

**Structuring Stories: A Framework for Developing Narrative
Structure to Enhance Creativity for Art Students**

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2023.09.26

DECLARATION

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ABSTRACT

Since identifying the challenges of enhancing students' creativity in the fields of narrative art as the research question, I aim to apply trans-disciplinary thinking by bringing some insights from physics into art and design practices, which are depicted as "a cultural symbiosis" (Galili and Zinn, 2007, p.453). In the practices of art and design, the concept of creativity is the most vital ingredient as its appearance is unpredictable just like quantum leaps (Koyama and Niwase, 2017, p.3). Referring to String Theory, the eleven dimensions of space-time might show similar patterns with information exchanges of interactions. The physicist "sets out to break nature down into its component parts while the artist synthesizes different features of reality" (Shlain, 1991, p.16). This deconstruction-reconstruction process is the core of structuring creative stories. In order to find opportunities that might encourage creativity in narrative art, I am looking for a way to analyze or untangle interactions and enable a novel framework for considering storytelling in art and design.

My hypothesis: I borrow ideas that describe the 'quantum entanglement' in order to compare the information loop of interaction as analogy between the physics and phenomena of art. By constructing the eleven dimensions of interaction, a theoretical framework called *Interaction Hyperspace* is proposed, which, when applied through teaching, will inform and enhance students' creation of story combinations by affording a range of possibilities for innovative solutions.

To test the theory of the framework regarding *Storytelling as Interaction*, an original interactive application is developed for art students and practitioners as a creative practical tool. The research aims to be engaged with professional practices, including academic teaching and interactive narrative design as case studies. The data collection and analysis are based on Activity Theory (Engeström, 1987) and Action Research (Costello, 2003), which provide the main theoretical and conceptual methodology of the research.

The case studies in practices come to a conclusion that a framework *Interaction Hyperspace* for narrative structure can potentially fuel the inspirations and offer directions for art students in their art and design. Furthermore, the creativity of a existed work can be enhanced through the instructions of this framework from the view of the designers and the peer reviews.

Keywords: Narrative Structure, Creativity, Art and Design, Trans-disciplines

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Acknowledgments

I would like to express my deepest gratitude to my supervisor team, Dr Howard Riley and Dr Peter Spring, for their knowledge, guidance and every supports for me in completing this research. Also, many thanks to Dr Robert Charters and Programme Manager Timi O'Neill of their lectures and academic helps over years.

I am grateful to my family who always support and love me without reserve. Especially, I started my research since my son Tianlang was 4 months old and he has given me inspirations, strengthes and belief to complete my doctorate research all the way.

I extend my gratitude to my colleagues and students of Fujian Jiangxia University for supporting me and being sympathetic to me during this research.

1. Introduction

1.1 Overview

This practice-based research aims to develop a framework for exploring and structuring stories which support the concept design for arts and design in university teaching. In a way of thinking *interaction as storytelling*, the creative practices of university arts students require a rational mechanism for enhancing creativity rather than relying on the sparks of ideas. "Intuition in art is actually the result of prolonged tuition" as Ben Shahn (1957, p.108) pointed out in *The Shape of Content*. Similarly, nurturing creativity is a systematic and structured synthesized process.

When people encounter a piece of art work or a product design, we tend to analyze them for meanings, make up a background story by our own imaginations or interpret them from one's particular experience. Especially, modern interactive work is more immersive, providing a broad narrative space for the audience. As a game designer and later an animation lecturer for eight years of professional practices in the creative industry, I am exploring how to construct a systematic logic of stimulating creativity for the students of narrative art: animators, illustrators and similar designers.

By proving a framework for structuring storytelling called *Interaction Hyperspace* as a working title, the research intends to give shape to the visual construction of narrative for practical use in university teaching and the larger scope of creative industry. The primary inspirations of *Interaction Hyperspace* borrow ideas from the field of physics, quantum theories and hyperspace theories, as analogy with some phenomena in the areas of arts and humanities. The trans-disciplinary thinking is not looking into the hyperspace by the scientific knowledge, but borrows some terms and phrases from quantum science. In both areas of quantum mechanics and humanities, there are some common features across the boundaries while the term *interaction* is the most prominent connection in-between.

1.2 Identifying the Problem

From my experience as a digital game designer for two years and later eight years of teaching in university as animation lecturer, I recognize many art practitioners and students considered that creativity is the most valuable ingredient in their work. The homogeneity of art and design is a growing issue in the creative industry while the students often find it hard to discover where innovations come from.

When asking students the philosophical question about what creativity is about, they tend to agree with Albert Einstein: "Creativity is seeing what others see and thinking what no one else ever thought" (Hargadon, 2006, p. 219). However, most of them were stuck with *where the creativity comes from*: "I would take a bath or clear my mind then let the creativity come to me" said by Xiao, a graduate student of animation

who has won six national awards for his final project and is working as a senior effect artist. In teaching and supervising students, I recognize some creative minds are more remarkable than others. However, the situations about the students coming from different backgrounds are not always the same. I admire what Mary Lou Cook (Torronez, 2018) said about “the creativity is inventing, experimenting, growing, taking risks, breaking rules, making mistakes, and having fun.” The majority of creative practitioners engage in similar actions to foster innovation, rather than relying on conscious thought.

Being Chinese and an educator, I believed *YouJiaoWuLei*, the proposition from Confucius’s discourse, which means making no distinctions of students in teaching. No matter what a student’s talent is, one is supposed to be educated equally. Moreover, there is no end for creativity. I am always curious about how the great ideas were stimulated and keep experimenting in my own professional practice. In teaching animation students, the creative combinations occur between the stories, characters, environments, audio-visual language and editing montages. For this study, the original starting point is the students’ own perceived problems of generating ideas and their desires for a formula of creativity.

In the scope of art and design, it is inevitable that the spark of an idea sometimes comes from coincidence. However, I argue that the methodical guidance might provide a more productive way to develop creativity. In the book *A Technique for Producing Ideas*, James Webb Young(2003, p.38) as a former advertising agency executive, set up an instructive paradigm and influenced the advertising industry for half a century. He asked: “Can a formula or technique be developed in answer to the question: How do you get ideas?” By answering the question he summed up the steps as:

1. Gather raw material constantly.
2. Combine old elements in new ways.
3. Go do something else for a while. (Unconscious Processing)
4. Wait for the idea to come. (The A-ha! Moment)
5. Take the idea to friends for their review. (Idea Meets Reality)

Not only the brand designers look for the recipe for creativity, every discipline of art is eager for the answers. The example of Picasso has to be raised as described in the book *The Art of Ideas: Creative Thinking for Work and Life* (Duggan et al., 2019). *Desmoiselles d’Avignon*, one of Picasso’s most famous paintings of modern art was inspired by Matisse’s *Bonheur de Vivre* and African sculpture. The secret of Picasso’s creative style is ‘combining two pre-existing elements into something new’. Through many stories told, the creativity comes from a process of deconstruction and reconstruction. One might be able to synthesize from raw material and design for objective-oriented purpose. When the innovation works in art and design, what could be the formula for it specifically?

In my professional practices, I work with animation design mostly, but also game design, interactive design, and graphic design. In other words, they are different disciplines of narrative art. Narrative art tells a story, either as a moment in an ongoing story or as a sequence of events unfolding over time (McNamara *et al.*, 2012, p.63). From traditional Christian painting to modern experimental animation, people keep trying to discover and interpret the narratives behind the art. In my opinion, it is the instincts of humans, consciously or unconsciously, to unscramble what they see and feel. When storytelling involves the capacity for interactivity, it often means “what happens when some form of communication between two separate entities causes a story to be created” (Tearse, 2018, p.9). Especially, when storytelling works within animation, in my understanding it tends to “bring the participants into the works (stories) instead of instilling the information into the passive receivers” (Laaksolahti, 2008, p.1). This research tries to indicate that interactions between the audience and the stories are more than simply delivering background stories, but convey sympathy, value, and emotional exchange. Therefore, from the perspective of interactivity, to enhance the storytelling is the main function for art and design, which enables the source of creativity to be more methodical and practically useful.

1.3 Research Questions

In order to find opportunities for encouraging and enhancing creativity in animation and other narrative art forms, I am looking for a way to deconstruct or untangle interactions and trying to build up a framework for structuring or enabling a way of storytelling to help inform students and young practitioners.

The interactions between the art and audience, characters and environments are processes of a series of dynamic changes. In the entangled relationships, they influence the story through user interfaces, unpredictable plots and social cognition. To test if a straightforward framework can benefit in outlining the essential information in interactions and inspiring ideas in storytelling, the main questions that are explored in this research are:

- (1) What is interaction from the perspective of storytelling?
- (2) Can storytelling be seen as interactions for informing narrative art?
- (3) If storytelling can be seen as interactions for informing narrative art, how could a framework for structuring storytelling work for empowering or enhancing creativity?

Since the research aims to contribute to the professional practices in art and design by producing more creativity in the field, it is essential to identify an angle to understand narrative structure storytelling. When the first question is determined, then the latter questions try to discover how *interaction as storytelling* influences and helps the construction of narrative.

Structuring interactions by multiple dimensions refers to *M-theory* (Schwarz, 1999, p.107), describing that there are eleven dimensions which consist of ten space dimensions and one time dimension in terms of the supersymmetric quantum mechanics. The research will be put into the professional field of animation as a practical strategy providing solutions. As an academic researcher in the field of creative industry, I intend to explore and focus on these aspects in this practice-based research:

- (1) Explore and analyze the storytelling and its interactivity within narrative art.
- (2) Explore concordant patterns from quantum theory in relation to interactions.
- (3) Develop a storytelling framework, *Interaction Hyperspace* as its working title, and apply it to university teaching practices.
- (4) Design an interactive installation using the theory proposed above as a useful tool for professional practice.
- (5) Compare and analyze, to find out if the framework works for the designers of narrative structures and the perceptions of the public.

1.4 Research Background

When teaching Animation Planning and Composition Design for more than 5 years, I have been looking into the question about how to produce more creative design and have gradually developed and introduced lectures about creative combinations. My research aims to help the students to develop unrestrained enhanced creativity at the early stages of the design process.

My interests in creative design started with my B.Eng. in Digital Media Art from 2007 to 2011. I had studied script-writing for animation, graphic design, user interface design and game design experience. From then, I took a career direction as a game designer of mobile online games for the following two years. In order to pursue more possibilities in the creative industry, I continued my academic education in M.A. Creative Arts Practice at Newcastle University from 2013 and exhibited interactive installations as my main practices. I have committed to study about the interactive and immersive design, and I have taught and supervised Animation in university since 2015.

As an interdisciplinary practitioner I recognize the diverse skills and techniques I explored and applied to different type of art and design practices are not all the same. However, the part I value and admire the most is the process of creative concept design. It is normally in the very beginning stage of every design and influences the entire process. In my interpretation of art and design, the most valuable peculiarity lies in how work conveys particular emotions or experience through the work. The concept design about a piece of art might be able to depict an age of prosperity, a tragic but heroic figure or abstract but passionate mood. We see them in most of the narrative art and analyze the work with stories. Therefore, in my professional practices, how to construct and deconstruct art and design with narrative skills is

always a core point.

In the university teaching practices, I have tried my prototype method for brainstorm or stimulation for design. It has been influenced from my years of art education and a synthesized absorption of many creative methodologies. As an early concept design, the method focuses on divergent thinking and random potential combinations. In these early stages, I would put a key word (which usually would be the theme of subject creation) in the middle of a sheet of paper. For example, starting from *childhood*, it begins the first level of association like *innocence*, *games*, *snacks*, *songs*, *TV* and so on. It would continue the imagination of keywords and diverge like a sun-shaped diagram by the second, third or fourth levels of associations. Then, the next main step is selecting two or three words from the diagram and combining them as a new setting. For examples, from the different branches, I randomly picked words *a song called Planting Suns* and *Angry Bird for game* which leads to an imagination story: for example: a big bird is angry about the vicious summer sun, while a team of little birds is planning to breed a series of new suns for comforting the freezing northern areas and in dark nights. In this way, a beginning and conflicts for a standard story emerges, which appeals to the innocence of childhood and empathy for different people in various situations.



Figure1.1 My Drawing Note on 2019

My students have benefited from this method from past courses and it still remains as a rough approach to be polished in the university art classroom. These teaching experiences and wider literature reviews influenced the developing questions from *how to produce more creative design?* evolved into a deeper and more concrete exploration about *what do we see in art and design?* and *how do we approach it methodically?*

The concept of creativity in art and design has been a myth for artists and philosophers for thousands of years. A series of horses and rhinos movement drawing

were discovered on the walls of caves in southern France from at least thirty-two thousand years ago (Figure 1.2). This Palaeolithic art was interpreted as a creative act by presenting the animated movements like what the modern animators do. Picasso said “They’ve invented everything” (Thurman, 2008, p. 59). He was a brave pioneer in searching multiple possibilities in creativity, and amazed by this mysterious art across thousands of years.



Figure 1.2 Photograph by Jean Clottes / Chauvet Cave Scientific Team

In this thesis, I do not aim to propose the ‘secret’ or reveal it in a philosophical approach, but attempt to start considering this question: *what hinders creativity when we design?*

In animation students’ projects, when the work is showing lower level of innovations, they tend to imitate some Hollywood-like stories, as the commercial films have a strong influence upon them. In other words, the plots or the characters are so predictable for the audience, whereas I maintain the creativity which narrative arts require is exactly the opposite. But the far more serious problem is that students sometimes are not aware of what hinders their creativity and keeps producing the similar routines. The French sociologist Pierre Bourdieu (1992) said that the *Habitus* is how a person influences the actions which responds to the social world by way of their personal habits, skills, and dispositions. The common pattern of social lives and media influences have affected the current students into making similar decisions and exhibiting similar behaviors. Kendell Haven (2007), a professional storyteller and story consultant carefully defines a story: “A story is a character-based narration of a character’s struggle to overcome obstacle and reach an important goal”. When the students would like to deal with objective-oriented design, their inspirations come from the search engine by typing a same keyword and evoke their memories with

similar life stories. In China, the ‘Millennials’ generation is growing in relatively well-off families while their main goals for the first twenty years are academic pursuits. The shared experiences of the university students show influences on their creative works based on the social habitus of this age.

1.5 Identify the Academic Gap

The aim of this study is to address the research questions by developing a practical teaching approach for creative art that draws on diverse disciplines, such as M theory and quantum theory, employing analogies and metaphors. The application of physics principles such as quantum mechanics, to the construction of art and design is an emerging field of research. For example, Galili and Zinn(2007, p.453) argue that art and science share a common goal of understanding the world and that they should be seen as complementary rather than opposing fields. They have explored this connection and suggest that physics and art can inform each other by providing insights into the essential principles of the universe.

To address this gap specifically, the computational framework and its display of *Interaction Hyperspace* is designed to embody the trans-disciplinary method of narrative construction in realizing the enhancement of creativity for art students. The original contribution of knowledge of this research may offer creative design thinking of structuring stories as well as an interactive tool in professional practical education. However, further research is always needed to explore these relationships between disciplines and improve the theoretical framework from the actual creative industry.

1.6 The Methodological Approach

The research questions lead to the core inquiries of how structuring storytelling through the perspective of interaction could assist art students with their practical design. “All research is interpretive: guided by a set of beliefs and feelings about the world and how it should be understood and studied.” (Denzin & Lincoln, 2018, p.19). The beliefs and inquiries processed through the researcher, and the data retrieved and analyzed by the interpretations from subjective perspectives. In the context of encouraging creativity, this research involves helping students to explore their own creative processes and understand how they personally generate new ideas and concepts. An Interpretivist philosophical stance is adopted to this research. In response to the research inquiries, the research is designed using qualitative methods to collect and analyze data from three case studies of different assignments with art students and practitioners.

In terms of method, there are several alternative paradigms (Figure 1.3) and methodologies that can be considered. There is a brief review of the available paradigms of my research regarding to *The SAGE Handbook of Qualitative Research* (Denzin and Lincoln, 2018).

Issue	Positivism	Postpositivism	Critical Theory et al.	Constructivism	Participatory*
Ontology	Naïve realism— “real” reality but apprehensible	Critical realism—“real” reality but only imperfectly and probabilistically apprehensible	Historical realism— virtual reality shaped by social, political, cultural, economic, ethnic, and gender values; crystallized over time	Relativism— local and specific co-constructed realities	Participative reality— subjective-objective reality, cocreated by mind and given cosmos
Epistemology	Dualist/objectivist; findings true	Modified dualist/objectivist; critical tradition/community; findings probably true	Transactional/ subjectivist; value- mediated findings	Transactional/ subjectivist; co-created findings	Critical subjectivity in participatory transaction with cosmos; extended epistemology of experiential, propositional, and practical knowing; cocreated findings
Methodology	Experimental/ manipulative; verification of hypotheses; chiefly quantitative methods	Modified experimental/ manipulative; critical multiplism; falsification of hypotheses; may include qualitative methods	Dialogic/dialectical	Hermeneutical/ dialectical	Political participation in collaborative action inquiry; primacy of the practical; use of language grounded in shared experiential context

Figure 1.3 Basic Belief of Alternative Inquiry Paradigms- Updated (Denzin & Lincoln, 2018, p.111)

Ontology deals with the nature of reality and the fundamental essence of existence (Creswell, 2017, p.19). Within an interpretivist ontological framework, “Our individual personal reality- the way we think life is and the part we are to play in it- is self-created. We put together our own personal reality (Guba & Lincoln, 1985, p.73)”. The coexistence resonates with the multiverse concepts in quantum theory (Wallace, 2012, p.46), which the analogy in this research across discipline. In the Chapter 4, there is discussion about the reality of interaction. When the storytelling seen as a form of interaction, varies interpretations are perceivable by the storytellers, the designers and the audiences. Thus, the first research question aligns the discovery of ontology of interaction as start of story construction.

The constructivist paradigm emphasizes the importance of understanding how individuals construct their own understanding of the world around them, which is the understanding of creating art and design in this case. Through lived experiences and interactions with other members of society, researchers must participate in the research process to produce reflective knowledge (Denzin & Lincoln, 2018, p.115). In the case studies of teaching practices, researcher as teacher plays an important role in ensuring the research process and the main interpreter of the reality.

Epistemology concerns itself with the grounds of knowledge or the 'connection between reality and research.' In the context of interpretivist epistemology, the proposition emerges that the researcher constructs comprehension through subjective knowledge acquisition. This involves seeking to comprehend a particular context and directing attention toward the distinct and tangible aspects within it (Carson *et al.*, 2001, p.16).

The critical paradigm focuses on issues of power and inequality, and encourages researchers to take a critical perspective on societal structures and systems. In the context of encouraging creativity, this could involve exploring how different societal factors (such as gender, race, or culture) impact creativity, and working to empower students who may face barriers to creative expression.

Methodology is the process of how we seek out new knowledge. The principle of our inquiry and how inquiry should proceed (Schwandt, 2007, p.190). In the interpretive approaches, interviews, observation and analysis from the interaction between the researcher and participants are applied in the case studies concerning this research mainly regard the practices in the design activities and the process of ideation.

Though, there are many different paradigms and methodologies that could be relevant for this research. By carefully considering the strengths and limitations of different approaches, I am attempting to develop a framework that is tailored to the unique needs and experiences of the students they work with by a framework for encouraging creativity among art students. The learner autonomy always values highly in the educational industry, thus it drives my momentum to conduct research focusing on the individual perspectives of their design according to a storytelling framework. The particular interpretations of participants involved in the design activities are valued in the data collection and analyze to this research. Therefore, it is intended to be conducted within the interpretive paradigm to reflect the subjective meanings of the participants (Pring, 2005, p.243).

Since adopted in the Interpretivist paradigm, this research has found its consistency in Symbolic Interactionism, which is from the many approaches of Interpretivism. Gray (2009,p.21) believes that “human interaction with the world is mediated through the process of meaning-making and interpretations”. He also concludes these essential tenets of Symbolic Interactionism:

- People interpret the meaning of objects and actions in the world and then act upon those interpretations.
- Meanings arise from the process of social interaction.
- Meanings are handled in, and are modified by, an interactive process used by people in dealing with the phenomena that are encountered.

In the case of this research, “the meaning of objects and actions” means how the students construct their storytelling when “acting upon those interpretations” could symbolize the design they generate upon their stories. Especially, my understanding of storytelling could be seen as interactions, which fits the second tenet where art and design find their meanings from these interactions. Stories from *Framework IH* are easy to be “handled in and modified by”, which makes the storytelling “an interactive process” with the students’ individual experiences.

Figure 1.4 is the research model designed for this process, which indicates the relations between the theoretical framework and case studies: how each case study feeds into one another and responds and reflects on the fundamental framework. The first case is defined as the Test phase of a short-time classroom design assignment among animation students, which aims at delivering the idea of *Framework IH* to assist their narrative design and comparing the differences before and after the intervention. Based on the data and observations in the first case, the second case is defined as the Adjustment phase when the interface of the framework utilizes an interactive application to convey the *Framework IH*, which pays attention to a complete work by a group project and how the storytelling framework affects a long-term assignment and compare the different stages of design. The last case is defined as the Promotion phase, aiming to put the storytelling application to a more general use with more narrative design conditions. It explores the possibilities of different categories of design using a narrative-centered method among multiple backgrounds of practitioners. All cases and discussions feed into the core concepts and reflect the process to improve the framework.

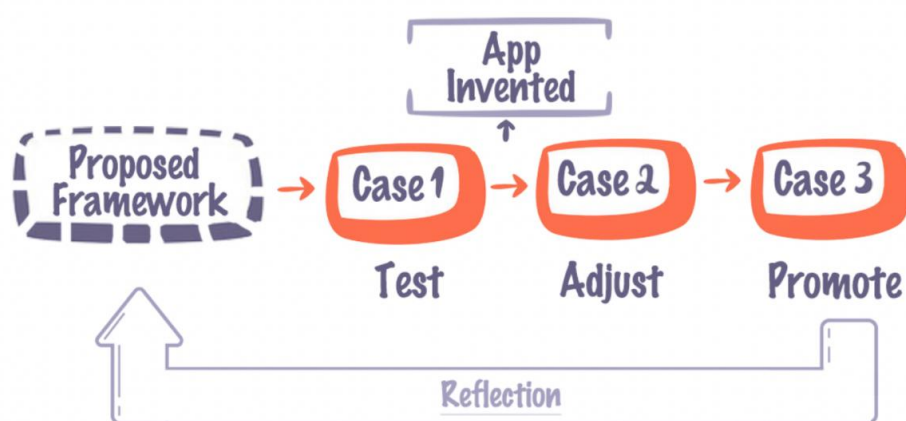


Figure 1.4: The Research Model

Research design is based on qualitative research, taking into account Activity Theory (Engeström, 2015) (Figure1.5) and Action Research (Costello, 2003), which provide the main theoretical and conceptual framework of the research. Furthermore, I am trying to propose my own interpretation of Activity Theory regarding my working framework as Revised Activity Theory (Figure1.6) used in one of the case studies. Activity Theory offers a systematic model to deal with multiple environments like university classrooms and the complexity of subjects. The use of Activity Theory as a method for creativity (Kinsella, 2018, p.493) enlightened me to develop a new method to apply to my research which takes into account more interaction-related aspects.

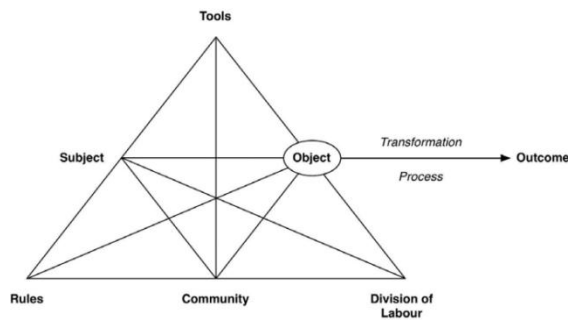


Figure 1.5: Engeström's Activity Framework

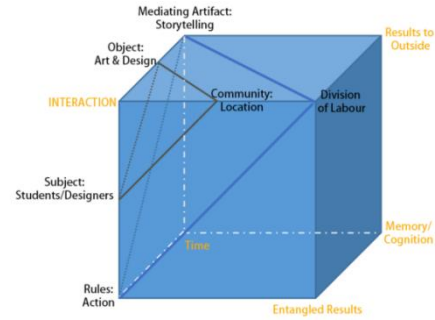


Figure 1.6: Revised Activity Theory

As my research necessarily suggests that I am an insider action researcher, I cannot be separated from the participants because it is our social interaction that created the data (Guba and Lincoln, 1991, p.158). I might be participating in most of the practices, instructing the process while I am the researcher observing and interpreting these case studies. The following is a brief description of the three case studies:

Case Study 1: Animation Planning

Content: Conceptual design practice in classroom for first-year undergraduate students.

Methods: Data will be gathered mainly using on-line questionnaires, discussion notes taken in class by the researcher and analyzed using Revised Activity Theory.

Participants: Students (sample size about 35) from animation in Fujian Jiangxia University.

Case Study 2: Augmented Reality Animation: *Door*

Content: A complete animation work from a group of students.

Methods: Data will be gathered mainly using in-depth interviews and design diaries by students, and analyzed using Action Research.

Participants: A small number of animation students collaborating on one piece of work.

Case Study 3: Theme design: A Piece of Sea Take-Away

Content: Experienced designers working on a common theme's design.

Methods: Data will be gathered mainly using online questionnaires and interviews about the design process, and analyzed using Activity Theory.

Participant: 9 Chinese designers currently residing in China or abroad.

1.7 Thesis Structure and Overview

In this chapter (1), the critical question about creativity and interaction is brought up from original daily experience and thinking, along with the discussion and explanations about the main methodology of this research. In the following chapter(2), literature reviews about visual construction of narrative and ideas inspired from

quantum theory are discussed. As an early working framework, Interaction Hyperspace will be deliberated and explained how it related to and influenced by the *M theory* in chapter (3). In the next chapter (4), there is the detailed explanations of the specific methods conducted in this research. Inspired by the hyperspace dimensions, the layers of interaction is going to be dissected into eleven aspects in the early research. After determining the basic framework, three case studies of teaching and practical applications of creative scenario will be described in chapter 5, 6 and 7. In the final chapter (8), conclusion of the present research, preview of further professional practice and proposed questions will be presented. Therefore, this thesis is trying to propose a means to stimulate innovative ideas by analyzing interaction between people and objects, where more specifically, the research is intended to feed on educational methods and creative industry as a interactive tool.

1.8 Research Contributions

The goal of the original contribution to knowledge that this research offers is to feed into the professional creative practices, while the main original product of this research is an interactive digital tool for encouraging and facilitating creative storytelling and design. By proposing a storytelling framework, it aims at figuring out the connections or *interactions*, the term used in this thesis, between objects, audience, environments in structuring more possibilities and help people break the original patterns and beyond boundaries in art and design.

Another outcome of this practice-based research is the development of a teaching model for art students, especially engaged with the young undergraduates, targeting on providing more creative means and interactive tools to design narrative art.

1.9 Chapter Summary

Practice as research is an ongoing process during the DProf programme and the framework considering storytelling is proposed to be critical development for the creative art and design activities. This research will continue to discover trans-disciplinary theory and put into professional practices as main evidence and adjust the methods in helping university art students with more possibilities of creativity.

Since the researcher's perspective and interest for structuring stories is *interaction*, the case studies were collected and analyzed focused on this perspective to improve the application *Interaction Hyperspace*, which potentiality feed into the educational environments and creative industry in the following research stage. In this first chapter, the motivation, and the evolution of research question, proposed methodology and cases overview have been briefly introduced. According to the research focus, more relevant literature reviews will be elaborated in the next chapter.

2. Literature Review

2.1 Overview

This literature review supports the aim of helping to contribute to the practice of art and design and the assumption that interaction is the core element within the arts. The discussion is divided in four sections which give a general foundation for the framework of structuring stories for art and design. Firstly, in Section 2.2 the focus is on the discussion about *interaction*. In the domain of art and design, the definition of interaction responds to many interpretations and leads to more critical discourse across different disciplines. Secondly, the next section, 2.3 searches similar patterns and inspirations from the quantum theory, especially the hyperspace theory. The borrowed ideas from physics afford more insights of universal rules between science and arts to organize a structure and start setting up theoretical model. Next, the following Section 2.4 concentrates on the storytelling structures through texts and visual art. The comparison of different narrative theories carries diverse characteristics and, crucially, helps identify the gap in the research field. Lastly, more literature and practice review about the methodology of creativity are introduced in Section 2.5 for the purpose of this practice-based research as the final contribution is to provide a suggesting solution for the practical creative field.

2.2 What is Interaction?

When a piece of art is brought up in an art review, what is seen in that work? Having completed a design, what are we expecting it might communicate? When we appreciate something as creative, what is the formula that actually involves, inspires people?

These questions are not the essential research questions to answer in this thesis, but are the starting points. Many answers to the above questions would be considered appropriate and even wise, philosophically. Among them, there might be a chance that the interaction is my interpretation of these questions and it gives me motivations to look into the art and design though the entangled relationships. Coincidentally, Claire Bishop (2012, p.235) holds a similar view “the consideration of art as participative with a concept of interactivity...” while Steve Dixon (2007, p.559) announced “all art is interactive”. In agreement with them, in order to contribute original knowledge to the practical industry, I am trying to look into the topic from a perspective of interaction as a starting point.

In the search of a theory of everything, which unifies all theories, the scientists have made their efforts in finding the answers in physics. Brianna Browne’s (Harman, 2018, p.22) claim that “physics, and string theory in particular, has limitless applicability”, which postulates the total number of dimensions was expanded to eleven rather than the four dimensional space-time from Einsteinian physics (Harman, 2018, p.23).

However, Harman's Object-Oriented Ontology (OOO) indicated "science cannot provide a theory of everything" while philosophy is a form of knowledge and aesthetics is the root of all philosophy.

The mention of aesthetics tends to bring the questions to art ontology while this thesis is in search of the ontology of interaction, which means what interaction is. When people are asking what something is, the answers are subjective to the responders, often millions of them. Generally, the answers fall into the two categories, "knowledge (what a thing is made of) and practical know-how (what a thing does)" (Harman, 2018, p.44). It is the human instincts that attempt to comprehend something by their emotional experience and physical feelings.

Technically, according to the *Oxford Advanced Learner's Dictionary* (Turnbull *et al.*, 2010), the definition of interaction is "the act of communicating with somebody, especially while you work, play or spend time with them" when the relationship exists between performers and their audience. Or "if one thing has an interaction with another, or if there is an interaction between two things, the two things have an effect on each other" .

From the definition, *communication* might be seen as one of the synonyms of *interaction*, which requires messages and media used through the information exchange for *having an effect*. In Chinese aesthetic theories, there exists discourse about "Integration of *Tao* and *Artifact*" from *Zhouyi*. *Tao* is the metaphysical, which is believed that *Tao* is the noumenon or content of *Artifact* while *Artifact*, representing the physical, is the appearance or form of *Tao*. They are supposed to be integrated and synthesized under the laws of how the world works. In the practical field of art and design, *Tao* could be explained as the actual meaning the art is trying to express and *Artifact* is seen as the technical methods for achieving the goal. Communication could be seen as the *Artifact* of interaction in this case.

In sociology, communication means "the various methods of sending information between people and places, especially phones, computers, radio, etc." (Turnbull *et al.*, 2010) In Shannon–Weaver model of communication (Shannon and Weaver, 1949), the transmitter exchanges information to the receiver. When the message is sent back, the circulation of information comes up. This model describes the legible process of message moving and participants in each module.

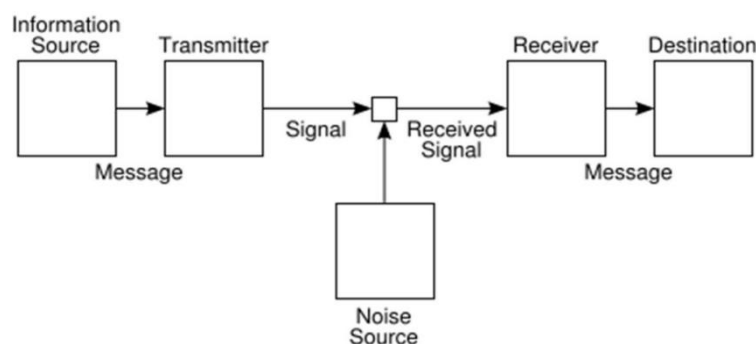


Figure 2.1: Shannon–Weaver Model of Communication

Even though this model is classic and has been iterated for many years, I have doubt about the linear model of information exchange. I would imagine the information is in a loop like the flow of water. In my opinion, the attenders switch roles and their messages become entangled.

The transmitter and the receiver are swapped every time the message is delivered so there is no need to point out the specific identification. The objects within the loop as the main attenders are affected by the impact of information. Whatever the signal or the noise, these interrupt the constituent flow of messages, creating certain effects caused by reacting to each other in this information entanglement. When there are more than two objects attending the information interchange, the information flows within them. Notably, the *information flow* is integrated with all the messages, signals and noises. That would never be one pure ingredient but create a complex mixture with all the unexpected influences caused within the entanglement we understand as communications.

As to the direction of the information flow, the situation varies from different scenarios. If the interaction is time-divided communication like instant messaging or letters writing, there is an initiator and replier. That pattern follows the Shannon–Weaver model as a linear form. But not all the scenarios all that typical and simple. In a football match, the interactions between the players are triggered in the same time. Since the whistle blowing, every body movement and every eye contact are collected into a Mobius-Strip-like information flow.

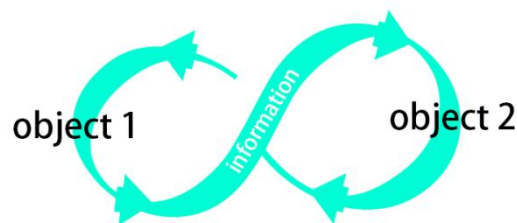


Figure 2.2: Flow of Information Exchange

Therefore, the entangled loop of information is my definition of *interaction*. The actual useful messages, the media used to convey, the environment and even all the unwanted noises constitute the interactions, where the objects (human or non-human) are parts of the entanglement and have effects on themselves and on others.

2.3 Quantum Theory

It is information that is the most vital factor within the various communication modes. As shown in Figure 2.2, the primary understanding of interaction is described as an

information entanglement within two or more than two objects. In my early thought, I used to imagine that the overlap of multiple human experience (or information) would be visualized as a structure of layers (Figure 2.3). Various routines of A,B and C are independent experiences in their lifespan. They would come into contact with each other, have intersection for a period of time and at last would move on separately. The yellow shadow indicates the intersection between A and C while red shadow means the intersection between A and B. Notably, the dark part with ABC is the triple overlay when A and B and C are having the interaction together.

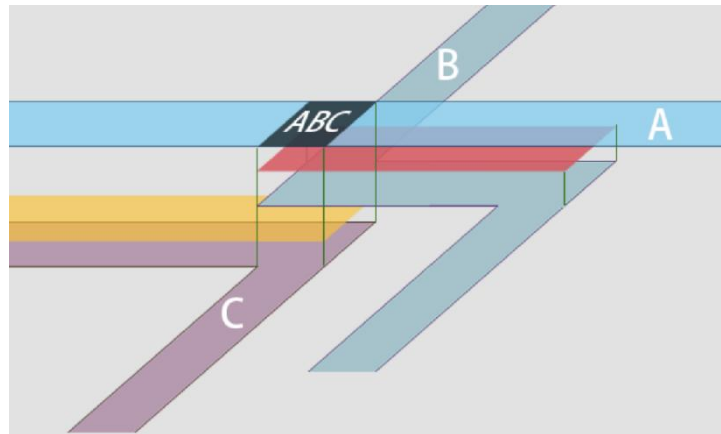


Figure 2.3: Interaction Visualization

Everyone has shared the mutual experience for a while and then continued to move on by each own track of life. The universe is conventionally described in terms of physical quantities such as mass and velocity, but a quantity at least as important as these is information. (Stone, 2016, p.17)

If I could use an analogy from physics to information theory, the mutual entangled interaction could be described as *dimensions* instead of layers. The quantum entanglement fits the pattern and how people cognize the flow of information exchange. Especially, in the scope of art and design, most would agree that we place a high value on creativity. In quantum mechanics, the quantum leaps are not linear, but discontinuous, as Koyama and Niwase (2017,p.3) claimed that “the sudden appearance of idea is like the quantum leap.” Also, the latest research has discovered: “the researchers could spot when a quantum jump was about to appear, ‘catch’ it halfway through, and reverse it...” (Ball, 2019) This *action* resembles a lot with some kinds of interaction process. Certain interaction happens after a signal sent out. For example, people could pick up their phones talking to others only after they discover the incoming phone call ringing. And they are able to reverse the interaction from happening by hanging up. Also, when doing sport like tennis, people are ready to interact with their tennis ball after they swing and hit. These gestures are strong messages before the real action coming, while most people are used to read that hints to their relative chain reactions. They are necessary and sufficient conditions of pre-signals and they could be interrupted to cut off the interaction.

Based on the analogy between quantum theory and my definition of interaction, here is a comparison table to show the relativity between the quantum terms and the interaction terms (Table 1).

Table 1. Comparison of Terms

Quantum terms	Interaction terms
Quantum entanglement	Information loop of interaction
Quantum leaps	Interaction
Signal before quantum leaps	Signal before certain interaction
Reverse quantum leaps	Cut off interaction

That's why I try to borrow some concepts of hyper dimension from quantum theory, or particularly M theory, as references for the later research.

Considering that we ordinarily live in a universe of (3+1) dimensional space-time, we perceive the world by relying our physical tactile sense and inferential experience. Length, width and height allow us to detect and locate three-dimension geometric volume while time is measured by different calendars or clocks. As a three-dimensional being, we might only have vision of three-dimensional objects and find it hard to perceive higher dimensional notions. From the perspective of spatial theory, the hyperspace is based on calculations by use of the mathematical-physical method that is clarified and further developed from the string theory up until the present moment.

At the present study claims, the eleven dimensions were introduced by *M theory* where M could stand for magic, mystery, meta, to reflect our current state of incomplete understanding, membrane and Matrix theory for other possibilities or even mother of all theories (Schwarz, 1999, p.107). The M theory describes that there are eleven dimensions which consist of ten space dimensions and one time dimension in terms of the supersymmetric quantum mechanics.

Through various thoughts on the space-time, the quantum theory and how we perceive interaction, the entangled information flow might allow us to observe, to explore and to design both physically and philosophically.

2.4 Storytelling

2.4.1 Story and Narrative

In the *Oxford Advanced Learner's Dictionary* (Turnbull *et al.*, 2011), there are two key definitions of *story* fit the purpose of this research: "A description of events and

people that the writer or speaker has invented in order to entertain people”; “An account, often spoken, of what happened to somebody or of how something happened”. A similar term in the category of discussion is *narrative*, which means “a description of events” or “the part of a novel that tells the story, rather than the dialogue” (Turnbull *et al.*, 2011). In this thesis, the attention is drawn to the construction of visual arts and how we approach to them. Therefore, on my definitions, I would not make a severe distinction between *story* and *narrative*, which are both *artifacts* for guiding visual arts and providing interaction between the work and the audience.

2.4.2 Storytelling

As for storytelling, this derivative word from story means “the activity of telling or writing stories” (Turnbull *et al.*, 2011). It adds a more dynamic and action-driven state to story and enhances the interactivity between the tellers and the audience. This tension precisely describes the essential attribute this research seeks to present, which emphasize on the connectivity and relationships. Further, defined within this research, *storytelling* is the action, the influence and the bond of attenders communicating stories.

2.4.3 Quantum Storytelling

As John Polkinghorne (2002, p.26) once claimed, “Classical physics describes a world that is clear and determinate. Quantum physics describes a world that is cloudy and fitful”. When narratology meets with quantum physics, the multiple interpretations of narrativity could be seen as the possibilities within the multiverse by its readers’ or observers’ view. Boje (2014, p.201) also proposed Quantum Storytelling “by outlining a three-part model of the storytelling process: Empiric Stories, Epistemic Narratives, and Ontological Living Stories, each as connected to one another through the antenarrative process.” He looked at the processes of turning subjective experience into narrativized understanding and brought his 11D’s approach of ontology to the surface. In Tang Li’s (2013,p.11) view, “the transdisciplinary quantum narrative brings fresh vigor to post-classical narratology and also offers a new method and cognitive pattern to the creation and explanation of literature”. The moment when the story's ending is spotted, is like the opening of the box containing Schrodinger's Cat. It is not the moment when the universe breaks apart, but the moment when the observer becomes aware of the universe in which the story is set.

2.4.4 Narrative Theories

When one is looking into the narrative theories associating with arts, there is evidence showing many structuralists contributed to art as narrative in the late twentieth century (Elkin, 2015, p.38). In art education, prominent theorists like Claude Lévi-Strauss (1963), Seymour Chatman (1978), and Paul Ricour (1984), remind us of

the importance of narrative to art, along with the traditions of semiotics and phenomenology in the study of art. (Green, 2018, p.33).

Inspired from Goethean botany, Vladimir Propp was convinced that “the realms of nature and human creativity are not separated,” and that “there are laws valid equally for both, that can be investigated with similar methods” (Propp, 1984, p.68). His theory of the composition of folk tales is “not an archetype or the reconstruction of a single imaginary tale, but something altogether different: it is the compositional scheme underlying all wondertales, the skeleton” (Propp, 1984, p.74). This resonates with the idea of proposing my original framework, borrowing trans-disciplinary thinking of quantum theories and forming up a creative scheme. However, argued by Lévi-Strauss, the essence of a particular tale is not to be found through any single “archetypal tale,” but rather through “many concrete tales” (Lévi-Strauss, 1984, p.181).

The opposing opinions and debates between Propp and Lévi-Strauss were enlightening, not only the phenomena between formalism and structuralism but the methodology how text is structured. To deduce or reduce from the literature across stories, folk, tales, epic, poet, novel, and even new media in the context of digitized culture, might shift the following research and adjust the framework according to the practical case studies.

As for the narrative structure, the Three-Act structure is known as a storytelling model for narrative fictions. It divides a story into three parts termed as Beginning, Middle and End by the great Greek philosopher, Aristotle (384 BCE - March 7, 322BCE) in his book *Poetics* (Ismail, 2006, p.40). Syd Field (1984, p.41) simplified the three-act structure, Setup, Confrontation, and Resolution, usually used in screen writing and films. He associates the Aristotle dramatic structure with the screenplay, corresponding each other as Figure 2.4 shown.

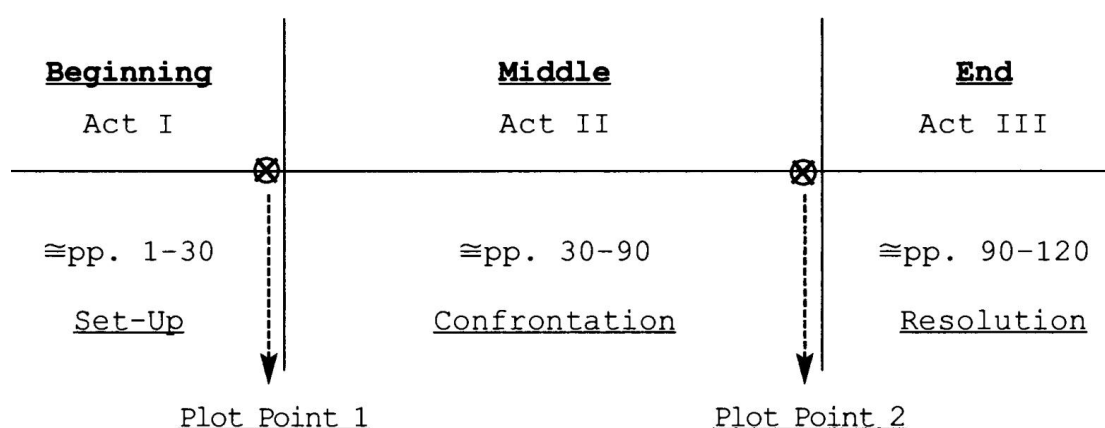


Figure 2.4 Paradigm of a Screenplay by Syd Field

In China, the narrative education from early age of students provides a four section

for a story, that is the beginning, the development, the climax and the end. It is tacitly accepted as a classic model when we learn, analyze and create narratives. These theories more or less have a subtle effect on my prototype of framework. The consideration about structural composition will be deliberated in the next Chapter 3.

2.5 Creative Visual Construction

Throughout the history of research on creativity, beginning with “learning about and understanding the world around us” (Sternberg, 1999, p.17), most artists agree with the view that “creativity comes from selecting and combining parts of what came before” (Duggan et al. 2019, p.11). The most innovative ideas might develop from personal experience and synthesize fragmented raw materials, a process of deconstruction and reconstruction.

The physicist “sets out to break nature down into its component parts while the artist synthesizes different features of reality” (Shlain, 1991, p.16). This deconstruction-reconstruction process is the core of structuring creative stories, which might inform the meanings of art and design and why they matter. Physics and arts could be depicted as “a cultural symbiosis, making two areas mutually dependent and attract the natural curiosity of many students” (Galili and Zinn, 2007, p.453), the two disciplines share similarities in some respects.

In trans-disciplinary thinking, Michael O’Toole (1994) also applied Michael A.K. Halliday’s linguistics to the visual arts and attempted to provide a systematic framework of tripartite functional semiotics. In this system, visual arts are analyzed and evaluated from the representational, modal and compositional functions (O’Toole, 1994, p.24). Nonetheless, O’Toole gave examples of classic paintings, like Botticelli’s *Primavera* (pp.7-23) based on his abundant knowledge of art histories but hasn’t directly related these evident advantages to the art and design practices of students. Whilst appreciating the semiotic interpretations across paintings, sculptures and architecture by O’Toole, my research aspires to discover a framework of practical exercises in the narrative arts through multiple media.

2.6 Interaction as Storytelling

Narrative art tells a story, either as a moment in an ongoing story or as a sequence of events unfolding over time (McNamara *et al.* 2012, p.63). From traditional Christian painting to modern experimental animation, people keep trying to discover and interpret the narratives behind the art. In my opinion, it is the instincts of humans, consciously or unconsciously, to unscramble what they see and feel. When storytelling involves the capacity for interactivity, it often means “what happens when some form of communication between two separate entities causes a story to be created” (Tearse, 2018, p.9). Especially, when storytelling works within animation, in my understanding, it tends to “bring the participants into the works (stories) instead of

instilling the information into the passive receivers” (Laaksolahti, 2008, p.1).

Installation artist Olafur Eliasson (2019) claims “Changing the world means changing the way we experience the world” in a documentary *Abstract: The Art of Design Season 2*. That resonates with my opinion about interaction, which is capable of changing the relationships between the art and the audience; the characters and the environments; and the physical feelings and emotional cognition. In the scope of art and design which this research is targeting, every interaction is how we experience the world and everything is interaction. Thus, I define *interaction as storytelling*, in which case every art and design artefact is construed as storytelling, referring to its interactive way of constructing and engaging with audience and the environment.

2.7 Chapter Summary

This chapter starts from the consideration of contribution to art and design practices and explores the possible solutions from the perspective of *interaction*, which is assumed as the core of art and design practices. In the discussion of the ontology of interaction, some ideas from quantum theories are introduced as main analogies presenting comparable patterns with the social behavior of interaction. By structuring stories, it shows a potential methodical way of creating visual narratives, like photographs, paintings, films and animation. In the scope of this research, the *storytelling* is a dynamic and interactive process in association with concepts of quantum storytelling. Instead of looking into the aspects of physics, the borrowing of ideas from quantum theories helps the interpretation about creative visual construction as a storytelling framework. Thus, *storytelling as interaction*, is the fundamental root guiding creative arts and design, which is *Tao*, while the proposing framework into practices is the *Artifact*. In the next chapter, there is the constituent of the framework *Interaction Hyperspace*, corresponding to the research questions and some evidence to support its reasonability.

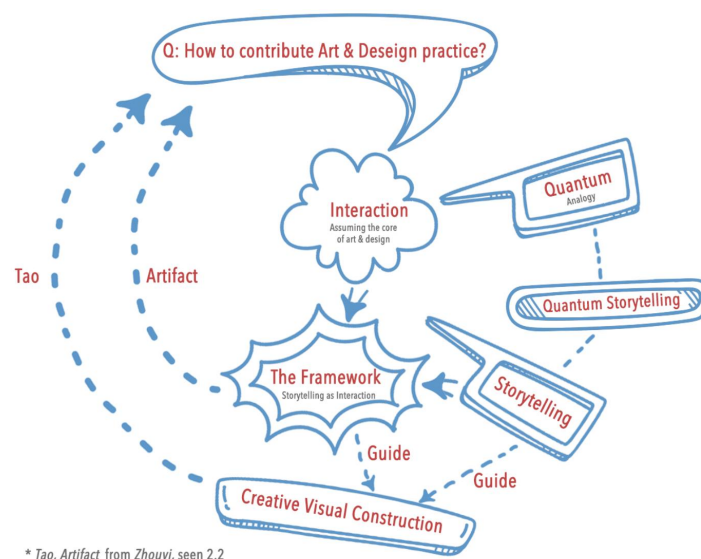


Figure 2.4: My Mind Map of Literature Review

3. The Framework Interaction Hyperspace (Framework IH)

3.1 Overview

From the review of literature and discussion, the appearance of *interaction as storytelling* might be seen as evocation of the creativity from art and design practices. It corresponds the first research question of *What is interaction from the perspective of storytelling?* The consideration of a framework about structuring stories is the *artifact*, which is the proposed assumption to the research question: *If storytelling can be seen as interactions for informing narrative art, how could a framework for structuring storytelling work for empowering or enhancing creativity?*

The framework is established by the review of the question and refilled with inspirations found in the scientific perspective. To testify the proposed framework, there are also some ‘lab-experiment’ examples by myself to show how this framework is used for analyzing art and design and encouraging creativity for designers.

3.2 Establishing the Framework

*“Nature requires five,
Custom allows seven,
Idleness takes nine,
And wickedness eleven.”
Mother Goose*

In the earlier chapter, referring to the quantum theory, hyperspace theory in particular postulates the total number of dimensions as expanded to eleven (Harman, 2018, p.23). From the *Oxford Advanced Learner's Dictionary* (Turnbull *et al.*, 2010), *hyperspace* means “space that consists of more than three dimensions”. This is my initial inspiration borrowed from physics and helps to establish eleven dimensions or layers of interaction, and the use of *Framework Interaction Hyperspace (Framework IH)* as my early working definition.

Table 2: The 11D Framework of *Interaction Hyperspace (Framework IH)*

Dimensions	Concepts	Question asked	Definitions
0 D	Object	What is the main target in the story?	Nominate a leading object in the interaction and the story will be told from its subjective point of view. Object could be human or non-human.
1 st D	Location	Where is the main object?	The location means where the main scenario takes place.

2 nd D	Action	What is the object doing?	The action, either dynamically or statically, indicate the original condition before interaction.
3 rd D	Result(State)	What is the state/ result of the main object?	The result/ state could be an identity, or an important adjectival description about the main object.
4 th D	Time	What time is the story happening?	Indicating a specific time or a vague concept of time.
5 th D	Interaction	What interactions happen with the object?	Describing a short story, including the attender(s) and main event.
6 th D	Entangled Result(to self)	What is the result on the main object by the interaction?	The effects on the interacting object by this interaction.
7 th D	Time of Interaction	How long is the interaction?	The period of time when the interacting participants are involved.
8 th D	Possibilities of Interaction	How likely is the interaction occur?	Evaluated by the users (Likert scale), what the possibilities of the interaction are.
9 th D	Intensity of Interaction	How strongly does this interaction occur?	Evaluated by the users (Likert scale), what the intensity of the interaction is.
10 th D	Result to external participants	What is the result to those outside (other than the main object) by the interaction?	The effects on any ‘outsiders’ (apart from the interacting participants) or the environment by this interaction.
11 th D	Memory/Cognition	What is the most memorable or perceptible thing in the interaction?	The more psychological effects influenced by the interaction.

In geometry, a single point is the zero dimension when the single object is doing nothing in nowhere. It is the so-called zero dimension that is a single *Object* of *Interaction Hyperspace*, with no meaning of information exchange. Notably, the *object* as defined in this framework could be a protagonist (as the principal character in most literary work), or it could be a non-living thing as a piece of design. The principle here is object-oriented. When we deal with a target in need of further analyzing or designing, the main focus is the *object*.

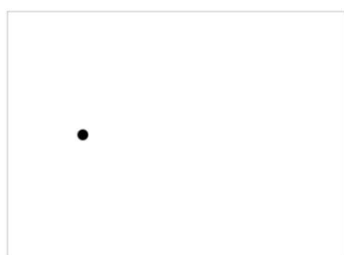


Figure 3.1: The Zero Dimension: Object

The first dimension of the framework is defined as *Location*. Based on knowledge about the geometric point, the point moves, forming a line which constitutes one dimension in space. In the visualization of one dimension, it might be imagined as a coordinate, presenting that a single object moves with the information of location. But in a literary context, the location is not always an absolute coordinate point in the map; the description about location could be addressed as a vague or relative concepts, such as in a wonderland, in the mind, or in dreams.

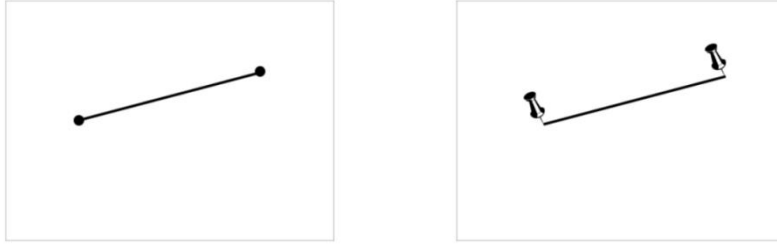


Figure 3.2: The First Dimension: Location

Next, the second dimension is defined as *Action*, while this dimension in geometry is the plane. In the framework of storytelling, when a participant is moving from one point to another point, they are conducting a certain action as they move. The right-hand section of Figure 3.3 visualizes this state, carrying more information than the first dimension.

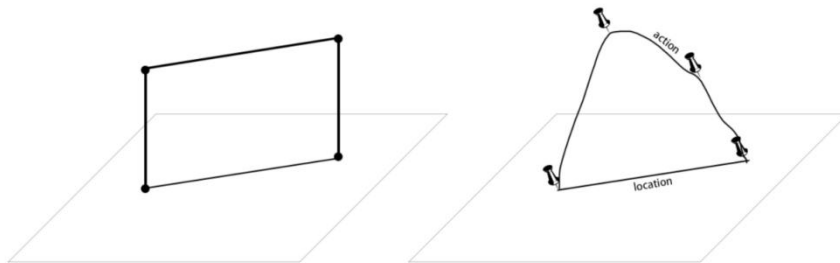


Figure 3.3: The Second Dimension: Action

Then, the three-dimensional space corresponds to the framework, which makes the third dimension is *Result (State)*. The result for a single object means the original state. It conveys more information about the condition of the object. As indicated in Table 2 above, this dimension could be described as the adjectivally or as an identity, or an important effect upon the main object. For instance, one's state might be happy, or a princess, or poisoned. Compared to the other concepts, this dimension is more likely to show the qualities of flexibility and creativeness.

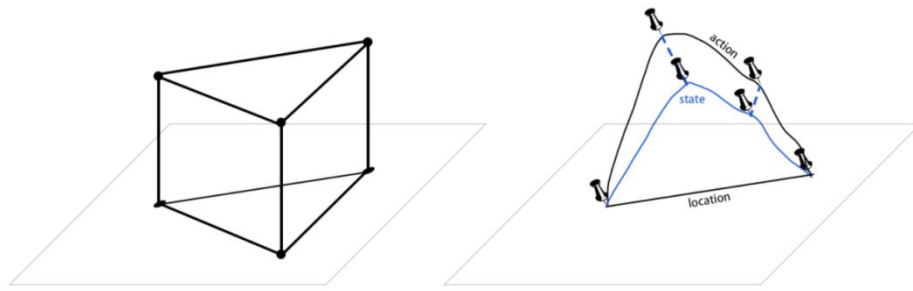


Figure 3.4: The Third Dimension: Result (State)

The fourth dimension of the framework is *Time*, understood as what we know of the physical space-time. Figure 3.5 represents the time-superposition state of the object. Particularly, the definition of *time* is also not a definite concept and appears in many narratives as a directional time, like long long ago.

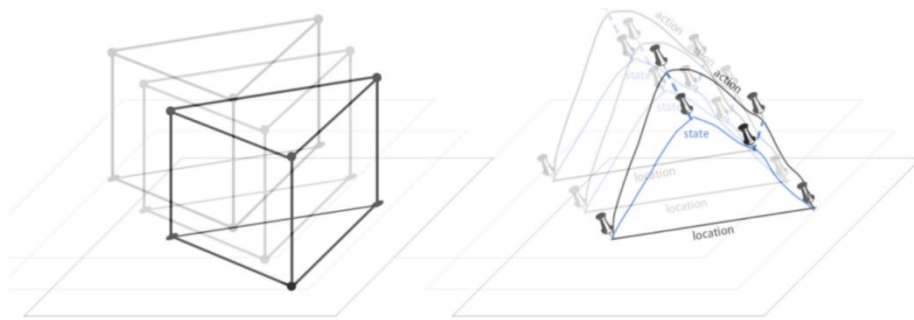


Figure 3.5: The Forth Dimension: Time

So far, an object with the information of *location*, *action*, *result(state)*, and *time* is prepared for an incoming interaction. The fifth dimension of the framework is designed to be *Interaction*. This framework tends to determine a main object and the other attender(s). Even though the interaction is mutual, the description in a story is in a subject tone.

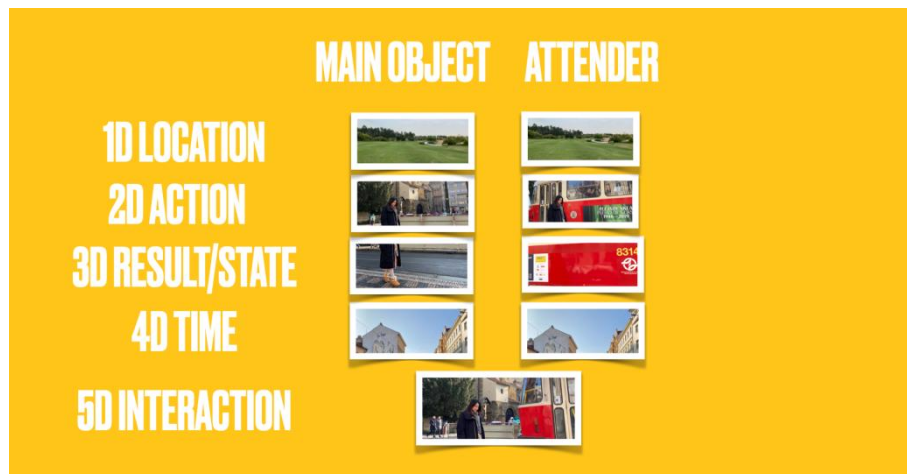


Figure 3.6: The Fifth dimension: Interaction

The sixth dimension is *Entangled Results* (to the main object by the interaction). All participants are affected by the interaction no matter how small it is, they are influenced eventually, either physically or mentally. This dimension addresses these effects to oneself and how the main object reacts to the interaction. Figure 3.7 visualizes this interactive process, *New A* identifying what the sixth dimension implies.

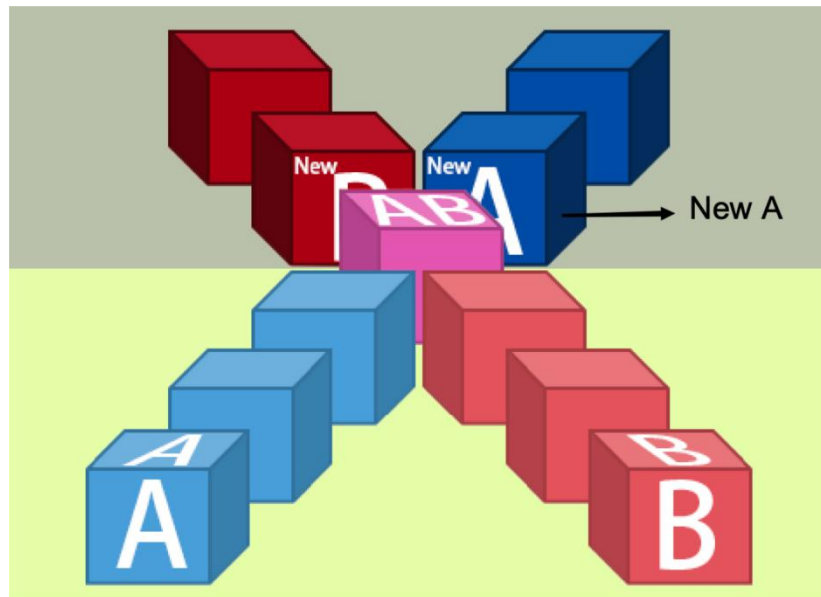


Figure 3.7: The Visualization of Interaction

The seventh dimension is *Time of interaction*, which describes the duration of information exchange in the interaction. Note that the duration of interaction is not always the same when the interaction happened between certain participants. For instance, there is a group of people (more than two) in a free discussions (see Figure 3.8). Their time spent differently in this mutual conversation while they join and leave separately; the time would be described subjectively by the judgement of the main object.

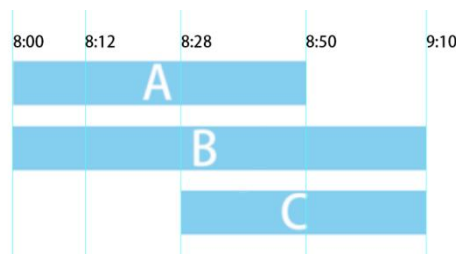


Figure 3.8: Different Time of Interaction

The eighth dimension is *Possibilities of Interaction*, evaluated by the users or

storyteller through the Likert Scale. Within the framework, the possibilities of interaction refer to the various potential instances of interaction, including those that have occurred and those that have not. In the sense of hyperspace, it might be compared to the multiple parallel-universe theory. When the story used for art and design, the higher possibility of interaction might indicate the story is more predictable and more reasonable. When the value shown on the Likert Scale is lower, the more unexpected and unusual combination might show up. Imagine in a coordinate of possibilities, the lower direction tends to be of higher aesthetic value and special pieces of art while the higher direction points to the more popular products that appeal to the majority of the public (Figure 3.9).

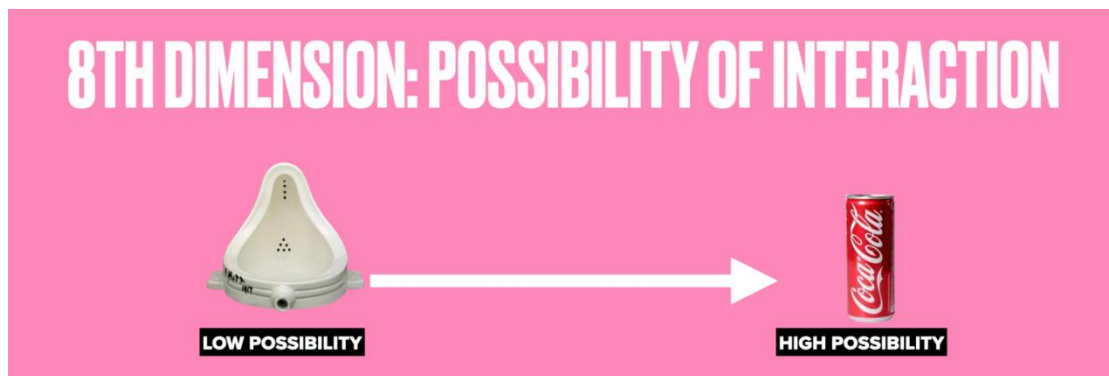


Figure 3.9: The Example of Possibility of Interaction

The ninth dimension is *Intensity of interaction*. As mutual complementation to the eighth dimension, it also means the depth, how strong the interaction might be perceived in the specific process. Also evaluated by Likert Scale, the stronger the interaction is, the more critical the plot interaction tends to become, leading to the climax of narrative.

The tenth dimension is *Results (to the outside)*, which deals with the effects on the outsiders (apart from the interacting participants) or the environment by this interaction. The new environment contains the people, the non-human object, and other factors such as public opinion. Even if only slightly changed, the new environment is different after the interaction. However, this demarcation between the before and after is not a clear line, as in Figure 3.10, but is a gradual and dynamic process.

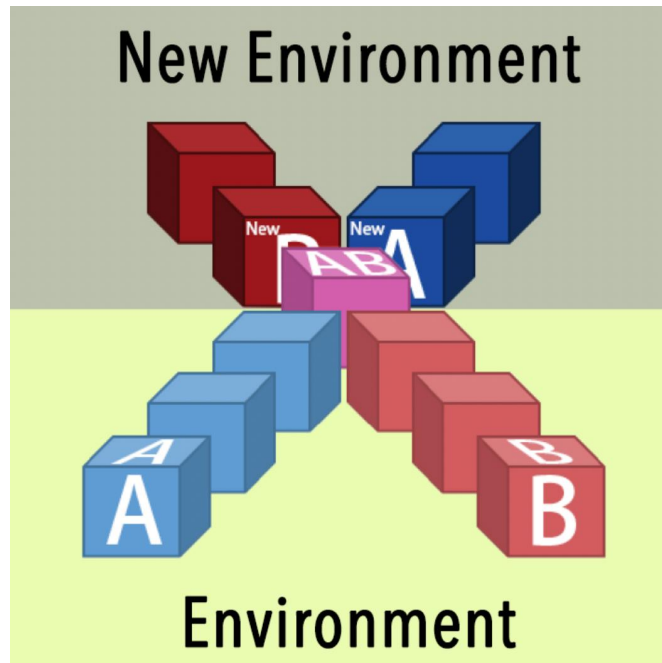


Figure 3.10: The Visualization of Interaction

The eleventh dimension is *Memory (Cognition)*, beyond all the other dimensions, like the description about the string theory. It presents the more psychological effects influenced by the interaction.

3.3 The Development of the Framework Prototype

The proposed eleven-dimensional *Framework IH* is based on the consideration of narrative structure and interactivity-related aspects, along with an analogy from eleven-dimensional hyperspace theory. Within the eleven concepts, the first four dimensions are designed to represent the more crucial elements in the structuring of stories. They are the independent variables when the other seven dimensions are the dependent variables. To show these differences and to illustrate the theoretical framework, a model of the *Interaction Hyperspace* is presented here as *Hypercube* of my definition. Figure 3.11 illustrates the first paper prototype:



Figure 3.11: The Paper Hypercube

After several trials, I designed a tetrahedron within the cube, with eleven vertices in

total. In that way, the second model made of clay (Figure 3.12) might be more concise and clearer to present the relations of the eleven elements. There is also a stop-motion animation made to describe the story about the interactive process of how the framework was found (Figure 3.13). The video will be found in the Appendix.

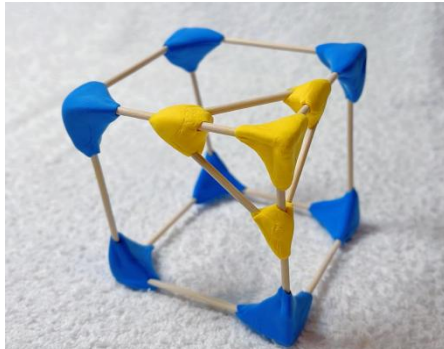


Figure 3.12: The Model Made of Clay Figure 3.13: Screen Shot of Animation

The third version of framework prototype (Figure 3.14) is designed in digital graphics. Based on my initial eleven-dimensional *Interaction Hyperspace*, the position of each vertex of *Interaction Hypercube* shows not only the layers of relative elements, but how each elements influences the others.

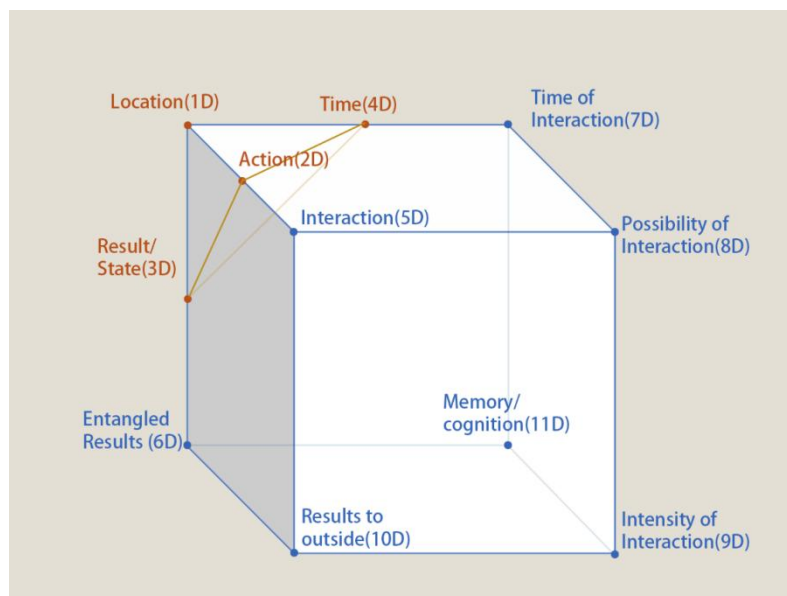


Figure 3.14: The Digital Model of Interaction Hypercube

Defined as the first relation group, the interior tetrahedron presents the basic elements in an object, starting from 1D *Location* expanding to different dimensions: 2D *Action*, 3D *Result/State*, 4D *Time* (Figure 3.15). In the latter part of this chapter, I will provide examples demonstrating how these four fundamental elements can be utilized to transform a modified narrative into a more innovative design.

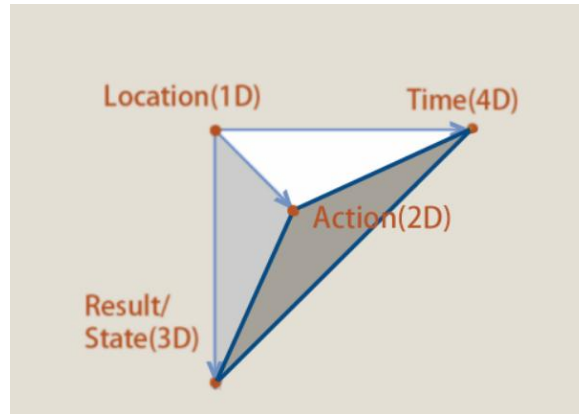


Figure 3.15: The Relationships in Tetrahedron

The interior tetrahedron is developing and following the arrows (Figure 3.16) and forming up into a cube, which the second relation group, *5D Interaction*, *6D Entangled Results* and *7D Time of Interaction*, are the extension of the first group's coordinate. If an interaction happens, the *2D Action* tends to develop into the entangled *5D Interaction*, the *4D Time* will shifted from a point-in-time into *7D Time of Interaction* while the *3D Result/State* of one object are supposed to be *6D Entangled Results*.

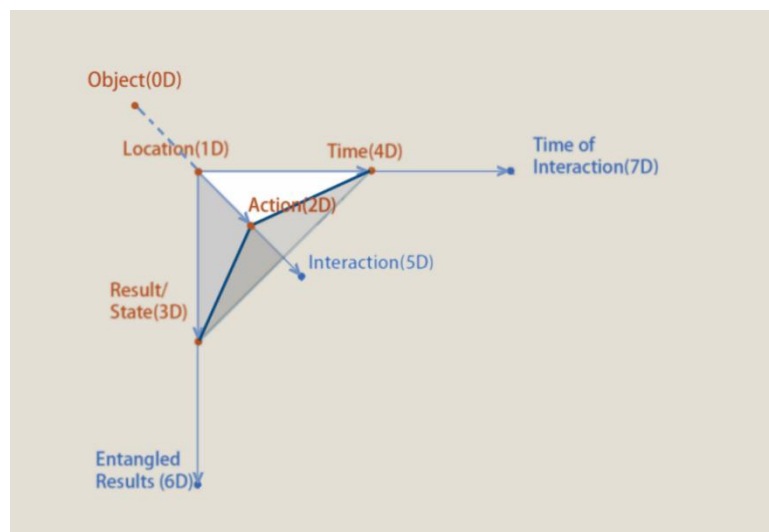


Figure 3.16: The extension of dimensions

And then, the elements cross with each other, coming to the point of intersection, forming the third relation group (*8D Possibility of Interaction*, *9D Intensity of Interaction* and *10D Results to Outside*). The last relation group, all the information flows together to the last one vertex (*11D Memory/ Cognition*), also the farthest vertex from the starting vertex. That's the reason why the *11D Memory/ Cognition* are argued to be higher than, and beyond other space-time dimensions. In the computer modelling software, a 3D model (Figure 3.17) was built to present the relationships and able to rotate itself as animation (display of animation in the appendix).

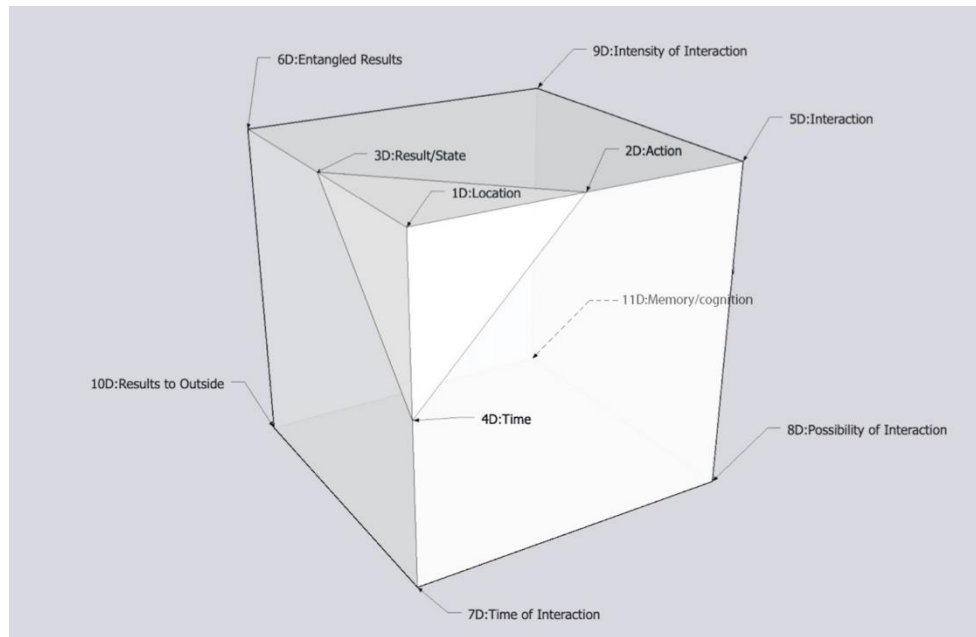


Figure 3.17: The 3D Model of Hypercube

However, this process wouldn't happen when there is only one single object. The cube-framework doesn't elaborate the other participants in the interaction system. Therefore, another presentation of multiple objects' interaction might be visualized as in Figure 3.18. The point of 5D *Interaction* are the contact point. It could be seen as a shared area, a media interface, or a blurred area, where there exists some tensions in between.



Figure 3.18: The Interaction with Two Objects

As for this tension in-between, it might be defined as *Inter-Tension* in this research. At the point of contacts or no-contacts, it could be intersection between objects but with a feathered range. For example, when people are having a conversation, the interactions are normally straightforward, bidirectional and shared simultaneously. Or,

when a person is typing on a laptop, the interactions between person and computer are relying on user interface. However, some contacts are not always obvious: one individual might dream of a fictional creature where the interaction happened fictionally between one and one's mind. Even, the presence of a rock exerts an influence on the overall process of evolution through various butterfly effects. These are complicated and implicit reactions, which require a vacuum area to draw the interacting interface (Figure 3.19).



Figure 3.19: The Inter-Tension

3.4 Examples

To examine how the framework operates, there are several examples to elaborate each dimension of stories from design, to create one by construction or analyze it by deconstruction. I started to test the framework by myself as the designer and storyteller and called this process as lab-experiments.

3.4.1 To Create a New Story

When I was in the roles of script writer and director of an animation, I used to spend all nights in searching the sparks of a story. Sometimes, I dreamed about it and used my subconscious as fuel for a creative story. Talking with people and going through relative information from the internet are also helpful and insightful. However, such strategies do not work every time. To develop and innovate methodically, a system for encouraging creative combination is required at the stage of concept design.

As an example, here is a story for a suspense film, involving James, who is the main character in the story about to happen:

Table 3: The Example of Creating a New Story 1

Dimensions	Concepts	The Main Object
0 D	Object	James
1 st D	Location	On the way to school
2 nd D	Action	Whistling
3 rd D	Result (State)	With a limp for one of his legs

4 th D	Time	In the morning
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There were some fields filled by providing the information according to the framework about the original condition before the interaction. Then it is allowed to introduce a participant into this interaction. When other participants join a mutual event, an actual interaction is triggered and that forms the fifth dimension.

Table 4: The Example of Creating a New Story 2

Dime nsion s	Concepts	The Main Object	The Second Object
0 D	Object	James	A tram
1 st D	Location	On the way to school	On the way to school
2 nd D	Action	Whistling	Running
3 rd D	Result (State)	With a limp for one of his legs	A mysterious sign was marked on the tram
4 th D	Time	In the morning	In the morning

Carrying the same first four dimensions of information, a second object encounters with the main object, and makes it possible to complete an interaction. From the fifth dimension, the interactive process is shared between the participants even the description is based on the perspective of the main object.

Table 5: The Example of Creating a New Story 3

Dime nsion s	Concepts	The Main Object	The Second Object
0 D	Object	James	A tram
1 st D	Location	On the way to school	On the way to school
2 nd D	Action	Whistling	Running
3 rd D	Result(Stat e)	With a limp for one of his legs	A mysterious was marked in the tram
4 th D	Time	In the morning	In the morning
5 th D	Interaction	James encounters a tram passing by	
6 th D	Entangled Result(to self)	James recognizes the tram by a mysterious sign on it and it reminds him of something.	
7 th D	Time of Interaction	For James, when he notices the tram and he perceives the time of interaction with the tram is five seconds.	
8 th D	Possibilitie s of Interaction	As the storyteller myself, I would score the possibility of 2.5/5 as an average number	
9 th D	Intensity of	As the storyteller myself, I would score the intensity of 4/5 for a relative higher number	

	Interaction	
10 th D	Result to external participants	A private detective notices James with the tram and takes a photo of them.
11 th D	Memory/Cognition	The appearance of the tram changes James's emotion when he sees it. It might influence his behaviour for years.

With information is delivered successfully, there are entangled results to the participants in the interaction naturally. The effects are sometimes delicate but inevitable eventually. That's what sixth dimension is clarified. According to the Butterfly Effects (Lorenz, 1963, pp.130-141), the environment is definitely different if this interaction between James and the tram happened. Last but not least, the eleventh dimension are memories, cognition or spirit, existing beyond all the space, time, events.

Using the framework as instructions or inspirations, the story could be told as one of the scenes in a suspense film:

In a cloudy morning, James is whistling a dismal melody on his way to school with a limp affecting one of his legs. There is a tram railway in ten meters away and a running tram is coming James's way. He notices this tram is going to pass by so he stops. Whistling an unknown tune, he stands still until he recognizes the tram by its mysterious sign on it. It reminds him of the last time he saw it when his leg was hurt one year ago. He didn't remember a thing about the accident apart from the tram-sign. Since the sign reappears again, James hesitates for a second but makes up his mind to get on the tram to find out what happened to his leg. With nobody noticing, a private detective takes a photo of James with the tram from the dark corner.

3.4.2 To Reconstruct a Story

It is noteworthy that all the eleven dimensions are not linear and separate, but intertwined and blended with each other. Every aspect is crucial and any slight modification could make the objects interacting totally differently. As the example shown earlier, if the story is not satisfying or requires more creative combinations, the framework is able to be modified, producing new ideas, and the reconstruction of the story.

The modification could start from the basic four dimensions before interaction. The changes aim to increase mystery of the story and show unpredictable plots. Keeping some of the parts invariant, I would change slightly in the framework to see how the interaction is influenced.

Table 6: The Example of Recreating a New Story 1

Dimensions	Concepts	The Main Object	The Second Object
0 D	Object	James	A tram
1 st D	Location	On the way to school	On the way to school
2 nd D	Action	Whistling	Running backward
3 rd D	Result(Stat e)	With a limp for one of his leg	A sign was marked on the tram
4 th D	Time	In the morning	In the morning

The second dimension is amended and that change triggers a new interaction different than before. The red texts in the following Table 7 shows those changes and the theme of the story tends to be like science-fiction with suspense.

Table 7: The Example of Recreating a New Story 2

Dimensions	Concepts	The Main Object	The Second Object
0 D	Object	James	A tram
1 st D	Location	On the way to school	On the way to school
2 nd D	Action	Whistling	Running backwards
3 rd D	Result(Stat e)	With a limp for one of his legs	A sign was marked in the tram
4 th D	Time	In the morning	In the morning
5 th D	Interaction	James encounters a tram passing by and notice the abnormality about the tram.	
6 th D	Entangled Result(to self)	When James notice the tram, everything surrounded him is moving backwards	
7 th D	Time of Interaction	For James, when he notices the tram and he perceives the time of interaction with the tram is five seconds.	
8 th D	Possibilities of Interaction	As the storyteller myself, I would score the possibility of 0.5/5 presenting the unusual incident	
9 th D	Intensity of Interaction	As the storyteller myself, I would score the intensity of 4.5/5 for a relative higher number	
10 th D	Result to external participants	The people and all things around James start to moving backwards.	
11 th D	Memory/Cognition	The odd interaction changes James's value of the world. He might involved with a magical journey.	

The reconstruction of story might be described as:

In a cloudy morning, James is whistling a dismal melody on his way to school with a limp affecting one of his legs. There is a tram railway in ten meters away and a running tram is coming James's way. He thinks this tram is going to pass by so he stops. When the tram is near, he realizes something unusual about it. The tram is moving backwards quickly and there is a blurred sign on the tram that looks familiar to James. He tries to think hard but more strange things happened. The fallen coffee from his hand is returning to his hand. The passengers near him are walking backwards also. The time is twisted since the tram passed by, so James stops whistling, takes out his notebook and draws a sketch of the sign on the tram. There might be an adventure in front of James now.

The reconstructing a story does not demonstrate it as a 'better' idea, but another way of telling a story. Identifying the eleven dimensions for an interaction and then modifying the first four dimensions to make it a new interaction, the construction and reconstruction is a constantly circulated and iterative process (Figure 3.20). The *Framework IH* aims to encouraging risks and possibilities, enhancing creativity as its purpose. The decision about when to stop the cycle and achieving a satisfying solution is made by the users and the audience to judge.

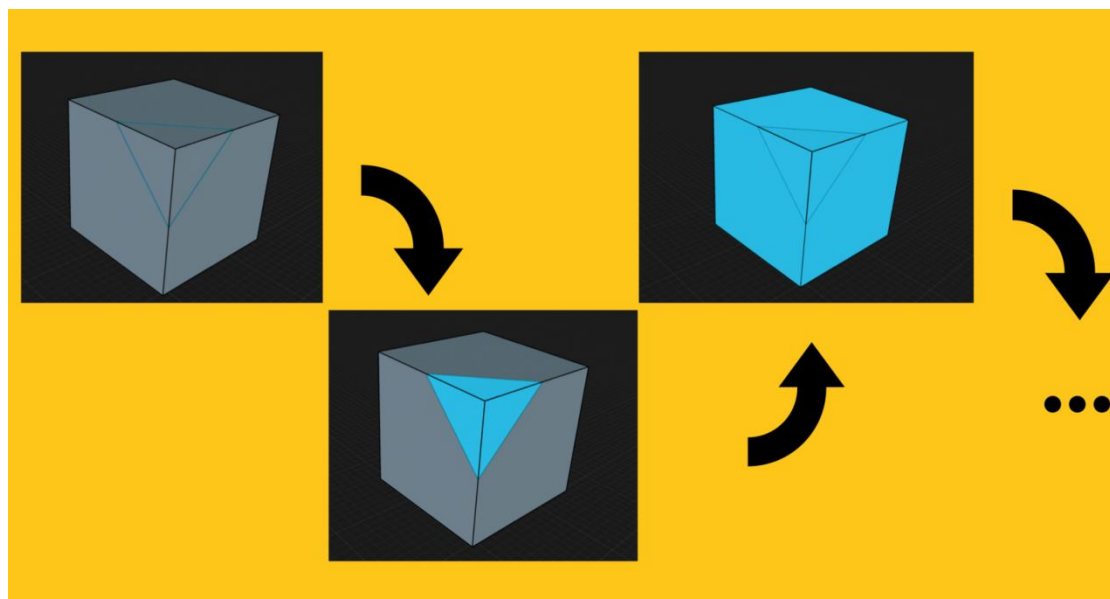


Figure 3.20: The Construction and Reconstruction Process

3.4.3 To Deconstruct a Story

To deconstruct a story is also how the framework may be used. Learning from an existing famous example of story-telling from the perspective of interaction between participants and their circumstances might feed into the pedagogy of art education.

As example, a story is described to search for the true meaning of oneself, a boy sets out on the adventures and eventually grows up as a new self. As a classic theme, it suggests many possibilities and combinations of characters. The basic storytelling structure is shown below in Table 8, which contains main characters' relations and their interactions from a famous story.

Table 8: The Example of Deconstructing of a Story

Dimensions	Concepts	The Main Object	The Second Object
0 D	Object	A gifted boy-Harry Potter	Rival-Lord Voldemort
1 st D	Location	Hogwarts-school of magic	Hogwarts and the magic world
2 nd D	Action	Go to school to learn magic	Revenge and reborn
3 rd D	Result(State)	A famous boy in the wizard world but grew up miserably as orphan in non-magic world	Coming back from 'dead'
4 th D	Time	When Harry turned 11 years old	In 1981, after attempting to kill Harry Potter
5 th D	Interaction	Harry's forehead left a scar by Voldemort instead of death, and he tried to protect himself and others from Voldemort.	
6 th D	Entangled Result(to self)	Harry got his own life lesson's to defeat the evil in the world and of himself.	
7 th D	Time of Interaction	Eighteen years	
8 th D	Possibilities of Interaction	Very surprising and unlikely (0.1/5)	
9 th D	Intensity of Interaction	Strong and highly influential (4.5/5)	
10 th D	Result to external participants	It is world-changing event for all the people and they have survived from the dark lord.	
11 th D	Memory/Cognition	The whole experience affects many people's life and souls, they are inspired to be brave, to be selfless and to love.	

The first interaction between Harry Potter and Voldemort happened when Harry was 1 year and 3 months old. The greatest dark load Voldemort encountered his first downfall and was ripped from his body. The boy become a legend in the wizarding world but raised by his aunt's family and was brutalized as a cursed orphan. They came across each other again when Harry went to Hogwarts and was entangled with friends, tutors, enemies. Figure 3.21 below briefly indicates the track of interactions

between Harry and Voldemort: the two individuals intersect from different start points and then develop tangled relations and finally are doomed in one's extermination.

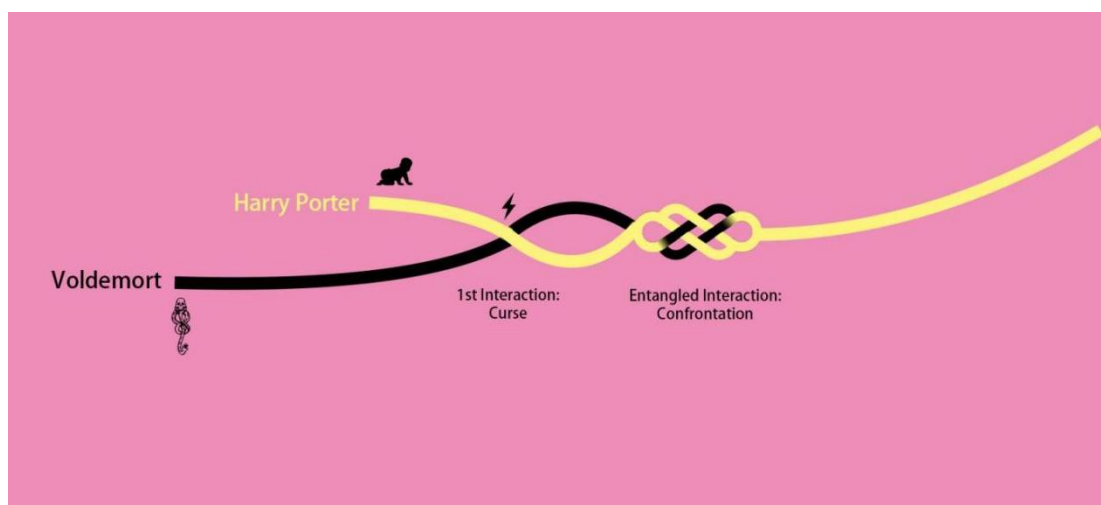


Figure 3.21: The Visual Narrative of Harry Potter

Those examples are trying to present the similar plots and theme might end up as totally different storytelling which the core idea is prominent for an unique innovation: a paradox behavior, an unexpected scenario, surprising time perspective or state transforming. In creative writings, the interactions set the vision of the dramatic narratives while it influences the user interfaces and experience in general art and design. Hence, to deliver the appropriate information to the audience and to design the design of it are the current important tasks in this research.

3.5 The Mathematical Conjecture

Hypothetically, to visualize the interaction process combining the different dimensions, I use coordinates to locate object A and Object B (only the first 4Ds as a start). Figure 3.10 uses three-dimensional cube to present an object with the information of 1D *Location*, 2D *Action* and 3D *Result(State)*, and the linear arrangement indicates 4D *Time*. When Object A and Object B come across with each other, the interaction happens between them. They might share the same location, action, state or time to make this interacting connection successfully but these are non-essential elements. For instance, remote meeting doesn't require the same location; the car crash happens when car's action and pedestrian's action are not exactly the same; also, shuttlecocking letters are not always at the same time. Therefore, AB means they are having interaction but not particularly overlapping with their coordinates. Instead, AB of Figure 3.22 shown purple out of red and blue indicates they have entangled and affected themselves and others. After they separated from this interaction, the Object A and Object B became the New Object A and the New Object B with relative influences. Accordingly, the environment is also changed along with them that is what the tenth dimension represented.

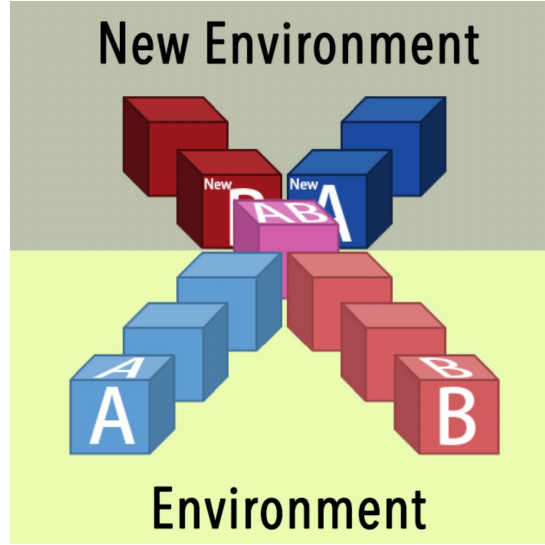


Figure 3.22: The Visualization of Interaction

Assuming, Euclidean distance here is the possibility magnitude. In general, for points given by Cartesian coordinates in n-dimensional Euclidean space (Tabak,2014,p.150), the distance is

$$d(p, q) = \sqrt{(p_1 - q_1)^2 + (p_2 - q_2)^2 + \dots + (p_i - q_i)^2 + \dots + (p_n - q_n)^2}$$

In this system of *Interaction Hyperspace*, the first four dimensions are the fundamental factors of positing an object. Here I take these four dimensions as an example to calculate the distance between two objects. The position of the object A in the coordinate system could be describe as A (p1,p2,p3,p4) while the object B as B(q1,q2,q3,q4)

The distance is

$$d(p, q) = \sqrt{(p_1 - q_1)^2 + (p_2 - q_2)^2 + (p_3 - q_3)^2 + (p_4 - q_4)^2}$$

In this way, when the object A and Object B interact with each other, the distance could be noted as 0, then the equation would be:

$$d(p, q) = \sqrt{(p_1 - q_1)^2 + (p_2 - q_2)^2 + (p_3 - q_3)^2 + (p_4 - q_4)^2} = 0$$

When an interaction happens, the location is the nearest (|p1-q1| is infinitely small), the action is the most alike (|p2-q2| is infinitely small), the state is the most alike (|p3-q3| is infinitely small), time is the most consistence (|p4-q4| is infinitely small). Of particular note is that the shorter the distance between Object A and B, the higher the possibilities, which is negative correlation. Subjectively speaking, when the location is the same, people or things are in the same space. There are great chances they come across, especially when they are conducting the same action and remaining

same state simultaneously.

The possibility of interaction is higher, and therefore any surprises are less likely. If the original position of object A and object B is far away, the interaction of them is highly unusual. By challenging the variable of the equation, this system could apply in the creative industry where the minority is highly valued.

3.6 The Application of Interaction Hyperspace (App IH)

This practice-based research focuses on the possibilities of the development of professional practice of art and design and creative solutions through Action Research (the detailed methodology will be elaborated in Chapter 4). In the following section, the testing process will be involved with several practices of teachers' or designers' action research.

To visualize the framework and uphold my interest in interactive design, I developed a mobile application (Figure 3.23) to explain my framework and collect data from practices in case studies.

In the university teaching practice, this creative method is intended to be a teaching tool conducted by the researcher or by other lecturers with the researcher doing observations as an outsider. It might be easier for the interaction between the lecturer and the students and the digital process of producing creativity enhances efficiency. The more detail about the application and the data collected will be elaborated in the later chapters of case studies.

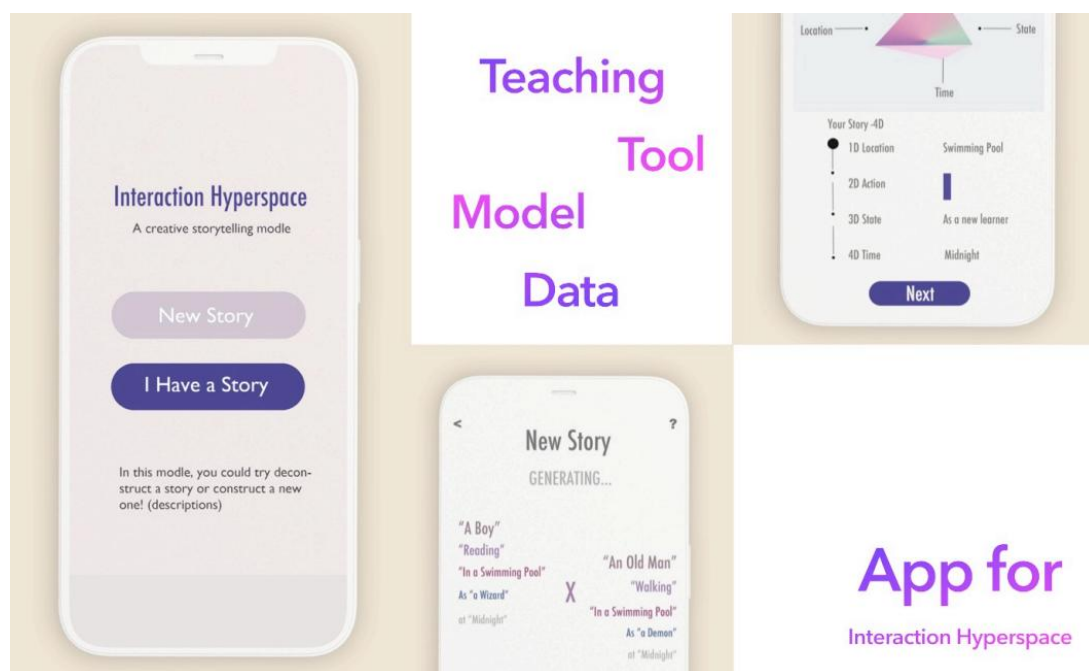


Figure 3.23: Application Screen Shot

3.7 Chapter Summary

To review the research questions, there are the proposed answers and theoretical solution by designing a *Framework Interaction Hyperspace (Framework IH)*. In the system of Interaction Hyperspace, interaction is extremely important and supports the main structure of storytelling. As defined as *Interaction as Storytelling*, the narrative structure will be deconstructed by interaction-related aspects.

A new artifact aims to construct storytelling, which is why the framework is established. In this chapter, it presents the definitions in the scope of this research, the examples of structuring stories and how the framework is used as analysis tool and encouraging possibility of innovations.

Though the examples are ‘lab-experiment’ from the researcher doing self-testing, the more rational and academic methodology and approaches will be explained in the next chapter.

4. Methodology

4.1 Overview

With respect to creative storytelling, it is essentially based on the designers' own perceptions and understandings of arts and design. The framework is applied to the practitioners who might connect their individual lived experiences and perspectives and form these ideas into a synthesized embodiment. As the data of this research are collected from personal interpretations of participants in their constructing narrative art, the research study falls into the Interpretative Research Paradigm. Ontology deals with reality and the nature of being, Interpretivist ontology suggests that many realities can exist at once, and that there is no direct access to the real world (Carson et al., 2001, Hudson and Ozanne, 1988)

As my main interest starts from the exploration of interaction and interactivity, the elements of storytelling and how they are associated with art and design are established in the discussions and reflections about interaction. In Chapter 2 in Section 2.2, there is a discussion about *What is Interaction?* This is the main motivation and leading inspiration regarding the framework proposed in Chapter 3. To test the theoretical method in the professional field of teaching and learning narrative arts, there will be more discussion towards *Interaction* from participants' interviews and questionnaires.

As general definitions from many scientific fields like physics, chemistry, and biology, interactions emphasize the behaviors of systems between entities. They tend to focus on the properties of matter and the interior linkages. In the context of arts and humanities, interaction can be defined as the process of two or more entities engaging in entangled communication or behavior with one another. Moreover, process ontology, especially from the perspective of Zhuangzi, which claims that everything is in a state of constant change and transformation (Damyanova, p.177), suggests that all entities are engaged in a process of interaction with their environment and with other entities. That responds to the earlier discussion, which proposed that everything could be seen as interactions. Therefore, while the concept of interaction may have different understandings and interpretations depending on the context and field of study, my research tries to deconstruct it and synthesize it to apply to the creative process of art and design.

From ontology to methodology, it fuels the power from the internal to the external process, and furthermore influences the research approaches and data analysis. It gives my momentum to the ontology of interaction, which construes the notion of the reality of interaction. Moreover, the methodology ensure the researcher and those whom they interact collaborating construct a meaningful reality (Angen, 2000, p.385).

Since the consideration and discussion about methodologies has been introduced in Chapter 1, this chapter emphasizes on the specific academic methods applied in each cases. In Section 1.5, the academic gap of this research is deliberated as attempting to make analogies and metaphors across different disciplines from physics to the practices of art and design. In the latter section of this chapter, the limitations of qualitative approaches of this research are described and explained according to the specific situations to complete this chapter.

4.2 Research Method

4.2.1 Case Study

In terms of considering the possible research method, Gray (2004, p.125) introduced a different strategy as Yin (1994) made the Table 9 for determining them.

Table 9: Determining Research Strategy

STRATEGY	FORM OF RESEARCH QUESTION	REQUIRES CONTROL OVER BEHAVIOURAL EVENTS	FOCUSES ON CONTEMPORARY EVENTS
Experiment	How, why	Yes	Yes
Survey	Who, what, where, how many, how much	No	Yes
Unobtrusive measures	Who, what, where, how many, how much	No	Yes/No
Case Study	How, why	No	Yes

In section 4.1, the review of research questions focus on how structuring storytelling through the perspective of interaction could assist the art students with their practical design, which makes the form of research question is “How”. The “requires control over behavioral events” are not necessary in the context of this research activity as the storytelling-based art and design are encouraged to be imaginative and unlimited. Nevertheless, the focuses on contemporary events are highly valued in the research activities of a qualitative study. After considering the above factors, Case study is the appropriate research method for data collection in this research. The specific techniques of each case study will be deliberated in the Chapter 5, 6 & 7.

4.2.2 Activity Theory and Revised Activity Theory AT

The idea of using Activity Theory (AT) as the methodology for developing creativity in art and design was inspired by Kinsella (2018, p.493). As an analytical approach, the second generation of AT proposed by (Engeström *et al.*,1999) focuses on understanding human activity in social and cultural contexts, where interactions are highly valued. It can help the researcher to analyze the underlying and dynamic

process during teaching activities by identifying the different elements of AT system, such as the goal of teaching, the tools used to encourage design and the environment associated. Relatively speaking, AT is also a complex and nuanced framework, the data collection and analysis are required to be ensured the validity and reliability of the research. Researcher as teacher was therefore encouraged to reflect on practice through questionnaires, lesson reflections and observations.

A revised Activity Theory is mentioned briefly in Chapter 1 in Section 1.5. In this system, the analysis parameters expand from the original six elements into eleven elements, which is defined as Revised Activity Theory (Revised AT) by the researcher for considering more aspects with interactions. To visualize the relationship between the AT and Revised AT, the second generation of AT could be seen as a top view from the tetrahedron in the *Hypercube* (Figure 4.2). It might offer a new spacial relationships within the Activity Theory, and explain that the point in the center of AT triangle is the perspective of *Interaction*. As the main research questions aim to help the students improve their creative art and design, the central topic is about how the students deal with their work. Thus, the *Interaction* in this case specifically means students interacting with their own creations.

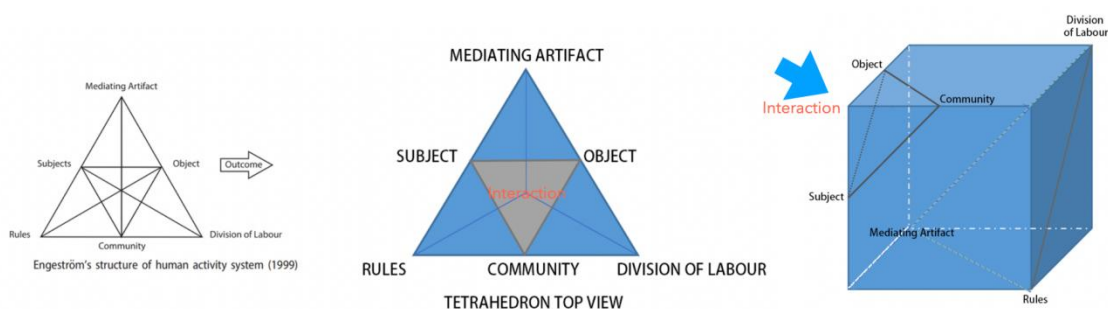


Figure 4.1 The Visualization of the AT and Revised AT

Therefore, this Revised AT is adapted in the first case study and it shows certain differences to the original AT in this particular classroom activity. Table 10 present these factors and the specific research contents in comparison. The more detailed parameters and analysis are explained in Chapter 5 in Section 5.5.

Table 10: Comparison of AT and Revised AT

Activity Theory	Revised Activity Theory	Specific meaning in the case
Object	Object	Art & Design
Subject	Subject	Students as Designers
Tools	Tools	Storytelling Framework IH
Rules	Rules	Requirements of Assignments
Community	Community	The class in university and the Chinese cultural background
Division of Labour	Division of Labour	Teacher instructing students and students completing design tasks
/	Interaction	Between the students and their

		design works as the focus of the whole activity
/	Time	The duration of the teaching, learning and practices
/	Entangled Results	Impacts on students from this activity
/	Results to the external participants	Influences on the researcher as teacher from this activity
/	Memory/Cognition	The following developments for students

4.2.3 Action Research

Action research (Costello, 2003) is a particularly useful methodology for a case study in regard to developing creative projects for university art students. One of the reasons is that Action Research involves highly participatory (Costello, 2003) working between researcher and participants, which fits into the scenario of a university design practice. Another reason for selecting Action Research in the case study is the potential of solving practical problems and generating knowledge, which can be applied to improve practices for the following cases. In encouraging creative storytelling skills, the collaboration of the researcher as instructor and students can lead to more effective interventions and solutions to the identified problems within the process. At last, Action Research is an iterative process involving cyclic planning, action, observation and reflection (Costello, 2003). These iterations may provide more improvement and refinement to the original theoretical framework than other methods, resulting in a more effective impact on the creative design development of art students.

However, there are some limitations and flaws in Action Research. As an iterative approach, Action Research can be time-consuming and resource-intensive. It may require long-term and continuous observations and collaborations between the research and participants. In the university system, the students are committed to diverse courses and projects. It may lead to some inevitable distractions and interference with this research. Most importantly, Action Research is highly participatory and the perspectives on the enhancement of creativity vary among the students in the case. It may be challenging to find out a consensus in the context of university teaching.

In comparison to these analytical approaches, Activity Theory concentrates on understanding the patterns and dynamics of classroom teaching while Action Research focuses on problem-solving and generating practical knowledge through a series of activities. Both methodologies have their strengths and limitations. To consider all these factors, the strategy is balanced by introducing mixed approach into this research and fitting into each case study specifically.

4.3 Limitations

Concerning to the diverse approaches of this research, the main philosophical stance is based on the Interpretivist paradigm, in which the understanding and interpretations of this research are developed mostly by the researcher's perceptions. The researcher represents the first limitation of the study, in that the reader has to rely on the competency of the researcher and is free to judge the methods they employ (Carson *et al.*, 2001, Hudson and Ozanne, 1988).

Due to the fact of creating storytelling, the subjective factor to the results is obvious. The individual interpretations and descriptions of the effectiveness of the framework as an intervention varies from person to person. Therefore, the discussion about each case study will only be applied to the specific situation.

4.4 Chapter Summary

In summary, this chapter explains the main philosophical stance of Interpretivist with ontology perspectives. Also, the research activities fit with Symbolic Interactionism as principle. To explore how structuring stories may inspire creative art and design for students, different qualitative research methods and approaches are employed for gathering data and analyzing. Multiple case studies are designed to collect data on the professional practices of art students when systematic Activity Theory and Action Research methods are established to provide more participatory and iterative perspectives of this research. The case study and corresponding methods are explained in the following chapters.

5. Case Study 1: Animation Planning

5.1 Overview

Animation Planning is a four-week starter program for animation students to use professional strategy to have a comprehensive plan for an original animation. It is set up for second year undergraduate students at Fujian Jiangxia University. In this case study, the researcher selects the first week of Animation Planning as inspiration for animation and encourages more creative thinking in the early stage of the scheme. Specifically, this case is designed for the first stage of the verification of the proposed research theory, which enables 35 students to create their primary concept design and reflect on the intervention of *Framework IH* to have an impact on their design.

5.2 The Process

The activity was conducted in 3 sessions of Animation Planning, aiming to foster the abilities of planning animation projects and generating the initial idea for animations. Each session lasted 45 minutes and conveyed different topics:

1. The discussion about different understandings of art and design from students;
2. The introduction to using storytelling *Framework IH* to help design;
3. The feedback after using *Framework IH*.

The process of practical assignments was designed to produce three primary designs of imaginary chairs: the first design is with no instructions at all; the second design comes after the introduction of the storytelling *Framework IH*; the last design is encouraged to alter some key elements of *Framework IH* to improve from the earlier design.

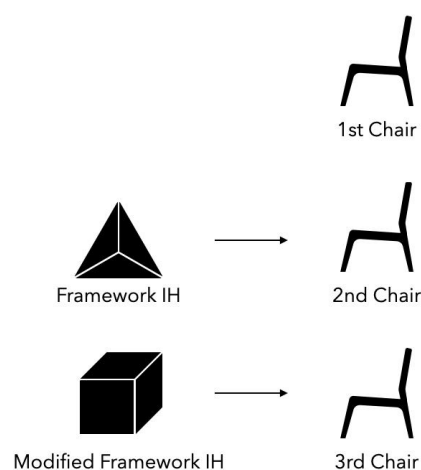


Figure 5.1 The Three Imaginary Chairs

The criteria of the case were measured in two ways, group discussion and voting for

the King of Chair (Figure 5.2) during class from the students and a more systematic online questionnaire from individual perspectives. Although this case study was based on a short-term classroom practice, the students showed high engagement and concentration in these sessions. Along with the observation of the researcher as the teacher in this case, the data also included the audio recording retrieved from the classes.

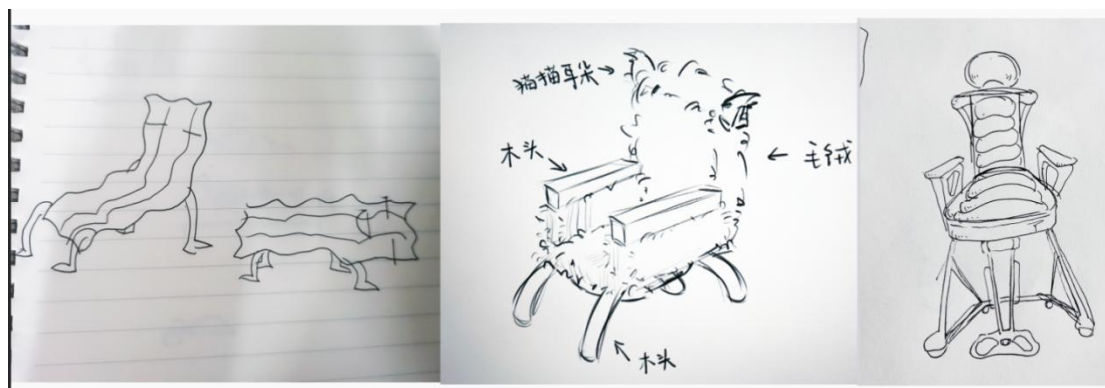


Figure 5.2 Some of the Top Chairs in Selections

Particularly, it is an important phase of experimenting with the theoretical framework in an early stage of research, to have the potential for widespread usage among young students and adjustment of the research method for the following research.

5.3 The Intervention

This case is intended to use three design assignments to present the differences before and after the intervention, *Framework IH*, which is using the storytelling structure to help narrative design.

The intervention in this case was straightforward and immediate, when the design approach was applied in the classroom. The introduction of *Framework IH* was displayed and presented to the students right after the first free-design mission. Notably, the story framework of Interaction Hyperspace used in the classroom was in the form of questionnaires. But the core framework worked in the same way to explain the theoretical system for inspiring more concept designs.

Notably, as an animation class, the design of an imaginary chair was not assessed by its ergonomic functions but the characteristics and storytelling potential for later animation design. These chairs may have personalities, habits, background stories along with humanized expressions. The intervention of *Framework IH* provides a scenario where a simple chair interacts with other objects, which leads to more possibilities.

5.4 Data Collection

Data from this case study was collected through online questionnaires, including the views towards art and design from students; the design concepts and sketches; and the feedback about how the students reflect on the storytelling framework for their design. Moreover, the process is monitored by the researcher who kept their answers anonymous. In the framework of Activity Theory, teachers are there for supporting students' active participation, encouraging collaboration in the particular environment as classrooms, and moreover, prompting the learning process through necessary guidance. Therefore, the monitor not only guaranteed the students' commission to their assignments, but also help with the reservation of the classroom activity as a role of insider researcher.

The collection of the online questionnaire will be shown in the Appendices. The specific approach during the classroom activity followed the Revised Activity Theory to designate the subject and object, tools, rules, community, division of labor, interaction, time, entangled results, results to the external participant and memory/cognition.

As the main approaches of data collection were mainly retrieved from online questionnaires, the design of questions was fundamental to the research. As Boje(2014) developed his quantum storytelling in epistemic, empiric, and ontological ways, the primary questions before intervention discussed the native views of students. They were targeted to reflect three main categories in the practice of arts and design:

1. The ontological perspective: what are arts and design?
2. The epistemic perspective: how are the most important ingredient of arts and design?
3. The empiric perspective: what is the challenge in creating art and design?

The specific questionnaire is designed as below:

1. What do you think is art?
2. What do you think is design?
3. What do you think is the relationship between art and design?
4. What do you look for most when creating your art/design work?
5. Where do you think the creativity comes from?
6. What challenges do you face in creating your work?
7. What do you think interaction is?
8. What do you think is the relationship between interaction and art/design?
9. Now imagine a chair in your head and describe what it looks like and what inspired you to create it.
10. Maybe you can sketch it out. (Voluntarily choose whether or not to upload pictures)

When the storytelling approach intervened, the second questionnaire collected the

specific response about how they use the *Framework IH* as a tool in design.

Question designed:

1. 1D: Where is the protagonist?
2. 2D: What is the protagonist doing?
3. 3D: What state is the protagonist?
4. 4D: When does the story take place?
5. 5D: What interaction does the protagonist have?
6. 6D: What effect does it have on the protagonist?
7. 7D: How long is the interaction?
8. 8D: How possible does the interaction happen?
9. 9D: How strong is the interaction?
10. 10D: What effect does the interaction to the others/environment?
11. 11D: What's the most impressive memory/cognition from the interaction?
12. Please give your description of your design (chair).
13. Maybe you could sketch it out. (Voluntarily choose whether or not to upload pictures)
14. If you could create a different design by changing the first 4Ds (Location/Action/State/Time), what would you change?
15. Please give your description of your new design (chair).
16. Maybe you could sketch it out again. (Voluntarily choose whether or not to upload pictures)

At last, the final questionnaire targeted at the feedback about the method of Interaction Hyperspace as an inspiration for arts and design with open questions and Likert Scale. These data were reflective and meaningful to prove how my theoretical approach is effective for art students in professional teaching practices and useful for instructing the later cases and improving them for the research.

Question designed:

1. Can you understand the method (Hyperspace of Interaction) as a way of design through the researcher's explanation or written materials?
 2. Before learning about this method (Hyperspace of Interaction), how did you conceive the inspiration for your chair design?
 3. How do you evaluate the first chair designed in the preliminary survey?
 4. How do you evaluate the chair design after understanding this method (Hyperspace of Interaction)?
 5. How do you evaluate the design of the chair after changing the 4Ds of the Hyperspace of Interaction?
 6. Which design do you think is your favorite?
 7. Where do you think this method (Hyperspace of Interaction) can be applied?
 8. Evaluation of the effectiveness of this method (Hyperspace of Interaction) for creative improvement (Score from 1 to 10).
- The possibility of using this method (Hyperspace of Interaction) for your design in the

future (Score from 1 to 10).

9. What are the weaknesses of this method (Hyperspace of Interaction)?

10. How do you suggest this method be improved?

The data were collected through online questionnaires and the observation notes were taken down by the researcher during the class.

5.5 Data Analysis

To explore how the art students embrace the *Framework IH* as a working protocol for their practical design mission in the first case study, the data collected from online questionnaires and observation from the researcher will be archived and analyzed systematically by Revised Activity Theory. As explained in earlier Chapter 4 in Section 4.5.2, Revised AT is applied in this case, in which activities are carried out from the subjective perspective of students' interaction with their works. Along with the view of design activity as interaction, the other elements such as time, entangled results, results to the external participant and memory/cognition are added into qualitative analysis.

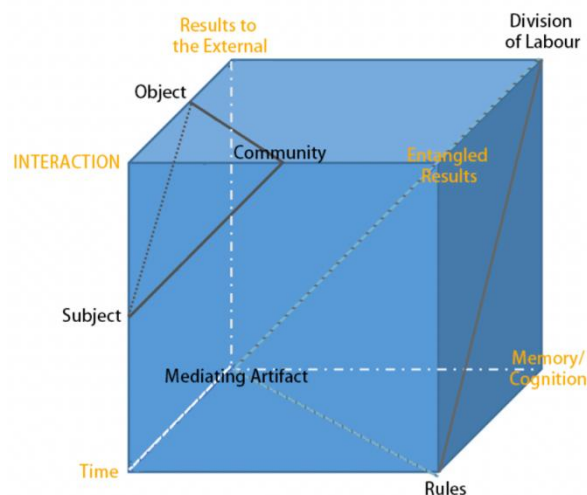


Figure 5.3 The Elements in Revised AT

Object: Engeström *et al.* (1999) believed that the object of activity shapes and determines the action. In this case, the object refers to the goal or outcome of the creative design. Seen as the production of creative thinking, it reflects the students' learning outcomes and the application of the storytelling *Framework IH*. The object plays a crucial role in determining this design activity, leading to other factors involving subject, community and cultural historical interactions in this system. In the case, the goal of the design tasks was producing innovative chairs in class to prepare for later animation planning training.

Subject: The subject in this context of teaching activity usually refers to the individual or group of students who are the primary actors of the assignments in class. In this

case, the students are the primary subjects, as they are the ones responding to the learning process and producing the design by applying the storytelling framework. The 35 students are around 20 - 22 years old with a primary experience of animation, equipped with basic drawing and script writing skills.

Tools: The tools in this context refer to the different mediating artifacts, either the physical materials or the medium of mind used by the students in their creative work. In this case, in particular, it emphasizes the impacts on the design from the usage of *Framework IH*. As the main observation target for this research, the tool is introduced by lecture and examples by the researcher as teacher in the class.

Rules: The rules in this context refer to the expectations, norms, and conventions that govern the students' work in university teaching. These rules can include the guidelines for the use of specific techniques and the criteria for assessing the quality of the artwork. The procedure of producing three imaginary chair designs and the introduction of storytelling *Framework IH* are the specific rules for this case. There were specific instructions to conduct these assignment and the design outcomes were assessed by the students' voting and teacher's comments.

Community: The community in this context refers to the social and cultural context in which the students' activity and design assignment takes place. This community can include the other students in the class, the instructor, other faculty members, and the broader art community outside of the university. This case takes into account the university environment and the Chinese cultural influences on the students' design concepts. It reflects the collective consciousness and aesthetic evaluation of the current university students through their designing and reviewing the assignments.

Division of labor: The division of labor in this context refers to the distribution of tasks and responsibilities among the different members of the community involved in creative work. For this case, the researcher as teacher has the responsibility of introducing the storytelling method to help design and provide feedback to the students, while the students have the responsibility of producing the artwork and applying the storytelling framework.

Interaction: This research parameter is considered in this particular case to pay attention to the interaction between the students and their design works. The relationships target reflecting the teaching method and the effectiveness of the *Framework IH*. Also, the interaction associates with how they evaluate their own and peers' work.

Time: Time is taken into account in this case as the activity is limited within the class schedule and the reflections on the efficiency of framework as a design tool from students are monitored and controlled by the researcher. The data are documents of

the duration of the design assignments and the time students react to the framework, which can be an assessment of the app development for *Framework IH*.

Entangled Results: Entangled Results are usually defined subjectively involving both participants in the interactions. In this case, the main consideration is the acceptance and understanding of the teaching method from students.

Results to the external participants: As the interaction is limited between the students and their works in this case, it makes the researcher to be the external participant. The researcher observes this activity and analyzes the results from the data collected and reflects on the next stage of research.

Memory/ Cognition: In this particular case, memory and cognition refer to how the students perceive the teaching method and if they may use framework IH voluntarily in the future.

Understanding these elements of Activity Theory in the context of the university classroom of an art class can help identify the various factors that influence creativity and inform the development of more effective and inclusive art education practices.

5.6 Discussion

The results were discussed and reflected immediately after the class to document direct feedback from students. The effectiveness of *Framework IH* was assessed in multiple dimensions.

One of the measurements is Net Promoter Score (NPS) system. It borrows the idea from a market research metric that is based on a single survey question asking respondents to rate the likelihood that they would recommend a company, product, or a service to a friend or colleague (2021). The question “Evaluation of the effectiveness of this method (Hyperspace of Interaction) for creative improvement” and “The possibility of using this method (Hyperspace of Interaction) for your design in the future” uses the type of question of NPS, and both scored 10.52.

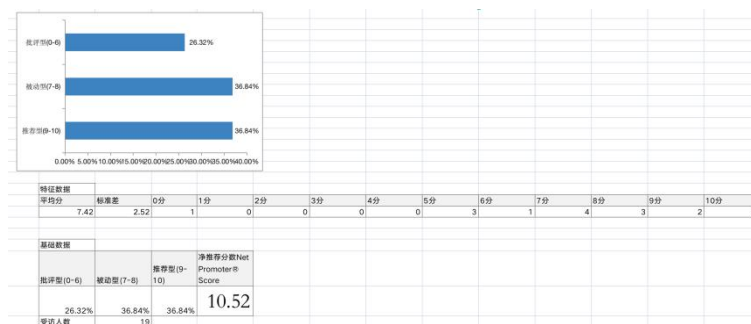


Figure 5.4 NPS Score of the Questionnaire

The other dimension is the subjective assessment of the design of chairs. The discussion around the best chair was through a voting called the *King of Chair* from selections of all 3 assignments of design. The result was surprising but inspiring when a simple sketch won out. The story was about a curved nori-shaped chair with four hands crawling on the floor. The class burst out laughing when I show them this sketch at once. As they soon associated this chair with *Lying flat*, a network buzzword in China means the people are mentally relaxed, satisfied with the current living conditions, have no anxiety, no extravagant expectations, no expectation and hope for the future and lay down without pressure. This sketch was rough, simple, and even did not point to *Lying flat* as a veiled meaning by the original designer. However, the interpretation was misunderstood still by peer students in the classroom as the community and the current social environment as the broader cultural context.

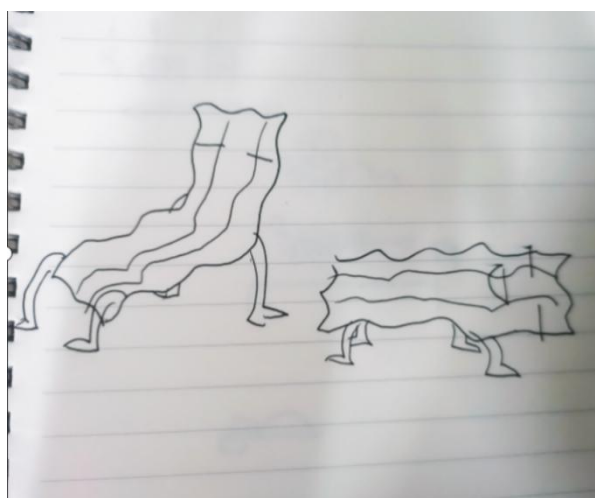


Figure 5.5 The King of Chair

Another interesting fact is that more than 50% of students chose the second chair as their favorite chair out of their own three designs (Figure 5.6). The second chair was designed after using the framework IH to construct a new story, while the third chair was designed to encourage students to modify one of the story elements and alter their design. The original questionnaire designed by the researcher was meant to stimulate more creative perspectives for improving design. However, the last assignment on the third chair design was less engaged with students and the approaches to explain the necessity of modifying the elements were less convincing within a relative short time. Thus, the proper methods of constructing, deconstructing and reconstructing stories were considered to conduct respectively in the next case.

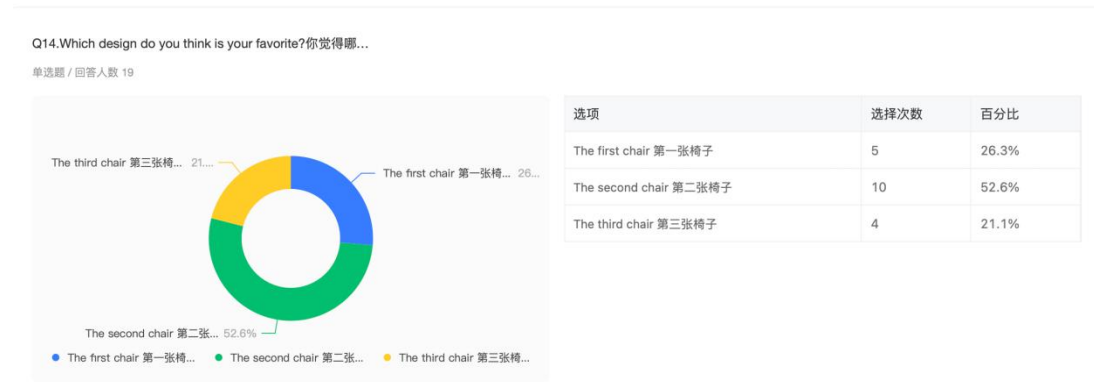


Figure 5.6 The Preferred Chair

5.7 Chapter Summary

In summary of the first case study, the prototype of *Framework IH* was applied to practical university teaching with animation students in order to provide an opportunity to encourage creativity for narrative design. Overall, the class was highly engaged with this method and produced concept designs that benefited from it. Data were retrieved from online questionnaires completed in the class and the observations of the researcher as teacher in this case. Analyzed by Revised Activity Theory, the results present the relationships of designers and their work in the interactions of creation and the impacts reflected on the design by the social-cultural community. Through educational practices, the limitations and flaws of the framework reveal themselves to help the improvement of this research. Particularly, in a short-term design assignment, the effectiveness and applicability of the *Framework IH* are not typical. As the Test phase of research, this case study still provides valuable insights and directions for adjustment for the next case.

6. Case study 2: Augmented Reality Animation: *Door*

6.1 Overview

The second case study AR Animation: *Door* is a relatively long-term Augmented Reality (AR) animation project by a group of three undergraduate students of Fujian Jiangxia University through nine months from September 2023 to May 2024. It involves a complete story and Unity technique to realize an interactive animation by mobile phones. This case targets the whole development from a primary concept to an interactive story. In this stage of research, the storytelling tool is presented as a mobile app to record and assist design for students and document the series of changes along the development of animation stories. With respect to a long-period project, Action Research being an iterative and collaborative method, is used in this case for data analysis.

6.2 The Process

This case was a graduation project supervised by the researcher as instructor, the *Framework IH* was intervened from the early stage of Animation *Door* for providing more options for stories.

At first, there was only an abstract concept about doors by the group members without clear ideas of stories, protagonists or scenarios. In need of more narrative features, the virtual environment for animation expanded with the conceptual theme Door.

That was the time the group members asked for inspiration with more creative stories when the *Framework IH* was introduced. As a theoretical model, *Framework IH* was capable to provide a collaboration method for groups. Each group member including the researcher produced 10 random terms towards the first 4 dimensions of *Framework IH* separately (Figure 6.1). Randomly combined by the 4 dimensions, every member create 5 short stories as potential concepts for animation (Figure 6.2). The group then discussed together to find out the most appealing and innovative stories as their initial idea to develop from.

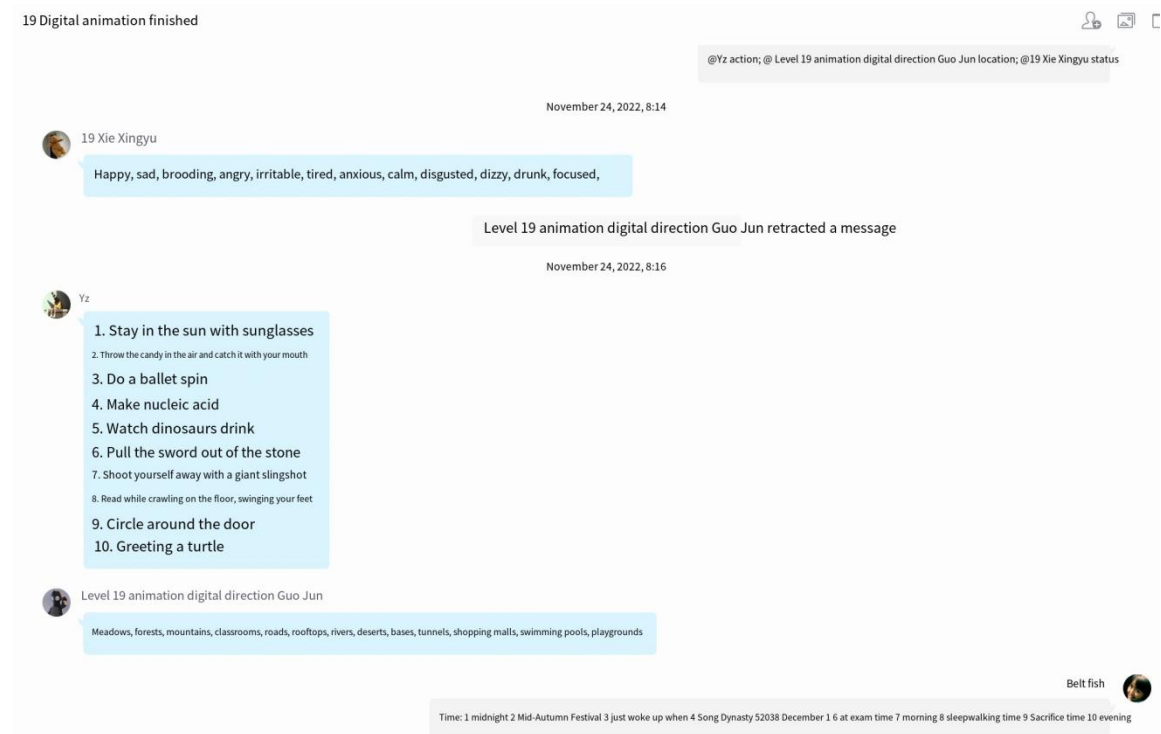


Figure 6.1 Division of 4 Dimensions

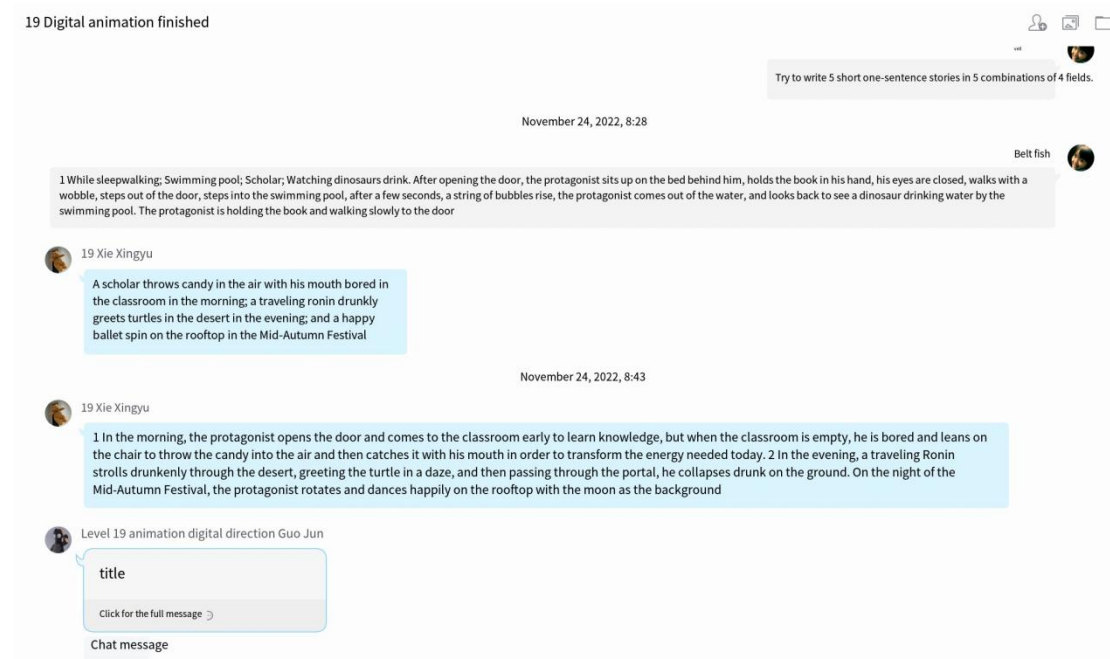


Figure 6.2 Constructing stories by the random combination

As a participatory practice, the group member helped to provide some suggestions and reflected on the *Framework IH*. When the initial idea was settled for a few days, *Application Interaction Hyperspace (App IH)* came to use individually to help the group members to develop more stories. The animation aimed to be interactive through a physical door installation when the main story was set to be segmented by

entering and getting out of the door. *App IH* assisted the group member to produce 3 different short stories and eventually unify them into a complete experience via Augmented Reality technique.

The planning, action, observation, and reflection were throughout the whole design process, but could be seen as division into 2 stages of cycles. By engaging in the spiral of Action Research, researchers are able to actively improve their practice and gather evidence to evaluate how the practice has improved (McNiff & Whitehead, 2010).

Altrichter *et al.* (2005) explain the different stages (Figure 6.3), and state that the researcher should begin their Action Research study by identifying a practice that could be developed further, acting as the researcher's starting point. In this case, the Action Research spiral began with the planning for a new animation with the collaboration with students, adapting a storytelling tool of narrative art in order to stimulate more creativity.

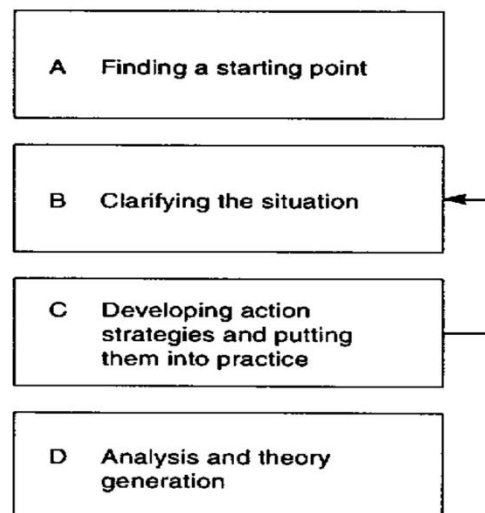


Figure 6.3. Stages of Action Research Process. (Altrichter et al., 1993, p.6. Routledge)

Identifying the challenges by interviewing students, the planned tutorial was executed and data was generated and collected during this process. After the first intervention, a review and analysis of feedback from students help to reflect on the core *Framework IH*. It led to the second cycle of planning, action, observation and reflection on the theory. In this case, the digital tool of *App IH* was introduced and used for the development of animation stories.

The working process of *Animation Door* showed the interventions and different approaches involved in this case (Figure 6.4). The detailed interview and design diary are deliberated in the next sections.

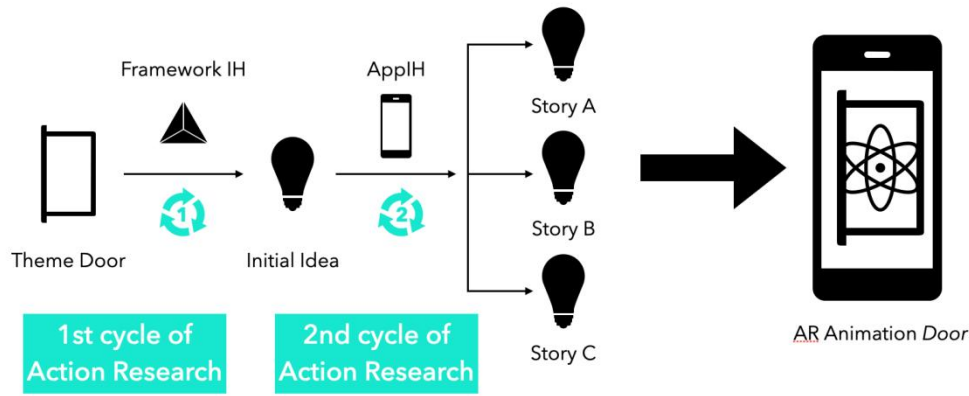


Figure 6.4 The Working Process of Animation *Door*

6.3 The Intervention

The intervention of *Framework IH* influenced this case in two different methods. One was traditional teaching instructions (Figure 6.5) and the other one was a digital user-friendly mobile *App IH* (Figure 6.6). The second case worked as the Adjustment phase of the research plan, the different methods of approaching student participants provided valuable insights into the improvements of the teaching artifact. The cyclic Action Research also revealed the different stages of reflection on the intervention.

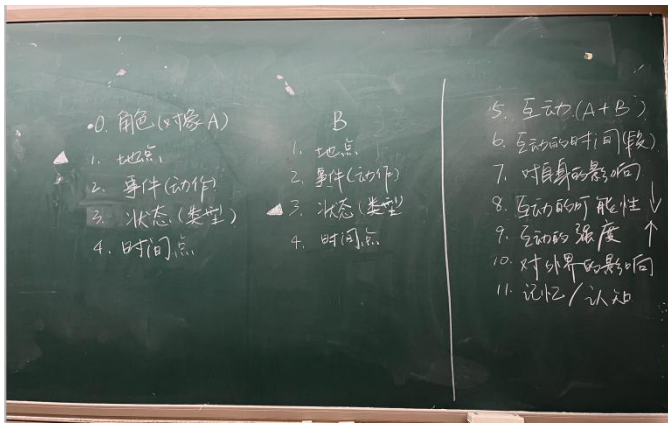


Figure 6.5 The teaching instructions

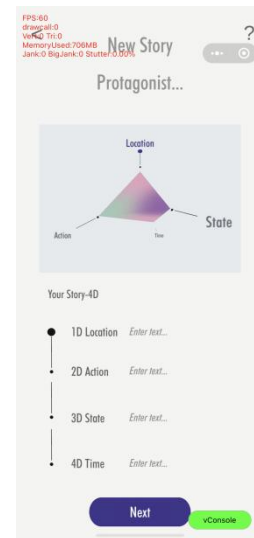


Figure 6.6 The App IH interface

As a 3D fiction AR animation, *Door* was required for more imaginary and novel plots and scenarios. The original conceptual theme has nominated a main object but lacks of storytelling elements. The optional and changeable *Framework IH* was capable to offer more possibilities for stories from targeting a protagonist to interactions. Animation *Door* eventually developed three segmented plots through different interactions between the character and a magic door.

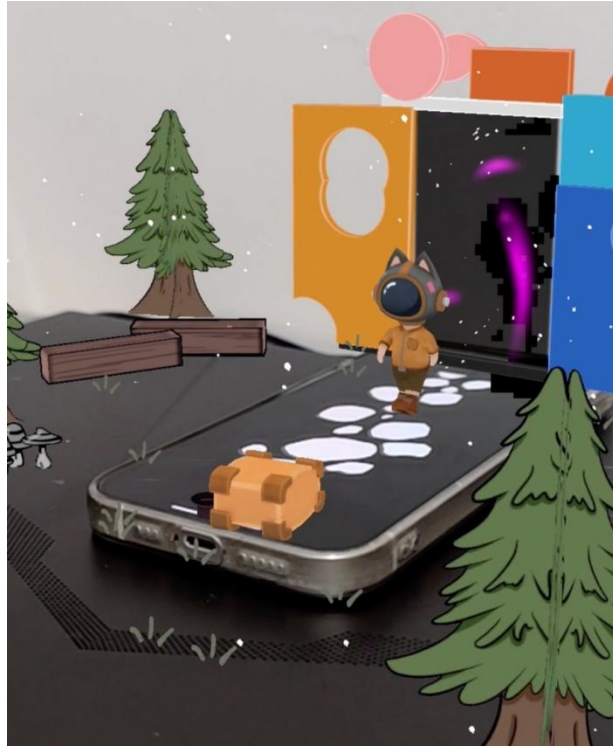


Figure 6.7 The Screenshot of AR Animation *Door*

6.4 Data Collection

In this case, there was a digital log to record the design diary which collaborating between the students and the researcher. It included the instruction from the perspective of the teacher, feedback from students and the discussion between themselves. The primary data also involved interviews with the group member in this case. It documented how these teaching methods approach the students, which method they preferred, and if they are efficient for guiding future design work. In the context of cultural social relations, the background introduction will be provided for each of the interview participants in this case, detailing information about their roles and division of labor in this animation project and the type of previous work they are good at. For confidentiality reasons, every participant has been given a pseudonym with one letter.

Interview participants:

X: 23 years old, Fujian Province. He was responsible for the design of the door, the scene and the animation editing. Before this project, he has 2-year experience of 3D modeling and is good at constructing virtual environments and architectures.

G: 24 years old, Jiangxi Province. He was in charge of the character design and the 3D animation in this project. G specializes in character modeling in 3D software and team management.

Y: 23 years old, Fujian Province. He was responsible for the Unity programming and the 3D movement of the character in the animation. Also, he is capable of script writing, interactive design, and action binding of the animation characters.

The general process of producing an animation story follows the development from story element, story script, storyboard to animation (Figure 6.7). The design diary and interviews were taken place when the stories of animation evolved.

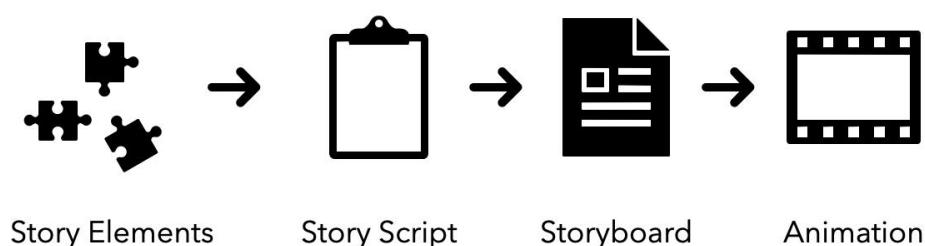


Figure 6.7 Story Development

The first interview happened when the story elements were created through group discussion and creation using *Framework IH*. The feedback from students was gathered through group interviews conducted in Chinese, then translated and transcribed by the researcher. Each group member was asked a series of questions that focused on their experience of the storytelling *Framework IH*, which are presented below:

1. What are the biggest challenges when you start to create an animation?
2. How do you feel when using the *Framework IH* to help create stories?
3. Did the short story develop since the group creation based on the *Framework IH*?

After the second intervention *App IH* was used among the group members, the second interview documented the differences in the tutorial approaches and reflections from the perspective of students. The key points of the interview were noted down and transcribed digitally, of which the questions are asked below:

1. How do you feel when using *App IH* to help create stories?
2. Is this app different than other methods in helping design? If so, what are the differences?
3. What are the differences between the *Framework IH* and *App IH*?
4. How is your story developed through these methods?

The last interview was conducted after the completion of *Animation Door* as a final review and reflection. It helped the research to reevaluate the whole process and lead to theoretical conclusions. The interview questions were:

1. Is the final story concept for the *Animation Door* different from the last story utilizing the *App IH*?
2. If so, what changed your mind?
3. Review the animation-producing process, what do you think is the most important element?
4. Would you use the *Framework IH* or *App IH* in your future work?

The researcher recorded concise written notes to comprehensively document all responses, utilizing keywords and composing full sentences for particularly noteworthy comments.

6.5 Data Analysis

After collecting data from the student interviews and design diaries, a thematic analysis was conducted to analyze and categorize the notes. The categories were not predetermined but emerged organically based on the topics discussed in the data. The categories were analyzed to identify patterns and recurring themes within the data. These common themes were synthesized to provide an overview of the feedback, which informed improvements for the second stage of Action Research.

Thematic analysis is a qualitative analysis technique that was used to analyze the notes collected from the student interviews and teacher observations (Braun & Clarke, 2006). The flexible approach of thematic analysis allows for a variety of epistemologies and research questions to be addressed (Braun & Clarke, 2006)

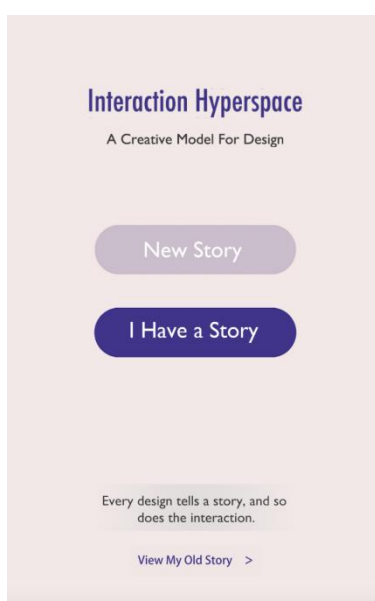
The collected data from a group of three animation students' interviews and design diaries pertains to the construction and development of the *Framework IH*. Through analysis of this data, valuable insights can be obtained regarding the efficacy of the storytelling framework in facilitating narrative art practices.

The first student interviews are presented first, providing direct feedback regarding the user experience of *Framework IH* working as a creative tool for brainstorming. This result is relevant for review and adjustment of the development of *App IH* which was implemented in the second period of the Action Research. Furthermore, this data served as valuable references to students' engagement and perception of the teaching methods in professional art practices.

The researcher used several methods for data analysis, including comparing design diaries, and drawing conclusions from student interviews. Combining suggestions from the students from the perspective of important participants and reflections on the first cycle of Action Research, it is crucial for the preparation of the second process of planning, action, observation and reflection. The final evaluation of this case considered all the analysis of interviews, design diaries and reflective writings.

6.6 Discussion

This case witnessed an important development of *Framework IH*, from a theoretical structure into an interactive application. The data also show the different user experiences through two methods for helping structure stories for *Animation Door*. After the first cycle of action research, the group members of this case have determined certain key elements for their stories and put them together into mini script writings. This period could be seen as the embodiment of the *Framework IH*'s ability to construct stories. With the development of the animation-producing process, the intervention helps to improve the stories as the form of *App IH*. It was capable of deconstructing an existing story into 11 dimensions and modify the first 4 dimensions to reconstruct stories to stimulate more creative combinations. The functions of App IH could be displayed separately according to the stage of developing stories (Figure 6.8). In the second cycle of Action Research, the animation stories have been modified by advanced consideration of creativity and inevitable technique issues and made into storyboard for animation producing (Figure 6.9).



ID	Accumulated time	content	duration
1	0	The door starts to activate the prism on the door starts to move	4 s
2	4 s	The protagonist walks out of the door	2 s
3	6 s	The protagonist scans his surroundings and finds the hat	1
4	7 s	The protagonist goes to pick up the hat	2 s
5	9世纪	The protagonist dances with joy	1
6	十年代	The main character wears a hat and walks back through the door (the light on the door changes from green to red)	3 s
7	13世纪	The protagonist walks through the door, is scared by the tentacle inside the door runs out, falls the hat also falls on the ground, the tentacle redraws, the door	2 s
		The light turns green again	
8	15	Out flew a butterfly	2 s
9	17	The protagonist finds the butterfly and starts chasing it	3 s
10	20	The butterfly flew around and back to the door	2 s
11	22	The protagonist picks up his hat and follows him through the door (the light on the door changes from green to red).	4 s
12	26	A group of butterflies chase the protagonist out again, and the protagonist knocks his hat down and drops it where it started (the light on the door starts flashing). The protagonist gets up and runs.	5 s
13	31	At last a butterfly flew out of the door and round the door	5 s
		The butterfly turned and flew away.	
15	39	The eyes return to the door, the light on the door gradually goes out and turns green, and the door begins to change and gradually close	5 s
	44岁的年代	The closed door and the lost hat	

Figure 6.8 The Homepage of *App IH* Figure 6.9 The Storyboard of *Animation Door*

The interviews with the group and conclusions from the design diaries present that in the early stage of planning animation, the Framework IH and App IH were surprised by the student participants. They show their interests and passions to create multiple combinations of stories. "It was interesting and interactive like a game" said G, who used to play many online mobile phone games. They could also work as a team to cooperate on stories as well as write an absurd story only kept to themselves. However, approaching the end of animation-producing process, they haven't fulfilled all of their ideal stories but compromised to the reality of some 3D technology they failed to complete. It happened almost all the time to every production of animations according to my experience of being animation teacher for 8 years. It might remind

me of the remedial planning as one of the extensional functions to the *Framework IH* as to solve more practical problems when put into boarder usages.

6.7 Chapter Summary

To conclude, the *Framework IH* and *App IH* was introduced to a group of students as participants in Action Research to help improve the bottleneck of lack of inspiration in the early stage of design. Working in an iterative and participatory project, the interviews and reflective discussion benefit this research. This case study was able to yield insights regarding effectiveness of the storytelling *Framework IH* providing more possibilities of students' abilities of narrative design. However, the outcomes may not simply rely on the storytelling skills, but many technical issues. The findings presented in this study imply that *Framework IH* can be utilized as a tool in improving the motivation and inspirations for students. In the next stage of research, it will also consider the learner autonomy and universality of application among the different practitioners of art and design.

7. Case study 3: Theme Design

7.1 Overview

This case aims to promote the *App IH* to apply to a wider range of scenarios and assist in the enhancement of creativity for the practitioners in the area of art and design. The theme of this experimenting design case is set as *A Piece of Sea Take-Away*. It might guide the participants to produce an oriented art or design in a short time. There are 9 participants taking part in the design practice and interviews. Relatively, they are more mature designers or practitioners of the creative industry than young college students. As this case targets the professional in order to obtain different insights and expertise evaluations, it fits the third phase of the *Promotion* of this research, which enables more users to apply and evaluate the *Framework IH* and *App IH* in their daily or specific industrial practices. In this case, the researcher plays a role of an outsider, without instructing, evaluating, and participating in the design task. The only responsibility is to explain the procedure and answer questions when needed.

The interaction between humans and technology has consistently captivated activity theory, a focus that aligns naturally with the theory's emphasis on mediation and tools (Kaptelinin and Nardi, 2018, p.3). This case relies highly on the technology, *App IH*, as an artifact in the design activities, which might inform the future research paradigm.

Motivation:

I have been to many art workshops and held a few by myself. These activities mostly faced to the public and attract those who study or are interested in art and design. However, when visiting these workshops, people are told to ‘make something’ as the beginning. I was in the Boat-making event in Edinburgh Sculpture Workshop. The procedure was simple and friendly as people dropped-in, grabbed some materials provided, and built their own boats. The inspirations were some examples printed on the wall. My friend told me: “If I had more ideas at the beginning, it would help me to build the boat, the Me boat.” The formalism of the boat is typical and symbolic, and the general image consists of a functional boat bottom to carry on the water and maybe a striking flag above.

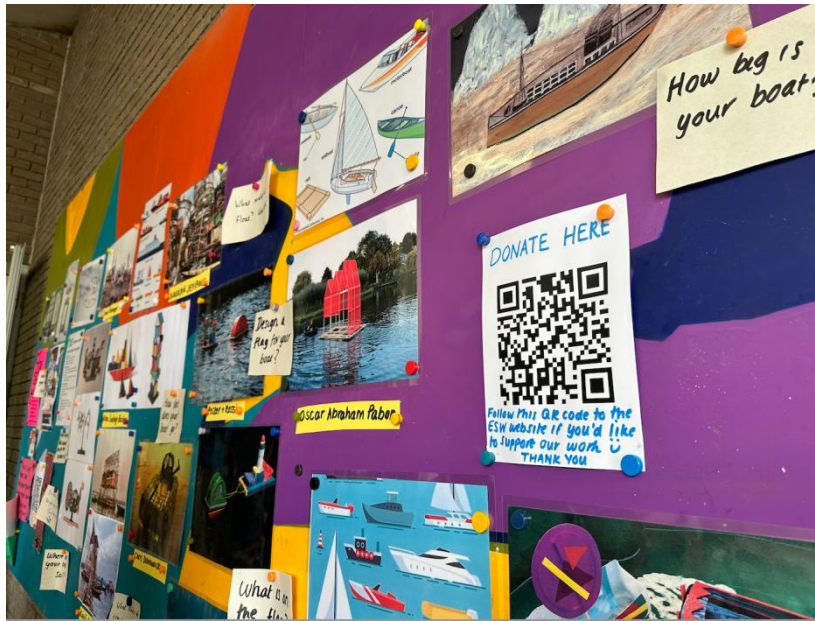


Figure 7.1 The Inspiration Wall of Edinburgh Sculpture Workshop

To ‘make something’ in a workshop is easier than ‘creating something’ for art students. The motivation for this case is to attempt to encourage art students to conduct a concept design under an unifying theme.

7.2 The Process

The design experiment or task is set in a gamified scenario, which encourages people to generate more unlimited inspiration and imagination. To embody the take-away of a piece of sea, the theme itself is surrealism and a challenge to rationality. The outcomes include but are not limited to drawings, photographs, videos, collages, writings, poems, sculptures or sounds. Each participant has a first design when showing the poster *A Piece of Sea Take-Away*. After the first attempt, the *App IH* is briefly explained and applied for their narrative design. The second design is encouraged to produce right after it, which might reflect the differences before and after the intervention. Interviews and questionnaires are used in this case to gather their responses and feedback. The data collected are analyzed by Action Research. The procedure is conducted in Figure 7.2 from the perspective of attenders. The suggestions are intervened when constructing or reconstructing stories for art and design.

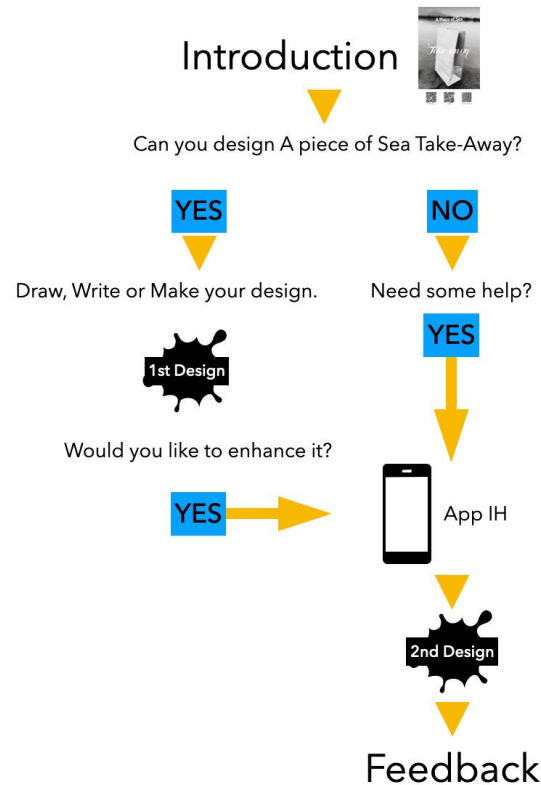


Figure 7.2 Procedure of the Design Task

7.3 The Intervention

The intervention in this case is the user-friendly mobile *App IH* as the tool for structuring narrative design. The first design is based on people's instincts and lived experience while the second design is a storytelling-oriented re-design. The intervention works to empower or enhance creativity by providing a narrative structure in the design. It presents as a self-guided tool for the participants to utilize and reduce the orientation and subjective factors from the researcher. In this particular theme design task, the researcher reduced the most subjective guidance and only provided the design procedure.

7.4 Data Collection

Data are collected from questionnaires and semi-structured interviews, along with the sketch design practices as a visually supported material. The questionnaire is designed to minimize the researcher's tendentious questions and subjective guidance. It contains the background of each participant, the process of creating ideas, and the general challenges when they conduct designs. These questions reflect that these senior designers experience years of design thinking and generate relatively familiar design patterns by themselves. The following questions are proposed to them by evaluating the *App IH* and the suggestions for this specific method from their perspectives. They respond to the two designs and the differences between the design

process by the intervention and it will feed into the future study for this research. The questions are designed along the process of design as follows:

1. Can you understand the method (Hyperspace of Interaction) as a way of design through the researcher's explanation or App?
2. Before learning about this method (Hyperspace of Interaction), how did you conceive the inspiration for your design?
3. How do you evaluate the first design in the preliminary survey?
4. How do you evaluate the second design after understanding this method (App Hyperspace of Interaction)?
5. Evaluation of the effectiveness of this method (Hyperspace of Interaction) for creative improvement.
6. The possibility of using this method (Hyperspace of Interaction) for your design in the future.
7. How do you suggest this method be improved?

With more in-depth inquiries, the semi-structure interviews expand from these questions with more associations with the individuals:

1. Where are you from? (Your Hometown)
2. When you were creating an oriented theme design before, how did you start thinking about it?
3. What do you think is the most difficult part of a design?
4. Do you think creativity can be cultivated/trained?
5. Please talk about the influence of today's design experiment on you or what you want to talk about. (Any aspects, such as your previous experience, or what you think can be used for reference, or what are the weaknesses of using this method?)

7.5 Data Analysis

The retrieved data is analyzed by Activity Theory, as it provides a framework for understanding how individuals, tools, goals, and cultural factors interact to shape design activities and outcomes. It emphasizes the interplay between individual actions and the broader social context, making it a valuable approach for studying the case study in a complex and dynamic system in design practices.

According to the Activity Theory, this case applied the classic Activity Theory model by Engeström *et al.*(1999) as more and more technology-related cases focus on the production of human-technique collaborative outcomes in activities.

Activity Theory	Specific meaning in the case
Object	Theme Design: <i>A Piece of Sea Take-Away</i>
Subject	Participants as Designers
Tools	Storytelling <i>App IH</i>

Rules	Follow the instructions to design 2 pieces of work
Community	The design environments of different individuals
Division of Labour	Researcher launched the instructions and participants completed design works

Object: In this case, the object is a conceptual theme design using *A Piece of Sea Take-Away* as inspiration. To attempt to embody the sea, it is ultimately encouraging associations and imaginations about the sea. The other level of object of this case is the goal for this process, which is using the technique app to improve design for art practitioners.

Subject: The participants as subject conducting this design experiment are from China, but they are currently living in different cities in and outside of China. They generally have more than three years of design experience in college or the creative industry. Relatively, they are defined as senior designers compared to the other two case studies.

Tools: The main tool in this case is the *App IH* providing a digital and interactive structural story framework for helping design. The *Promotion* phase of the research focuses on the potential development and user acceptance of the application.

Rules: The rules applied refer to the design instructions of the process. After showing the poster image, the instruction was simple and straightforward: Make a preliminary design sketch (concept design) based on the theme. Any design form can be used (video, graphic, industrial design, poetry, etc.).

Community: These senior designers are influenced by the major Chinese cultural social environment as a common background, which keeps in consistent with the other case studies of the research. Though the theme design is conducted individually, they work for a common concept in the scenario of the sea.

Division of Labor: The researcher takes responsibility for launching these design tasks and monitoring the design procedures and the participants are the primary users of *App IH* and designers in this case.

Around these elements, the data consists of subjective descriptions and NPS scores. The application as a storytelling method is accepted by 100% of participants while they value the effectiveness and possibilities of future usage are 33.3 and 44.4 respectively, shown as Recommended.

7.6 Discussion

According to the feedback, one of the most inspiring points is that the storytelling method offers more angles at the start of the design. For example, “the aspects of time,

and state are not usually the elements to be considered in my old habitat of design” said Z, “but they did offer me more perspectives to design”. Similarly, C claimed that she did not have a clear impression in her first design but doodles, but she sorted out the whole picture using the app providing a story structure for her design.

One point of view appeared as Participant C stated: In the past, she has recognized the importance of telling a compelling story in design as many designs rely on human narration to achieve a more comprehensive expression. Narration can enhance the design through a secondary enrichment, sometimes even exerting a greater influence than the design itself. However, this theme design has made her consider from another perspective, “Why not reverse the process, starting with a story and then proceeding with the creative design?” This approach provides positive momentum for the completion of the design and, at the same time, offers significant assistance to the creator. Figure 7.3 is the screenshot from *App IH* generated by C and she developed her sketch (Figure 7.4) from the narrative as what she described “Reversed process”.



Figure 7.3 Screenshot from C



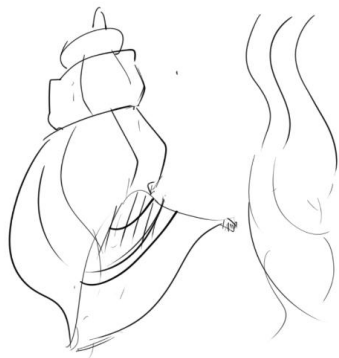
Figure 7.4 Sketch by C

Similarly, as Participant L mentioned, he came up with many ideas when he first got the theme. However, after he started to draw a sea snail (Figure 7.5), he lost the other images in his mind. Even though this method might not be the one he was looking for, it was capable of offering a clear structure to remind him of the other aspects to consider and the relationships he was after. Figure 7.6 is an after-intervention sketch, he pointed out more elements and colors into consideration.

These reflections also inspired me, not solely due to their illustration of the method's effectiveness to some extent, but rather because of their potential to encourage

independent thinking among students. This research might extend its significance from framework construction to a mode of reflection.

草图1



珍珠



整体是五彩斑斓的颜色

Figure 7.5 First Sketch by L

Figure 7.6 Second Sketch by L

On the other hand, from an improvement perspective, one of the suggestions is that the users expect more explanations or definitions of different dimensions in the application. When the researcher stepped back and the students took control of comprehending and using *App IH*, the users would like to be offered more examples or options under each dimension. But it is a dilemma, ‘options’ mean the imagination is selective and bounded while the creativity is encouraged to be unlimited and fearless. A potential compromise solution could be to add a button after each option, providing some reference values (Figure 7.7). More consideration of these issues will be discussed in the later research.



Figure 7.7 Solution for Suggestion Buttons

Another promising suggestion is to “design multiple sub-story lines to allow creators to explore more possibilities”. This might bring more interactive stories into the narrative design as the interaction not just between the designer and the work, but within the audience and the work. In the future literature, the interactivity of narrative artwork is emerging and the audience require more and more immersive experiences. Since *App IH* as a storytelling aid program is always challenged by the development of techniques and requirements of society, there will be some consideration towards Artificial Intelligence (AI) technology in the next chapter.

7.7 Chapter Summary

In conclusion, the exploration into the theme design of *A Piece of Sea Take-Away*, featuring two distinct design phases before and after the intervention, highlights a nuanced perspective. The experienced practitioners demonstrated how *App IH* becomes a pivotal tool in organizing structures, weaving narratives, and examining design paradigms, even within the context of pre-existing user design preferences. The responses from the participants predominantly shows a favorable reception of the outcomes, though it's important to acknowledge the inherent subjectivity in qualitative interpretations. Activity Theory analyzed in this case emphasizes the creation environment and tendency have some impacts in producing creative work. This study might shed light on the potential of leveraging intervention to reshape design approaches and suggest adaptable methodologies of interplay between design, user habits, and creative imaginations.

8. Conclusion

8.1 Overview

In this chapter, the conclusion is drawn from the analysis of case studies and contributes original knowledge into professional practices of art and design.

To review the research questions, the first inquiry is based on literature review and primary discourse with the participants of this research. In exploring *what is interaction from the perspective of storytelling*, the interpretations vary and the researcher dissects it with an ontological explanation. Defined in the context of this research, interaction is seen as storytelling, a narrative structure within events, between people and environments. The second question built upon the first one, interaction as storytelling might be able to inform narrative art in constructing interrelationships from different layers. This leads to the third research question, which tests if a framework concerning hyperspace theories as references is able to provide a narrative structure for enhance creativity to art students. The researcher proposes the Framework Interaction Hyperspace deconstructing interaction into 11 dimensions and tests its practicability and effectiveness through case studies, Activity Theory and Action Research as methodologies applied. From Chapter 5 to Chapter 7, practical cases have been conducted to help *Framework IH* improve in the professional domain of design activities. The narrative structure is proven to be beneficial to guide design and enhance creativity for art students, thus the *App IH* is supported as an interactive technique for constructing stories in these teaching practices.

8.2 Original Contribution

As previously mentioned, this research study presents its original contribution to knowledge in multiple ways. Firstly, the pivotal discoveries provide a framework describing narrative structure that can enhance and empower creativity in design. Secondly, the originality lies in the insights with respect to the interaction and the analogy with quantum theories. Lastly, to put this framework into the practical field, a mobile *Application IH* along with a teaching model consistent with the theoretical *Framework IH* is developed to feed into university teaching practices of art and design.

As established in the introduction of this research study (in Section 1.5) there is a gap in knowledge with respect to trans-disciplinary thinking from physics to art and design by constructing narratives and setting up a storytelling framework of interaction in this context. There is little evidence that associate physics with art, but this research field is emerging and provides more creative insights for both disciplines. In terms of pedagogical practices, the *Framework Interaction Hyperspace* appears to be an innovative and methodical teaching model in assisting narrative design for

students.

The framework could be interpreted from the ontological aspect of interaction. By deconstructing a story in a way of interaction, the multiple dimensions offer more perspectives in art and design. Some of the key findings in practicing the framework are shown below:

1. A relatively comprehensive structure works for a story for the purpose of creating art and design, especially in the early design concepts.
2. The relationships are considered thoroughly between the plots, between design and audiences, and between the environment and the work.
3. The new creative combinations that emerged from the interaction may enhance and empower an existing work.

By focusing on an interaction perspective within narrative design, the framework has shed light on the pivotal role that storytelling plays in the design process. Simultaneously, it has facilitated the comprehension of the intricate connection between designers and design in terms of their mutual influence. Consequently, the *App IH* has been promoted as a means to structure narrative design, thereby fostering diverse methodologies and providing instructional guidance in pedagogy.

8.3 Limitation

Since adopted in the Interpretivist paradigm, the observations and narration analysis through the lens of the researcher is inevitable to remove subjective elements. Within Activity Theory and Action Research, the participants are highly involved in the research process and provide individuals' insights and evaluations, which might be considered valid only in the particular cases.

Another limitation of this research might be the different definitions of Framework Interaction Hyperspace. Some dimensions are less explicit than others when the students use the App IH alone to conduct the design process. As a digital tool in the practical field, the functionality and programming of an application usually require many tests and iterations of development. Due to the duration of this research, the App IH remains a test version and primary tool in testing the theory instead of a complete product in the market.

8.4 Future Development

In addition to tackling the study's limitations, more professional practices in the domain of art and design will be implemented in the future. Insights and feedback were gathered not from the view of students, but more from teachers and experts with mature experiences.

Suggestions of *App IH* gathered from case studies also present an opportunity for future work. Although this is a storytelling aid program, the drawing board function is not perfect and convenient for users on a mobile device. There might be an option that add a picture upload into the app to assist the users to keep records of their instant sketches. Hence, future development will involve software upgrading and testing.

One of the undeniable impacts is that the rapid development of Conversational Artificial Intelligence (CAI) systems has permeated into various creative industries and replaced some traditional work. The recent arrival of generative AI tools like Stable Diffusion, Midjourney, and Chat GPT enables individuals to create imaginative narratives, images, videos, and animations by using these AI platforms. In particular, AI text-to-image programs afford easier and faster ways of producing creative content (e.g., music, animation, story, and visual arts), which can be effective in the creative processes for creators (Vincent, 2022). It might be the biggest challenge to the current research and the future development of the creative industries. My current strategy involves reframing this as an opportunity rather than a confrontation and utilizing its strengths for the purpose of this study. AI systems are based on a large amount of database and generate new content aligning with most general logic. However, the core value of creativity lies precisely in its continual disruption of these 'universal values' and its creation of new possibilities. Hence, future work might take into account more AI-based data as inspirations and train creative thinking to reverse AI. This will be a lengthy and challenging exploratory research, yet it also carries immense potential and improvements simultaneously.

8.5 Chapter Summary

In this chapter, the research questions are reviewed and responded to in the beginning in terms of the the purpose of this research. Subsequently, the focal points of this study, the original contributions to the practical research, have been elaborated and concluded. As demonstrated by the case study of this research, and through indicating further ways in which this research could continue and develop in this final section, it is evident that a framework of narrative construction can inform the creativity in art and design for students.

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Appendices

A1: Template of Research Consent Form

Academic Research Consent Form

学术研究许可书

Introduction:

This document serves as a consent form for your participation in a research titled "Structuring Stories: A Framework for Considering Storytelling to Encourage Creativity for Art Students".

We want to find out what you think about art and design practices. We are trying to find out what would be beneficial to generate more creative art works and design.

简介：本文件作为一份研究同意书，邀您参与一项名为“构建故事：鼓励艺术学生创造力的一种叙述框架模型”的研究。我们想知道你是如何看待艺术和创作实践的。我们正在试图找出是什么有助于产生更多有创意的艺术作品和设计。

You are being invited to take part in a research study that is being run by the University of Wales Trinity Saint David. Before you decide, it is important to understand the research is about student's opinion towards creative ideas and design. It will involve with your feedback about art and design and how you deal with design practice. Please take time to read this information carefully and discuss it with others if you wish. If there is anything that you are not clear about, or if you would like further information, please ask.

你被邀请参加一项由威尔士三一圣大卫大学进行的研究。在你做决定之前，重要的是要了解这项研究是关于学生们对待创意灵感和设计的看法，并且它将涉及到你们对于艺术设计的反馈和如何进行设计实践的。如果您愿意，请花时间仔细阅读此信息并与他人讨论。如果你有什么不清楚的地方，或者如果你想了解更多的信息，请随时提问。

***1. I confirm that the above study has been explained to me and I have had the opportunity to ask questions.** 我确认上述研究已经向我解释过，我也有机会提问。

YES

NO

***2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.** 我明白我的参与是自愿的，我可以在任何时候自由退出，而不提供任何理由。

YES

NO

***3. I agree to the note-taking or audio recording of the discussion.** 我同意对讨论进行笔记或者录音记录。

YES

NO

***4. I agree to take part in the discussion group.** 我同意参加集体讨论或分组讨论。

YES

NO

***5. I am aware that the results from the study may be published but I will not be identified in the research findings.** 我知道这项研究的结果可能会发表，但我的身份信息不会在研究结果中体现。

YES

NO

***6. What is your name?**

你的名字是？

***7. Name of Participant** 请手写签名确认你的同意书。

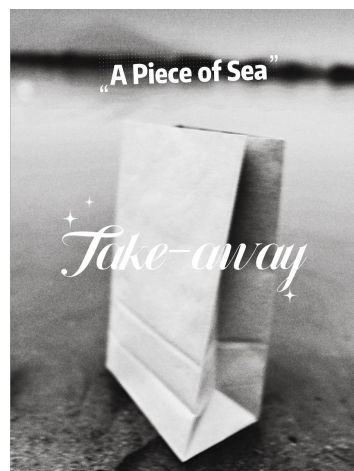
A2: A Brief about Theme Design: *A Piece of Sea Take-Away*

This theme generated from the idea of the researcher, fascinated in light installations and the relationships between human and the sea. I use the storytelling framework IH by myself when I have the initial interest about this topic. It leads me with a story of turning sea water into light, which assembles a video installation. I used a chemical mediator to powering the light through the electrolytic properties of seawater. It enabled me to consider the transformation from liquid sea water into untouchable light. Moreover, the interaction not only happened between the designer and the sea, between the light and the water, between the take-away paper bag and different locations, but exist with time.



The Screenshot of Video Footage: *Sea Light_By Wenchang Lin*

This project works as a theme-oriented design discussed and experimented among students in the third case study, also it is assembled by myself as an insider designer in a video installation. The footages and trails were taken in these locations: Fuzhou (China), Edinburgh (UK) and Swansea (UK). It involves with Psychogeography thinking and interactive techniques, which expecting interactive storytelling in the story of my design.



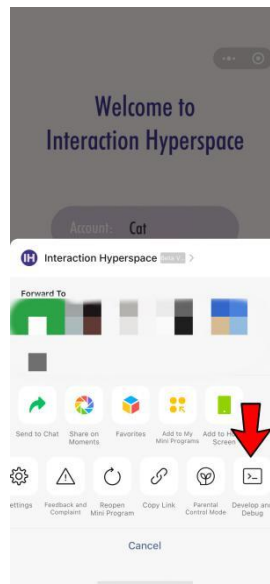
A Poster of Theme design: *A Piece of Sea Take-Away*

A3: Instruction of App Interaction Hyperspace

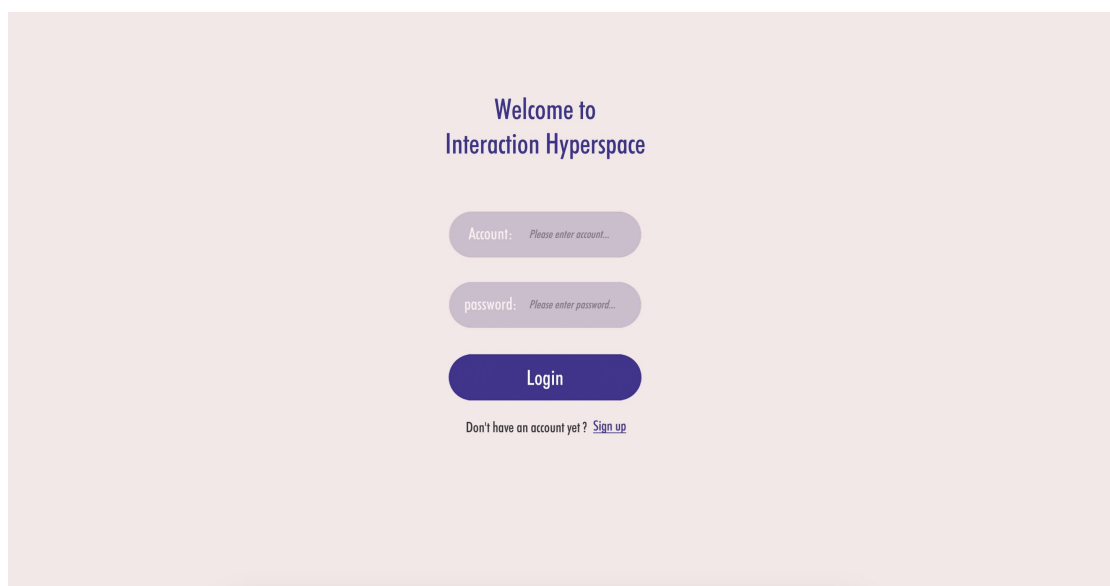
This is a step-by-step instruction about App Interaction Hyperspace, which can access through different platforms.

✧ Installation

1. The web version app through browser on computers :
<http://test.interactionhyperspace.com>
 2. The Android version downloaded from:
<https://pan.baidu.com/s/1lPNkHG53A6qWg7FRDWiLDA?pwd=xsiw>
(Password: xsiw)
 3. A test version via mobile software Wechat by scanning QR code:
- *Wechat app need to start **Develop and Debug** as it is a test version.



Once the app is downloaded and installed properly, this will be shown on your device:



✧ Sign up/ Login

By registering, the users could set up their own accounts and use them in the login process. The future stories the users created are also able to review through the personal account. After signing up, the users are able to use the account and password to login.

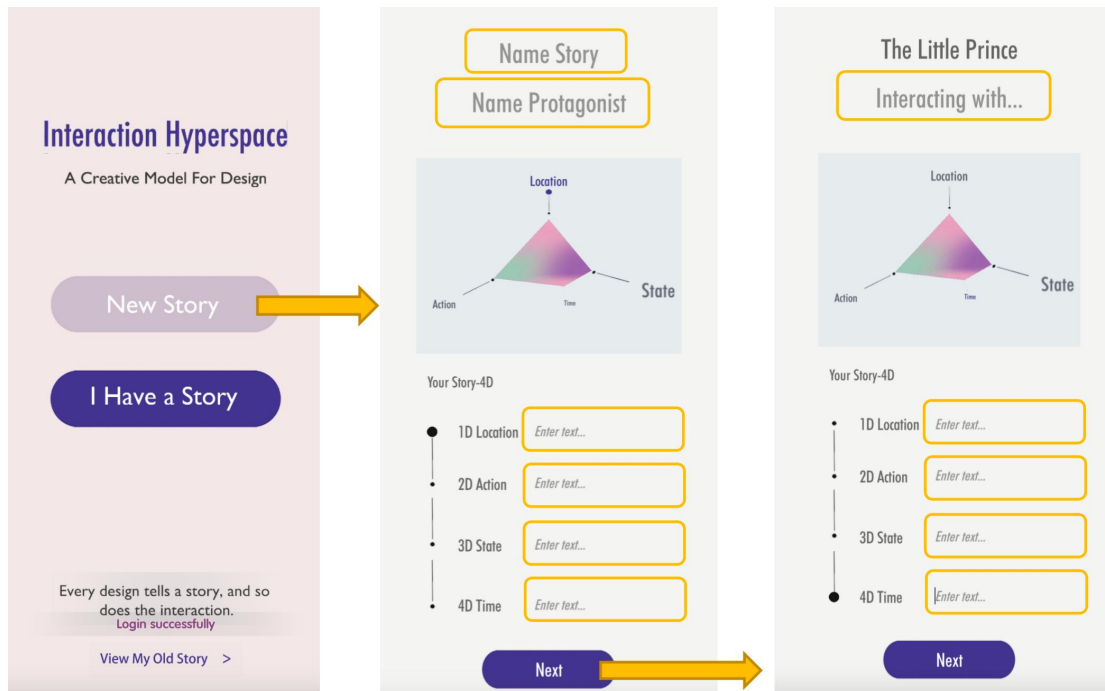
The image displays two mobile application screens side-by-side. The left screen is titled 'Register' and features three input fields: 'Account:' with a placeholder 'enter account...', 'password:' with a placeholder 'enter password...', and 'Name:' with a placeholder 'enter name...'. Below these fields is a dark blue 'Sign up' button. At the bottom, there is a link 'Already have an account? Sign in' and a small disclaimer: 'By Signing up, you will authorize to share your information in the academic research activity, and your personal identity will not be published.' The right screen is titled 'Welcome to Interaction Hyperspace' and shows the same 'Account:' and 'password:' fields, but with the values 'user' and '****' entered respectively. Below these fields is a dark blue 'Login' button. At the bottom, there is a link 'Don't have an account yet? Sign up'.

✧ New Story

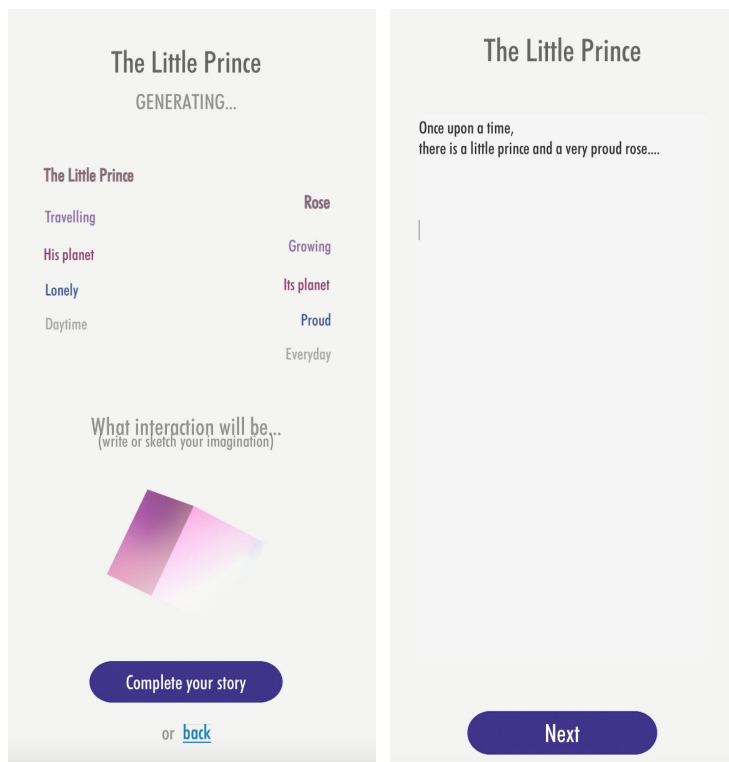
When users want to create a new story or design, they can go to *New Story* process. By filling in ***Name Story***, give a title to the story which is about to create, as well as nominating protagonist by ***Name Protagonist***, which is the main object the users want to target in this design.

Follow with the four aspects about the protagonist, ***1D Location***, ***2D Action***, ***3D State*** and ***4D Time***, the users need to fill in all these 6 areas to continue by clicking ***Next***.

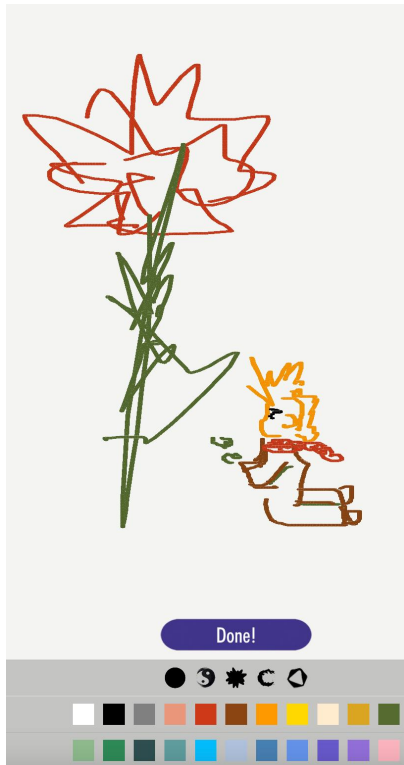
It will lead to a second object that the protagonist going to interact. By filling in to ***Interacting with..*** along with its ***Location***, ***Action***, ***State*** and ***Time***, that complete the main interaction in the story.



The next step will show a brief chart displaying the key words for both objects in the interaction. The users can review their contents to continue to ***Complete Your Story*** for future design or go ***back*** to the last step.



Lastly, when completing the story writing, it leads to a drawing board that users can sketch based on their story and produce a visual image if they want.



Clicking **Done**, the data will be updates to the server and the creation is finished at this step.

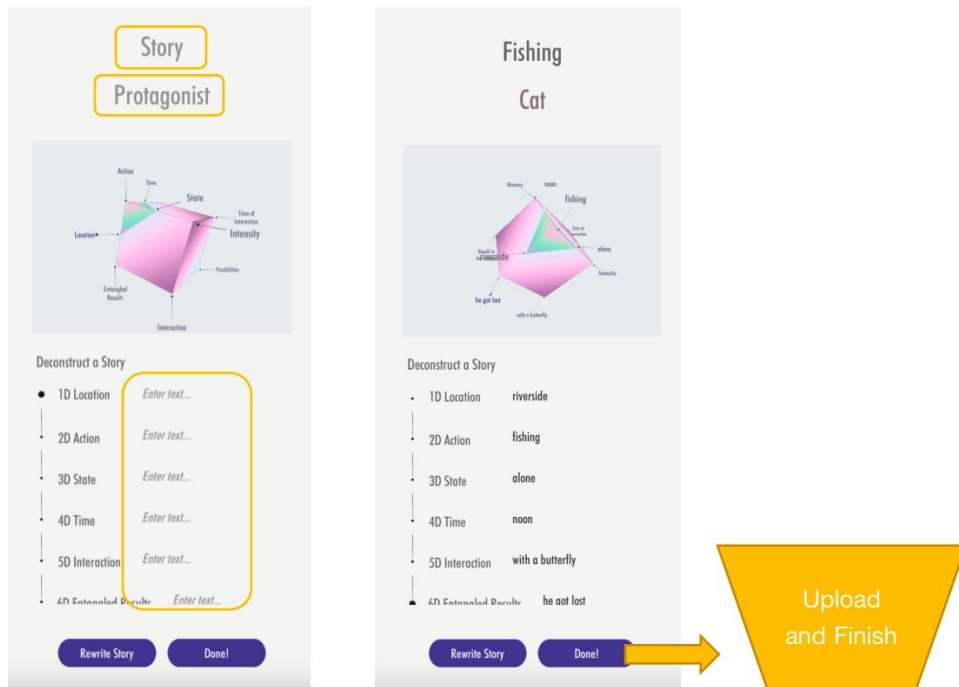
✧ **I Have a Story**

When the users select ***I Have a Story*** in the homepage, it will show an 11-dimensional framework for analyze a story. The users will identify the name of the ***Story*** and analyze it for one of the ***Protagonist***. From the protagonist's perspective, the interaction exists in 1D Location, 2D Action, 3D State, 4D Time, 5D Interaction, 6D Entangled Results, 7D Time of Interaction, 8D Possibilities, 9D Intensity, 10D Results to the outside, 11D Memory.

- * 8D Possibilites and 9D Intensity require to be filled in numerically.
- * The 11 dimensions are able to scroll up and down.
- * The cube displayed above is able to rotate.

Done:

When completing the 11 dimensions, clicking **Done** allows the data to be uploaded into server and finish this process.



Rewrite Story:

The page will show the 4D about the protagonist was created before, and able to be modified in the page.

Next, it will start to create a new object that protagonist **Interacting with...**, following the 4D to fill in. This process is the same as setting up **New Story**. The last process will be the sketch board.

