Finding Chapter One - Missions

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## Chapter introduction

The purpose of this chapter is to explore how the data gathered informs thinking on two research questions of this study.

* How can game design patterns support the development of coding practices by novices?
* How can the experience of fostering community focused digital game making practices inform wider practice in this area?

This section starts with a Vignette of parent child interaction in game making process. The vignette is used to introduce an overview of interpersonal interactions of that pair via analysis of video data.

The chapter then focuses on the use of game design patterns (GDPs) by participants in these interactions and then in reference to wider cultural and personal planes of activity.

The predominant analytical lens used in the chapter is that of interpersonal activity. Specifically in the form of guided participation in this game making community (Rogoff, )(explored previously). ALTER - MERGE WITH BELOW

The working definition of GDPs explored in the literature review and enhanced in the design chapter is augmented with analysis of specific examples of their use by participants in practice.

ADDITIONAL COMMENT ON UTILITY / HOW THIS ADDS TO EXISTING RESEARCH

## Other Documents

This chapter builds towards a Matrix that could be included in a concluding chapter. https://docs.google.com/document/d/1DRgpgIUfq5XIktYy-lX4WlviUDnffNc0v8SOeLGgHho/edit Also the RQ questions which answered https://docs.google.com/document/d/1RZnznbR4HKrgL8VFfIqoCrCAJM0mf\_sM8iEN4KCGeZ4/edit And the coding structure here  
https://docs.google.com/document/d/19PafC\_w\_7uObYL4v86IGeeFZTw2yKxjHfP\_k85rHk\_s/edit#

## Introduction to This Writing

In the previous chapters we will have looked at the research landscape to develop coding and design practices in line with social understandings of learning. In particular, the intentional development of a communities of designers and coders with an educational aims has been explored paying particular attention strategies that educators can use to aid these processes.

While this piece of writing contains results, it also contains references to concepts and methodologies which will be included in other chapters in the final thesis. The following bullet pointed list gives an overview of an emerging chapter structure and contents.

* Introduction
  + Context
    - Coding digital making’s movement from informal -> formal settings / curriculum
    - Game making as a particular focus of digital making
  + Inclusive approaches and the value of Project Based Learning, Universal Design for Learning
    - Critique of implementations of Computational Thinking as a non-inclusive approach
    - Use of Game design patterns as a more “relatable” pedagogy
  + Description of Research Questions
  + Brief outline of thesis chapter structure
* Literature Review -
  + What game making pedagogies exist?
    - UMC and Games - Half-baked games
    - Design-based & Tinkering / Exploratory
    - More on Game design patterns - a shared language - turn to community aspect
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* Methodology
  + Summary of social turn
  + Justification of choice of methodology
  + Design-based research and Intervention studies within educational field
  + Data gathering methods and justification
  + journal, evolution of design, video analysis,
  + Data Processing, technical nod to challenges and resolutions
  + Data Analysis and justification
    - Analysis of non-video data, diary, notes, created Resources
      * Coding to 3 planes & other techniques
    - Analysis of video Data
      * Coding structures, design stage, 3 planes, game element addressed, participant interaction
  + Research Questions
* Chapter on Emerging Design
* emergence of focusing of Design Patterns - currently as different chapter
* Use of tensions as a useful analytical tool.
* Analysis of structure and evolution of design elements using 3 planes approach
  + cultural
  + social
  + personal
* Results Chapter - Cultural (inclusive ) Practices
  + Funds of Knowledge as they emerged - not universal, but pervasive
  + Game Player / Makers Types
* Results Chapter - Game Design Patterns
* focusing on Design Patterns
* Use of design patterns as a communicative tool
* Design patterns as a “middle level” construct to open door to more concrete and abstract
* Results Chapter - Personal Practices / Maps
  + Vignette on difficulty of X
  + Discussion linking to learning dimensions of Petrich and Bevan
* Conclusions and Next Steps
* Limitations of the study
  + The lack of motivation of ticking of curriculum led to less focus on individual knowledge work - This could be followed up
  + Other Limitation.
  + Interesting areas that have emerged.
  + Next areas of development.

**Comment:** More writing in this area is available online at - https://mickfuzz.github.io/phd4/thesis\_chapters.html OR just create hyperlinks.

## Context for this writing

To help the reader understand the data in this chapter the following notes on methods/ methodology are included.

* The study uses mixed methods in methodology. Informed by analysis of journal diary, notes, video data and interviews (Methodology)
* The research design evolved as the game making program was underway based on feedback and reactions of the participants (supported precedent in design-based research) (Methodology)
* A long pilot course and development stage resulted in extensive support materials and activities which I have structured into a learning design called 3M (Methodology + see recent chapter on 3M model)
* A narrow data samples has been used for this study. This prioritises a greater depth of analysis on interactions over generalisation. This is justified in a section on data validity in Methdology chpater.
* The concepts of resolving tensions within activity from Activity Theory are used to explore the evolution of the design of activities and resources. (Design results)
* Results chapters use Rogoff’s 3 planes of analysis (Cultural, Interpersonal and Personal) which aligns well with AT (Methodology)
* Game making is based on remixing code from an existing incomplete game template (half-baked games & scratch community processes)

## Study of Vignette A

To situate the results of this chapter it will start with a grounded vignette.

// create with google docs to markdown extensions // current version here - // then at this page online conversion. https://markdown-convert.com/en/tool/table // OR - AND PROBABLY BETTER TO DO THIS //keep as table with images - online or open office - then download and copy and paste into documents to be shared. // On line version is here - https://docs.google.com/document/d/1B7kFl5QsGV -oWtFWHLBIJNpa5GeYMlCntq31BnPAQT4/edit#heading=h.4rwirct7hqca

For the previous five minutes the parent and child dyad have face a blockage of a glitch in the software which prevents their wider objective of adding game design pattern of adding keys and doors to their game. In short, in this pattern the users must collect a key and then navigate to a door to progress to the next level.

The parent Sh has been trying many different things and changing things in the code while the child Th has been expressing boredom. In response, Sh has expressed frustration and irritation. Finally Sh suggest that Th asks facilitator for help to resolve the coding glitch.

|  |  |
| --- | --- |
| **Dialogue** | **Activity** |
| S: You can ask him for help again if you want. | S is using laptop. T is nearby |
| T: Why |  |
| S: Cos I can’t do it. |  |
| T: Ok |  |
| Exchange follows with Mick and S - Problems solving using debugging methods and exchange of information about sequencing of variables. Ends after several minutes with game exhibiting desired behaviour of moving to next level after collecting a key. |  |
| M: Great | (On Screen) Platform game bug is resolved shown by game progressing to the next level. |
| S: Thank you. |  |
|  |  |
| Did you see T? | (Off Screen) M cedes computer to S. |
| T: Did it do it? |  |
| S: Yes |  |
| S: I’ll reload it. Here you go | S presses refresh key to reload the game |
| T: Laughs | T moves laptop to point towards her and takes over using the keyboard |
|  |  |
| T: (Makes excited cat noise) | T is using arrow keys to control game and check desired behaviour of player progressing to level 2 is working. T progresses |
|  |  |
| T: We need a door in this one. |  |
|  |  |
| I want to make more levels now. |  |
|  |  |
| So you can put lots of doors and lots of keys |  |
|  |  |
| Key Door Key Door Key Door |  |
|  |  |
| Key Door Level. Key Door Level, Key Door Level | S moves computer back to take over the use of they keyboard. She changes tab and navigates to the section of the code which deals with the design of levels and placement of different game components. |
|  |  |
| S. Well. Where are you going to put your door in level two? |  |
|  |  |
| Do you want to change the layout at all? | S gestures to screen |
| T: What’s door? | S doesn’t move laptop but gets closer to take over keyboard |
| S: d |  |
| T: Ok |  |
| T: d . Door right there. | Inserts a “d” in an array high above a platform |
|  |  |
| S: And where’s the key going? |  |
|  |  |
| Must be quite hard through get to that door |  |
|  |  |
| Key is K |  |
| T : (Calmly) Ok just let me do something | T starts to delete multiple characters on a line |
| S: (Alarmed) What are you doing? |  |
| T: You’ll see! |  |
|  |  |
| T: Ah yes |  |
|  |  |
| S: What are you.. Ah you’re making a platform. I see. | T starts to add x’s to replace the spaces she has deleted |
|  |  |
| T: See! |  |
| S: So where is the key going? |  |
| T: Key, so it’s K? |  |
| S: Yes |  |
| T: Where’s K gone |  |
| S: There | S points to the K Key on Keyboard |
| T: Back. K for Key |  |
| S: Are you putting one in your third level as well? |  |
| T: Yes and then I’m going to make more levels |  |
| T: You do this bit |  |
| T: And then delete those H’s. And in there. |  |
| S: No. No. |  |
| T: Then, let me do it. | (off screen) T takes over the keyboard |
| S: It’s no fun having a game with any hazards to avoid |  |
| T: Is for me! do you go that way back? |  |
|  |  |
| So sorry for deleting… They just… | (on screen) T deletes hazards in Level 3 of game |
| Back Back Back |  |
|  |  |
| Oh Oh Oh. |  |
|  |  |
| (laughs) |  |
|  |  |
| (replaces another) Back Oh (giggles) | (on screen) T adds three coins to Level 3 |
| S: Goodness me what what the point of designing our car with fumes if we’re not going to use it? |  |
| T: I don’t know (sighs) |  |
|  |  |
| T: You put the key and door in this one. |  |
|  |  |
| T: Go on then. Key - Door - Person. |  |
| S: Person? |  |
| T: Key Door Person. | (off screen) T indicates that her mother is the person she is referring to |
| T: (laughs) | T start play through of their game again. She progresses past the first level, completes second level. The game then goes back to the first level unexpectedly. |
| S: Is this the first level again |  |
| T: I think so |  |
| S: OK so our the door for the second level goes back to first level and we want it to go to the third level presumably |  |
| T: Yes (laughs) Yes. Why could that be? That’s silly |  |
| S: I’m just going to go see something. | S dives into the code to try to troubleshoot the problem. T watches for a short while becomes disengaged. She then leaves mother to explore the wider environment of the room and objects within it. |

### Descriptive Commentary on Vignette A

In this section a summary of the interaction observed in the above vignette is described using three foci of activity.

Where appropriate I make observations on similar patterns of behaviour from outside of this vignette.

**Cultural - Apprenticeship**

The parent has taken on the role of solving harder code problems and it engaging with the material being presented as part of the sessions and following the instructions carefully. The child is one of the younger participants and does not maintaining attention on the problem being solved. When blockages occur she is keener to explore interactions

For both participants there is an explicit awareness of game making patterns and concept of the game as a dynamic system. Both seem to drive their work on the design and coding mechanics of the game.

Keys and Doors as a pattern or concept may have been something explored in a previous game or it may be a clear concept that has appealed to the child in another way. What is more clear is that it drives engagement with the game making process with the child repeating the name of the pattern in a sing song voice.

In terms of understanding of the game as a dynamic system, this is seen clearly in the parent’s alarm at the child’s deletion of all elements of hazard. The parent is keen to keep a sense of game balance to ensure a sense of challenge for the imagined player. “It’s no fun having a game without any hazards to avoid.” The child seems determined to remove all hazards. My understanding is that she is also aware of implications for game balance but is taking pleasure in this seeming destruction of the key challenge of the game as an act of disruptive play.

One interaction with the facilitator uses the debugging tool of the browser.

**Social - Guided Participation**

The parent immediately re-engages the child when the blockage is removed. “Did you see Th?” The child then is then prompted to play test the game. The child is keen to both replicate the GDP of keys and doors in the second level and to add a new GDP of adding additional levels to the game.

The choice of a new GDP often involves new code to be added to the game or a significant change in code which needed debugging.

For this pair, larger coding activities were beyond the ability of the child from feedback date the parent shared this was due to reading ability but mentioned a strategy to deal with this.

“Th got on better during the coding once the student who was hovering initially left us alone. Because every time Th hesitated, she jumped in to do it for her. Whereas I know her better so can judge how to facilitate more minimally, and I resist the urge to fix things immediately when she struggles. Plus she can’t read yet, so she was recognising the relevant bits of code by matching the individual letters, which takes longer.”

Game making patterns are outlined by both the child and parent. They talk of adding more levels, of the mechanic of keys and doors and then progressing to another level. The child takes delight in outlining this pattern of game progression. The transformation from the period of time when her parent was problem solving code is dramatic.

**Personal - Mutual Knowledge Creation**

There are cultural elements that are transmitted through interaction with the facilitator that this parents is very quick to pick up on. For example the use of the project documentation website of which the parent was an early adopter. Also, the debugging tool which the parent notices the facilitator using in this interaction is used by the parent in later sessions.

The parent shows an evolution of problems solving knowledge through their independent work.

The child shows their personal knowledge of game design patterns in end of course evaluation. She responded to the question What if - What would you like to see next time? What would you add? with the comment. “Th: I’d add a health bar and lots more levels and keep on changing the characters and background.”

### Other Notes on use of GDP (to integrate with above)

## Representing Coded the Patterns of Activity via coded data -

NOTE - NOT SURE WHERE TO PUT THIS PART OR IF THE CHART ELEMENT IS REALLY VALUABLE - IT COULD BE A DISTRACTION (IT PROBABLY IS - PERHAPS ADD AS A POSSIBILITY IN CONCLUSION)

We can to examine patterns of activity is through an analysis of the coded video interactions. The coding structure decided upon and the process of coding in five minutes sections.

Note The full coding scheme will be included here. https://docs.google.com/document/d/19PafC\_w\_7uObYL4v86IGeeFZTw2yKxjHfP\_k85rHk\_s/edit?usp=sharing

The main schemes as below.

* Design Stages -
* Interaction Description -
* Game Elements Addressed (Game Polish, Game Space, Game Mechanics, Game Challenge(remove?))

The process of coding data shed light onto patterns of activity in creating a list of general behaviours shared by participants and thus also identifying outlying behaviours that did not meet the emerging coding scheme. (NOTE FOR HERE OR PREVIOUS?)

Later in the chapter the limits of the chosen design stage schema are explored as a way of illuminating interesting game making behaviour of participants.

In the following section I use key tools provided by the research software Nvivo to give insight about the engagement of participants by compare time on different tasks.

The coding structure (may) also allows to show the overlap between different code areas. This is useful to explore a question like the following:

* Question One: During which design phase does parent-child pair interaction happen most frequently?
* Question Two: What are the different patterns for participant interaction that happen when working on different game elements?

TO COME.

The first scenario represented in a chart which compares activity grouping with design stages and activity description.

Pair work -> TEST, CREATE, IMPROVE, etc Peer work -> TEST, CREATE, IMPROVE, etc Solo work -> perhaps dont an

CHART

The second scenario is represented by pie charts for each game element showing the duration spent on each by a diversity of participants.

CHART

#### Discussion on data.

For the first question only suitable pairs were chosen. This removes a lot of validity from any generalisation of claims that could be made.

This approach has some clear limits. Firstly the breaking of data into 5 min sections is practical but does not allow for some of the finer interactions and changes of behaviour to be accurately coded. There may be some value is coding some key interactions more carefully in more granular detail.

The game elements / design patterns categories which are presented are created as a design guide rather than on exact principles. It is possible to code drilling down into another level. This might yield more results.

In summary, the coding process is more valuable as a tool to allow more qualitative reflection and analysis rather than a quantitative process as attempted above.

To make a quantitative approach work better X,Y and Z would need to be in place which was not suitable for this study because of A and B.

### Describing design stages for this pair

I coded two complete sessions of this parent child pair. The following observations have been made by comparing the codes on stages of design and types of participant interaction. This data was then triangulated with the accompanying transcribed fragments of conversation and my own journal notes. The observations are presented themed by the design stages with some general observations listed at the start.

**General Observations at all stages**

* This parent-child pair alternate between use of keyboard and mouse. Currently the parent takes the driving seat. (Their roles can be contrasted to pair programming).
* When parent problem solving the child is sometimes physically inactive, looking into space, but then explores the space and/or engages in peripheral activity with other groups (cf Rogoff, observation as valid form of participation)
* When possible, the parent engages child to input the design activities. This is done at different levels at different design stages.

**Ask / Imagine**

* In early ask/imagine stages parent and child discuss storytelling, graphical and other aesthetic choices
* The parent struggles to implement quite ambitious code challenges that she takes on but signals clearly when the process returns to ask / imagine stage indicating that she is aware of the greater possibility for effective child input at this stage.

**Plan**

* in planning stages the parent provides scaffolding to help the child.
* In one example the parent notices the child’s difficulty in using cursor and delete/backspace keys to edit a matrix allowing level design. The parent provides a book with grid paper to allow the child to replicate the matrix. The parent then transcribes the design while engaging the child by checking she has interpreted the design correctly.

**Create**

* At certain points in the create stage the parent needs total concentration and is not able to respond effectively to requests of attention.
* At times the parent asked the child to seek help from facilitator.
* At another time, when the child was bored waiting for parent debugging, she approached the facilitator to ask for help on behalf of the adult without prompting.

**Test**

* The parent cedes the keyboard and mouse and sometimes swaps chairs to allow child to play test the game created.
* The testing process here is quite frustrating as gravity is very low. This is addressed later as it is improved on the suggestion of the parent who has to do the majority of the testing.

**Improve**

* Parent navigates to a particular part of the code for child to alter design
* Child takes on challenge of making smaller changes once the core game mechanic code has been added.

**Share**

* One of the most active times for the child allowing interaction to explain their game to others and to play the games of others.

### Further observations and discussion on game making activity

**Note:** I am not totally clear on the purpose of this section. Needs revisiting in terms of chapter structure.

#### Comparing the activity of this family to others MOVE / REINTEGRATE?

We can compare this pairs pattern of activity with other pairs / families.

* The parent here is much more commonly rooted to the computer than other parents.
* This meant they engaged far less in play testing of other games and found it harder to gain attention for direct support.
* This grouping sometimes left early having completed more in code development than others but completed less social activities.

Discussion

* The parent had indicated that she considered herself a “planner” as a maker type which is confirmed by less social Interactions

The observations above show the importance of recording the whole room. Some participants will roam to observe the work of others, to socialise, to gain attention of others for support or for feedback.

When analysing data using 360 recorded video side-by-side with the screen captured data, the participant can be followed around the room and their activity can be noted even when away from their activity.

## Identifying GDP as key unit of Analysis

Note: How much of this needs to be relayed earlier in the Design chapter to explain design decision? A LOT - MOVE THIS?

### Relating to AT and design Theory

CONTEXT PROBABLY PARTLY COVERED IN LITERATURE REVIEW:

Design patterns are most commonly used for computing students at higher education to teach object oriented computing but they are also useful for all levels of learners. Design patterns are rooted in real-life incidences of problems that are often solved in a particular way. They are concrete examples of coding principles in context. Design patterns can help the development of coding communities if more experiences coders take the time to document the patterns they use in an accessible way for novice coders. For educators the use of design patterns can help support learners develop coding proficiency by providing scaffolding and modelling good design decisions. However, one of the challenges for teachers of using worked examples and design patterns is how to integrate them into student-led design challenges.

* Drawing on AT terminology
* Discuss how GDP as key unit was arrived at - draw on journal notes in planning stages
* Relate - AT terms to those of design stages
* Begin to comment on utility of GDP as a unit of analysis for practitioners, parents and young participants - i.e. in navigation and goal setting.

## Other Findings Emerging related to Game Design Patterns

Previously we have explored the concept of activity as a primary unit for analysis. In particular the utility of this approach to research community activity (Cite Blunden). In this section I will explore how game design patterns became the primary unit of activity for participants.

Discussion points

* How the GDP are sub activities goals in AT terminology.
* Thu, the game pattern goal rather than the overall making of a game, took up the majority of their focus.
* In playtesting with others the wider focus of making an engaging game comes into focus.
* The difference in goals in terminology
* How this unit allows a more detailed focus on some of the tensions involved in tool use

We have also looked at the other studies which look at game design patterns as a useful tool for advanced and less frequently for notice coders.

In the following sections, I draw on observations of participants in practice to outline how game design patterns are used in the making of games. I use extracts/ vignettes to do this.

### Cultural, Interpersonal & Personal Planes Analysis of use of GDPs

While each of these observations do not fall nearly into any one of the three planes being used as analytical tool, I begin with those oriented more to cultural focus which will deepen the observations in the previous chapter.  
and progress to the bulk of observations oriented chiefly to interpersonal activity and end with those more to do with personal knowledge construction.

## Cultural Plane / Apprenticeship - and Game patterns

In the (previous) chapter on inclusive methods the role of cultural activites to engage and sustain engagement were examined. This chapter allows us to examine the role of game design patterns through a cultural lens.

* Design patterns imagined used in other contexts as a form of apprenticeship
* Tools: Specifics on Code Playgrounds and Phaser and a Javascript framework
* the media literacy practices of transfer between tools - similar to other studies - see guided participation papers

### Use of design patterns as a form of / to facilitate apprenticeship

In 2019-05-08 Da and Te are working closely as a pair.

Da invites thinking outside of the constraints of the suggested design early in this first session. Add context if needed.

An interaction (see full transcript of interaction at the foot of this chapter) shows a rich interchange where the parent is trying to draw on the game playing experience

Da: Have you thought about pushing it a bit further and have a different style of game? Te: What do you mean? Da: Well the previous style of game was a platform (makes shape with hands) game wasn’t it? You went along and there was gravity pushing down (points down). There are other types of games aren’t there? Te: Pause. I don’t know what to do thought. Da: Well quite but what other games are there?

Te adopts with this suggestion readily once he understands Da’s suggestion in full.

Te: You could have a game where every 15 seconds 10 seconds you could add and enemy to such and such a random number between such and such (holds up hands to indicate parameters). You could block it somewhere. Da: So instead of.. instead of the world… the world being sideways. We could have the world being looked down on. (reindicates the change of perspective) Te: Hmm. How should I do this then? Da: That’s a good question. Shall we ask Mick to see if that would mess things up or not?  
Te: Mick Mick: Hi ya. Te: Erm. Thinking about what game to do . I was thinking can we make like a pacman game kind of thing (indicates movement of character with hands) Da: If we had an on the top game rather than a platform game Mick: I think it could work. You could kind of adapt that game by, kind of, removing gravity. Da: and see what happens? Mick: and see what happens.

Even saying “I was thinking can we make like a pacman game kind of thing”.

Da speech show desire to for the pair to try something new. This may be to avoid repition in the educatational experience of the child or perhaps by the desire for challenge which would result from stepping outside of the existing walled garden of choices offered as existing guides. Their new choice is a change of perspective which involves a new game pattern of a new movement game mechanic. The specific proposal is to remove a jumping game mechanic and using a 2D top down movement mechanic used in maze and adventure games like Pac-man and Zelda.

However Da is still aware of potential challenges of straying too far from the templage. He does not want to “mess things up”. There seems to be a mirror here of the value of playful enviroments to provide challenge but within some boundaries of safety.

My own positive response to their suggestion was driven partly from knowledge of Da’s cultural background a both a professional coding and a volunteer supporting children’s coding programmes. While simultaneously checking with other groups that they use the starting template as a base, to avoid overload as previously descussed in design decisions, I encourage this pair to see what happens as a potential learning opportunity. I am conscious that the change of movement may open up different posibilities for new game patterns that this pair may be able to solve.

There are cultural elements here of a family learning culture between these two playing out in this space. That way of approaching the task is very different from interactions with grandparents on a previous iteration.

This and other exerpt from this pair show that Te and Da’s interaction is much more guided and focused than many other participants. This is influenced by Da’s experience as a software engineer and volunteer at Coder Dojo. This process of active guiding but suggesting and fishing for the right answer is intentional from the consistent nature of the interaction and from a supporting interview.

“Extract from interview with Da?” to support some of the above observations.

TRANSITION - Te and Da - have a very typical guided apprenticeship

### Accessing External Help

Te and Da - Accessing documentation Phaser

The process of modelling the specific practices of accessing developer documents and help forums is a form of apprenticeship and a direct sharing of a professional cultural practice.

Te takes a lead on looking for help on added a new GDP following enemies. He starts with menu, then book, then Da suggests googling and thus taking a step outside of the walled garden.

Discussion. There are pros and cons stepping outside that garden. Confusion, conflicts, complexity. etc. Vs. generating new patterns and personalisation of game content.

## Interpersonal Plane (Guided Participation)

I will recap Rogoff’s take on guided apprenticeship and the features of the learning design which facilitate it. If needed then I will explain how AT terms like division of labour are appropriate here.

### GDPs used as an organising tool

#### Task delegation

While there was no formal organising of groups in phase 2 and 3, the family bonds between parents and children created similar patterns of seeking validation, sharing planning. Although this was more the case for dyads working side-by-side on the same game, similar patterns existed for other configurations.

The opening vignette shows the name of a GDP as a way to communicate about the shared work of making a game. The utterance by the child “Key Door Person” seemingly indicated that the child ceded responsibility to the adult. The child has judged it the level of complexity needed to add a new pattern into the code to be beyond her ability and delegates appropriately.

|T: Go on then. Key - Door - Person.| | |S: Person?| | |T: Key Door Person.|(off screen) T indicates that her mother is the person she is referring to|

Gesture analysis (explained in a the methodology chapter) is valuable to shed light on this exchange. It is the indication that the mother is the person who will be responsible for implementing the GDP that the child is tangentially prompting to be implemented.

### GDPs and division of Labour

Similarly, rather than direct delegation, dividing of labour can be observed.

The implementation of some GDP involved the use of different tools and activities. For example, the design of a graphical element suited some learners and they depended on the support of others to implement those changes in code.

For pair Fi and Ma the existence of GDP seems to empower the young person to direct a division on labour. See transcript of interaction for - <Files\2019-03-11–fi\_ma\_pt1\_TOCODE> - 18.00 mins

The child is able to jump around and work on parallel projects using their existing tools set, or even taking on researching other toolsets, for example independent work to find an online tool to created . This serves the child as it allows them to keep busy and moving different parts of the overall project forward.

In contrast, the parent shares both with the child and the facilitator that they feel overwhelmed by the ‘jumping around’ between different GDP stages. While the parent wants to stick to one pattern and complete it, they are still responsive to help the child when they get stuck on an alternative pathway they have chosen to avoid waiting on the parent.

While this may be stressful for the parent, lots of progress in the overall game project can be observed in any particular session and the child seems to be developing useful skills managing the parent.

While the above interaction between Fi and Ma points to the parent doing the heavy lifting for code implementation, this was not always the case. Mi and Ne had a reverse relationship where the child would reluctantly implement the graphical changes in code but would pointedly not explain them seemingly taking pride in knowing something that her mother didn’t.

ADD TRANSCRIPT EXAMPLE FROM - 49:52.2 - 53:38.0 - 2019-03-18-mi

Here the child has a powerful position but misses a chance to develop useful communication skills.

The parent here takes great pride in the graphical work being done. This allows them a level of participation which is helpful without being stuck on more tricky technical or code related problems. The design which allows choice of GDPs facilitates this. The process of building an identity as an individual or a family is shown in this families work on graphics.

ADD TRANSCRIPT EXAMPLE FROM - 2019-03-18-mi Mi - Oh thank you very much. I’m very proud.

#### GDPs for Goal Setting and Prioritisation

The following exchange between participants Fi and Ma shows GDPs being used to organise future activity.

NOTE - This needs to be merged with the above - or a different take on it explored.

Online version as table - https://docs.google.com/document/d/1wLx8j9djYqJdZHwKJ09mmIDMYO7YqlMDhuHx2hiqpJI/edit

M: I’ve brought the music, and also we could just concentrate on one thing and just change that. You know, keep working through.

F: Yeah. I think I want to get an enemy in - oh no - my person animated.

M: so you want to get your person animated that’s the main thing

M: Shall we concentrate on that and changing the platforms into something different?

F: Yeah. M: Yeah? F: I also want to make a theme tune.

M: Yeah it’s, that’s what I mean, you can’t just skip around like that. F: hmmm M: just cos it gets really overwhelming. M: Yeah..? So…?

Long pause

M: Well I’ll have a look at the code and see if I can make sense of that.

M: I’ve brought the music, and also we could just concentrate on one thing and just change that. You know, keep working through.

F: Yeah. I think I want to get an enemy in - oh no - my person animated.

M: So you want to get your person animated that’s your main thing. F: Yeah

M: Shall we concentrate on that and changing the platforms into something different?

F: Yeah. M: Yeah? F: I also want to make a theme tune.

M: Yeah it’s, that’s what I mean, you can’t just skip around like that. F: hmmm M: just cos it gets really overwhelming. M: Yeah..? So…?

Long pause

M: Well I’ll have a look at the code and see if I can make sense of that.

This example shows the use of the names number of game design patterns by the child . While the planning discussion happens the child is concurrently testing their game. At this stage of the design some have been imagined and perhaps partly worked on and dis-guarded. In addition, the child describes a feature that they want to see happen.

This interchange shows a tension between a more chaotic style of working jumping from one goal to another and potential resolution with parental dialogue prioritising work to be done.

Here the child may be picking activities to fit their strong suit of creating graphical and audio assets in other gui based environments. Leaving the father to piece things together in the code based progam.

Or perhaps the parent steers the child into graphical areas as they are able to continue without stressing out the parent. Thus the child’s compliance may be a kind or pragmatic decision to allow smoother progress.

Discussion: The child’s initial listing of features is a brainstorming technique. Such techniques are used to aid a creative process however the parent seems to lack the skill to map these out and then to work together to priortise them. Instead he appears to be keen to quickly pick one that seems manageable.

GDP are already being used as a way to set goals, track progress and prioritise but the process seems stressful or unsatisfactory. Some kind of support help scaffold this process would be potentially productive.

Note: Such support is explored in more detail in the next chapter.

### GDP and sustaining engagement

The process of adding in a new GDP to the game was often a sustaining activity.

When GDP was completed and participant or pair move to a new phase there is evidence of a reenergising effect. e.g Example of adding a new level in 2019-03-18-th\_sh -

In the process of doing that, the pair return to a paper stage, and the process of turning that into reality on the screen and sharing with others is transformative in terms of energy level and interaction during the course of the session.

This activity can be examined with an interpersonal focus it is the product of interaction between the pair and the parent highlights the pivot point which facilitates input and greater engagement.  
In addition this shift can also been seen from a cultural focus. The completion is mirrored in the work of other pairs. Thus replicating is a kind of participation in an emerging community. There is also a link made by the parent to previous working practices. Using a paper book to make a sketch of the work to be completed.

These kinds of shifts of activity and cultural practices brought by the participants also feed into the ongoing culture of the game making community. For example the use of paper designs and paper prototyping was something that I adopted more broadly after observing the families involved.

#### GDPs and personal expression (cultural) - CROSS OVER WITH PREVIOUS CHAPTER? (may need to move?)

As part of the creative process participants were able to input their own preferences and interests. These commonly seemed to be driven by existing preferences and habits stemming from home life and other cultural sites.

Examples include participants choice of the theme of their game. Environmental aspects appeared to be something that many families could draw on from their home lives. Perhaps a transcript at start of process. Ma and Fi ?

Another opportunity involved choice and design of game assets that allowed the expression of identity or a designed element - for example graphics, audio or a written message to appear at various stages of the game.

Graphics in particular seemed to be driven by home cultures. One example is that of Sh and th using a g background graphics in 2019-03-18-th\_sh -

The incorporation of the graphic was relatively quick and easy change to make the game but had a significant factor in the affect towards the game [erikssonUsingGameplayDesign2019;] - cultivativing a sense of ownership - playing around the graphic - covering it over and revealing it - participant self-expression and a conversational prompt to other during sharing of the game

This is supported by other research on digital making and motivation. CITATION HERE? - or in cultural discussion?

Discussion on how cultural interactions seem to be able to motivate and sustain other interpersonal activity which may be experienced as work.

These interactions re sometimes playful, and sometimes chance to share something serious. It allows young person to talk about dogs and their love of dogs. Even at one point that they used to have two and one died.

#### GDPs propagation through peer activity

The process of adding levels was something that was spread predominately through one child’s work to help others to add that features. The work of the child to add 21 levels to their own game served as a way to publicise this possibility. The role of that child as an expert in that design pattern, and their willingness to share their knowledge, shifted focus away from help from myself as a facilitator, or the instruction-based support documents.

PERHAPS ADD TRANSCRIPT EXAMPLE ?-

### GDPs to support Iterative Design Practices

Iterative agile design is a highly cultural / interpersonal process.

Discussion drawing on more radical attempts to describe the best way to bring young learners into a design practice.

Perhaps in the field of participatory design.

Highlight how the granular and relatable nature of GDP

Well suited to build a repeated design practice. Especially with starting documents, Small changes had big effects. Variable changes needed immediate testing.

#### The limits of design cycle stages

[PERHAPS SOME OF THIS TO DISCUSSION?]

When coding data a design cycle framework was one of the code structures. REFER BACK TO ENGINEERING SOURCE. Ask / Imagine, Plan, Create, Test, Improve, Share.

While design cycles was not an explicitly part of the game making instruction, certain interventions supported this approach. In particular the use of maps as a planning and reflection tool and the use of playtesting as a social and personal form of evaluation of emerging designs.

When coding I quick became aware of the limits and challenges to coding to this.

For example a lot of time in this informal game-making sessions were spent on activities outside of this cycle. For example, opening up the right tools, navigating to correct locations and finding past assets involved a fair deal of effort and collaboration.

I have been pragmatic and map elements like this these loosely. Where appropriate I make notes on that activity in free form areas of other documents like spreadsheets.

This limits claims I can make from the coded data. However it raises interesting points which merit discussion.

First - Value Faff Time. So much of the creative process is faffing. More precisely many creative moments happen in times not neatly represented in the cycle. For example the navigation to the right location in creative software, finding assets, migrating assets between authoring tools, converting to correct formats, evaluating new tools.

This is something that I do not have a precise name for. I call it digital laundry or digital housekeeping. Things that at times can be low attention span or which can be extremely frustrating like needing to tidy up so you can find your car keys. There is frustration here, but there are also moments of creativity, and there are bonding moments which are undirected activity but shared.  
For example…..

Second - Digital Jamming This has an example in the use of sound making software Fi & Ma - The process of tinkering and messing spurs creativity that doesn’t map to a design cycle.

They are in an evaluation of tools which could be said to be in Planing. however this quickly become creation as they decide the spontaneously created music is preferable to the one created using a different tool at home.

The joint jamming then has created two different soundtracks. This sparks a new thought to create different soundtracks for different levels. This would fit within the Imagine stage. Plan then Create then Imagine then Revise all in the space of a minute.

Implication one - When mapping the activity to a design cycle. There may not be neat matches and at some stage if the process is very fragmented the researcher or teacher can legitimately ask how valuable the design cycle is as a planning or analytical tool. Others exist like rhizomatic approaches.

Implication two -when designing a program and thinking of how to present the process to participants, over structuring around a design cycle approach may be not be productive or accurate. Question? How does this relate to tinkering methodology? What other framework would be suitable here?

### Interaction of GDPs with Playtesting as method

Playtesting but in particular designing for others .

What was noticeable about - this in particular?

Playtesing as a regular practice is a immediate way to shift learners into a perspective designing for others.

This fits into our design cycle, as our first stages of ask and imagine are more productive when informed by a realistic sense of what the end user experience is. Regular self testing and playtesting achieve this.

Some examples: (should be many)

Pull on examples of learners imagining the experience of others. - Th - in session 2019-03-11 - comments on wanting students to be frustrated when playing it, it’s fun - then the final level being a secret fun experience playing against the norms of platform game design, thus illiciting surprise. - Another example -

Discussion - Designing for others - as a key perspective in constructionism. Note: What added insights or tips for practitioners can I bring here?

Also noticeable is the variety of ways in which playtesting happens and how younger and older participants looked to give and take from the experience.

Older participants often used this as a way of being supportive to both parents and young people. This happened in the following ways: - praising graphical content - making links with home interests of participants and building rapport - ( e.g. do you like dogs? )

## Personal Plane

The personal plane is explored in a following chapter (working title Maps). This will cover findings relating to the value of participatory methods of mapping project progress and potential learning dimensions of activities.

### Mutual approaches to knowledge building

In this section the processes of personal appropriation of experience and knowledge emerging from game making are examined closely in relation to participants experience of GDPs.

* quick summary of Rogoff’s take on personal appropriation compared to a transmission model of knowledge & that participants re-contribute their experience of knowledge beck into the social mix
* e.g - GDPs used in this research program were mutually created based on feedback from participants
* While there is a curricular value attached to CT concepts & to some extent design practices, in this context participants can create their own understandings of what is useful to them.

### Game Design Patterns as a way to give language to participants when sharing back to Community

Example - 2019-03-18 - Sh & Th

Contrast general lack of confidence with ability to share back progress and decisions using language afforded by GDPs.

Include excerpt? 1.05 - Looking for Th using GDP language - as well ask drawing on other home interests.

This is also dealt with above “GDPs propagation through peer activity”

### Game Design Patterns vs CT and more established “knowledge”

THIS SECTION PROBABLY MOSTLY OR FULLY BELONGS IN THE NEXT CHAPTER

My end design highlights game patterns as a starting point for user interest and to draw participants in to other elements of learning dimensions. More abstract dimensions like systems thinking, and more concrete like coding concepts.

* Compare formal teaching of CT and CS with an approach based on a freer choice of patterns.
* Discuss the use of gdps as a gateway to other concepts as explored in CS in a more abstract, and more concrete direction [@eriksson\_using\_2019] .
* Leading with GDP as a way to explore other Learning Dimensions
* Discussion - The use of GDPs hits a sweet spot as a “middle” level construct, (see Eriksson and Bjork)
* Discussion - Rising to the concrete - as a key AT concept - how does this fit?
* Make Code cards which contained links to game design patterns and the different component concepts
* (see Eriksson and Bjork)
* Draw on material and critique in chapter on semantic profiles / waves.

#### On CTs and CTs emerging in the wild.

As explored in a previous chapter, the 3M design leads with concrete game design patterns chosen by participants. This approach can be compared to others which lead with more abstract computational thinking concepts which are introduced and explicitly taught from first principles.

However, while not explicitly taught, the CT concepts are contained within the learning dimensions of the 3M model allowing participants and especially facilitators to be aware of examples of practice allowing for development of these skills. This section explores examples of CT in action that emerge from video data of game making.

##### Compare formal teaching of CT and CS with an approach based on a freer choice of patterns.

The design choice of leading with GDP was based on increasing the agency of participants over the pathway of their design activities. LINK TO LITERATURE ON CHOICE AND ENGAGEMENT.

It is problematic to compare participants engagement with this learning design with another fictional game where they learn CT concepts first and then put them into practice. However, it is helpful to identify key characteristics of the design which run counter to a principles first approach and describe how participants experienced these elements.

Elements of contrast with 3M include;

* The remix element of code (explored in previous methods chapter perhaps) - which allows participants to add new features quickly. They can also see and replicate existing patterns in the code. This could compare to many hours writing from scratch and many abstract concepts explained before getting to anything looking like a game.
* Lack of value placed on CT as overarching knowledge. No posters, no curriculum content, no tests on concepts, no lesson objectives and end tests,
* Code patching from existing code examples, as previously explored, allows for participants to take code and add it into their game without full knowledge of the syntactical complexities of each line they use.

##### CTs emerging in the wild.

There are several examples of CT arising in the wild without being explicitly taught. Here the focus is on Wing’s narrower take rather than including general practices.

#### Decomposition.

in 2019-05-08-te-da - Da the parent suggests revisions to the agreed overall goal which break a larger problems into more manageable steps. It can be legitimately questioned if this is a specialist skill rather than general good creative practice.

#### Abstraction

This concept can be concretely taught using the code structure of functions -

There is scope for doing this. In my journal notes and notes following interactions I notice when there is a call for a new function.

#### Generalisation / Pattern recognition

Present in the work of Te to find patterns and to duplicate them in different situations. 2019-05-08-te - With prompting from parent the child is able to recognise, duplicate and alter the update code for accepting left and right key input to change character x-axis velocity. After update and test iterations they change this to up and down key input to update y-axis velocity.  
NOTE - Ideally find another example of a child doing this.

The 3M approach lends itself well to exploring pattern recognition as patterns are readily available to participants in starting code and the extra patches that are added.

Also the knowledge of the GDP helps ability to recognise patterns in the code. Left / right -> Up / Down

#### Sequencing / Algorithms.

Sequencing and writing algorithms is one of the most common CT principles explored in research. INCLUDE CITATION.

This is a relative weak point in comparison to from first principles approach.

However the process of patching into different areas of the code and creating functions does address this.

The following transcript of Sh’s interaction with myself shows that the process of copying patterns in the template code and patching in new lines from the supporting documentation gives ample opportunity for sequencing mistakes to be made. The process of working with students on their existing code is valuable to explain why and how the order of lines of code and when functions are called.

The comparison raises a potential discussion point on what the practical value of this CT concept is.

#### Commentary / Discussion

NOTE - As in last paragraph, the practical value of CT concepts can be discussed as well as the nature of CT as a practical skill or a more abstract concept.

A tactic that could be explored further is the value of reflective practices to back up CTs being found in the wild. This possibility is explored in more detail in the next chapter of results.

Probably end with different strokes commentary. Depending on aims of the practitioner and context of the game making.

## Additional Chapter Discussion

The following observations are primarily focused on implications for practitioners. A deeper exploration of other concepts may suit another chapter looking at synthesing observations in relation to broader research. In this draft the focus is included in each sub-title.

### Discussion on UMC and PRIMM in relation to use of Game Design Patterns? INCLUDE OR NEXT CHAPTER? (Practitioner focus)

* UMC - should be covered in the Remix part of the design
* PRIMM - stage based - more prescriptive - probably suits next chapter.

Note on PRIMM and personal knowledge.

Da and Te - In these interaction the parent seems keen for the child to be able to express and demonstrate their personal knowledge of coding, games and maths concepts.

This is an interaction which in some ways is comparable to the PRIMM model which is suggested for classroom use. However to do it in the way demonstrated by this pair would involve a level of coding familiarity, and ongoing familiarity with the structure and thinking of the participant which would be difficult to achieve in many classrooms.

UMC on the other hand while being less described and open to interpretation seems to match the more informal, iterative game making of many participants.

### Discussing Game design patterns as a tool to expose and give participants a language to discuss tensions (Practitioner focus)

Synthesise examples which highlight the value of developing share language and short cuts. Draw from the above examples.

However, also look at potential short comings of short cuts - hiding more complex patterns within the name. When short cuts or misapprehensions prove less useful.

For example the shortcut of a name for a pattern in Fi and Ma’s interaction hides a large amount of problems solving which seems “overwhelming”

Is there an advantage to less support in terms of setting out a pathway which participants cover step by step. Or is the process of working on a sprawling problem which seems unmanagable, but which in with participants have to

### Design patterns as a “middle level” construct to open door to more concrete and abstract (Wider focus)

In the introduction of this thesis I highlighted some of the challenges for inclusivity and motivation of more abstract approaches including a perscriptive approach to Computational Thinking.

Papert and Turkle celebrated diversity in approaches and celebrated the concrete.

In the relevant literature () - design patterns are seen as a useful middle ground between abstract CT concepts and more concrete techniques. There are the advantages of both a relatable, tangible shape of unit of activity linked to a community of practice. They also include a more abstract / and thus repeatable structure thus fulfilling some of the promise transfer offered by CT advocates.

The heart of the matter here is how transferable knowledge is without a contextual meaning attached. This is a contested area.

In this context of novice coders it seems appropriate to introduce some levels of reusable practice whilst prioritising individual learner engagement and community participation.

We can see evidence of both the potential for reusable elements of knowledge and practice involving practice in the following ways;

* Use of levels as a array which is parsed by a loop to create layout
* Other examples.

### Discussion - Pumping up the Jam - allowing for improvisation in design process.

Example - Te and Da - 2019-05-08 - da- use paper to design te - I’m just going with it

The tools, process and the community encourage a jam / improvisational approach. Remixing, chipping away, a shattering of design cycles. More of an informal approach

The concept of Jam is explored in rapid, improvisational events called Game Jams.

## Outroduction - Summary on contribution to existing research

Bring more synthesis here especially in translation of design elements due to this context

* Whereas Game Jams focus on x, 3m has a focus on y.

## Transition Conclusion of Chapter Paragraph - themes to explore in other chapters.

A theme to follow up in the Maps / personal learning chapter is that of picking up on some of the behaviour of participants, especially that of experienced parents, experience either in coding practices of supporting their children. Once identified, how could beneficial interactions be encouraged in the next iteration of design.

Examples include;

* supporting reflection on design and coding concepts / skills.
* navigation / organisational support - use of a physical map.

For example, the use of CT concepts in a framework, listed as part of the initial design pattern card, which could then be discussed, ticked off or otherwise reflected on.

## Transcript Excerpts

### 2019-05-08-te-da pt 1

Da: Have you thought about pushing it a bit further and have a different style of game? Te: What do you mean? Da: Well the previous style of game was a platform (makes shape with hands) game wasn’t it? You went along and there was gravity pushing down (points down). There are other types of games aren’t there? Te: Pause. I don’t know what to do thought. Da: Well quite but what other games are there? Te: I don’t know er. Da: Well I tell you what .. muffled. Te: Erm - (navigates to list of GDP for platform game) De: So. You played them before didn’t you (indicating grid of games ) Te: What do you mean? Da: The flying game that’s a different kind of game Te: Oh like kind of like moving along kind of thing Da: Yeah and those where. There are games where you are in a world and you have to move around the world like pac-man (points down and moves an imaginary character around), Te: nod Da: There are games where things drop down like Tetris Te: … game. You could have a game where every 15 seconds 10 seconds you could add and enemy to such and such a random number between such and such (holds up hands to indicate parameters). You could block it somewhere. Da: So instead of.. instead of the world… the world being sideways. We could have the world being looked down on. (reindicates the change of perspective) Te: Hmm. How should I do this then? Da: That’s a good question. Shall we ask Mick to see if that would mess things up or not?  
Te: Mick Mick: Hi ya. Te: Erm. Thinking about what game to do . I was thinking can we make like a pacman game kind of thing (indicates movement of character with hands) Da: If we had an on the top game rather than a platform game Mick: I think it could work. You could kind of adapt that game by kind of removing gravity. Da: and see what happens? Mick: and see what happens. Da: It’s not a bad starting idea is it? Te: I suppose make a new one (begins the process of remixing game from the template)

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