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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?

The working definition of game design patterns (GDPs) is 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. This chapter continues with a Vignette of parent child interaction in game making process. The vignette is used to introduce an overview of interactions of that pair generated from analysis of video data. The chapter then focuses on the use of game design patterns by participants in these interactions and then in reference to cultural, interpersonal and personal planes of activity. Finally a discussion section explores implications and observations from these findings in relation to existing research and concepts.

## 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. Other emerging chapters are online at - https://mickfuzz.github.io/phd4/thesis\_chapters.html OR just create hyperlinks.

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)

### Recap on Game Design Patterns -

NOTE - A QUICK RECAP OF TERMS FROM LIT 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.

The term Game Design Patterns (GDP) use used in different ways. It can be used to describe the kind of code programming patterns that are used to structure code and keep it architecturally neat thus facilitating code sharing and extension. These patterns would be invisible to the end player of the game. The term also describes common patterns of game play and design that are visible to the player. Indeed players may become very familiar with these GDPs as they build their literacy as players about what they like or dislike about game they play. The results of this chapter focus on the second interpretation of GDPs. Eriksson and colleagues (2019) use the second interpretation rephrasing slightly as gameplay design patterns, thus placing emphasis on the exposure to the user via playing the game. They described the utility of games design patterns as a *lingua franca* for game developers. Other benefits cited are GDP as a source of creative inspiration and as an aid to problem-solving. Their research builds on related research which complied a list of GDP patterns as a public collection (available at http://virt10.itu.chalmers.se/) (Bjork and Holopainen, 2005).

In my own game making model students picked missions from a choice of printed resources. There were four colour themed categories of missions. *Game mechanics* are features to do with the actions of the game. *Game space* patterns address the layout of the game. *Game polish* patterns involve adding music, backgrounds, graphics and story elements. Finally *System and Challenge* patterns look at how different elements interact to create challenge in the game. An example of a game mechanic design pattern follows.

PRINTED CARD TEXT BEGINS

Your mission is to apply the following pattern to your game. There are supporting step-by-step resources available if you need them. When you finish be sure to reflect on how adding this pattern helps your understanding of the computing concepts and similar patterns listed. This concludes your mission.

* **Name of Game Design Pattern:** Jumping on Enemies to Zap them
* **Type Pattern:** Game Mechanic
* **Description:** If the player is descending from a jump when they touch the enemy the player is zapped and in this case disappears.
* **Need for Pattern:** Enemies create challenge and being able to jump on an enemy is a good way of clearing the area you want to explore.
* **Coding Concepts involved:** Arrays[^8], Change Listener[^9]
* **Links to other Computing Patterns:** Systems Dynamics[^10]
* **Related Game Patterns:** You’ll need to have added the **Add Enemies** pattern to your game before you can add this one.

PRINTED CARD TEXT ENDS

## Study of Vignette A

To begin more detailed study of participant interactions taken from video recordings I use vignette to give a snapshot of the interactions of one family.

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.  The exchange contains good troubleshooting of sequencing  And uses the debugger as a tool.  A fuller transcript is available.  One error is due to different versions having different state names. So documentation is out of date. | |
| 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 to level 2 where there is not a door or key. |
|  | |
| 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  (in a rhythmic voice)  Key Door Key Door Key Door (in a sing song voice)  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: Back. 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 indicates where the K key is on the keyboard by pointing |
| 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 Smiles at S and then looks away for a short while |
| 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!  How 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  O O O.  (laughs)  (replaces another) Back O (giggles) | (on screen) T adds three coins to Level 3 by inserting o in the matrix |
| 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  She add a platform and a key and door to the design of the third level |
| T: (laughs) | Sh starts 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 |  |
| T: 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 the foci of cultural, interpersonal and personal activity (Rogoff, 1995). Where appropriate I make observations on similar patterns of behaviour from the same pair from outside the scope of this interaction.

**Cultural Focus**

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 the room or to dwell on the periphery of other participants interactions.

Keys and Doors as desired a pattern emerged from feedback from participants in previous sessions. It is a concept that has appealed to the child in a way that drives engagement with the game making process. This is evident in the way with the child introduces and repeats the name of the pattern in a sing song voice in this interaction.

Another pattern the child advocates for is that of adding levels. This desire to add this pattern may have been picked up from the emerging culture of the group. The process of adding new levels is something that one participant Te has been teaching other children to do via peer support. He has added so many levels to his own game that children and parents in this session are commenting in on it.

In the above interactions, there is cultural understanding of the conventions of a platformer game being shown by both the child and adult. Understanding of the game as a dynamic system 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. “It is for me!” the child counters. She may be aware of the implications for game balance but takes pleasure in this destruction of the key challenge of the game as an act of disruptive play (as explored in the previous chapter).

This interaction shows the parent guiding the child to imagine the user experience through the use of terms from GDPs. This process is repeated by this parent for other patterns in other interactions. In the vignette for example, Sh shares “Must be quite hard to get through that door.” when Sh places the exit door high above a platform.

**Interpersonal Focus - Guided Participation**

Game making patterns are outlined by both the child and parent. They talk of adding more levels, of the mechanic of keys and doors in this vignette. After a blockage caused by debugging coding is removed, the parent immediately re-engages the child. The parent says “Did you see Th?” and then prompts the child 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 child shows high engagement at this stage outlining her plan for adding pattern to make progress in the process of designing their game. The transformation from the period of time when her parent was problem solving code is dramatic. For this pair this alternation between higher and lower engagement with the coding processes happening on screen was fairly consistent. The implementing a new GDP often involves adding new code to the game or a significant change in code which may need debugging. For this pair, larger coding activities were beyond the ability of the child. Feedback from the parent indicated this was partly due to reading ability. They also mention a strategy to address with this barrier to participation. “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.”

Two observations follow. Firstly, the design choice of a grid of letters representing different elements of the platform game appears appropriate in the case of a novice learning to code and read at the same time. Secondly, it is of value to explore during which design stages is the child is most active and engaged.

**Personal Focus - Participatory Appropriation**

Personal knowledge and practices are harder to observe in the video data of mostly pair interaction. However, following Rogoff’s interpretation of this personal plane as participatory appropriation (Rogoff, 1995), knowledge or processes which individuals adopt, reuse and transform fits within this plane. Thus beyond solo activity demonstrating personal knowledge, expressions of personal knowledge or practices when they are shared back into the community activity are also valid here.

From video data I identified certain coding practices that were transmitted through interaction with the facilitator that this parent is quick to adopt and use. For example the use of the project documentation website. In addition, the debugging tool which the parent notices the facilitator using in this interaction is used by the parent in later sessions. The use of these tools and processes are introduced to solve a particular problem in implementing one GDP. However the same process is uses to solve issues that crop up while implementing other patterns. Throughout the recordings, the parent shows an evolution of problem solving knowledge and processes in relation to coding through their independent work.

The child shows their personal knowledge of game design patterns in the end of course evaluation. She responded to the question *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.”

### Describing design stages for this pair beyond this interaction

As mentioned in the previous sections, after analysis of this vignette in particular, it seemed promising to investigate behaviour and engagement at different stages of design process for this pair. To do this I have made extensive notes and used a coding structure for 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 participant feedback and my own journal notes. The observations are presented themed by the design stages used in the coding process with some general observations listed at the end of this section.

**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.
* The child makes comments about sharing their game with others imagining the experience of others playing their game. The sharing process motivates sustained activity.

#### Discussion on design stages and GDP for this pair

This parent was much more commonly rooted to the computer than other parents. The parent had indicated that she considered herself a “planner” as a maker/player type (concepts explored in previous chapter). This interpretation seems confirmed by less social interactions compared to may parents. The pair engaged far less in play testing of other games and peer support to overcome barriers. They also followed the stages of design more closely than may other groupings, an observation which is explored in more detail later in this chapter.

This parent-child pair alternate between use of keyboard and mouse. The parent is keen to give the child hands on experience when possible, noting “I resist the urge to fix things immediately when she struggles.” This alternation is driven or facilitated by the different stages of implementing GDPs. The parent may take the driving seat to overcome code blockages early in a create stage but yield to allow the child to input their design choices when more complicated work is complete.

Using the coded data from nvivo to compare design cycle stages with pair collaboration, it can be observed that the most likely stages for pair collaboration were during the Ask/Imagine stage, Testing and Planning.

The vignette shows evidence of that the actions of the parent to re-engage the child at different stages of the design cycle helped sustain the child’s engagement in the more focused design process happening on the screen. However, an opposing pattern of behaviour may also be valid. 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. Within Rogoff’s model of community of learners (1994), this observation is viewed as valid form of participation. The child’s ability to legitimately disengage from pair coding to observe the work and interactions of others in this emerging community of learners may also be sustaining.

It is of note that when describing the design cycle for this family that this family along with others are working with decomposed smaller design challenges in the form of implementing GDPs. Thus the cycle is repeated for each new pattern that the pair take on. These smaller design iterations can be expressed within the framework of AT as an activity system.

## Identifying the implementation of GDP as a key unit of analysis

Activity Theory allows researchers to identify intersecting or nested systems of activity with varied goals. Taking a holistic view of goals of the game making activity, we can identify the larger and smaller scale objectives of systems of varied scale. These include:

* larger - learning computing skills and concepts as a home education project
* larger - participating with other home educators in a creative environment and thus building team and communication skills
* larger - learning transferable design skills and processes
* large - creating a game which is fun to play and communicate an environmental theme
* medium - identifying and implementing key game features (Game Design Patterns) to add to the games
* smaller - creating, changing and transporting game assets to enact or change GDPs
* smaller - implementing or changing code constructs to enact or change GDPs

In the last chapter we explored inclusive pedagogical methods that helped participants become part of an emerging community of game makers. In that community-focused analysis, the unit of activity/ analysis was the creation by individuals learners or pairs of an engaging game with an additional goal of exploring an environmental concept. This chapter analyses a sub-activity system to the creation of the whole game, namely the implementation of individual game design patterns.

#### Discussion on scope of activity systems (MAY MOVE)

NOTE - this may move, it seems to get in the way here. Thus this is partly in note / bullet point form.

In the methodology chapter the concept of activity as a primary unit for analysis to research community activity was outlined. While Blunden makes a pragmatic proposal to use the project as they key unit of activity (2010, 2014), there is a strong case to make for the sub-project of implementing GDP as a key unit of analysis for this chapter.

From the perspective of participants, the goal of implementing individual game patterns rather than the overall goal of making of a game, took up the majority of their focus. This can be evidenced in the following observations;

* the frequency of GDP language referring to patterns used by pairs in particular in the process of collaborating on their games
* the utility of the smaller unit of analysis in aiding resource creation
* the value of completing something concrete a sense of sustaining achievement.
* the ability to reflect after implementing each sub project,
* any other value for practitioners, parents and young participants - i.e. in navigation and goal setting.

The implementation of GDPs as a unit of analysis for the researcher also has the following utility / validity;

* There is a practicality in terms of defining possible boundaries of what to analyse in depth.
* There is a more frequent iteration present - usually a period of playtesting after each new pattern added.
* This research with a practitioner focus, looks to identify emerging barriers to comprehension, communication and practical barriers to implementing code structures. Thus a smaller unit that allows a large amount of granularity is useful. (compared to broader observations)
* Each GDP can be seen as a project given an interpretation of project as the concrete implementation of a goal
* That concreteness / implementation is particularly valid given the regular play-testing of creations often after each GDP is added in a peer environment.

### Operations, actions and activity

Analysing the implementation of GDPs as a unit of activity allow the use of useful concepts to explore the specifics of participant behaviour. In the methodology and design chapter I explored the concept of resolving tensions involved in tool use and interaction with the learning design. In this section I briefly explore the utility of the concepts of activity, actions and operations when applied to implementing GDPs (Kuutti, 1995).

“…actions consist of chains of operations, which are well-defined habitual routines used as answers to conditions faced during the performing of the action. Initially each operation is a conscious action, consisting of both the orientation and execution phases, but when the corresponding model is good enough and the action has been practiced long enough, the orientation phase will fade and the action will be collapsed into an operation, which is much more fluent.” (Kuutti, 1995)

For now I list some bullet points with examples followed by a brief commentary to develop at a later date;

* **Activity:** Implementing a game design pattern - e.g. adding keys and doors pattern
* **Action:** Creating a graphical asset of a key and adding this to the level design
* **Operation:** Exporting the graphical asset as a suitable file format from graphical design tool and uploading it to the code authoring tool.

**Commentary:** In this example, while the final an operation for some participants it would be a more conscious process, for others it has become second nature. To illustrate this take this interaction between parent Mi and child Ne.

Mi continues to do solo design using the Piskel graphical too. She encounters a design problem. When erasing a part of the design she gets rid of background colour. Mi asks for help from partner but receives misleading advice which does not help her progress.

Mi – Oh no it’s not done that has it?

Mi calls the name of her child across room with theatrical gesture and loud whisper voice Mi – “Ne!” Mi then makes face, wiggles head and shrugs at parent peer. The other parent laughs.

Ne arrives to help. Mi – I’m trying to delete them but they turn light grey. Ne – So you want to get rid of them? Mi – What are you doing? You have to tell me what you are doing so I can do it myself. Mi – laughs Ne – laughs. Mi – I’ll just have to keep shouting at you if you don’t tell me.  
Ne uses the mouse to select the grey background colour with the colour picker tool, then the pen tool to fill in gaps in the design. She then swaps the active colour back from grey to black by clicking the option to swap foreground and background colours. Mi - How did you do that so quickly? I’ve got to like, carefully… (makes hand gestures to show a sense of hesitant keyboard use) Parent peer laughs Ne bounces up in place and smiles broadly. Mi- Thanks Mi – So am I like back with the black now?  
Ne – Yeah but if you want to delete it just press X (which switches between foreground and background colours) and then do it. Mi – Oh X. Alright Bubs. Thanks.

In this interaction the parent is focused on completing the action of creating a graphical asset of a hazard as part of the activity of adding the GDP of including a hazard into the game. We can see that the operation of changing pen colours on the graphical tool is one which the child has been able to translate into a effortless process whereas the parent is still consciously building her competency.

This interaction underlies the validity of exploring the implementation of GDPs as a unit of activity as it allows for a more detailed and granular exploration of the many actions and operations that comprise each pattern. In the following sections, I draw on such detailed observations of participants in practice to outline how GDPs are used by participants.

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

In the first part of this chapter I focused in detail on the three planes of activity for one vignette. In this section I present the results of analysis of other video recordings as separate observations on the way GPDs are used by participants and facilitators to further their game making objectives. Acknowledging that these observation do not fall nearly into each of the three planes, I begin with those oriented more to cultural focus before progressing to the bulk of observations oriented chiefly to interpersonal activity and then ending with some observation on GDPs impact on personal knowledge construction.

## Cultural Plane / Apprenticeship - and Game patterns

In the previous chapter the role of cultural activities to engage and sustain engagement in this game making programme were examined. This chapter allows us to focus in on the role that game design patterns in particular. Design patterns are by parents, children and facilitators as a tool of apprenticeship in this emerging game making community.

### GDPs and their interaction with play-testing to build a supportive community

In the previous chapter play-testing was seen to provide opportunities to build a supportive game making community, including x,y & z. This section will explore the particular role of GDPs within this process using an example about one of the core GDP of the platform game, that of jumping.

The discussion of game challenge, specifically comment about how ‘hard’ participant games were as the most common interaction during playtesting. The concept of difficulty for most of the participant’s games was dependent on the interaction between the feel of the game controls and elements of game challenge associated with placement of hazards and moving enemies. The term *game feel* has varied interpretation but is generally framed as the responsiveness and feeling of control over the main character during the core movement of the game. In this case, it effects the ability of players to move between platforms and avoid enemies.

In this design the jump mechanic is determined by the use of variables controlling gravity, jump velocity and movement velocity. The importance of these variables to is was behind the design decision to place these variable right at the top of the code and to rename them with player centric names rather than mathematical terms like velocity and acceleration.

The regular playtesting of games allowed participants to give each other feedback regularly and game feel was one of the aspects that young people in particular to gave frequent and valid feedback on.

Parent Mi had been focused mostly on completing asset design. She had been made aware by her daughter Ne about the relevant game variables. She had also asked for advice but Ne gave none leaving Mi to note “She’s left me to my own devices.” Player jump (y) velocity was set very high but left right (x) velocity was slow. This created a very frustrating game feel. The following is a compilation of feedback comments or reactions over a 15 minute time period.

Mi: (Talking to self) No! It’s so hard that. (referring to a particular jump in her game.) Mick: How are you getting on Mi? It’s looking good. Mick: (Noting frustrated air of Mi) Have you made it to hard. Mi: I don’t know. Can you jump from here to here with this.. this.. him? (point to main character) Mick: So it look like you bump your head and fall down. Mick: One bit of friendly feedback that I would give you is that it’s taking a long time to move left and right. And that is something that you can change if you want to. Mi: Oh right yeah. Mick: Yeah. Mi: Yeah, actually that’s a good idea. Mick: If you think about average games. Your average jump time would be about one second in the air. So that can be a bit of guide sometimes.

Ch likes the look of the game and begins with that as a comment.

Ch: That looks nice (referring to the graphical look of the game) Mi invites Ch to play as she can’t progress due to the difficult game controls.

Ch: It jumps super high but so slow  
Pause. Mi: He has to go slow because he’s an astronaut, you see.

Ch: It’s hard. Ch then leaves

Mi: (to peer parent with proud tone.) It’s hard. Wow.

Fi comes to play the game

Fi: How much jump speed to you have? Fi: Your jump speed is massive.

Other children come and play the game but only for less than a minute before leaving. After the last one leaves Mi comments “It’s so frustrating.”

We can see that Mi justifies the game feel of a very high fast jump with a narrative response about the character being spaceman. However, the limited amount of time anyone plays her game and her own frustration in playing it is telling. The game feel is frustrating in the wrong way here. Mi seems to initially misconstrue the feedback she is getting here equating her ability to make the game hard as a positive thing. However, towards the end she notes the frustrating nature of the game. As a caveat, it is hard to be clear about the motives or decisions of Mi in this situation. It is not impossible that she enjoys the frustration of others playing her game at this point.

In these interactions we can see a consistent message coming from peers in the playtesting process. They praise the look of the game but offer constructive feedback to help improve the GDP of jumping. This kind of feedback was present in many exchanges during directed playtesting and during pair interactions.

When pairs return from playtesting to pair design work they are guided in decisions by their interaction with the games of others. I infer that the process of playtesting other games is a direct and accessible way to explore vital game making concepts like game feel and challenge without being directly taught.

THIS HAS THE POTENTIAL FOR MORE DEVELOPMENT AND EVIDENCE

### GDPs and personal expression (cultural) -

Existing research on digital making and creative coding has emphasised the role of personal expression to incentivise the creative process [Scratch roque community]. The creation of personally meaningful object to share with a community is a foundational concept in Papert’s constructionism [CITE]. While the 3M design is more limited than a Scratch media project in the potential to incorporate home interests, participants did embrace existing immediately clear possibilities offered by the certain GDPs in the 3M starting design.

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.

The incorporation and design of game assets is taken as work on GDP for the purpose of this model. The core GDP involving game assets already exist in the starting template. - Objects as a reward to incentivise player exploration - Objects as a hazard penalising player progress

The starting three assets, player, hazard and reward provide a scaffold to guide the choice of game possible themes

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

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.

NOTE - WHAT EVIDENCE TO USE TO SUPPORT THIS.

* Perhaps a transcript at start of process. Ma and Fi ?
* Perhaps interview data? Te and Su?

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.

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

Participants draw on their cultural experience at home and from work contexts to guide interactions with others. Some experience is of general coding proficiency and practices (previously explored) while other experience relates to experience of GDPs through home game play.

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. The following 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 experiences.

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 repetition in the educational 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 template. He does not want to “mess things up”.

NOTE - There seems to be a mirror here of the value of playful environments 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 discussed 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 possibilities 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 example is typical of other interactions of this pair. Te and Da’s design process is more guided and focused than many other participants. This appears to be influenced by Da’s experience as a software engineer and volunteer at Coder Dojo (previously explored in lit review). This process of active guiding but suggesting and seeking for the right answer appears as intentional from the consistent nature of the interaction and from a supporting interview.

SEARCH AND INCLUDE HERE - An extract from interview with Da?" to support some of the above observations.

### Use of Help and Documentation related to GDP

The use of help files and other documentation was explored in the last chapter but the specific use of GDP related support is explored in this section.

#### Use of a non-linear menu of Gdp

Learning resources were presented in a menu format with graphics focused on the player experience rather than underlying coding constructs. The purpose was to;

* increase learner engagement through accessible design
* make documentation relatable to existing gameplay experience
* develop use of common GPD terminology

NOTE - TO FOLLOW EVIDENCE OF PARTICIPANT ENGAGEMENT WITH THE RESOURCES

#### Use of simple code examples which demonstrate the pattern in isolation

Code examples were initially the starting resource. The idea being it was quick to see the behaviour in context. This was changed after this iteration based on the difficulty of finding the relevant section on step-by-step resources.

However the, use of code examples by Te in 2019-05-08 shows the effectiveness of the use of code examples by participants. DEVELOP THIS EXAMPLE - RELATE TO PRACTICE OF CODE PATCHING (EXPLORED IN PREVIOUS CHAPTER)

## Interpersonal Focus (Guided Participation)

This section examines the use of GDP to facilitate guided participation in game making. The primary source of material is from pair interactions between children and parents.

* If needed a quick recap on guided apprenticeship.

### 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.

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.

This example shows the use of the approximate names number of game design patterns by the child adult. These are get the person animated, get an enemy in, changing the platforms into something different, make a theme tune. Patterns and the multiple actions and operations they entail are referred to briefly using short cut names. At this stage of the design some patterns have been imagined and perhaps partly worked on and dis-guarded. 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.

Mick: Hello Ma: Hi Mick Ma: So we’ve made quite a lot of progress this week. I think the issue we’re having is that Fi’s super excited so we’re kind of jumping form one thing to another and that’s kinda overwhelming me a bit.

Father describes previous behaviour as ‘skipping around like that’ or ‘jumping all over the place’ (in the above comment to Mick) as unproductive, but reviewing video data shows a more complex picture. While the father seems keen to prioritise and then complete one pattern, the child takes a more piecemeal approach. Later in the session the father then gets drawn into creating audio assets after observing his son searching for suitable tools. Ironically, it is the father that becomes distracted from his stated task rather than the child.

NOTE - THIS DISCUSSION NEEDS MORE DEVELOPMENT 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. Changes to the emerging 3M design to provide such support are explored in the following chapter.

### GDPs and division of Labour

#### Direct task delegation

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.

#### Informal task division

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.

Ma has been reading documentation on how to add animation to a character for some time.

Ma: Quite complicated. But we can do it. But it would mean a lot of mucking around Fi: Ah Er Ma: Which is difficult to do while we’re here. But it’s doable. Ma: It’s like a project in itself really. Fi: Project in itself? Ma: Yeah! (laughing). I just want to know like. We can get him in. So if I ask about the sizing. Fi: Hmmn Ma: I think you can edit the size here. Fi: Why don’t you go here for a computer and you can do that? Ma: Why. What. While you’re doing what? Fi: Um making a sound track or something. I could do something like that. Ma: Ok. Yeah. I’ll see if there’s any more computers in the cupboard.

Here, after a blockage, the child suggests continuing with activities to fit his existing skill set of creating assets in non-code / GUI environments. The child appears to make a tactical decision allowing the father to piece things together in the code based program.

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.

### GDPs motivation and sustaining engagement

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

The transition from adding one GDP involves playtesting, which then often led to the identification of a next GDP to implement.

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 propagation through peer activity

The popularity of certain GDP spread through peer activity. For example, the work of the child to add 21 levels to their own game served as a way to publicise this possibility. The process was also spread by that child’s willingness to help others to add that feature to their game. This shifted dependence on myself as a facilitator, or on the instruction-based support documents. This excerpt shows this more experience child coder Te, agreeing to show another child Ch how to add new levels.

Ch: Why’s that enemy in every level Te: He’s not. Ch: Can you show me how you add more levels on to yours. Te: Yeah sure. Pause Te: I’m just going to have one go of beating this. It’s 21 levels in it. So .. Yeeeeah. Pause Ch: It’s like parcours in Minecraft but times. It’s like playing the game Wipe out. Have you ever played wipeout. Te: Er not really. Ch: Or seen it. Ch: That’s like my second level. Te: Ah so hard (Te fails at a high level on his game and starts to move off)

Te: (To someone else calling for attention) No I’m helping .. (Te then follows Ch to his workstation to help him implement more levels.)

FURTHER DISCUSSION HERE

### GDPs to support Flexible (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

FIND TRANSCRIPT / NOTES OF A PLANNING PAIR TO ILLUSTRATE THE FOLLOWING.

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

While the design suits repeated design practice as illustrated by the example above, not all pairs or individuals interacted with GDP in such a neat way. A later discussion section in this chapter illustrates a more complex interaction with design stages.

### Interaction of GDPs and designing for others as a method

As discussed, one interpretation - the one used here - of GDP focus on recognisable behaviour rather than hidden constructs or code patterns.

This helps a focus on change that others will observe and thus help participants to design for others.

As explored, Playtesing as a regular practice is another way to shift learners into a perspective designing for others.

I found many examples of pair partners and peers nudging others into imagining others user experience to suggest game design alterations of additions.

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 of 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.

The use of GDP as a unit of activity may help encourage regular self testing and playtesting. NOTE - ANY EVIDENCE FOR THIS BASED ON INTENTIONAL DESIGN OR IS THIS JUST AN OBSERVATION OF ORGANIC BEHAVIOUR?

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

Value of design as a process, to see surrounding world as a designed experience, Latour.

## GDPs and the Personal Plane

NOTE - THIS SECTION IS TO INCOMPLETE FOR MUCH FEEDBACK TO BE USEFUL. BUT INCLUDED AS AN INDICATION OF OVERALL PROPOSED STRUCTURE OF CHAPTER.

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
* Example - 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 (or not)

There are many examples of the use of language afforded by GDPs being used to increase effectiveness and confidence in communication. However not all participants take full advantage of the language available to them.

NOTE - THIS SECTION IS NOT REALLY COHERENT - THERE’S DUPLICATION AND IT IS TOO INCOMPLETE FOR FEEDBACK.

For example - 2019-03-18 - Sh & Th in the same session as Vignette A. We can contrast Th’s general lack of confidence in coding and other peer activities (where she remains on the periphery) with her strong ability to share back progress and decisions during the end of session playtesting. using language afforded by GDPs.

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

However, this use of language is not universally taken advantage of. Take the following interaction between parent Mi and her daughter Ne. The mother wants to export an image from the graphical editing tool and to import this into the game.

Mi - Ne!, Ne! Ne.

Mi: Do you know how to get it in the game? Ne: Oh my god! Mi: Well . First of all save it to the gallery. How do you save it? Ah there you are. Save it. Is it saved? Right now export it. Ne: Do you even know what export means?  
Mi: I know what export means! Ne- Ok then smartie pants. Mi: Right so I don’t want this rocket here. I want the rocket to be the yellow thingie. Ne – Gold coins. Mi - Right so, What are you doing? Do you know what you are doing? I want the aliens to be the hazard, the rockets to be the gold coins and the spaceman to be the character. Mi: Poop Ping? (alarmed )What are you doing? What’s poop ping. Where’s my spaceman? Ne: Wait! What do you want the aliens as? Mi: The hazards. Mi: Yaaay! Mi: And now the rocket thing as the like you know the good thing - the reward. Ne: Who wants a rocket for their reward? Mi: Because if a spaceman gets to a rocket he can get home. But if he doesn’t then the aliens get him. Ne: It’s a very violent game. Mi: What ? Ne: It’s a very violent game.

NOTE - OVERLAP WITH THE BELOW WITH PREVIOUS SECTION ON AT TERMS

Ne appears reluctant to help at first and when she does she is mostly non-verbal and makes changes quickly in a way that her mother cannot then follow or replicate.

The pattern we see here is less relatable to every day game constructs in the way a game mechanic is. The pattern involved here is a coding pattern and a pattern in process. In code terms you need to add asset in preload, change name in create. In process terms you also need to export in correct format, note location of download, then using the editing tool locate and upload to correct area of the project file structure.

We can explore this behaviour from the child’s perspective using terms from Activity Theory. The process of exporting and importing has become an ‘operation’ for Ne through repeated practice.

The process of explaining this to her parent would be more time consuming. There may also be a power dynamic happening as well with the child enjoying showing proficiency without sharing the process perhaps as a performative demonstration agency or growing status within this community.

### GDP as a way to explore Computational Thinking Concepts

NOTE - Summary to come.

The start of the discussion is is draft form in the next chapter. See outline here - > insert link. https://mickfuzz.github.io/phd4/chapter/2022/09/07/Results-Maps.html

## 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)

ANOTHER NOTE - I HAVE NOT HAD TIME TO DO THE ACTUAL CHARTS OR WORK WITH THE 5 FULLY CODED VIDEOS YET.

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.

## 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.

#### 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.

#### 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…..

#### Improving is Creating and Planning when remixing

For example when altering jump and move variable for the first time. They are deliberately set low. Thus while technically this is improving the code. As the participant is meeting those variable for the first time we can recategorise in the create category.

CASE - One parent did extensive design and then altered the variables at the end. Mi -

#### 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 planning stage, 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. Other less formulaic theoretical perspectives on creative processes exist including rhizomatic approaches (de Freitas, 2012). And some attempts have been made to incorporate design thinking with a rhizomatic approach (Biffi et al., 2017).

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?

#### Discussion - encouraging improvisation in the design process.

In many interactions we see improvisational approaches.

Example from 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.

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

#### Use of GDP as communication short cuts

This section;

* synthesises examples which highlight the value of developing share language and short cuts
* explores possible drawbacks
* looks at restricted

Examples of short cuts include, “get an enemy in”, animate player from Fi and Ma’s exerpts.

The advantages of such shortcuts are, as discussed to help with the prioritisation and ideation processes, to facilitate peer propagation of ideas, and potentially to inform debugging and improvements to increase game playability.

However, there are challenges of the use of such short cuts including; - hiding more complex patterns within the name. - confusion over use of terms to new comers

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”

#### Use of restricted set of collated GDP patterns

This section;

* outlines the advantages to using a restricted set of collaged GDPs which participants cover step by step.
* compares again to instructional tutorials (previously explored in methods chapter)AND to the process of working on a sprawling problem which seems unmanagable - but which in with participants have to work with facilitators in depth to overcome issues to preserve a totally learner-driven approach (as per first iteration)

Example materials / examples include;

* Te and Da’s decision to explore a different starting point and add uncharded GDPs like following enemies.
* The reduced list of GDPs in a framework in Eriksson’s intervention (2019), to suit a younger audience / restricted time frame
* One to one instruction to explain concepts and allow freedom of choice is ideal but unrealistic in classrooms.

### 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 prescriptive approach to Computational Thinking. We have seen how Papert and Turkle celebration of diversity in approaches and in particular concrete coding approaches has influenced the design of popular educational programming software. In this chapter we have encounter examples of the use of GDP as a concrete and relatable construct that facilitates communication, engagement, planning and division of labour. Then enactment of GDP emerged from this exploratory design to be the key unit of activity.

THE FOLLOWING NEEDS RESTRUCTURING AND DISCUSSION

In teaching computing pedagogy the concepts of levels of abstraction is explored in some depth with an aim of (Statter and Armoni, 2016; Waite et al., 2016, 2018a).

To quickly review LOA, the levels are Problem, Design, Code, Running the Code. And the purpose is, “Levels of abstraction has been interpreted as a hierarchy to enable teachers and learners to describe which level they are working at, rather than as a methodology for programming projects.”(Waite et al., 2018b)

In professional coding programmes design patterns, particularly in object-oriented approaches, are seen as a useful middle ground between abstract CT concepts and more concrete techniques (Dearden and Finlay, 2006). The idea of middle level construct is also present in the research of eriksson and colleagues using GDP to collaboratively design games with young people. (2019)

The concept of levels abstraction can also be applied to our analysis of the game making practices with AT concepts. - most abstract - Activity - making an engaging game - most abstract - Action - choosing a GDP - most concrete - Operation - enacting in code

The observations of this chapter show the advantages of GDP as a tangible, middle level unit of activity to help not only the creation of designed objects and the development of personal knowledge but also the emergence of a community of practice.

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

Game design patterns contain elements of more abstract and thus repeatable structures thus fulfilling some of the promise transfer offered by advocates of Computational Thinking. This is explored in more depth in the next chapter.

Specifically in examining the concrete implementation of GDPs there are transferrable concepts and practice involving practice which include;

* Use of levels as a array which is parsed by a loop to create layout
* Logic statements of varied degrees of complexity
* Functions - code patching into the right area

## Final Section - Synthesis

Summary on contribution to existing research Bring more synthesis here especially in translation of design elements due to this context

### Strengths and Weaknesses of the GDP construct / terminology

The interpretation of GDP that this thesis adopts contains some weaknesses. The specificity of the term is weak in that in seeking to categorise a wide diversity of features that participants would want to add to the game to fulfil a pedagogical motivation of providing guidance and inspiration to the novice designers. The pragmatic nature of this interpretation can be contrasted to more formal definitions of say Game Mechanics related to user actions in the game (Sicart, 2008).

The term is particularly week in the area of Game Polish which involved were more aesthetic and narrative choices. These choices do not fall neatly in to the argument being constructed around the potential of GDPs to unlock repeatable, transferable practices. For example, some participants, specifically one who came as a friend of of others and didn’t have direct parental help, spent a majority of time working on these patterns especially if assets are being replaced.

It is perhaps the term *pattern* that is problematic here. It may imply a repeatable structural element rather than an aesthetic choices. Other academics have given a wider name of game elements (Tekinbaş et al., 2014) or lenses (Schell, 2008).

NEEDS MORE DEVELOPMENT

### Design patterns as a teaching aid in informal vs formal environments

TO DEVELOP

See journal notes and contrast with existing research with GDP and informal / formal coding programming debates. Asking what does this research add to these debates?

Some of the following may be relevant;

* Learner choice and levels of abstraction techniques
* From the literature what are complexities involving the practitioner practicalities surrounding creating communities of coders
* What is special about the use of GDP in this 3M model?
* How is this model different from Game Jams in particular.
* Whereas Game Jams focus on x, 3m has a focus on y.
* Exploring GDP and different kinds of types of coding errors?

### Link Paragraph to next chapter

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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