Growing ThinkPlus

Our approach to designing and researching a metacurriculum for growing Learnable Intelligence

To give young learners the confidence to know they can think through anything.

thinkplus
growing young minds

Growing ThinkPlus
v. 1.2
Created 22 April 2013

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> Learning in the 21st century will demand new ways of thinking...radical re-imagining, for new ways and places to learn...new ways to see learning as it takes place and–most importantly–a focus on fostering passion, thinking, creativity, innovation, and the skills that are needed to compete and thrive in a global, connected world.
>
> John D. and Catherine T. MacArthur Foundation

Introduction

The purpose of this document is to elucidate the research methodology, processes and practices being utilised in the development of ThinkPlus, and to map out the ThinkPlus journey. This document will give an overview of our Immersive Design Research approach, explain the journey that resulted in this approach being chosen as a research method for ThinkPlus, and explore how it is being used in the ThinkPlus project.

Growing ThinkPlus

To give young learners the confidence to know they can think through anything.

ThinkPlus is a metacurriculum for growing Learnable Intelligence for implementation in years Prep to 12. It is being co-designed with educators and young learners in Australian schools. The key to the ThinkPlus Metacurriculum is the idea that intelligence can be grown with effort.

The premise

Our fast-paced, globally connected world requires new levels of collaboration, innovation, creativity and problem solving to navigate unchartered challenges and opportunities. Formal education requires a boost to ensure that young learners acquire these skills.

ThinkPlus fosters the development of growth mindsets, good thinking dispositions, and provides learners with the practical tools for collaboration, problem solving, play and creativity. The ThinkPlus Metacurriculum is designed to be infused throughout all key learning areas enabling young learners to develop a Growth Mindset, to become resilient, persistent, creative and mindful thinkers.

The vision

Through the establishment of a metacurriculum for Learnable Intelligence and thinking skills, ThinkPlus will affect positive change at various levels: the individual, the classroom, the whole school, the family, and the community.

ThinkPlus aims to create a conscientious thinking community within a school. We envisage a leadership team that embeds ThinkPlus into their strategy work, using it as a way to solve problems and innovate. We see educators using ThinkPlus in their planning, during meetings and to help young learners grow their minds.

Through ThinkPlus, we see young learners developing resilience, improving their self-control and bolstering their persistence and optimism as they make their way in the world. We envisage parents learning how to optimise their child's learning, overcoming challenges and assisting the family unit to reach its potential.

ThinkPlus aims to make good thinking practices sustainable by integrating "whole-school" and "whole-child" approaches.

The process

ThinkPlus is based on contemporary research about how the brain learns and how thinking occurs, and what role neuroscience and mindsets play in developing young minds.

Our innovative approach to this project is breaking new ground. ThinkPlus is employing educational design research to conduct the initial phases of the project, which include the development of the Metacurriculum and its formative evaluation.

Educational design research provides a direct link between research and practice. It ensures that clarification of problems experienced by educators, schools, and young learners can occur without restriction. It also facilitates the creation and adoption of effective innovations.

We recognise that any product or learning experience needs to be directly informed by input from young learners and educators. Therefore, ThinkPlus is working in classrooms and working with young learners, educators, school leadership teams, and parents to co-design materials and approaches. This method involves true collaboration. Moreover, it is academically sound and is conducted with complete integrity and rigour.

We are documenting our educational design research process and journey to inform best practice principles. We envisage publishing this methodology to benefit others in their development of programs for education.

The ThinkPlus Goal:
To give young learners the confidence to know they can think through anything.

The concepts

ThinkPlus draws on the philosophies, theories and concepts from research in the areas of neuroscience, psychology, thinking development, learning theory, creativity and motivation, amongst others. It reflects the works of Dr. Edward de Bono, Prof. David Perkins, Dr. Daniel Siegel, Dr. Shari Tishman, Dr. Katherine Greenberg, and Prof. Carol Dweck, to name a few.

ThinkPlus is based on sound evidence that links a growth mindset with positive outcomes in mental health, education, and community building. Studies on creativity have shown that abstract thinking has benefits beyond creative exercises.

The community

Throughout each phase of the project, ThinkPlus is supported by a rich community of passionate individuals including educators, school leaders, parents, practitioners, academics, designers and, of course, young learners.

Our Research Committee consists of esteemed leaders in their respective fields who join together with a united vision of a holistic approach to education. The Committee ensures rigour in our research and provides valuable insights.

The ThinkPlus Advisory Board is formed by many interested and capable individuals who contribute their thought leadership and skills to growing ThinkPlus.

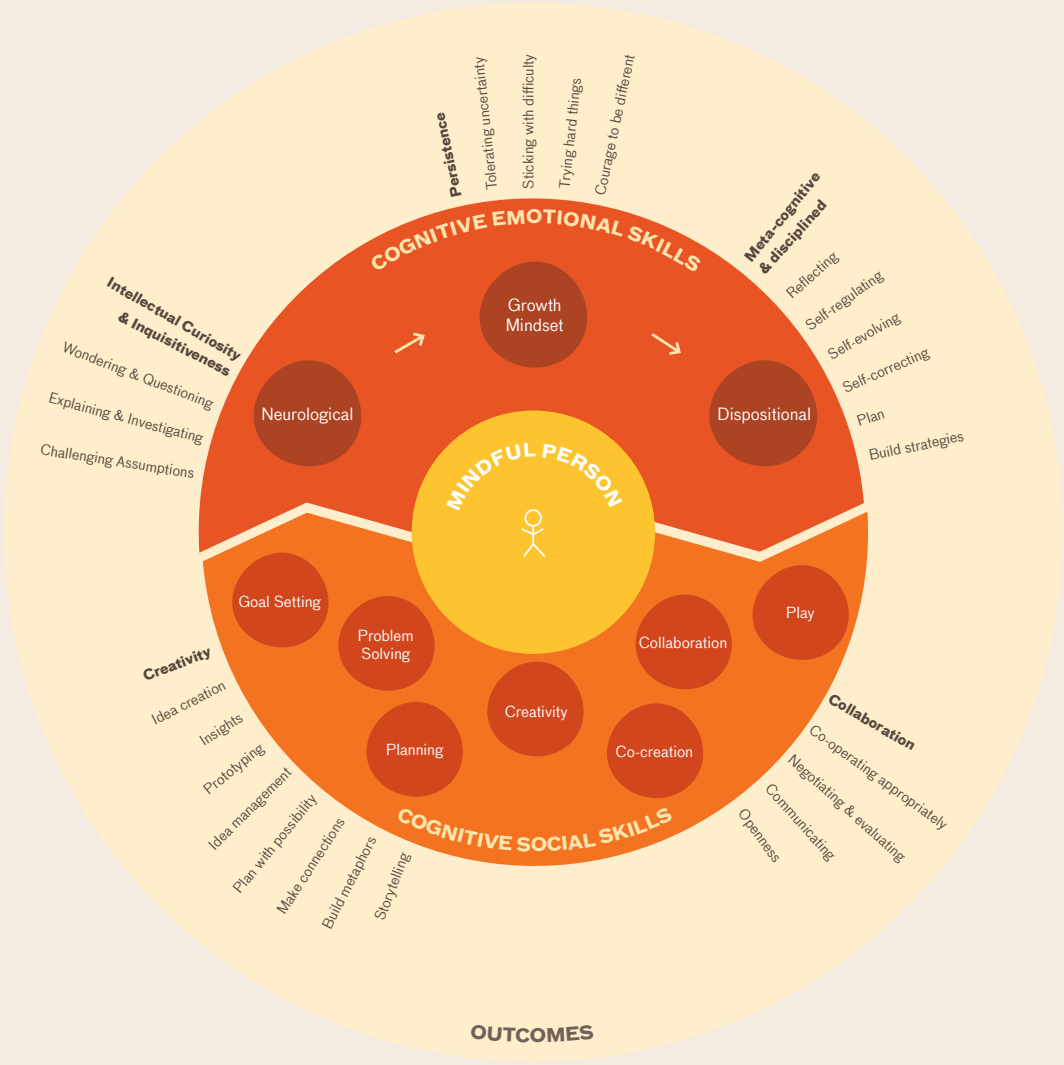
ThinkPlus pilot schools have also formed a healthy and robust community of learning and practice, which we aim to foster and replicate on a larger scale.

ThinkPlus is a metacurriculum for growing Learnable Intelligence for implementation in years Prep to 12. It is being co-designed with educators and young learners in Australian schools.

The key to the ThinkPlus Metacurriculum is the idea that intelligence can be grown with effort.

ThinkPlus Metacurriculum road map and outcomes

Prototype 1

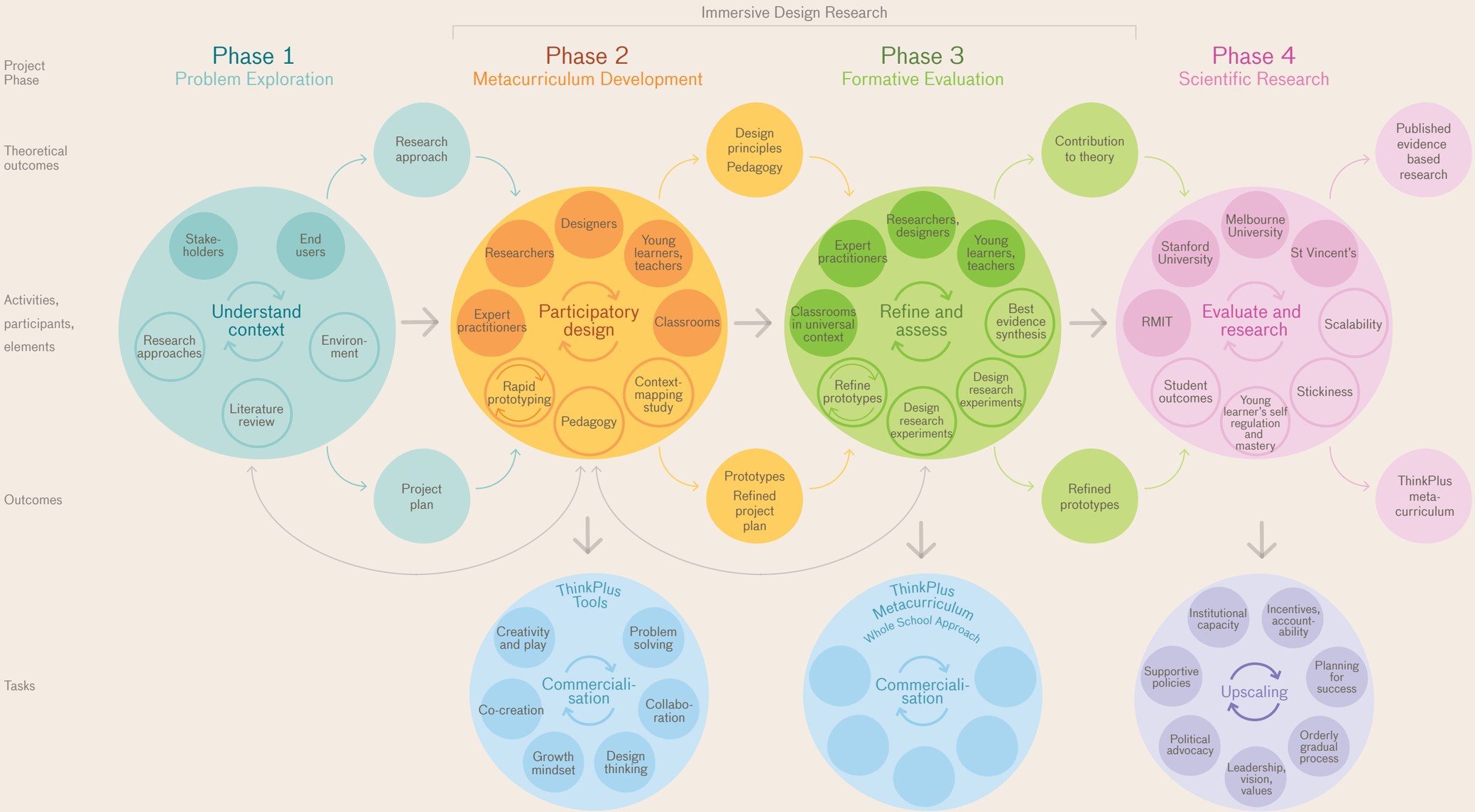


A mindful person

- is motivated to be an independent self starter who is responsible, persevering, self-regulating, reflective, self-evaluating, and self-correcting.
- is intellectually curious and able to find, select, structure and evaluate information.
- is a life long learner who shows leadership, is flexible and able to adapt to change.
- has skills of problem solving and decision making.
- is a creative and productive thinker.
- is collaborative and has the skill to co-create.

The road map to building ThinkPlus

Designing a metacurriculum for growing Learnable Intelligence



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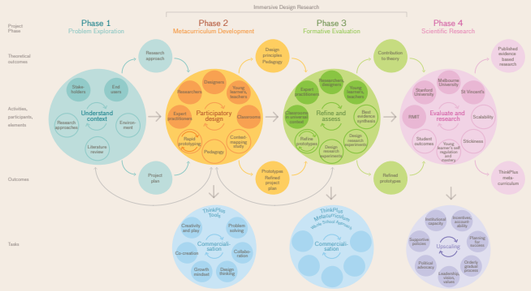


Oh heck!

It’s not working...

In the first phase of our development, we felt restricted by our design and research process and were concerned we were not achieving “stickness” (transfer), effectiveness, or ease of use in ThinkPlus.

Our conclusion was that we required a methodology that would facilitate us to:

- Address complex problems in real contexts in collaboration with practitioners, educators, young learners, and other stakeholders.
- Integrate known and hypothetical design principles with technological affordances to render plausible solutions to these complex problems.
- Conduct rigorous and reflective inquiry to test and refine innovative learning materials, as well as defining new design principles.

As a result, we conducted far-reaching literature reviews in the fields of pedagogy, visual design, and research methods used within education, as well as other fields such as engineering and medicine to help us tackle this complex problem.

During this process, we made two fundamental shifts in our research and design perspective:

1. **Adopting Immersive Design Research methodology.**
2. **Embracing participatory design as an approach.**

These will be explored in further detail through this document.

Shift 1.1

Adopting design research

The de Bono Institute chose to explore design research and educational design research as a potential methodology for the metacurriculum development and formative evaluation phases of the project. Thereafter, the refined prototypes will continue to the final phase of scientific research thus ensuring a robust evidence base.

Design research is a relatively new methodology borne from engineering and design but now employed in various fields such as education and medicine. Generally speaking, design research sits in contrast to the typical research process of identifying a problem, conducting a literature review, formulating a hypothesis, and robustly and rigorously testing it.

Design research is a conscious step away from the evaluative aspect of research. Instead, design research is in favour of the generative aspect. Whilst generative activities are often limited by restrictive and controlled research practices, design research encourages this creative process.

Design research achieves twin objectives:

1. It maintains a commitment to theory construction and explanation.

2. It solves real world problems (Reeves, Herrington & Oliver 2005, p 103).

Design research processes and practices strategically encourage an empathetic relationship with the user whilst maintaining important aspects of rigorous research. Further, this project does not (yet) require the analysis or evaluation of existing conditions; it requires the development of new strategies, theories, approaches and materials, a design research approach supports these aims.

Design research will enhance our ability to create a program that is:

- **Relevant** – The metacurriculum speaks directly to issues that we have observed first-hand.

- **Consistent** – By repeatedly testing the prototypes, we will ensure that there is consistency in outcomes, as well as consistency in the materials for teachers and young learners.

- **Practical** – Being able to test and manipulate the prototypes in the contexts in which they will be used will ensure that they are fit for purpose.

- **Effective** – The various iterations of prototypes will refine the efficacy of the materials and program to ensure improved educational outcomes for young learners.

Explaining the shift in research perspective

Understanding the diagram on the adjacent page

There are two intersecting dimensions: one is defined by approach and the other is defined by mind-set. Approaches to design research have come from a research-led perspective (shown at the bottom of the diagram) and from a design-led perspective (shown at the top of the diagram). The research-led perspective has the longest history and has been driven by applied psychologists, anthropologists, sociologists, and engineers. The design-led perspective, on the other hand, has come into view more recently.

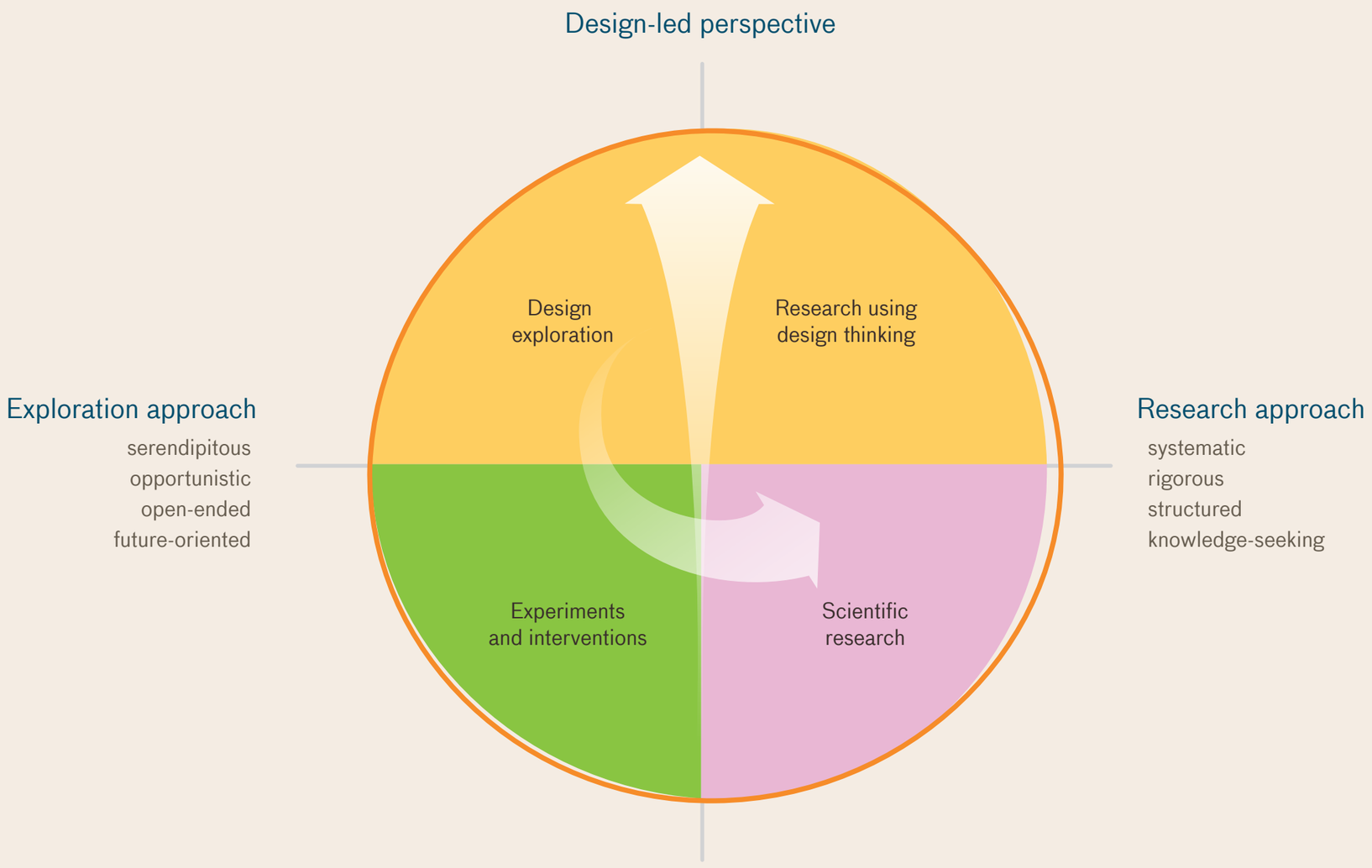
The shift that occurred for ThinkPlus was the need to move from only a scientific research perspective to design research perspective in the initial stages of developing a metacurriculum for ThinkPlus.

The reason is to give us opportunities to combine intelligence and a deep empathy for young learners and educators to deliver a unique approach to the development of a metacurriculum that is robust, “sticky”, and scalable. This approach helps layout a strategy from a user-centred design perspective while not losing sight of the academic considerations of rigour.

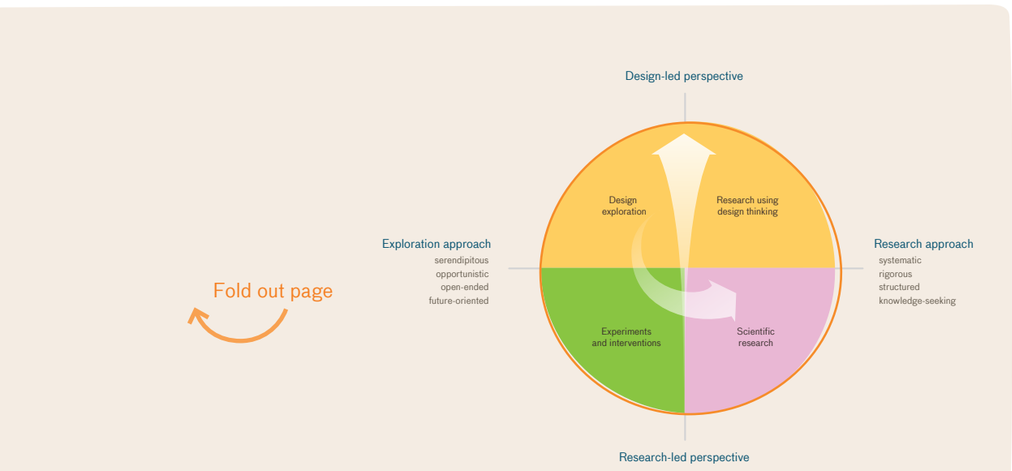
There is a need to spread across both the research-led and design-led approaches.

Following the design-led perspective phase (yellow quadrant), we move to formal evaluation (green quadrant) and then to scientific research (pink quadrant).

Shift from research-led perspective to design-led perspective



Adapted from Elizabeth Sanders, 2008.



Shift 1.2

Making the case for Immersive Design Research

Due to the context in which we are working, it made sense to draw on the body of literature regarding design research being conducted in educational settings.

Educational design research is the process of designing and developing an intervention (such as programs, teaching-learning strategy, materials, products, or a system) with the aim of addressing the research problem. The process involves iteratively and intimately enhancing our knowledge of the characteristics of the problem in order to develop and design the best intervention possible.

Educational design research is a promising solution to the problem of the sterility of the vast majority of educational research conducted and reported today (van den Akker, Gravemeijer, McKenney, & Nieveen, 2006 in Reeves, McKenney & Herrington, 2010).

Unlike other forms of educational research, educational design research provides a direct link between research and practice, and thus the chances that it will have a meaningful impact are greatly enhanced (Reeves, McKenney & Herrington 2010).

Educational design research seeks to ensure that progress is made with respect to clarification of the problems facing educators and schools, and ideally the creation and adoption of effective innovations in tandem with the clarification of robust design models, principles, and theory.

The value of educational design research

To understand the value of educational design research, it can be beneficial to look at the current dominant model and the issues surrounding it. A standard predictive model dominates educational research. Hypotheses are developed based on observation or theory, these are tested and refined, and the outcomes are then passed to policy makers and /or practitioners to implement. There is a wealth of research documenting the inefficacy of this approach in education and beyond (Hattie, 2009; ACER, 2008).

Further, the impact of educational research with respect to contributing to theoretical understanding and / or enhancing real world teaching and learning has long been called into question (Reeves, 2006).

On a practical level, educators, schools, and the education sector are plagued with increased pressure in the form of funding cuts, standardised testing, a national curriculum, increased accountability and technological changes amongst many others. Many of the aforementioned issues have been proposed as improvements, however, they have failed to address declining educational outcomes (Hattie, 2009).

Oddly, at the same time when educational attainments have been declining or remained stagnant in most nations, the number of educational research publications has expanded enormously (Reeves, McKenney & Herrington, 2010).

"Students of the 21st century regardless of where they are schooled can ill afford another decade of little outcomes. Educational design research is a promising solution to the problem of the sterility of the vast majority of educational research conducted and reported today."

van der Akker, Gravemerjer, McKenney & Nieveen, 2006

Educational research is conducted often with the aims of addressing problems and alleviating pressures by proposing improvements to education. Unfortunately, the research outcomes rarely translate into informed policy changes or tangible changes to education.

Regardless of the type of methodology used, there appears to be fundamental disconnect between the conduct and reporting of educational research and serious improvement in educational outcomes (Reeves, McKenney & Herrington, 2010).

John Hattie's flagship text, *Visible Learning* (2009), synthesises over 800 meta-analyses (over 50,000 studies) relating to the influences on achievement in school-aged students. Thereby it is effectively the largest ever collection of evidence-based research into what actually works in schools to improve learning. Hattie's analysis and visible learning model are based on findings that indicate that "most classroom innovations have been trialled at all levels of education with weak results" (Reeves, McKenney & Herrington, 2010).
The "innovations" were typically the outputs of educational research that failed to achieve its goal. It can be surmised that the current model of educational research's impact cannot be found in enhanced educational outcomes (Hattie, 2009).

In response to the aforementioned issues, educational design research provides a welcome alternative.

Educational design research in practice

Reeves, McKenney & Herrington (2010) cite three practices specific to educational design research which aim to make a more meaningful impact:

1. It requires practitioners, designers, and researchers to collaborate in the identification of significant teaching and learning problems.

2. It engages practitioners, designers, and researchers in the creative activity of developing prototype solutions to these and other serious problems based on existing design principles.

3. It involves the close collaboration of practitioners, designers, and researchers in the testing and refinement of both the prototype solutions and the design principles upon which they are based until satisfactory outcomes have been reached by all concerned. Educational design research is not done until desirable results are attained, results that represent progress in solving the problems with which the research projects began.

An example of educational design research in the field of medicine

In recent years, the field of cancer research was struggling to make progress due to a restrictive research paradigm, however, it has undergone significant change to become an example of innovative practice. Gladwell (2010) describes how there are two primary schools of researches seeking cures for cancer:

The first school, that of "rational design", believes in starting with the disease and working backward. As such, a solution is designed and customised based on the specific characteristics of the problem (Gladwell, 2010, p. 71).

The other approach is to start with a drug candidate and then hunt for diseases that it might attack. This strategy, know as "mass screening," doesn't involve a theory. Instead, it involves a random search for matches between treatments and diseases (Gladwell, 2010 p. 72).

The former approach has parallels with educational design research's approach. Educational design research aims to have intimate knowledge of the context and all its variables in order to have the most functional and true outcomes. Further, it allows for innovation that can overcome change that occurs during the development phase.

Conversely, the latter approach bears similarities to the broad approach that is taken with national testing and large-scale research. Whilst these methods have their purposes, they often fail to grasp the intracacies of the issues faced by students, teachers, schools and the education system. As a result, they often only manage to make and / or recommend incremental improvements.

> We could talk not (only) about participation at the moment of decision but about participation at the moment of idea generation.

Robert Jungk, a futurist and social inventor

Shift 2

Embracing participatory design

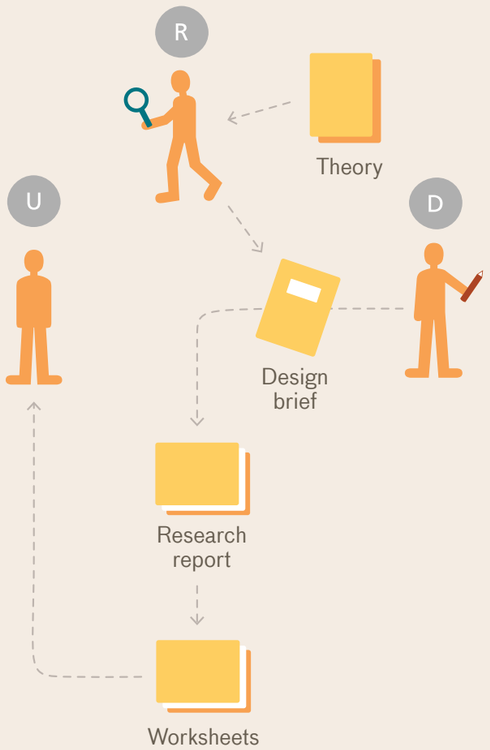
In our adoption of design research and educational design research principles, we initially employed a classical user-centred design approach. The process involved designing and developing prototypes that were informed by users but generated in isolation. The prototypes would then be taken in to the classrooms to be evaluated. The risk of this approach is that users' perspectives are not deeply understood and the users do not have direct input in to the generative process. The risk, in our case, is repeating an all-too-common pitfall of education - adults designing a curriculum and imposing it on young learners.

In our research, user-centred design resulted in some meaningful progress however it was stilted by an imbalance in the relationships between the researchers/practioners and the users. The approach was not working as effectively as possible as there were too many boundaries between the participants. It was felt that developing a successful and meaningful metacurriculum with real-world tools required the boundaries to be broken down and the users to be more empowered. We felt that it was essential for the users to be involved in the generative process; in doing so, the experience and innate knowledge of the users is given primacy.

An evolution in the design research approach

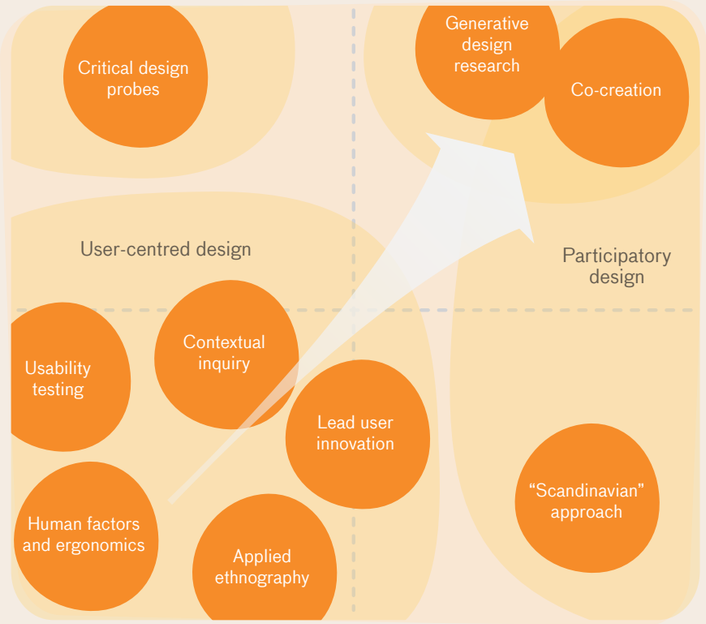
An alternative was found in the form of participatory design. This formed the second shift in the research approach. As the name suggests, participatory design involves participation of the users in the act of design. By co-designing the Metacurriculum, the strengths of users and designers are utilised to create materials and products based on real needs with a deep sense of empathy for the users' context. Co-design methodologies give us an opportunity to include our young learners in the act of design. Co-design means the user becomes an active expert. This evolution in our research perspective changed the roles of researcher, practioner, designer, and the various users.

From an expert mindset to a participatory mindset within the design-led perspective



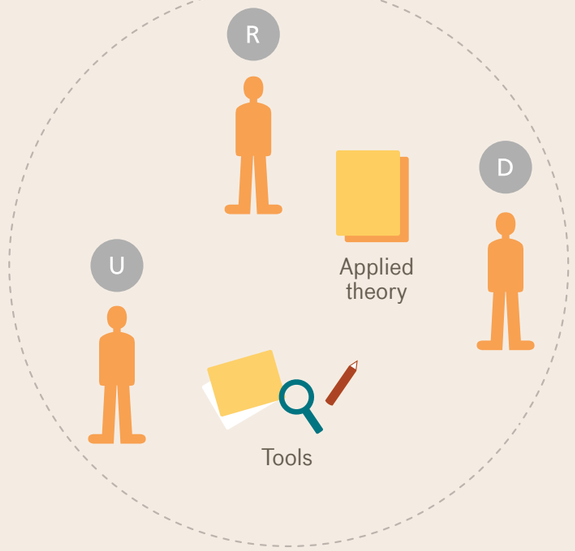
Design-led perspective

Expert mindset



Research-led perspective

Participatory mindset



Classical user-centred design

- Design informed with some user engagement.
- Designer usually given a brief and works in isolation.
- Role of user: passive object of study.
- Role of designer: receiver of research data.

Elizabeth Sanders, 2006.
Sleeswijk Visser, et al., 2005.

R Researcher

U User

D Designer

Participatory design

- Active design between both user and designer in order to create materials and products based on real needs with a deep sense of empathy for the end user.
- Role of user: active expert.
- Role of designer: active contributor to the research and design.
- Role of researcher: active contributor to theory and research.

> It seems to me that research represents a call to a more human dimension, one that is more open to investigating the sense and meaning of things, of events, of connections and relationships, especially interhuman ones.
>
> Loris Malaguzzi, Reggio Emilia

Immersive Design Research

We are attempting to define the problem we are trying to solve and the gap we are trying to fill. This requires an integration of theory (what do we know about how children learn and what we know about learning to think and learn), practice (what is actually going on in the schools), and context (what are the institutional constraints on/drivers of behaviour in the classroom). We can only do this by working in context with the very people it affects!

From the principles and practices of design research, educational design research, and participatory design, we embarked on a process of building an inclusive model for doing this type of work and research.

We call it Immersive Design Research.

Immersive Design Research

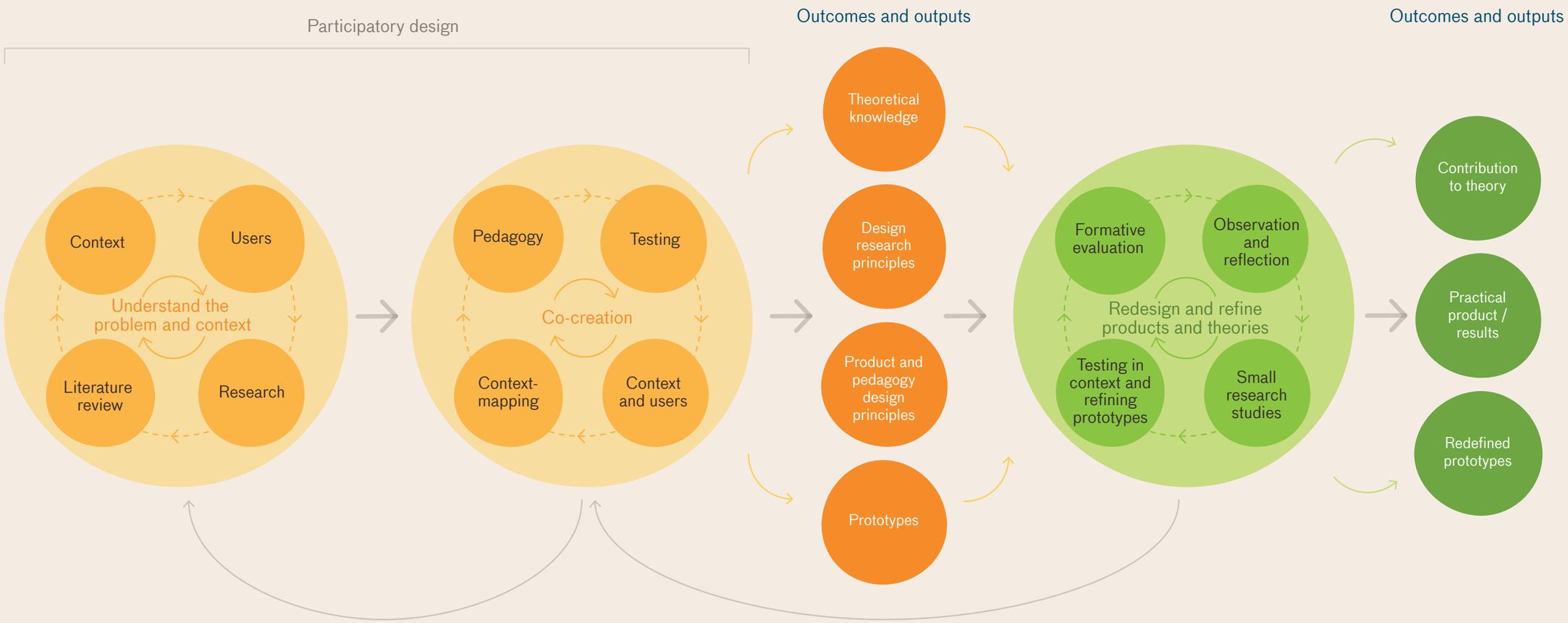
A new research process emerges for ThinkPlus

The de Bono Institute benefited greatly from the learning journey involved in finding the most suitable research perspective. These learnings were consolidated and we have built a model for design research. The model is called "Immersive Design Research" and it incorporates our learning along with many aspects from other approaches and research. The purpose of the model is to provide a framework for an innovative and design-led research process that encourages the production of new theories, artifacts (learning materials), design research practices, and prototypes. The model was built for the purpose of conducting the ThinkPlus research project, however, it has a much wider scope and applicability.

Design practice evolves through the creation and testing of prototypes, iterative refinement and continuous evolution of the design, as it is tested in authentic practice. A lot of the work through iterative adjustment and improvement of our interventions is characterized by "research by mistakes". Design-based interventions are rarely, if ever, designed and implemented perfectly; thus there is always room for improvements in the design and subsequent evaluation. This evolution has proven a challenge of the methodology in that it is difficult to know when the research program is completed. (Reeves, Herrington & Oliver, 2005)

The Immersive Design Research model is broken down in to three distinct phases. These will be subsequently explored.

Immersive Design Research



Problem in context

Preliminary investigation and design of problem, context and new approaches

- Refinement of problem, solution and method
- Successive approximation of theory
- Documentation and reporting
- Refinement of design theory

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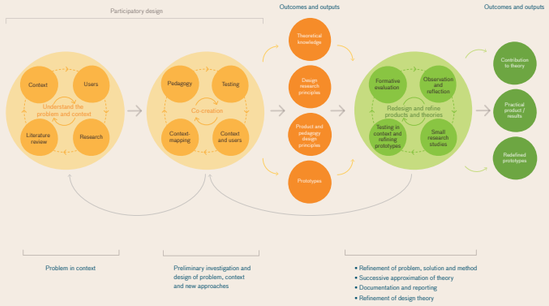


Deconstructing design thinking

The immersive design process

The diagram on the opposite page shows a simple representation of the design process. There is a large and growing emphasis on the front end. It describes the many activities that take place in order to inform and inspire an exploration of questions such as:

“How can we develop a Growth Mindset in all young people, irrespective of context?”

“What are the most important aspects to learning to think better and more creatively?”

“What do young people need to use these tools and strategies without adult intervention?”

Fuzzy front end

The front end is often referred to as “fuzzy” because it’s typically characterised by ambiguity and chaos. Moreover, in the fuzzy front end, it is often not known whether the deliverable of the design process will be learning materials, facilitation materials, an experience, an interface, etc. In this increasingly critical phase, many different considerations are present, such as understanding of users and contexts of use, exploration and selection of technological opportunities such as new materials and information technologies, etc. (Stappers, 2006).

The goal of explorations in the front end is to determine what is to be designed and sometimes what not to design and manufacture. The fuzzy front end is followed by the traditional design process where the resulting ideas for product, service, interface, etc. are developed first into concepts, and then into prototypes that are refined on the basis of the feedback of future users.

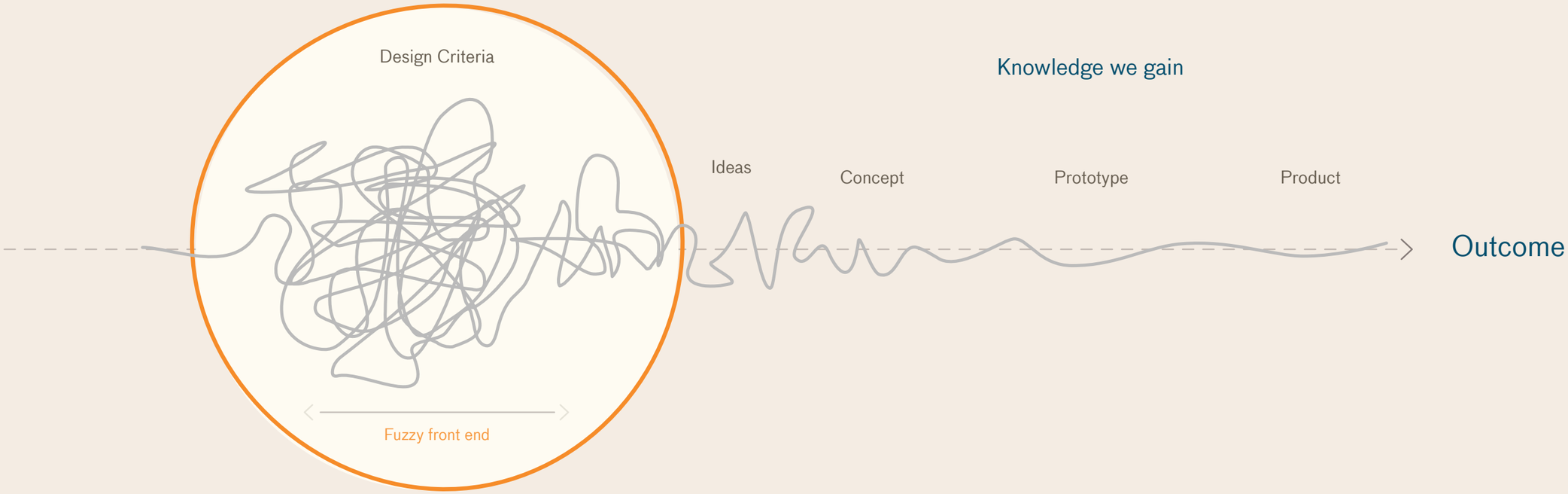
Immersive Design Research consists of 3 concurrent tasks:

1. Practitioners, users, designers, and researchers collaborate in the identification of the significant teaching and learning problems.

2. Practitioners, users, designers, and researchers participate in the creative activity of developing prototype solutions to these and other serious problems based on existing design principles. Theory plays a primary role in the shaping of the prototype innovations that address serious problems.

3. It involves close collaboration of practitioners, users, designers, and researchers in testing and refinement of both the prototype solutions and the design principles to achieve outcomes that work in the context they are being used in.

Immersive design and the fuzzy front end



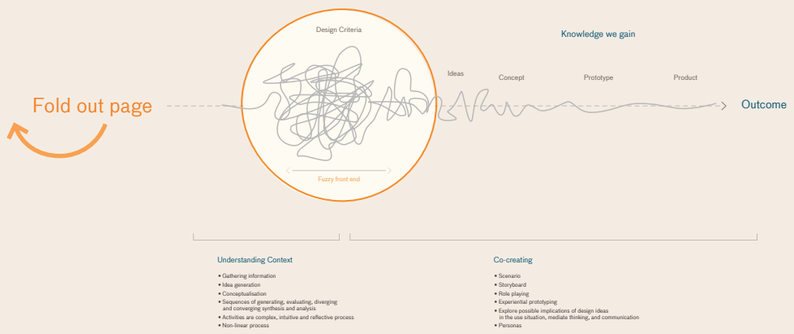
Understanding Context

- Gathering information
- Idea generation
- Conceptualisation
- Sequences of generating, evaluating, diverging and converging synthesis and analysis
- Activities are complex, intuitive and reflective process
- Non-linear process

Co-creating

- Scenario
- Storyboard
- Role playing
- Experiential prototyping
- Explore possible implications of design ideas in the use situation, mediate thinking, and communication
- Personas

"The Squiggle", adapted from Damien Newman, Central Office of Design.



Phases of Immersive Design Research

Phase 1

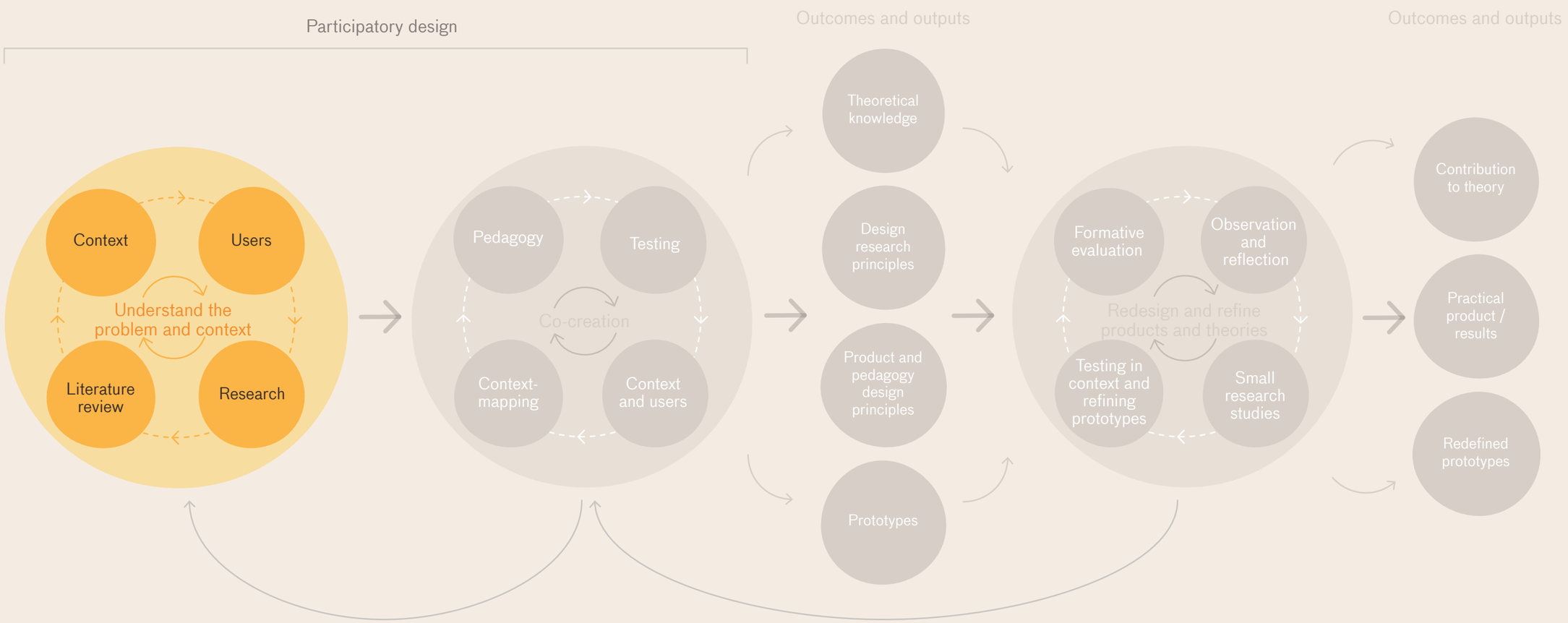
Understanding the problem

Understanding the problem involves conducting a preliminary investigation of the problem, opportunity or issue and its context. By conducting an in-depth needs, opportunity or issue, and context analysis in conjunction with a literature review, the researcher and designer ensure a broad and deep understanding of the problem. Similar to a standard research approach, a design research is chosen based on the knowledge and insights gained.

This process involves identifying relevant theories and applying any relevant frameworks or approaches. More specific to the Immersive Design Research process is the next step which involves any creation of research instruments, artifacts (learning materials), or probes. The instruments may involve questionnaires; the artifacts might be cards, posters or storyboards; and, the probes are designed to provoke responses within the context. These can be used to assist in the next stage of research.

This phase sets the scene and aims to identify a set of research and design principles to guide the project.

Immersive Design Research



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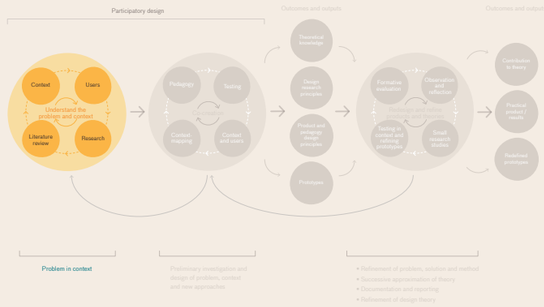

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Phase 2

Co-creation

The second phase is called “co-creation” because it embodies participatory design. This phase involves micro-cycles of research in relevant areas. The insights and outcomes are iteratively developed. Through rapid iterations the researchers, users, and participants can identify and respond to, insights that are often not visible or paid attention through traditional scientific research. Further, this process ensures breadth of the issue. This phase is conducted in the context of the problem.

The aim of these iterations is to elaborate and validate theories, explore domain-specific instruction theories, produce a design prototype for small scale testing in a particular setting (ie. a classroom, identify specific learning trajectories for a specific classroom). Through rapid iteration, the study identifies and responds to insights that are often not visible to a traditional scientific perspective.

Additionally, this phase aims to advance learning and instruction theories, such as:

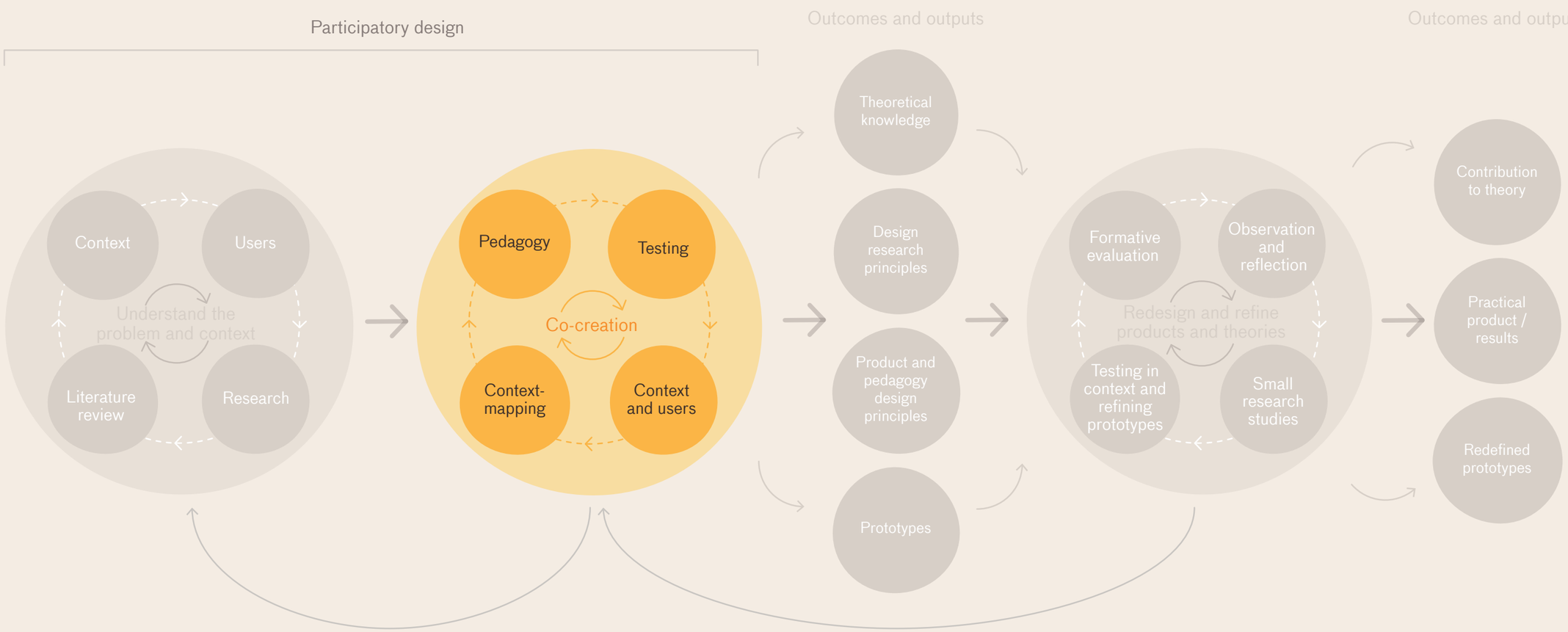
- Micro-theories: at the level of instructional activities.
- Local instruction theories: at the level of instructional sequence.
- Domain-specific instruction theories: at the level of pedagogical content knowledge (Gravemeijer & Cobb, 2006).

The intended output at the end of this phase is a sound theory base, design research principles, product and pedagogy design principles, and prototypes.

Gravemeijer & Cobb (2006) identify three stages in validation studies which can be likened to the co-creation phase:

- Environment preparation: elaborating a preliminary instructional design based on an interpretative framework.
- Classroom experiment: testing and improving the instructional design or local instructional theory and developing an understanding of how it works.
- Retrospective analysis: studying the entire data set to contribute to the development of a local instructional theory and (improvement of) the interpretative framework.

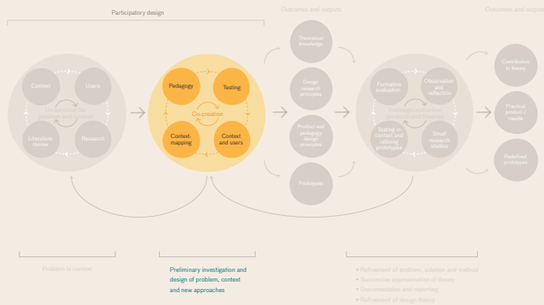
Immersive Design Research



Problem in context

Preliminary investigation and design of problem, context and new approaches

- Refinement of problem, solution and method
- Successive approximation of theory
- Documentation and reporting
- Refinement of design theory



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Phase 3

Redesign and refinement of products and theories

During this phase, a semi-summative evaluation is conducted to ascertain the efficacy of the proposed solution. It is also analysed in relation to predetermined specifications. This phase often results in recommendations for improvement of the intervention. The solution is evaluated on criteria such as:

- Ability to solve educational problems.
- Practicality of intervention.
- Broadly applicable design principles.
- Iterative development with formative evaluation in various user settings.
- Implemented interventions in several and various contexts / classrooms.

The aim is to develop design principles capable of framing innovative interventions that are relevant for educational practice. This process is supported by the previously conducted literature review and the initial contextualising phase. This is a beneficial and important phase because “by unpacking the design process, design principles that can inform future development and implementation decisions are derived” (Nieveen et al., 2006, p 153).

Two main types of design principles can be distinguished:

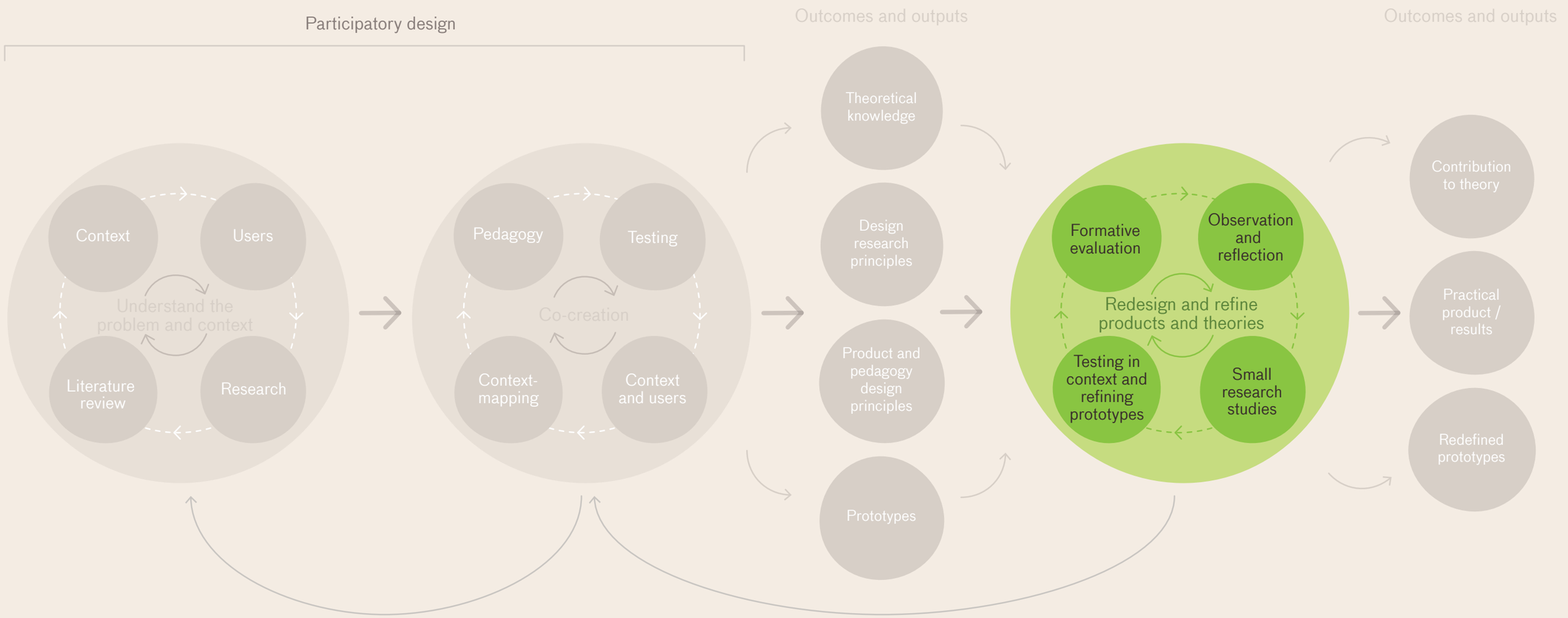
1. Procedural design principles: characteristics of the design approach.

2. Substantive design principles: characteristics of the design (intervention) itself. (van den Akker, 1999)

Throughout all activities during this phase, the research group does systematic reflection and documentation to produce theory and / or design principles as the scientific yield from the research (a concept taken from van den Akker, 1999). The primary goal is not warranted propositions, but the creation of products, artifacts (learning materials), or process leveraging learning and testing by making insights usable, actionable, and adoptable.

This phase quantifies contextual validity, exploring successful dissemination and adoption within a broader context (scalability), to a broader audience. During a formative evaluation of how the intervention interacts within a small contextual environment during an extended phase, data collection and analysis is iteratively conducted and the output is analysed to potentially feed back in the form of changes to the designed intervention.

Immersive Design Research



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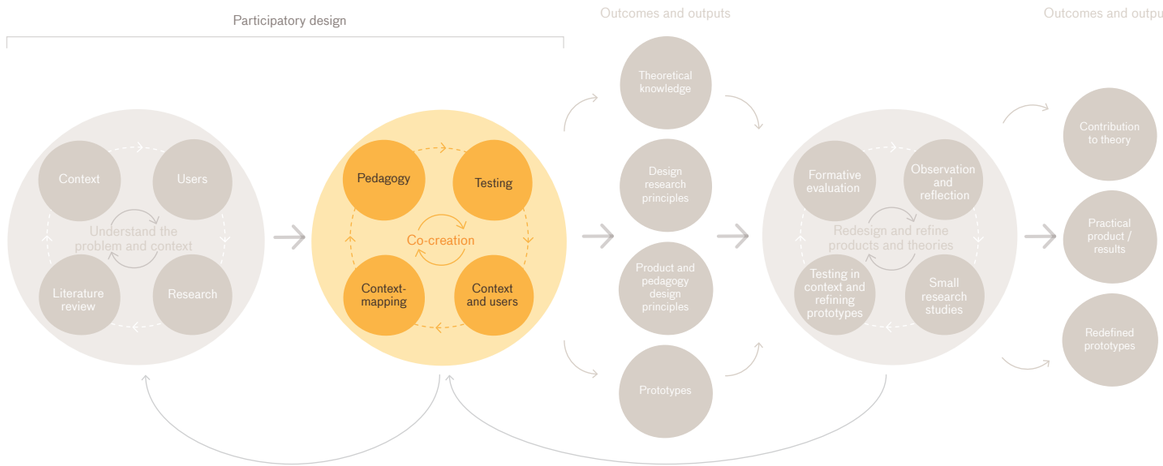
Diving deep into co-creation



Rich experience information

Gaining deep insight

Rich experience information is about how young learners and educators act and feel in their everyday lives within the classroom. Making people aware of their experiences and the many considerations that surround them is part of the user research. These details of how people experience specific situations and routines are a valuable source of information and inspiration for researchers and designers, in order to create products and interventions which fit into the notion of richness and complexity of the everyday lives of educators and young learners. An example is given in the opposite diagram.

As part of the co-creation process, when designing artifacts (learning materials) and interventions for learners, we need to gain insight into who we are designing for. Involving people (young learners and educators) helps to get a better insight into what would delight or serve young learners and educators, resulting in artifacts (learning materials) and interventions that better fit their needs, and so that the programs have less chance of failing when they are eventually commercialised.

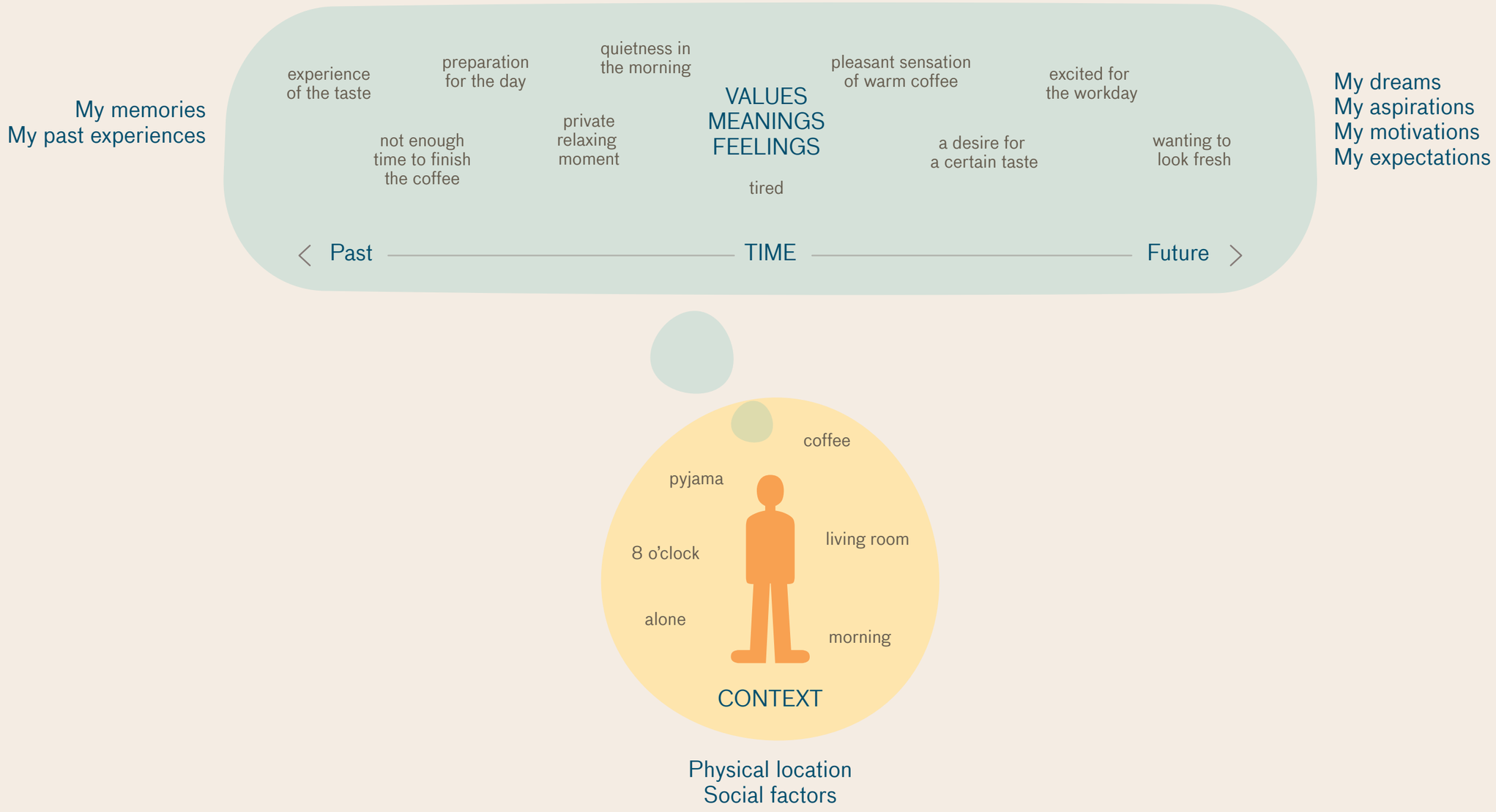
Part of this process in not just thinking about the artifact but also about the experience. There is no consensus on the definition of "experience". Most definitions agree that experiences are holistic, situated, and constructed (Dewey, 1934). This means they are multidimensional and not easily isolated, they depend on particular circumstances and they belong to the person having the experience. Experiencing involves doing and undergoing at the same time.

As explained by Visser (2005), the term "experience" can be translated into German in two ways: *erlebnis* and *erfahrung*. *Erlebnis* refers more to experiences of special, memorable events (Hekkert and Schifferstein, 2008). For example, last year's summer holiday or yesterday's dinner. This type of experience has a clear beginning and an end. The other term, *erfahrung*, relates to daily, very common run-of-the-mill experiences. There is no beginning and no end, and there is no clear order of cause and effect. The type of experience we refer to is closer to the latter term *erfahrung* (common event) than to the former *erlebnis* (special event).

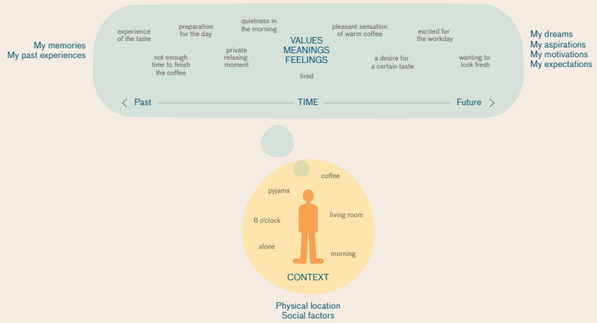
There are two key concepts in the process of rich experience information. They are psychological ownership and researching people's views.

An example of *erfahrung*: the daily run-of-the-mill experience

Elements of the experience of drinking your first coffee of the day



Adapted from Sleeswijk Visser, 2009.



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Psychological ownership as a key to co-creation

Partnering in the process

In co-creation, the researchers or designers invite young learners and educators who will benefit from the design outcome, as partners into the process. This new role essentially transforms the user from a passive spectator, to an important co-creator in the design process. They are valuable participants as they provide additional information and inspiration, evaluate ideas and prototypes, predict their future behaviour with the artifacts (learning materials) and learning experience, and provide new design directions.

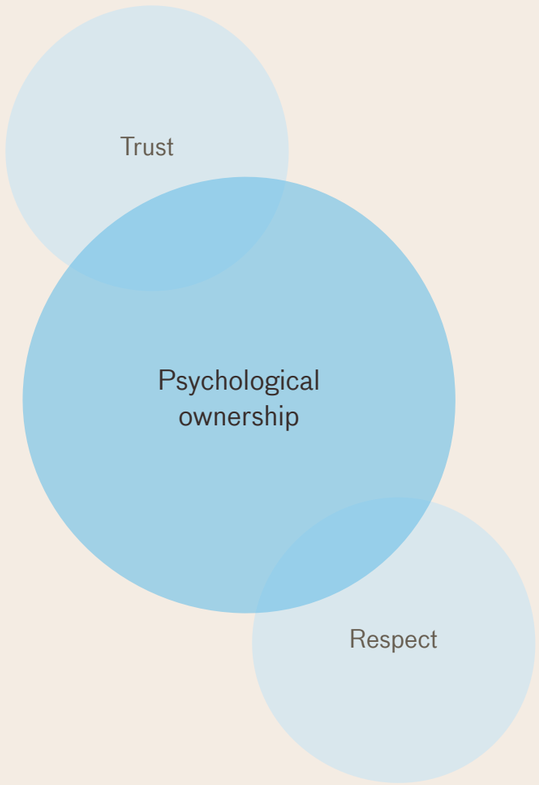
While educators and young learners may have intrinsic motivation to contribute to the design process, the way they are treated can further encourage or discourage them. It has been shown that external factors, such as trust, respect, and ownership contribute to a user's overall sense of motivation to co-create. Of most interest is "psychological ownership", a state in which individuals feel an object as theirs; an emotional connection expressed through a sense of responsibility or pride, for example. Wang et al (2000) distinguish three key motives to experiencing ownership - instrumental, perceptive, and symbolic.

In Immersive Design Research and through the process of co-creation, these three motives can make users feel that they own the results and process:

- Users can express themselves by means of tools and techniques (instrumental).
- Users can receive authorship, because their expressions are retained in results (perceptive).
- Results should reflect the users' input to show their contributions were valued and understood (symbolic).

Key motives for co-creative motivation

The user experiences...



By understanding and eliciting these motives...

Instrumental
Participation through tools and techniques

Perceptive
Authorship through recording of user's involvement

Symbolic
Outcomes reflect the user's input demonstrating empathy and the value of their contribution

Maintaining...

Motivation for involvement in the design process

Adapted from Wang, et al., 2000.

Researching people's views

Getting information

How can designers and researchers get an understanding of people's everyday experiences if experiences are so complex and holistic in nature, and our ability to describe them are so incomplete in ways previously mentioned?

Experiences contain so many intangible factors, of which the person who is experiencing them is not even aware of all these factors.

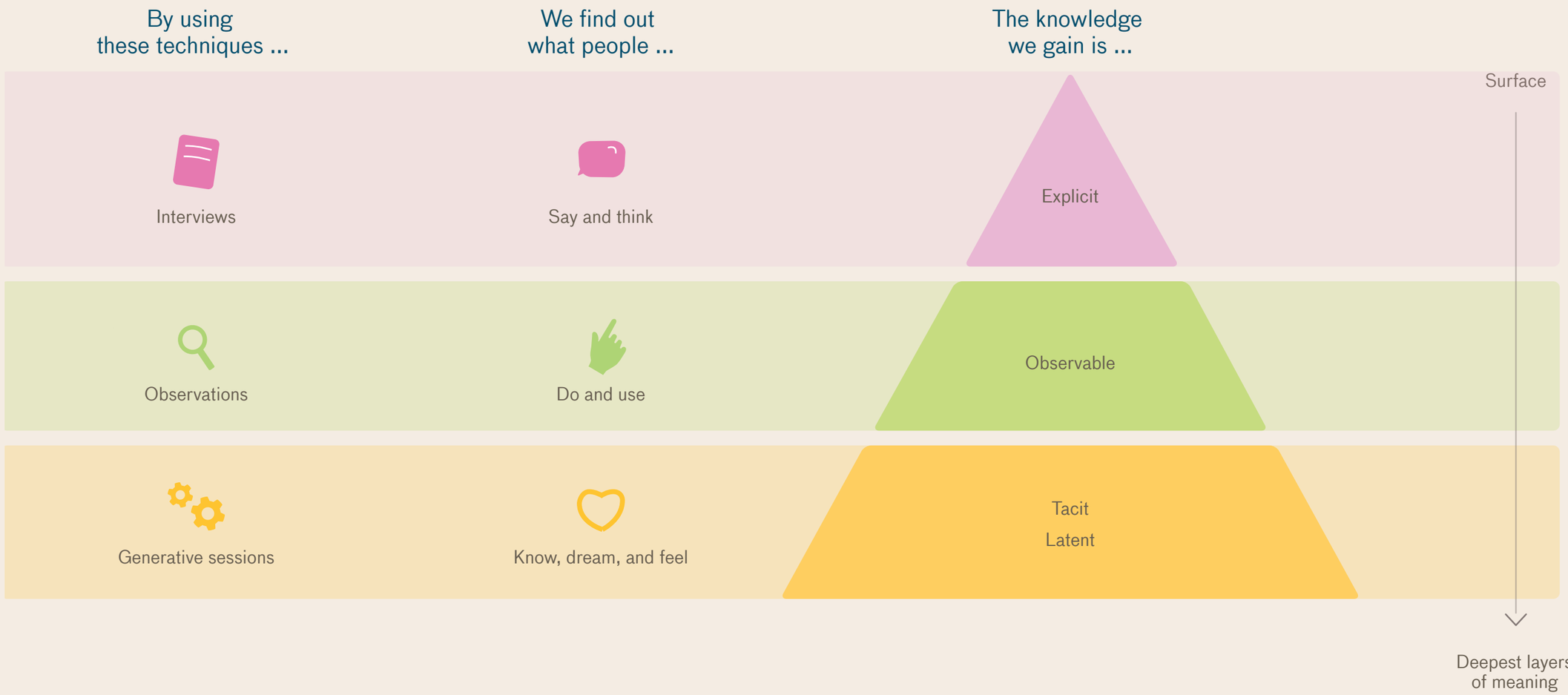
A prerequisite is that young learners and educators are respected as complex, rational, emotional human beings that have values, motivations, and needs (Green and Jordan, 1999). Different methods address different types of knowledge; from explicit knowledge to latent needs (Sanders, 2001).

Talking with people by, for example, interviewing them, provides information about what people can say, which is mainly explicit knowledge. Observation studies give insight into the physical context of people, and how people do things.

Generative techniques use the creativity of people for them to become aware and able to express their own experiences. Creative tools or self documentation techniques (Gaver et al., 1999; Mattelmaki, 2006) help people reflect on their memories, feelings, and motivations to create awareness about their experiences and express them in a visual form. These representations act as a basis for talking about the experiences (Stappers and Sanders, 2003). The benefit lies in the mix of experience information gained from these different types of methods. Anecdotes expressed in a generative session can, for example, elucidate the understanding of a field visit observation.

Rich experience information can be generated in a variety of ways and consequently, the data comes in various forms. The purpose is, through stepping into the user's shoes, to build deeper empathy around their needs, goals, and abilities and then to step back into the designer's role to create desirable solutions.

Methods to access rich experience information



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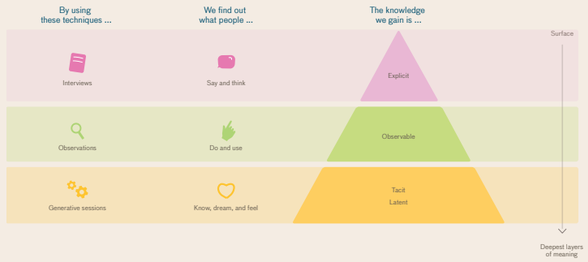

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Contextmapping

A key methodology in the co-creation phase

The rich experience information is mostly generated by way of a contextmapping procedure (Sleeswijk Visser et al., 2005). Contextmapping is a generative technique, developed at TUDelft University.

A useful definition of contextmapping:
"Contextmapping is a procedure for conducting contextual research with users, where tacit knowledge is gained about the context of use of products. It aims to inform and inspire design teams, where users and stakeholders actively participate in the design process to ensure a good fit between the design and the use of a product" (Sleeswijk Visser et al., 2005).

Contextmapping combines several research methods (interviews, observations, generative techniques and elements from probes) in order to generate rich experience information. The latter rely on self-expression of explicit and implicit knowledge people have about their experiences.

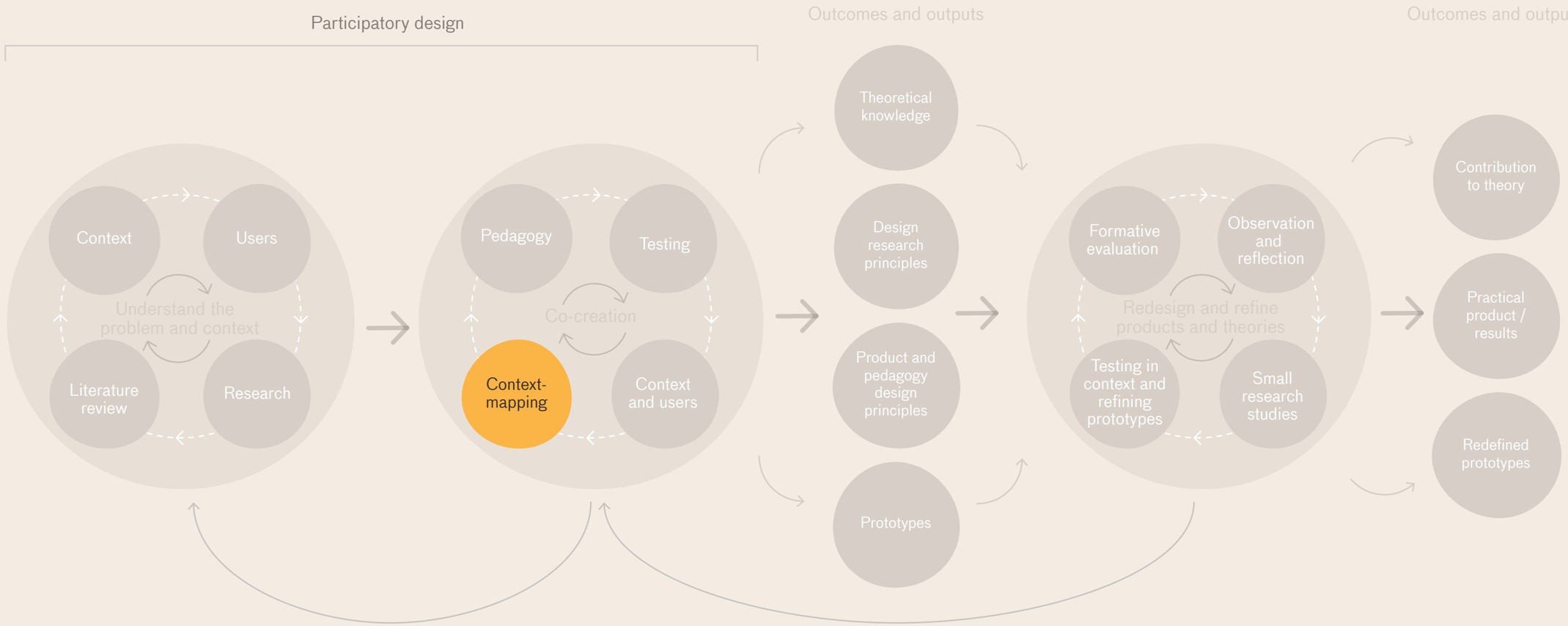
Emphasize the aim of contextmapping
Rather than reducing young learners' or educators' thinking and learning to discrete bits of information that can be produced via simple-answer questions, we are interested in the learning processes and outcomes involved in solving problems or creating products that are considered meaningful in a culture. The type of discovery we are interested in engages young learners cognitively, emotionally and aesthetically. It is situated in real world problem solving that draws on critical and creative thinking as well as disciplinary knowledge and skills.

Practically what does this mean?
The user is the expert of his / her experience for researchers and designers to attend to the functional, social, sensory or emotional factors of how the user experiences the learning experience or artifacts (learning materials).

Contextmapping has two main elements:

1. The context of the artifact use, defined as "all factors which influence the interaction between user and product, and illustrated in figure as all considerations around the user and product, both literally and metaphorically". Designing products for people technology push won't get us there. The user is increasingly being seen as a collaborator bringing valuable ideas and concepts and working with designers to identify needs and important directions. Co-creation takes time and investment to build a working collaboration and a shared understanding.
2. The mapping indicates the form of the information: a tool to help access to the terrain of experience, which takes many forms of depending on the needs of the traveler for whom the map is made.

Immersive Design Research



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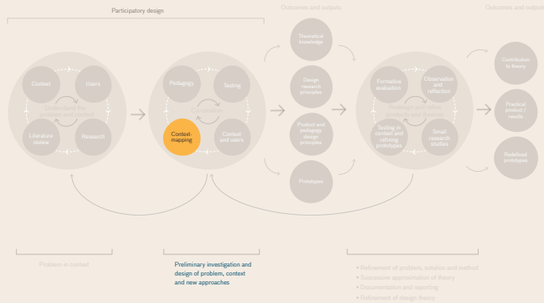

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Contextmapping

A study

Contextmapping is an established procedure that touches on culture and attitude. This includes context, expert, tools, and time. The meaning of the artifacts (learning materials) or experiences lies in the way it functions in the context of the user's life. The design team must not just understand the product, or its use, but also focus on all the factors such as place, situation, time, emotion, and other people.

We need to develop techniques aimed at involving users as experts of their experiences.

- Tools to observe.
- Recall their experiences.
- Reflect on them.
- Formulate insights.
- Contribute to design.

This insight by people based on reflections of their previous experience is key. User experiences and insights of their own life experiences form the basis on which the designs are developed. The user is the expert of his or her experiences. Their input is as important as that from the other experts and it needs to be integrated. The user is not "telling the designer what to do" but participating in the design process.

Tools are needed to support users so that they express their experiences to the design team. The tools involve typical design activities: making collages, scenarios, diagrams, and models.

You cannot ask a young learner, "How do you experience learning to be creative?"

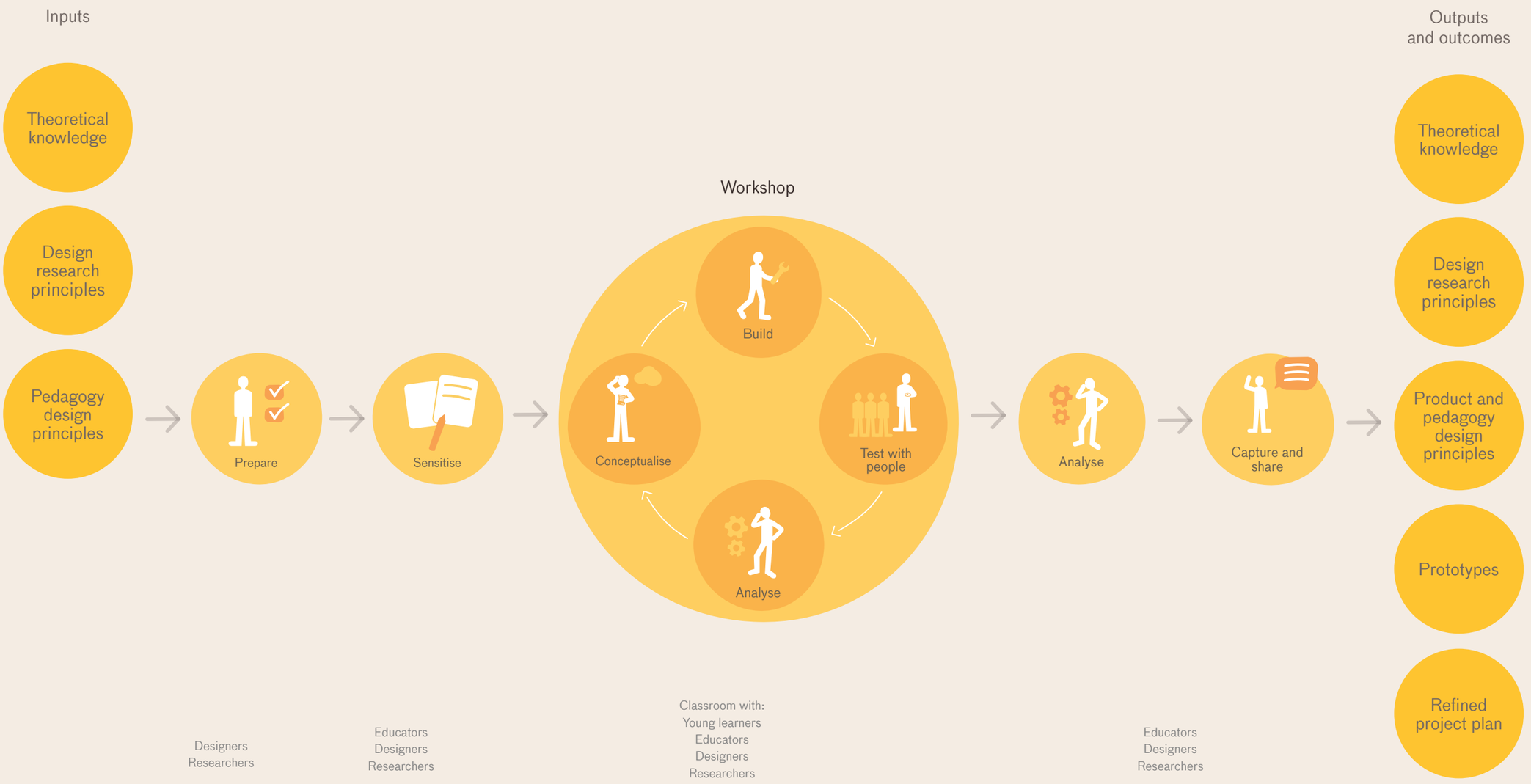
Time is needed to become aware of your daily rituals with a process or product and which aspects influence the experience using the product or process.

There are several tools used in contextmapping. Every different product category uses tailor-made techniques and requires different stimulative materials for the participants. There are different tools to be used, all having their own unique pros and cons; cultural probes, collages, creation of mini product models and hand-out photo cameras. There is one rudimentary rule: all stimulative material has to be ambiguous in all possible ways. Participants are allowed to free flow with whatever they come up with, as this is the only way of discovering our true motivations.

A contextmapping study is the backbone for organising various research techniques into a structured but flexible plan.

Co-creation methodology

Contextmapping study



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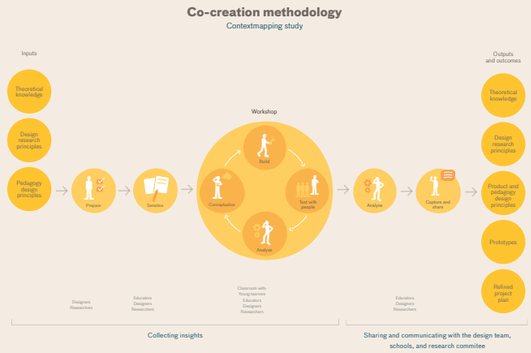
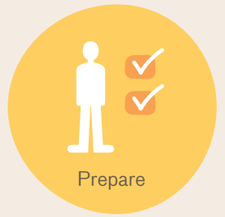
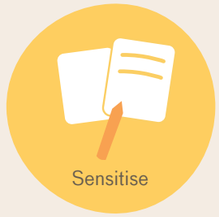


A contextmapping study





Step 1: Preparing

- Determine what you want to learn.
- Capture your preconceptions.
- Determine participants.

Establish a clear focus to guide the research project and the design project as a whole. Preliminary research is conducted. The basis of these findings, expressive tools such as workbooks, probes, and exercises for the sessions are designed.

Step 2: Sensitising

- Make it personal, but well cared for.
- Make it inviting and playful.
- Pilot test your materials when creating them.
- Invite user to extend rather than question and answer.
- Small playful exercises assist the users to observe and reflect on their experience and gradually build up their awareness.
- An example of a toolkit: mini-poster exercises to stimulate the participant to reflect on, express experiences, set of triggers and images.

Over time, users will start to think about the topic which will bring up memories and associations, and sharpen their sensitivity for the topic.

Step 3: Making, saying, and discussing (workshop)

Groups:

- Use a number of exercises to deepen the insights about the topic.
- Set-up – follow the path of expression:
  - Workbooks > talk about.
  - Word sheets > expression.
  - Collages > feeling.

One person facilitates the session and attends to the process. The other takes notes and observes.

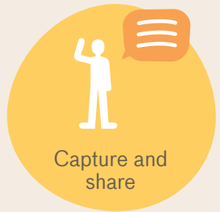
Group sessions:
Invite participants to discuss freely and deeply about each other's considerations.

Step 4: Analysing

- Immerse yourself in the data.
- Clarify your interpretations.
- Give it some time.
- Do it together (triangulate).
- Be surprised.
- Find patterns.

Transcribing videos, selecting and interpreting chunks of data, organising these to form themes and distill insights. The data contains film, photographs, and workbooks participants made, expressive artifacts (learning materials) from the session. From the video recording and full text, transcript quotes are selected, interpreted, and organised. Quantitative analysis – find patterns of similarities and differences. Small or large portions of quantitative analysis (counting how often a certain issue is addressed).

Interpretations and categories.



Step 5: Communicating – visual and verbal communication tools

- Communication techniques to convey pieces of experiences with semi complete action posters.
- Do a workshop.
- Leave room for interpretations.
- Make it personal.
- Show the raw data with interpretations.
- Prototypes preserve knowledge are used for presentations and communication.

Step 6: Conceptualising and beyond

- Keep the user and experience in mind.
- Tell stories, make storyboards etc.

Communication serves to improve idea generation, concept development and further product development and further product development. It can be worthwhile to re-use the same experts by letting them evaluate the designs.

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Background

1996 – 2008: Research development and pilot projects

Through the different projects and programmes, we have learned many new things. We describe these significant learnings as key moves and shifts in this document.

The de Bono Institute has a long-standing interest and investment in education. Since its conception in 1996, the de Bono Institute has conducted research, developed materials and pilot programs.

This included varied activities such as:

- 1998-1999: Accreditation training in Six Thinking Hats® of over 13% of the teacher population in the Western Metropolitan and Loddon Campaspe Regions, Victoria.
- 2000: Thinking Curriculum 2001 Project - a nationwide initiative to introduce de Bono methodologies to a broad range of schools across Australia.
- 2001 - 2002: Action research conducted in special schools across Manjimup, WA to learn more about how to infuse thinking tools into a classroom.
- 2000 - 2008: A state-wide initiative to embed Six Thinking Hats® and Direct Attention Thinking Tools™ into 9 regions with the Department of Education and Early Development, Victoria.

A key outcome of this stage was an Action Research initiative. Two papers were published: "*Towards the Thinking Curriculum: The potential for de Bono's methodologies and tools in Australian schools*" (2000) and "*Thinking, A Whole School Approach*" (2002).

1996–2008
Move 1: Whole School Approach

In 2002, the de Bono Institute developed a program that could be implemented alongside the curriculum. The program was named Mindsight and was initially based around the de Bono methodologies and how to encourage and promote active transfer through mediated learning.

The following considerations were taken into account:

- The need to understand the pressures schools and eduators face.
- The key concept that “learning is a consequence of thinking”.
- To demonstrate the de Bono Institute’s ongoing commitment through the development of a thinking metacurriculum.
- The process of innovative learning and researching.
- Merging a whole child and whole school approach.
- The importance of a rigorous evidence-base.
- Consultation with and contribution by key stakeholders such as experts, education departments and peak offices in the non-government schools sector.
- Resources and mentoring to support the consistent delivery of quality training.

2004 –ongoing

Move 2: Piloting a metacurriculum

In 2004, Canterbury Girls' Secondary College became the founding school for the project. In partnership with the de Bono Institute, Mindsight (de Bono Institute's first education program) established the Creative Minds Project which saw an explicit focus on incorporating the de Bono methodologies into the school curriculum, teacher training, student learning, and leadership decisions.

During the first few years of the partnership, we gained an insight in to the requirement for student-orientated learning materials. As a result, the de Bono Institute began developing materials from Edward de Bono's CoRT 1 (broadening thinking) & CoRT 4 (creativity) tools, to be used with young learners. These materials were quite successful. They also further informed the development of Mindsight.

From 2005 to 2009, the de Bono Institute conducted a longitudinal research project on the use of the de Bono tools within Canterbury Girls' Secondary College. This involved a literature review and focus groups. The results indicated the value of direct and explicit teaching of thinking skills and embedding transfer in learning materials. It also highlighted the ongoing challenge of active transfer where young learners use the tools without prompting. It showed that young learners still relied on ongoing teacher input.

2010–ongoing

Move 3: A metacurriculum for growing Learnable Intelligence

In 2010, based on key learnings and a significant shift in our understanding of how a thinking curriculum would work and the importance of moving from teachable thinking to growing Learnable Intelligence, ThinkPlus was launched. This saw the de Bono Institute adopt seven new pilot schools.

The intention is for the program to complement and enhance conventional education by infusing into all learning areas. This program is called a "Metacurriculum for Growing Learnable Intelligence, A Whole School Approach".

Our learning, research and experience culminated in the development of a framework for the Metacurriculum and prototype materials. During 2011, these were tested in classrooms within the pilot schools and further refined.

This process resulted in significant reflections and feedback which highlighted the following:

1. If young learners and educators have a "fixed" view of intelligence that is genetic and cannot be altered, then they are trapped in the notion of being less able rather than more able to learn and think. Therefore, we made the shift from just teaching thinking to how to develop and grow Learnable Intelligence and a Growth Mindset.

2. A "Growth Mindset" is essential as the foundation for learning to become a good thinker, resilient, and self-regulating.

3. The design of the artifacts (learning materials) plays an important role in transfer and "stickiness" of the Metacurriculum.

4. Concomitant findings concerning the psychological and experience aspects of teachers and young learners in understanding the various aspects of the Metacurriculum, as well as the roles of the artifacts (learning materials) and social interactions around them.

Glossary of terms

Artifact: materials or objects that compensate for the limitations of attention and memory to assist in good thinking. This is the basis of 'distributed intelligence' (see Perkins, 1995).

Co-creation: any act of collective creativity (Sanders & Stappers, 2008).

Co-design: collective creativity as it is applied across the whole span of a design process (Sanders & Stappers, 2008).

Contextmapping: a procedure for conducting contextual research with users, where tacit knowledge is gained about the context of use of products (Sleeswijk Visser et al., 2005). It involves mapping contextual influences to best understand the experience surrounding product usage.

CoRT: a package of 6 sets of 10 lessons for the direct teaching of thinking in schools. It was developed by Edward de Bono and first published in 1974. It is named after the Cognitive Research Trust;

CoRT 1: Breadth
CoRT 2: Organisation
CoRT 3: Interaction
CoRT 4: Creativity
CoRT 5: Information & Feeling
CoRT 6: Action

de Bono methodologies: the methods that Edward de Bono developed including Six Thinking Hats®, Lateral Thinking, and Direct Attention Thinking Tools™.

Design research: systematic inquiry whose goal is knowledge of, or in, the embodiment of configuration, composition, structure, purpose, value, and meaning in man-made things and systems (Archer, 1981). Cross suggests that "design research would therefore fall into three main categories, based on people, process and products" (Cross, 1999).

Design thinking: a style of thinking; design thinking is generally considered the ability to combine empathy for the context of a problem, creativity in the generation of insights and solutions, and rationality to analyse and fit solutions to the context.

Fixed mindset: in a fixed mindset, people believe their basic qualities, like their intelligence or talent, are simply fixed traits (see Dweck).

Growth mindset: in a growth mindset, people believe that their most basic abilities can be developed through dedication and hard work. Natural ability and talent are just the starting point. This view creates a love of learning and a resilience that is essential for great accomplishment (see Dweck).

Learnable Intelligence: a theory of intelligence by David Perkins. The theory builds on the notion of three distinct types of intelligence: neural intelligence, experiential intelligence, and reflective intelligence. You are born with neural intelligence (measured by IQ), and it never changes. You gain experiential intelligence through experience in a specific area, such as playing chess. You gain reflective intelligence by being aware of your thinking patterns and the way you can change these patterns. Perkins posits that learnable intelligence is the combination of both experiential and reflective intelligence with enables people to learn to think and act more intelligently (Perkins 1995).

Mediated learning: refers to the way in which the stimuli experienced in the environment are transformed by a mediating agent, usually a parent, teacher, sibling, or other intentioned person in the life of the learner. This mediating agent, guided by

intention, culture, and emotional investment, selects, enhances, focuses, and otherwise organizes the world of stimuli for the learner, according to a clear intention and goals for that learner's enhanced and effective functioning. The mediator selects stimuli that are most appropriate to his/her intentions, and then frames, filters, and schedules them; their appearance or disappearance is arranged to structure the learner's exposure according to clearly identified and explicit goals (Feuerstein et al., 2006).

Metacurriculum: the 'higher order' curriculum that deals with good patterns of thinking in general and in the subject matters (Perkins in Dickinson, 1991).

Participatory design: an approach to design attempting to actively involve all stakeholders (e.g. employees, partners, customers, citizens, end users) in the design process in order to help ensure the product designed meets their needs and is usable.

Psychological ownership: participants feel as though they have an instrumental, perceptive or symbolic investment in the research design process (Wang et al., 2000).

Rapid prototyping: a process that aims to build a visual and sometimes experiential manifestation of an intangible concept using an iterative set of activities that happen very quickly, as the concepts generated in the ideation phase gain detail, form, and nuance.

Rich experience information: information generated by research methods that gather data on participants' knowledge, dreams and feelings in order to gain tacit and latent knowledge and, in turn, build creative understanding.

Scalability: the ability of a system, network, or process to handle a growing amount of work in a capable manner or its ability to be enlarged to accommodate that growth (Bondi, 2000).

Sensitisation: a learning process in which thinking and reflection on a particular topic is stimulated to prepare participants for a learning session.

Stickiness: the propensity for learned information or skills to be used in the long term.

Transfer: a key notion in the psychology of learning. "Transfer occurs when a person applies knowledge or skills acquired from some earlier context in a new context" (Perkins, 1995).

User-centred design: an approach to design in which the needs, wants, and limitations of end users of a product are given extensive attention at each stage of the design process.

Whole child approach (to education): each child is healthy, safe, engaged, supported and challenged.

Whole school approach: the school community shares the responsibility for every student's achievement.

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