public and the expressive arts games will be available for wider scale exploration. Beyond the concepts described in the thesis, future work has emerged from the research.

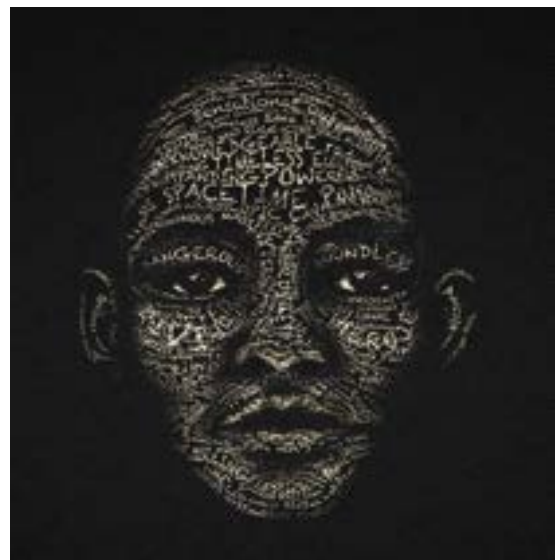
Mobile services: a location-based Centre has the possibility to offer visual scale via large display screens. Despite this, it is still important to reach visitors outside the Centre. The most realistic way is through a mobile apps and/or progressive web app (PWA). Future work should include determining the kinds of mobile technologies and feature that can best

blend in-person large display experiences with small screen mobile ones. Reeves taxonomy provides a useful framework to analyse how mobile could work within the Centre.

Creative writing as visual art: creative writing was discussed in the literature review but was not part of the studies. Future work could build on the LYRICAL KOMBAT application in order that lyric based art can become part of the Centre. There are various ways this could take place but types of work envisaged include: creating visual landscapes based on visitor's words, visual word art as a way to see data patterns, for instance language relationships; exploring relationships between words, meanings and shapes.



a) Handmade Typography Art Example



b) Digital Typography Art Example

Figure 6.1: One of the ways to integrate visual arts and lyric writing activities is with typographic art. With a combination of machine learning and designed templates, novel ways to translate lyrics into striking visual images could be offered. The images above (a) the author's personal story and created on day one at the Computational Foundry. (b) Image is owned by the author.

Deformable Interfaces: the thesis proposal for visual art is based on a large digital canvas which is activated and controlled through an HTML5 game engine. A limitation of this is the physicality and tactile aspect of painting and drawing is lost; with deformable interface it might be possible to offer something closer to the analogue but the the advantage of digital. The project could benefit from the body of existing experimental work in this area.

6. *Conclusions and Future Work*

Inclusive Design: the project as designed makes a number of assumptions based in part on the technologies. This is not as inclusive the Centre should aspire to. In order to create truly inclusive technologies with respect to say disability, the involvement of an organisation such as Scope is something future work should investigate.

The work described in this thesis is 3 months of a planned 3 year project. It is hoped that at least some of the ideas above are implemented within this period of time.

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Appendix A

Floor Plans

Below are the floor plans that the design was based upon. As the plans are not to scale, some adaption is likely over the implementation stage of the project.



Ground Floor Plan Measurements

Figure A.1: Building floor plan measurements used to estimate the maximum sizes of the display screens. The floor plan measurements were created by using Swansea Council's digital plan and opening the file with an online tool. The online tool allowed the distances to be visualized, and a file was created with the measurements superimposed on the floor plans.

Appendix B

Projector Calculations

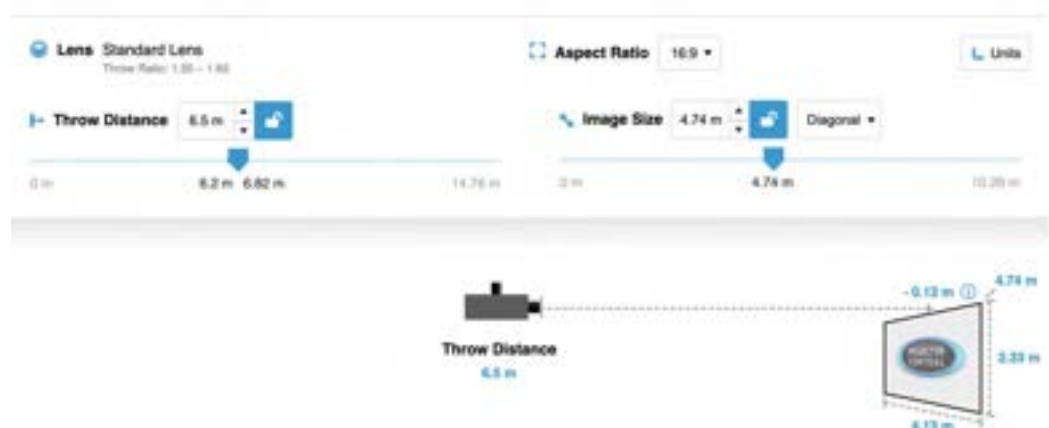
In order to design visual display areas it was necessary to understand the throw ratio, throw distance, and image width. These are defined below [116].

Throw Ratio: the relation between the throw distance and the image width.

Throw Distance: the distance between the projector's lens and the projected image.

Image Width: the width of the projected image.

An online projector distance calculator tool was then used to assess possible locations for ceiling mounted projectors.



Estimate of Projector Distance and Display Screen Size

Figure B.1: Brief detail of spaces etc. .