## Data analysis process

My study draws on traditional ethnographic methods of my journal as participant observer, participant interviews and analysis of artefacts used and created.

One of the challenges of adopting a naturalistic research approach is to work with material gathered to find and describe patterns of behaviour.

### Iterative approach of data analysis

Video data analysis involved description and transcription of video data and thematic analysis of the contents.

Due to the exploratory nature of the research, and the openness to new directions, the process of analysis of the data gathered was carried out in an iterative approach over several stages. The process is presented here in three stages, which are a simplified slightly in terms of categorisation into distinct stages. Progression through the different stages of analysis involved increasing granularity and focus, and to achieve this different forms of analysis were used. The use of stages was particularly needed in order to deal with the large amount of video data gathered for the different sessions.

### Summary table of data analysis - HERE OR AT END?

There is a table online here to summarise data analysis types

Outer pipes Cell padding

| Stage | Technique | Description |
| --- | --- | --- |
| 1 &2 | Making observations of activity based on 3 planes approach ( & practicalities) | Dipping into screen capture and 360 footage (VLC player) helped inform the smaller subsequent selection of data. Observations stored in an excel spreadsheet, separate word documents on tensions and barriers in activity. |
| 2 | Transcription of activity and conversations | Simultaneous view of screen capture and 360 footage.Actions and extracts of conversations Recorded into a word document For the individual / pair their activity split into 5 minute sections and recorded in a word document time coded via a grid table format. |
| 2 | Exploratory Thematic Clustering | Video capture data and 360 data in Nvivo 8 screen capture / 360 files from 5 group sessions analysedThis process was made complicated by the format of the data in video files and their extended length.During this period activity was coded based on an evolving schema which included design cycle stages, types of participant interactions and which game elements were being worked on by participants. |
| 3 | Revised Thematic Clustering | Video capture data and 360 data in Nvivo 12 screen capture / 360 files from 5 group sessions analysedA revised thematic analysis driven by the different use of game design patterns GDPs and dimensions of participant agency. |
| 3 | Choosing and transcribing Vignettes | Simultaneous view of screen capture and 360 footage in VLC player.Practitioner interviews in VLC player4 vignettes chosen and transcribedA full transcription for a limited period of time with description and commentary on non-verbal aspects of movement and gesture. Getting deeper into the pair processes at play and a deep sense of what an individual may be experiencing. |

### S1 (stage one) - expansive stage of data analysis

The overall rationale of data analysis at S1 was to

* check suitability of data to answer RQs and ROs
* identify which data to analyse in depth to achieve this
* check the mechanical and analytical processes for the next stage of analysis

Stage one of data analysis was designed as an expansive review, focusing on the suitability of collected data in answering the research questions and research objectives. This phase aimed to determine which datasets merited deeper analysis and refine the methodological processes for subsequent analytical stages.

The exploratory nature of this stage aligns with approaches of to iterative refinement in design-based research (DBR) (Bakker and Van Eerde, 2015),

Also open encouraging methodological flexibility based on emerging insights rather than rigid initial coding structures.

#### S1 Journal analysis (and evolving resources) data

Journal analysis provided a foundational perspective on facilitation processes and early thematic tensions, contributing to the development of early, external publications (Chesterman, 2023b, 2023a, 2023c) and mapping evolving pedagogical dimensions within online resources. Given the breadth of journal data, a comprehensive thematic analysis and exhaustive coding was in practical; instead, insights were triangulated with findings from the literature review to expose key themes and contradictions within the evolving pedagogy. Rogoff’s (1995) three planes of sociocultural activity were particularly useful here, allowing reflections on facilitation to be categorised across personal, interpersonal, and institutional dimensions, a technique further refined by Morcom (2014).

The process was driven by the requirement to create a summary of the facilitation process and some of the initial contextual tensions for a book chapter (Chesterman, 2023b), and for a map of learning dimensions created during the D3 development period for online resources [^lm].

**Journal notes**

My journal entries contain notes and initial analysis of workshop sessions and resulting reflections on experimental design and facilitation.

The process of analysis of journal notes and resulting resources required a different approach from that of video data.

Journal Notes were used in the following ways: (perhaps code this)

* as a reflective tool after sessions
* as a note pad to plan resource creation
* as a sketch pad to explore the relationship between Concepts being explored and existing game making frameworks

The quantity of data prevented extensive and detailed coding using thematic analysis.

Instead, observations are triangulated with data from lit review to expose key themes and tensions.

My journal entries contain notes and initial analysis of workshop sessions and resulting reflections on experimental design and facilitation. Post-workshop participant interviews will gather information to support analysis of specifics of in-session interactions and relevant detail of wider activity systems of home digital use and other relevant interests.

**Resources created as part of game making**

Digital artefacts created as part of the game making process include text-based games, pixel art, digital audio sound effects and background music.

There were two main types of resources created.

* supporting teaching / facilitation RESOURCES
* games and game and assets created

The documentation and other forms of support evolved during each phase -

Chapter four explores the evolution of these documentation and learning resources created in response to participant need using AT as a tool for analysis of the existing and emerging contradictions in activity.

Examples?

**RQS**

The journal notes contributed to understandings of all research questions but in particular the sketching out of evolving tensions in workshops sessions and frequently revised resources.

The principle RQ addresses the formation of a game-making community.

This process is co-constituted by planners, facilitators, parents and children. The scope is broad, but a unifying factor is my own role as a facilitator and researcher. Thus journal notes are limited in terms of reliability and bias, they were vital in this first stage to set the overall direction for subsequent analysis.

#### S1 Practitioner interviews

Practitioner data used in stage one of analysis along with themes from the literature review to identify themes for possible analysis.

The process of writing interview questions and the conversational process of semi-structured interviews helped expose new streams of thought, that which while present in existing researched helped bring them into clearer focus.

The interviews were semi-structured allowing me to ask follow up questions to gain more detail on areas of interest.

The chosen interviewees represented a certain diversity in audience however as these interview are limited in number, resulting data are also explore in relation to existing research and no broad claims are made from this data alone.

Interview data from participants was particularly helpful to inform analysis of barriers and tensions for both practitioners and participants which exist in this domain of creative coding projects.

* helped develop and deepen my reflection on key issues, to develop lines of thinking and to expose and explore barriers to participation in projects, tactics to address them and tensions

Themes included: agency as a focus came in part from reflections from Dave Potts in particular the value of surfacing and valuing the interests of participants in digital making, the value and tensions surrounding competitions in non-formal settings from Matt C, the importance of the helping roles of parents in digital technology from Saskia Leggett, and reflections of the affordances of toolkits and use of game mechanics as a meditational strategy from James C

**RQS** The practitioner interview data helped inform the broad themes of RQ1 and RQ3.

#### S1 - Initial video analysis - dipping a toe in

Stage one involved initial broad analysis of the video recording observations. The rationale was to get a sense of the quality and characteristics of the data and to begin evaluation of how much video data to examine in what level of detail.

To begin the process I sampled video data of sessions selecting sessions in P2, P3 and P4. The 360 video proved most valuable at this stage to give a more holistic view of the activity on a community level. Including, instructions and orientation to the whole group from me as a facilitator, movement of people around room, phases of session from intro, to pair working to peer interaction, Advantages included gestures, which at times helped disambiguate speech.

Disadvantages included a lack of clarity of audio.

Thus, at times I when some interactions were interesting, I would open up the screen capture file of particular participants. This allowed display of what was happening on their computer

At this stage I took notes in my data analysis diary on the practical issues arising.

Evaluation at this stage confirmed that full transcription of video data of all sessions was beyond the remit of the study.

And that P2 and P3 contained the most useful data to inform the research objectives.

Some initial observations and analysis of participant behaviour was recorded in a spreadsheet format (using the FLOSS libre office tool and MS office equivalent). (LINK TO 3 PLANES)

#### s1 - Initial description of video data using a spreadsheet and 3 planes approach

**This data was analysed, at a broad scale at this stage by noting tensions and behaviours, and in particular meditational strategies**

This was undertaking within a spreadsheet noted activity and tensions and meditational strategies as a list that emerged in initial review.

To help categorise these entries I using 3 planes of sociocultural activity. Following the approach of Morcom (Morcom, 2014) I drew on Rogoff’s (1995) three planes of sociocultural activity used to help understand activity in a Community of Learners.

While the three planes provided a higher level framework, specifics of the data gave greater granularity and formed I imagined / planned that later themes informed by LR would be used in the next stage of analysis.

### S2 (stage two) - exploratory phase data analysis

* original plan for quant thematic analysis
* choosing 10 sessions
* trialling nvvo
* coding schema , via clustering
* continue work on spreadsheet 3 planes, breaking out into separate word documents

#### S2a - The original plan regarding quantitive thematic analysis

The imagined end point for the process was a full coding of as much data as possible using full transcription of session and a coding scheme which emerged from thematic analysis using the Nvivo software.

This would involve a mixed methods approach, with some quantitive data involved created by a systematic thematic coding of video data allowing time spend.

My initial plan concerning analysis of both forms of video data and participant interview data was to undertake a process of thematic analysis and subsequent coding. Thematic analysis is a process of discovering underlying themes within data and can be carried out in varied ways. Coding involves applying the themes emerging into a set taxonomy which can be applied to the data. In the case of both textual and video data I proposed to do this using the NVIVO software [nv]

This section will outline the rationale behind a shift to drop such the quantitative approach, thus signifying a shift from mixed methods to a purely qualitative approach.

**What themes were was considered but then excluded at s2**

A candidate schema for initial thematic analysis had emerged from s1 from literature review, early analysis of journal entries, participant interviews, and dipping in to video data.

This schema included the following broad categories.

The following themes emerged as potential themes from LR, interview data and from initial clustering of data in Stage 1.

* Elements of Computational Thinking
* Systems Thinking Concepts
* Design cycle stages
* Participant roles and interactions
* Types of Gameplay Design Patterns (MDA)

Some of the themes were discarded relatively early in the clustering process, other remained for an extended time until a larger shift in thinking occurred.

Computational thinking and systems thinking were discarded relatively quickly in this process for the following reasons. There is other extensive or focused work in these fields (previously explored in the literature review) on CT which this study which this study does not need to replicate. Systems thinking was promising however the data in P2 and P3 which became a chief focus of this study was not as rich in this area as later P4 and P5 data.

These themes which reflected possible learning outcomes in the emerging pedagogy, were dropped partly following a decision to de-prioritise the applicability of this research to formal settings, allowing a greater focus on non-formal settings and processes.

The following section examines this shift in thinking through one of those themes, that of roles and modes of interaction between participants.

##### S2b - Defining of thematic analysis and video coding - via an iterative approach to thematic analysis.

Thematic analysis is commonly done in stages, each revision building on insights of the previous one.

What it is in a nutshell. And what are the common stages.

Reasons to undertake thematic analysis and subsequent coding of data include: to surface issue of relevance within data, to discover relationships and causality or at least correlation, and to organise instances of themes or behaviours so that the researcher can come back to get a summary of where that has been identified in the data.

The practical process of running queries on data gathered via video requires selecting parts of that video and coding to a coding schema that has emerged from previous process of thematic clustering, revision and then formalisation into a schema. There is a possibility that the process may evolve understanding which may subsequently evolve schema and thus require re-coding.

While grounded analysis involves starting with no preset themes, the kind of analysis I undertook began with some themes that had emerged from interviews with practitioners and subsequent research which is summarised in the literature of Chapter 2. This decision was guided by x, who said y.

The advantage of using a coding software like Nvivo is the possibilities to compare and contrast different coding schema using coding comparison queries. These queries within Nvivio are a potential powerful tool to identify x and y.

#### S2a Prioritisation of sessions meriting deeper analysis (10? )

**initial stage**

S1 process had indicated that full analysis of all sessions not possible. A first step was to prioritise some of the session to trial a S2 process.

To inform **prioritisation** of the video data at this early stage I began to formulate some guidelines to help prioritise sessions which included: a wide sampling of different sessions, more in depth previewing of a few promising sessions.

**justification of selecting sessions and sections for more detailed analysis**

A word document containing a table of broad evaluation of the characteristics each sessions helped to shape that decision on what sessions merited closer attention

Criteria for inclusion included both practical and theoretical considerations, including: quality of recording, how much activity, richness of interactions, a range of different kinds of participant interactions.

MERGE UP - Good quality recording - Diversity of kinds of participants, ages especially - Diversity of participant actions in terms of tasks being worked on - Diversity of kinds of pair and peer interactions

The two last 2 sessions in particular in P2 jumped out at being rich in community interaction as well as focused work. I coded 2 screen capture videos of from each of those in more depth. (Mark and Ed and Susanna and Tehillah)

**Later stage**

Increasing number of sessions based on capactity

I also sampled p3 work as well which could be characterised as more calm and focused with extensive pair work happening.

##### s2b Trail process of coding and Nvivo / Vlc use

I first attempted to undertake a trial process of coding screen captured sessions within Nvivo using a initial candidate of themes (which ones?)

However I came into issues regarding the use of Nvivo to work with video files [vf]. Issue of video playback prevented a detailed granularity of coding. In addition the

To counter these issues, I trailed a process of creating 5 min sections as a text transcript. The large amount of video data in each session forced a partial transcription process which was in part descriptive and in other parts involved a closer transcription of the words spoken by participants.

This trail was in part successful, word document created in the correct format could be imported into Nvivo for coding and query. Another reason prevented the further use of Nvivo.

Driven by a requirement to cross reference the video data of 360 footage with screen capture video, I researched a process to syncronise and display both sources of video side by side on the same screen. Vlc player has the ability to play multiple files simultaneously. VLC also had flexible (and configurable) playback controls of which in comparison to Nvivo made the process of transcription much less frustrating.

**Practicalities**

I some sessions I attempted to have a clock displayed within view of the 360 camera. However, this was not always practical.

Prioritise displaying time - have an old school clock under the 360 camera. For example.

**Implications**

The complications of video data coding in terms of granularity forced a reevaluation in imagined procedure.

Given that a systematic and granular process would be difficult, how necessary would complex queries using multiple coding schema within Nvivo be. In other words would the gain justify the pain?

#### s2b - Clustering of themes and later change of direction away from close thematic analysis

I began clustering of potential themes for analysis using 10 selected sessions and transcribing them.

The process of initial clustering helped to get closer to the data and to :

* start identify to thematic analysis of the stages of design with other learning models
* to identify roles through repeated patterns of interactions, and contrast to Barron’s work
* to reflect and revise on the thesis questions

The process also allowed for a re-evaluation fo the original plan for coding.

#### S2c - What actually happened - Revisiting the research questions and thematic analysis process based on initial clustering

Bakker offers guidance in the formulation of research questions in DBR studies which are relevant to this thesis (Bakker, 2018). He promotes HOW and WHAT CONSIDERATIONS formulation of question to be represent the exploratory nature of DBR approaches and to increase the possibility of possible generalisation without over promising in terms of projecting beyond the embedded nature of the findings as embedded in the context of the study.

Because the process of both formative intervention and DBR is exploratory with no set starting hypothesis, the process of formulation of RQs necessary one which is revisited as the process unfolds.

**RQ2 & 3 - Importance of GDPs already present and shift to agency**

The hybrid of DBR and formative methodology was chosen for its iterative, collaborative approach, which aligns with the study’s ethos of a detailed and systemic exploration of the expansion of the object of the game making pedagogy in an authentic and complex context. The Object of research here being in part the widening and clarifying research objectives.

GDPs were clearly emerging as an important meditational strategy and one which merited more attention due to gaps in research landscape.

How can learners build agency in an evolving community of game makers?

This widening of the scope of one of the research questions beyond impact of family involvement on a game making process to instead to focus on a diverse and complex picture of the development of agency as a community

##### s2 Video analysis - ongoing thematic clustering

I returned to the partially transcription of the video capture segments in word documents using the 5 minute segments originally created for importation into Nvivo.

This had pros and cons. Pros include:

* opening up lines of initial questioning which can be explored in future studies or triangulated with other data in this study.
* some sections clearly suited being transcribed in more details based on themes of interest, and the value of detail on gesture analysis also added. I kept a note of these time period and later used them as vignettes.
* Notes on the emerging themes could be kept in a sketchy text form within sections of word documents, and in tandem, notes could be added to a word document which outlines emerging thoughts on coding schema from themes and existing framworks which could inform coding process.

Doc of thematic analysis evolution - https://docs.google.com/document/d/19PafC\_w\_7uObYL4v86IGeeFZTw2yKxjHfP\_k85rHk\_s/edit

Cons of this approach in general include: - breaking up video timescales into 5 minute sections lessens the ability to make exact claims - not using either a predefined schema or a smaller data set and grounded approach was difficult - trying this with a large amount of data was overwhelming at times.

##### S2 On trying to create a quantitive schema - case study - e.g. participant roles and interactions

I took evolving notes on coding of roles and interactions are in an online document here.

Roles are different from interactions existing on a higher order of anaysis. Repeated patterns of interactions can be seen to develop into roles. Thus a more grounded approach may concentrate initially on interactions and develop this to become roles through analysis. However, many roles exist in other similar domains.

For example, the work of my own staring point when coding was guided by Barron and colleagues work on the roles of parents as learning partners (2009). The roles are as follows: Teacher, Collaborator, Learning Broker, Resource Provider, Nontechnical Consultant, Employer, and Learner.

I made adaptations which were significant in guiding later analysis . The process of adaptation involved two significant shifts

* mutual nature of interaction, not focused on parental roles exclusively
* the value of peer interaction of the community
* The drawback of this approach was the fracturing of the categories which felt to me to detracted from an ability to analyse what was particularly significant about the experience in terms of the research objectives.

The wider helping interactions, again while useful had drawbacks. Firsly, they were so numerous. Secondly, given the existing work of a general scope of digital making by Barron, it was not clear what I would add in terms of contribution to knowledge beyond broadly confirming it in the scope of digital game making.

This led to two things - revising the research process to return to a more holistic approach using 3 planes - revisiting the research questions and objectives to reflect the emerging sense of what was important.

#### s2 abandon a quantitive coding /thematic analysis -

**developing clustering via examples and consolidation**

By abandoning strict coding, I de-prioritised the comparative approach possible by Nvivo queries.

This is justified by wanting to cover a greater amount of data, to surface novel themes and describe them in detail using a high granular approach (vignettes)

Dropping design stages as a schema, for justification and implications see discussion in chapter six.

While I did not progress to a systematic coding of video data of emerging themes. The process of clustering themes in preparation was essential to surface the themes which did emerge for closer observations. Requiring changes to RQs and ROs

Thus categories of new uses of GDP and patterns of agency development in this domain were identified in S2 via 3 planes analysis .

and then described via word docs which categorised the uses of GDPs and exposed tensions in designing for learner agency (which I had not fully explored before analysis began)

**An example of a case where complexities that resisted coding**

Take for example the process of Da in 2019-05-08 - where he was leading some fairly advanced work on researching and reading developer documentation and the constructing a new design pattern.

There are competing and overlapping intention and foci here for the participants. - Solve immediate problem - add new pattern - communicate cultural practice of finding, reading and adapting developer level documentation and help from forums. - give hands on experience to the notice coder

Most clearly there is an overlap here between the interpersonal working on a code problem collaboratively for educational purposes and the interactions with the wider cultural artefacts and practices from a professional environment.

In addition the personal plane was perhaps the most problematic to address given the data gathered. Even when participants were demonstrating their personal knowledge by sharing back or directly altering game code, this was as part of a social and cultural practice. Thus my interpretation involved ….

#### s2 Continuing a 3 planes approach

As the process of transcription continued, I added to the document outlining meditational strategies.

The advantages of drawing on funds of knowledge, and the activities that I used to do this, as well as connecting to wider communities are address well with the plane of culture, in the concept of Apprenticeship.

### S3 (stage three) - Consolidation stage of data analysis

Stage three progressed to a finer level of analysis with data selected for a greater granularity of

Some sections chosen as exemplars for broader themes emerging in the data at S2.

Thus serving two purposes, a greater level of examination, in particular to inform thinking on use of GDPs and development of participant agency; and as a source of evidence to support the findings of the following chapters.

Final clustring, and GDP categoriesation, Use of vignettes, and triangulated with interview data.

#### s3 - Selection of vignettes for deeper analysis

* Full transcription of key moments: and description of participant activity, activity on screen including simple gesture analysis

Used in chapters to orient the reader

**Incorporating movement around the room in analysis**

The 360 camera allowed for side by side analyis of the group, pair or individual working. Due to the layout these were cluster often around a laptop.

In the initial stages of transcription and description having this data was extremely useful to disambiguate spoken statements.

As a personal experience of describing and transcribing even thought it was a significant amount of work to synchronise and then to play both video sources side by side, the additional information really aided the description process in adding detail to the interpretations of motivations of participants.

For an example see the vignette in appendix 6.x (Suzanna and Olivia) chapter 6 which details the movement and behaviours of the child away from the computer as an example of legitimate peripheral activity.

**Simple gesture analysis**

Feedback from a Ricardo Nemirovsky a review at the RD2 stage in response to the sharing of a prototypical vignette prompted a greater incorporation of gesture analysis(Nemirovsky et al., 2012, 2021)

It is limited here to broad scope and therefore does not address x and y

At times gestures helped clarify some things that were unclear from audio and screen capture data.

In some exchanges, 360 data was vital to disambiguate spoken word interactions. In particular, in deictic verbal referencing, where unclear statements were clarified with pointing or other gestures was common.

Gestures were also used often to communicate planned game movements on screen, or for other on-screen actions or procedures, e.g in Vignette x, indication of action of cropping an image.

#### s3 Use of participant interview data & importance of process of triangulation

Participant interview data mostly used to confirm and triangulate with video data from making sessions

Post-workshop participant interviews gathered information to support analysis of specifics of in-session interactions and relevant detail of wider activity systems of home digital use.

ANALYSIS - NOT SURE ON THIS YET IN TERMS OF ORDER OF THINGS - PERHAPS REFLECT THAT.

These interviews took place at the end of P3

At times the resources that were created were brought up on the screen during capture.

Interviews surfaced important data about home use of games and learning relationships.

These interviews allowed triangulation and confirmation of data observed in video recordings.

They were important to confirm initial researcher conclusions before a final process of closer video data analysis.

**Limitations in interview data**

In retrospect, shorter interviews at more regular intervals with participants would have been useful to answer

#### s3 - Clustering and deepening the analysis of GDPs (as mediational strategies)

This is not strictly , instead the process followed these stages

* identification of GDP as an important theme
* listing of GDP mediational uses in 3 planes doc, and in 10 transcriptions
* collation in S3 of those themes and identification in vignettes for closer study,
* triangulation with interview data & games created

The resulting data and analysis is explored in chapter 6,

In addition additional analysis using the model of PRIMM, semantic waves and LOA developed in Ch.7

##### s3 - Clustering and deepening the analysis of design/ processes on learner agency / including learning as movement

REMOVED AS PROPOSAL BUT INSTEAD HOW TO ADDRESS THIS?

FIND ANOTHER FRAMEWORK FOR AGENCY AND CODE TO THAT.

Answering RQ - on pedagogical resources / agency / use of GDPs

THIS IMAGINED FOR CONCLUSION BUT ALSO CODE TO IT? OR ABOVE?

* learners developing agency through personal expression of home and other Identities
* agency through choice over pathway via GDPS
* agency through flexible design cycle pathways, especially via community playtesting
* developing agency through celebration of different game maker styles
* authenticity of tool use, especially docs and access to Community
* authenticity of audience - and role of drama to facilitate reflection

#### s3 - Evolution of a conceptual model of learning

Analysis also involved developing a conceptual model for learning with agency development and movement between learning spaces at its root.

This is developed and advanced in Ch.7