

University of Tartu
Department of Semiotics

Kaustubh Khare

Semiotic analysis of the Mission Prerna structured pedagogy toolkit
Master's Thesis

Supervisor: Ass. Prof. Maarja Ojamaa

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1 Introduction

India's education system has over 260 million children in 1.5 million schools. While enrolment in primary school is high at 97%, learning levels are alarmingly low. More than 50% of children in grade 3 are unable to read a simple text or do basic mathematics (ASER 2018). Without these foundational skills, students fall further behind in grasping subjects in subsequent grade levels.

Many under-resourced communities across the globe face a similar predicament. A popular technique to address this challenge has been the creation and dissemination of 'structured pedagogy toolkits'. Communities in South-east Asia, Latin America and Africa are adopting this approach and developing toolkits relevant to their contexts. The objective of such toolkits is to change existing classroom practices (Snilstveit, Stevenson, et al. 2015). Toolkits have multiple components like lesson plans for teachers, student worksheets, learning objects like dice, and teacher training videos. These components work together as an integrated system to facilitate learning in the classroom.

To address low learning levels, the Indian government enacted the New Education Policy (Ministry of Human Resource and Development, 2020). It sets an ambitious goal of achieving universal Foundational Literacy and Numeracy by 2025. To achieve this, states in India are turning to structured pedagogy toolkits. Uttar Pradesh, India's most populous state with over 200 million inhabitants is undertaking a similar program called Mission Prerna. Mission Prerna is a government led program to improve foundational numeracy and literacy in Uttar Pradesh, India. The program began in 2018 and has many parts including teacher professional development, development of a teaching-learning resources, research to evaluate interventions and many more. I have been engaged with Mission Prerna as a designer to create structured pedagogy toolkits for literacy and numeracy for grades 1-3. This thesis is an opportunity to critically reflect on our work at Mission Prerna, gather insights to guide the next phase of its evolution, and prepare for iterations in subsequent years.

1.1 Research questions and structure of thesis

There are three research questions this thesis deals with. One for each phase of the toolkit's evolution.

Question 1 | Conception: How is Mission Prerna trying to change teachers' practice?

This question relates to the conception phase and will analyze the pedagogical principles and classroom instruction techniques that the coalition wants to change through this toolkit.

Question 2 | Creation: How is this “change” communicated in the toolkit resources?

This question deals with the creation phase of the project. The desired change formed a core part of the what the design system was created to express. The design system can be thought of as a framework that guides the relation between the content and expression planes of the toolkit. These relationships will be brought out here.

Question 3 | Launch: How do teachers react to the changes when they first encounter the toolkit?

The third question deals with the launch phase of the project. It deals with how intended users (teachers) of the toolkit recognize the changes proposed by toolkit. It also deals with tensions of accepting and rejecting changes proposed by the toolkit.

To answer these three research questions, the thesis is divided into seven chapters. This first introductory chapter delimits the research object, specifies my own position as a researcher, states my aims in conducting this research, specifies three research questions.

In the second chapter, a literature review is conducted to identify suitable object-level and meta-level concepts that can help answer the research questions. In addition, this chapter locates the thesis within the tradition of how education in India has been researched. In third chapter on methodology and materials, the concepts for analysis identified in the previous chapter are combined in relation to the research object. This is done by reframing the research object in the language of these concepts. The concepts and research materials relevant to each of the three research questions are then detailed.

Chapters four, five and six are each dedicated to answering one research question. Results from each chapter are the starting point for the next chapter. The concluding chapter summarizes the key results of the analysis, recommends changes for Mission Prerna and other groups working on similar educational interventions and ends with reflections on the theoretical concepts used in this thesis.

1.2 Research object, aims & researcher's position

What does the Mission Prerna Toolkit consist of?

The Mission Prerna Toolkit focusses on three grades (grade 1 -3) and two subjects (numeracy or math, and literacy or Hindi). It is a collection of 12 printed books (6 teacher guides and 6 workbooks), a set of teaching-learning materials (objects like dice, posters, big books etc.), and over 35 videos. The toolkit was created based on a structured pedagogy approach. In a structured pedagogy approach, a tightly knit set of resources is created that work as an integrated system to enable teaching-learning in the classroom¹.

Of the 12 printed books, six are for teachers and six are for students. For each subject and each grade, there is a teacher guidebook and a student workbook. The teacher guide has a compilation of daily lesson plans and trackers to map the teaching-learning journey of a class. The student workbook consists of daily worksheets for students to practice concepts taught via the daily lesson plans. The set of teaching-learning material (TLM) are to be used jointly by teachers and students. They consist of picture and poem posters, big-books, short-stories and objects like dice, 3D shapes, counting strings etc. These books and TLMs are intended to work as an integrated system. The videos (targeted at teachers) introduce the pedagogical principles and techniques the toolkit is based on and tips on how to effectively use the toolkit.

Who created the Toolkit and what was my role in it?

The toolkit was created by a coalition of partners which include the Uttar Pradesh state government and four not-for-profit organizations (Central Square Foundation, Language

¹ Structured pedagogy itself is an emerging concept and its meaning will be explored in the literature review.

Learning Foundation, Vikramshila and Samagra governance). Their roles can roughly be described as the government is the client, Central Square Foundation is the funder, Language Learning Foundation is the subject matter expert for literacy, Vikramshila is the subject matter expert for numeracy, and Samagra is responsible for project management.

The technical partners (LLF and Vikramshila) designed the pedagogy and classroom activities. My role was to come-up with an effective way to communicate it keeping in mind constraints like page size and numbers, print quality, video timespans etc. To achieve this, a design system of colors, visual motifs, typography, and layouts was created. In addition to effective communication, the design system also had two secondary objectives. The first was to build coherence among various components so that they belonged both functionally and aesthetically to a common toolkit. The third was to bring some degree of standardization so that the creation process could be done rapidly at scale. The design system was implemented by creating a library of elements and guidelines for how elements could be combined. Different guidelines were created for different types of content creators. These included teachers and teacher trainers who designed the activities, graphic designers who created the toolkit resources, script writers, and animators who worked on videos.

How was the toolkit created and how will it be rolled out?

The toolkit evolution can be split into four phases. Conceptualization, creation, launch and in-class use. The first phase was alignment among various partners on the pedagogical principles and constraints for the toolkit. These pedagogical principles included concepts like structured pedagogy, balanced literacy, gradual release of responsibility, assessment informed instruction etc. This was followed by development and field testing of prototypes with a group of teachers and teacher trainers. The creation phase involved refining the prototypes, formalizing a design system, and creating the various components of the toolkit. The third phase involves publication and distribution of the toolkit along with workshops to orient and onboard teachers. At the time of writing this thesis, the third phase is ongoing. The fourth phase involves usage of the toolkit in schools, ongoing support, and mentorship to teachers, and gathering evidence on what's working and what's not working.

Why do I want to do this research?

The nature of insights that I seek through this thesis are shaped by my role in its creation and the phase the project is in at the time of writing. The insights I am looking for have three motivations behind them. The first is to critically reflect on the design system we created. I hope to identify its strengths and weaknesses so that future iterations of this toolkit can be improved. The second motivation is to reflect on the design system and abstract out design principles for communicating pedagogy. This could be of benefit to creators of various forms of educational content. The third motivation is to develop a framework to analyze the usage of this toolkit by teachers in phase four of the project. This will be the next phase in the evolution of this project and will help us capture the diverse ways in which what we have created is being interpreted.

What is outside of the scope of this thesis?

To allow for a deeper reflection and in response to the constraints of time and space, I am restricting my object of analysis in the following ways:

- I will not be focusing on the material related to literacy. This has been done for two reasons. The first is my own comfort and confidence which is more in numeracy. Although I am a native speaker of Hindi, I have never learnt it in a formal school setting. My understanding of its grammar and pedagogy is relatively weak. The second reason is that literacy by nature is linguo-centric. Looking at numeracy instead might be an easier route to bringing out the non-lingual aspects of our design system.
- I will not be considering the videos in the toolkit. This has been done for two reasons. The first is that at the time of writing, these videos are work in progress and I am too close to them to be able to meaningfully reflect on them. The second reason is that while the videos are a part of the toolkit, they belong to its meta-layer. This is as their content deals with questions about the toolkit itself like “what is this toolkit?” “how to use this toolkit?” etc.

What ways of looking/ analyzing are outside the scope of this thesis?

The following ways of looking or analyzing are outside the scope of this thesis:

- I am not taking a quantitative lens for this analysis. This is because the nature of insights I desire are more suited to a qualitative approach and because there is a large body of research evaluating educational interventions that take a quantitative lens. These will be reviewed in the chapter on literature review.
- I am not looking at or analyzing student learning. This is for two reasons. The first is that in grades 1-3, learning experiences are heavily facilitated and shaped by teachers. While some components of the toolkit are targeted at students (6 workbooks and TLM set), even these depend on teacher administration to be used by students. The second reason is that a lot of research² that evaluates education interventions in India focusses on student learning outcomes. Taking a teacher centered approach will provide a good complement to these.
- I am not looking at making any assessment or evaluation of the effectiveness of the pedagogical principles or learning activities in the toolkit. This is not my expertise and my focus here is on the communicative processes involved in translating pedagogy from theory to educational content to in-class interactions.

Who are the intended readers of this thesis?

The primary audience for this research is practitioners in the field of education reform. It will be most relevant to those engaging in projects that adopt the structured pedagogy approach. The secondary audience is researchers interested in analyzing the evolution of education interventions from conception to implementation. The tertiary audience is semioticians. It can be of value to semioticians interested in analyzing changes in educational systems by applying Lotman's theories of cultural change.

To balance the expectations and needs of these audiences, I have simplified some terminologies. For example, if you are in education, you may feel I have avoided the word 'scaffolding'. If you are a semiotician, you may feel I have avoided the word 'semiosphere' or used the word 'icon' incorrectly. This has been done consciously with the hope of building shared understandings, knowing that it comes at the cost of losing some nuance.

² Details in chapter 2 on literature review.

2 Literature Review

This chapter will be a review of prior research and theoretical concepts that are relevant to the research object and aims mentioned in the previous chapter. There are four issues that literature review was conducted to address. These are:

- Locating this thesis within the tradition of how education in India has been researched.
- Unpacking the meaning of “structured pedagogy”.
- Finding a broad theoretical framework that can integrate all four research questions.
- Identifying specific concepts from both object level and meta-level to help answer the research questions.

2.1 Education research in India

The Indian subcontinent has an ancient lineage of theorizing education in diverse ways. These span millennia from the Vedic tradition to Buddha to Guru Nanak. Pre-colonization, the education system was largely based on the gurukul system, a form of residential schooling where the role of the *guru-shishya* or educator-learner relationship was at the core (Walia 2004, 93-94). In the build-up to Independence from the British, leaders of our freedom struggle theorized the role of education in emancipation (Ambedkar 1943), in building cultural identity and patriotism (Rai 1920, Nehru 1937) and as a vehicle of self-discovery (Tagore 2009, Gandhi 1921). Post-independence, the responsibility for educating a staggeringly illiterate, diverse, and large population fell on the nation state.

In the face of these constraints in a newly born nation state, the focus of theorizing education shifted away from philosophical goals to practical concerns³. There seem to be two interlinked motivations behind research on primary education post-independence. The first is research that informs or evaluates education policies. The second is research that studies education in its relation to social justice along axes like gender (Bhat 2015), caste (Asadullah and Gaston 2012), class, religion, language (Rao 2013, Groff 2017) and the urban-rural divide

³ A philosophical critique of Indian education system come from a decolonial/ post-colonial lens can be found in Gupta and Williams 2006.

(Agrawal 2014). These two strands can be understood as recognition of the deep inter-dependence between education, policy, and emancipation.

The next thing I've noticed relates to the dominant research approach. The dominant approach is quantitative research based on longitudinal analysis of large data sets. This is probably due to two reasons. The first is that the scale of India's population and education system is so large that the ecosystem needs a bird's eye view to reflect on their efforts. The second is that research is often used to inform decisions on effective ways to allocate economic resources.

The dominant approach can be generalized as finding co-relations between two types of data sets. The first type of dataset serves as a proxy for educational outcomes & the second type of dataset relates to social and demographic indicators. Data used as proxies for educational outcomes include student enrolment (Agrawal 2014, Gouda, et al. 2013, Desai and Kulkarni 2008), teacher absenteeism (Kremer, et al. 2005, Muralidharan and Kremer 2006) and student performance in standardized tests (Singh and Sarkar 2015). Data on social and demographic indicators comes from government surveys like the census and national family health survey while educational outcomes data relies on surveys by governments or NGOs like ASER. Various statistical models are applied to find co-relations between these data sets. This approach is used to analyze flagship government policies like Sarva Shiksha Abhiyaan (Goodnight 2017, Joshi and Moharir 2013), mid-day meal scheme (Chutani 2012, Afridi 2011, Deodhar, et al. 2010) and the Right to Education Act (Jha and Parvati 2014, R. Joshi 2020, Shah and Steinberg 2019). More recently, designing randomized control tests to test effectiveness of specific educational interventions has also gained prominence (Borkum, He and Linden 2012, A. Banerjee, et al. 2016, A. V. Banerjee, et al. 2010, Muralidharan and Sundararaman, 2011). Quantitative approaches offer valuable insights that enable decision making by answering questions like how effective a policy is at achieving intended outcomes, which interventions should the state spend on, and how much financial resource should be allocated to different interventions. They have given us stark reality checks of how little our children are learning.

However, this approach is not the best at finding out why children aren't learning and what we can do differently in the classroom to enable learning. Capturing insights like why an

intervention is succeeding or failing, how in-class interactions change in response to interventions, and how teachers and students experience these interventions require a qualitative approach. Such qualitative insights can help organizations and people involved in designing and implementing interventions set up a strong link between research and design. This can help iterate and refine interventions in a meaningful way.

Compared to quantitative, qualitative research on Indian education is at a more nascent stage. Qualitative research to identify challenges in achieving learning outcomes is gaining prominence (Sankar and Linden 2014, Dyer, et al. 2004, Saigal 2012). However, qualitative research to evaluate effectiveness of solutions is rarer. The few studies focused on solutions deal with use of technology in classrooms (Dey and Bandyopadhyay 2019, Phutela and Dwived 2020) and impact on learner experience due to factors like caste (Bhagavatheeswaran, et al. 2016) and gender (Ramachandran 2004). The lack of research based on qualitative field observations in primary education in India has been identified as a research gap (Velu 2015).

To summarize, the following are the key points:

1. Post-independence primary education in India has largely been studied and theorized in relation to government policies.
2. In the past two decades, the focus of both policy and research is shifting from student enrolment to student learning. Given this shift in focus towards student learning, a corresponding evolution in research methods and methodology is necessary.
3. Qualitative research based on field work, interviews, and classroom observations to inform evaluate policy is the exception rather than the norm.
4. This thesis is an opportunity to develop a qualitative approach to analyze an educational intervention led by the government.

2.2 Unpacking “structured pedagogy”

In this sub-chapter, I will unpack the overarching principle of “structured pedagogy” that guided the creation of the research object and identify a conceptual framework from the structured pedagogy discourse to include in the research methodology.

Multiple studies that seek to find and recommend the most effective approaches to improving learning outcomes in under-resourced parts of the world identify “structured pedagogy” as amongst the most effective (Fleisch 2016, Evans and Popova 2016, Chuang et al. 2019, Angrist, Barros et al. 2021, Gregory and Bend 2019). The interventions these studies review come from South-Asia, Africa, and Latin America. This concept also guided the creation of the Mission Prerna toolkit and is one of the key principles all organizations involved aligned on. However, this approach is at an emergent stage and the label “structured pedagogy” can have fuzzy definitions.

Three key institutions are responsible for shaping the definition of structured pedagogy. They are the World Bank, 3iE and RTI International. Collectively, these three institutions have conducted and/or commissioned majority of the research that defines “structured pedagogy” and advocate for its effectiveness (Snilstveit, et al. 2017, Piper, Sitabkhan, et al. 2018, Piper, Destefano, et al. 2018, Bashir, et al. 2018, Evans and Yuan 2019, Evans and Yuan 2019, Evans and Acosta, 2021). Scholarly work on “structured pedagogy” also relies on reports by one or more of these institutions to introduce and/or define “structured pedagogy” (Maruyama 2021, Jandrić and McLaren 2021, Angrist, Barros, et al. 2021, Evans and Acosta, 2021). Based on this, we can say that “structured pedagogy” is a meta-description that describes educational interventions that share some common features. Despite having the word pedagogy in it, it is grounded primarily in practice and evidence of effectiveness rather than fidelity to one or another educational theory like Piaget or Vygotsky.

The emerging definition of “structured pedagogy” must be explored to effectively guide this research. The definition can be unpacked by understanding the rationale that the three prominent institutions use to group different educational interventions under the common label of “structured pedagogy”. My review of literature produced by the three institutions, finds three rationales. They are:

- The interventions take a holistic multi-pronged approach to changing classroom culture as opposed to interventions that have a singular focus and view programs in silos.

- A common component of these interventions is the development of a toolkit of educational resources. These toolkits are a tightly knit set of materials like teacher guides, workbooks, posters, and object manipulatives that work together as an integrated system.
- Another common feature is a teacher professional development program that enables teachers to effectively use the toolkit. These can range from periodic workshops to ongoing mentorship or videos that explain the toolkit to teachers.

Of these, the first two will guide the selection of meta-level concepts. The third has been kept outside the scope of this thesis.

2.3 Semiotics and education

The theoretical framework for my analysis will be grounded in the discipline of semiotics. My simplest introduction to semiotics is as follows. Semiotics is the discipline that studies how life makes meaning by interpreting and combining different sign-systems. Apart from the fact that I am enrolled in a master's program in semiotics, I feel it is an appropriate base for my thesis for three reasons. The first is that semiotics is very broad and hence can comfortably house the different types of research questions posed. The second is that at the core of my research questions communicative processes & communication is semiotic by nature. The third is that given its interest in meaning making, semiotics has often explored topics like education and learning.

There are two broad types of studies that relate semiotics and education. The first category uses semiotics as the theoretical and maybe even philosophical basis to conceptualize what is education and what is learning. The second category is studies that use concepts from semiotics as a tool to analyze various aspects of formal education. These two types of studies are beginning to coalesce under the sub-discipline, edu-semiotics. The second category will be explored in the next sub-chapter where specific concepts for analysis will be identified. This sub-chapter will focus on finding a theoretical tradition to anchor this research.

2.3.1 Semiotic view of education and learning

Semiotic perspectives on education and learning come from two major traditions. One being the tradition of Charles Sanders Peirce and the other being the tradition of the Tartu Moscow School and its prominent scholar, Juri Lotman. Lotman's tradition can be viewed as semiosis described in cultural terminology and Peirce's tradition can be viewed as semiosis described in formal logic terminology.

The tradition of Peirce builds upward from the unit of a sign towards larger phenomenon like meaning making, habits, learning and life. Research that builds on Peirce views signs as educators (Nöth 2014), extends the triadic model of sign to teacher-student-meaning (Semetsky 2015), and applies the notion of unlimited semiosis to lifelong learning (Campbell 2017). In this strand, semioticians can view life, semiosis and learning as co-defining each other (Stables 2006). On the other hand, the tradition of Lotman identifies culture as a whole as a necessary precondition for all meaning-making and focuses on evolutionary dynamics of relations between the various levels of cultural systems, texts, languages, and codes. This tradition focusses on the self-descriptive and auto-communicative function of culture and views it as a system of education (Ojamaa and Torop, 2015). In this strand, culture and education can be understood as co-constructing each other. Peirce's tradition links semiosis more with learning while Lotman's links semiosis more with education.

While both perspectives are of value to this thesis, I have chosen to ground it mainly in Lotman's tradition. This is for the following reasons:

1. The research object emerged first as a whole within which its many parts are being created. This maps with Lotman's understanding of the whole being the precondition of meaning-making.
2. The research object aims to bring about "change" in a system of primary education. One of the fundamental questions in Lotman's tradition is "how does a system change and yet remain true to itself" (Lotman 2009).
3. My research questions range from issues like what the system is trying to change to design codes of specific texts and their interpretation by users. Lotman's approach can

be applied at various levels from the individual to culture and from text to code to language (Lotman 2005).

4. My research is a part of a research-design process linked to a specific educational intervention for public schools. In Lotman's tradition, a similar initiative is the work of the Transmedia research group at University of Tartu. The group designs and researches educational interventions for school students in Estonia (Ojamaa, Torop and Fadeev, et al. 2019, Milyakina, et al. 2020, Ojamaa and Milyakina, 2019). I was lucky enough to interact with and take courses with multiple members of this group.

2.3.2 Semiotics as a tool to analyze teaching-learning

Many studies use concepts from semiotics to analyze various aspects of formal education systems like teaching-learning materials, inter-personal interactions and learning environments. Studies have analyzed education of varying disciplines from mathematics to language and at various levels from primary school to university. While a variety of semiotic concepts including *umwelt* and *semiosphere* have been applied to the classroom and schools (Stables, et al. 2014, Pesce 2018), the most prominent concepts from semiotics used in educational contexts are multi-modality and translation. Mostly, they are used together.

Multi-modality has been used to understand two types of education related research objects. The first is the design and interpretation of teaching-learning materials like textbooks (Bezemer and Kress 2015, Van Leeuwen 2014), websites (Dagenais, et al. 2017, Unsworth 2008, Erstad, Gilje and Lange 2007) and the space of a classroom (Arzarello 2006, Kress 2009, Arzarello and Robutti 2010). The second is analyzing interactions in classrooms among educators and students (Arzarello, Robutti and Thomas 2015, Arzarello, Paola and Christina 2009, Ginsberg 2015). They focus on how different types of sign-systems like spoken language, printed text, images, color, gesture, gaze etc. work together to facilitate meaning making.

Many studies combine translation with multimodality to understand how meaning contained in one composition of sign-systems is transformed when it is rendered in a different composition of sign-systems. Translation could be applied both in the narrow sense of

between natural languages like from English to Hindi, and in the broader sense of translation from teachers' communication to students' internalized learning. Some studies have also extended these concepts to build analytical frameworks for evaluating the quality and effectiveness of educational interventions (Arzarello, Ferrara and Robutti 2011, Newfield, et al. 2003, Sabena, et al. 2012, Adler and Davis 2011). This is done by examining research material ranging from teachers' classroom practice to student art works created in class. What is common in these approaches is the use of modalities as a categorization framework and translation concepts like variance-coherence as an axis of evaluation. These studies have inspired the proposed framework for classroom observation in chapter 13.

Insightful research relies on an effective combination of concepts from the object-level and meta-level of analysis. The object level of analysis relates to the Mission Prerna Toolkit while the meta-level of analysis relates to semiotics. From the semiotic traditions discussed earlier, I have chosen five concepts to use in my analysis.

- Self-description and self-models
- Core-periphery dynamics
- Polyglotism⁴
- Translation
- Transmediality

For object-level concepts, I looked within the growing literature on structured pedagogy for a conceptual framework flexible enough be applied to all three research questions. For this, the criteria I used were the following:

⁴ I am considering multimodality which originates in socio-semiotics and polyglotism from cultural semiotics to be similar for this research. While a multimodal perspective is baked into both the research object and my approach, I will stick to using the terminology of polyglotism for coherence with the broad theoretical framework chosen.

- It should have emerged within the structured pedagogy discourse. In other words, it should have emerged from one of the three institutions responsible for shaping the definition of “structured pedagogy”.
- It should be related to how teaching-learning is constructed and understood by creators of structured pedagogy interventions.
- It should be articulated as a simple rubric with minimal reliance on technical terms or jargon.

Based on this, I have selected the framework of “What-How-When” of teaching learning presented by RTI international (Dubeck and Sitabkhan 2021). This framework will be the core concept from the object level that will be used to construct the research methodology for this thesis. It will be a common presence across all three research questions.

These five are meta-level concepts and one object-level concept will be combined in the next chapter on methodology.

3 Methodology and Materials

This research lens/ methodology for this thesis is made by assembling many puzzle pieces together where each puzzle piece is a theoretical concept. The puzzle pieces were chosen based on the phenomenon being looked at, the nature of insights desired and the person looking at it. Also, the puzzle pieces of the lens must be compatible with each other. In the previous chapter, concepts from the object and meta level were identified. These are the puzzle pieces for my lens. The previous chapter identified six concepts for this research. Briefs definitions of each follow.

Core-periphery dynamics

Every culture has a core where dominant meaning making systems are located. This core can consist of languages, texts, practices, norms that are highly organized and resistant to change. Around the core are peripheral parts of the culture. The periphery is more fluid, dynamic and experimental. It aims to affix its innovations at the core by displacing its existing elements (Lotman 2005: 214). The character of core and periphery can vary significantly. The tension between core and periphery and how elements move from one zone to another are central understanding change in any system. Change in a system can be triggered when the core engages in a process of self-description to articulate norms it wants to extend across the entire system (Lotman 1990: 128).

Self-description & self-models

Self-description has been identified one of the most fundamental abilities of any culture (Ojamaa and Torop 2015: 64). Self-description leads to the creation of a self-model which can be of three types. The first where the self-model aims for maximum similarity with the current state of a culture. The second where the model differs from current practices and aims to change them. The third where the model exists as an ideal of self-consciousness separate from and not oriented towards culture (Lotman 2000: 568-580, see Torop 2005: 168–169). Once articulated, a self-model is like a code for the generation of new texts.

Polyglotism

The presence of multiple languages is a necessary condition of any meaning generating unit (Lotman 2009: 6). The word language is to be understood here in a broad sense. It is not restricted to languages like English and Hindi but also includes the languages of music, artistic movements, rituals, body language etc. For clarity, I will use the more general term sign-systems instead. Polyglotism also relates specifically to self-description. The process of self-description creates its own specialized grammar (Lotman 1990: 128). This grammar is polyglottic and is constructed by combining a variety of sign-systems.

Translation

The polyglottic nature of any meaning generating unit has two consequences. One is that translation is an inevitable feature of any meaning-making process (Andrews and Maksimova 2008). The second is that due to differences among sign-systems, translations that results in a complete equivalence of meanings are impossible. Various sign-systems exist in a state of mutual-untranslatability or limited translatability (Lotman 2009: 2). Due to this, every act of translation necessarily changes meaning. Comprehension and non-comprehension (or interpretation and misinterpretation) are always simultaneously present. This view of translation is applicable across the entire range of communication from internal thoughts to inter-personal, inter-group and inter-cultural communication.

Transmediality

Transmediality is the phenomenon where a message or narrative is spread across multiple components that exist in different mediums and/or languages. The marvel cinematic universe, the story world of harry potter, or epics like the Ramayana and Mahabharat are examples of this. However, transmediality is not limited to fiction or myths and is also actively used in education. In understanding the relationship between education, transmedia and self-description, Ojamaa and Torop (2015: 63) make two observations that are relevant to this research. The first is that the construction of various parts ‘as a whole’ happens in the interpreting mind. The second is that repetition among various parts is key to aiding in its interpretation as a transmedial whole by the interpreter.

What-How-When of teaching-learning

This puzzle piece borrowed from Dubeck and Sitabkhan (2021), belongs to the object-level of analysis and can be understood as follows:

- “What”: The skills and competencies students are expected to learn. It is the primary goal of an educational system and is usually specified in the syllabus or curriculum documents.
- “How”: How are the skills and competencies taught? This refers to suggested instructional practices, learning activities and materials like textbooks that are used to construct learning experiences.
- “When”: This refers to the pacing and distribution of skills across time. It can be at different time scales ranging from an academic year to weekly routines or even the flow within a single classroom session.
- The features of what, how and when and their relationships with each other are a framework to analyze and/or describe the pedagogy of an intervention in a structured manner.

Reframing the research object

The Mission Prerna toolkit’s journey through all four phases of evolution is reframed in the language of the meta-level concepts below.

The ecosystem in which Mission Prerna emerged can be split into two hierarchical levels. Level one refers to schools and classrooms where teaching-learning interactions take place. Level two refers to the organizations that regulate, study, and administer level one. These include various government bodies, not for profit organizations, researchers etc. The core of level two views the core of level one as being characterized by low learning levels, having ineffective instructional practices, and using outdated texts. The core of level two wants to change this about level one.

The creation of the Mission Prerna toolkit can be viewed as the result of a self-descriptive process from the level two core as it was sanctioned and anchored by the government. However, it also included organizations and concepts of educational reform that had previously been at the periphery of the system.

Since it is clearly oriented towards change, the toolkit can be viewed as a self-model of the second type. It was constructed by focusing on practices and techniques from the periphery of level one that the core at level two believes and hopes would change the dominant feature of low learning levels in level one. The toolkit can be viewed as a model for classroom interactions that the core of level two wants to extend across level one.

To articulate the self-model, a specialized grammar emerged. This specialized grammar is polyglottic as it uses multiple sign-systems like Hindi, colors, icons, typography, layout etc. The design system created for the toolkit is a formalized articulation of this grammar.

In our case, the self-model itself consists of multiple texts (12 books, TLMs, videos etc.) Therefore, the self-model is not just polyglottic, it is also transmedial. These components can be constructed as an integrated Toolkit only in the minds of interpreters like teachers. The perception of these components as a mental whole relies on repetition. It cannot be guaranteed, only aided.

The polyglottic transmedial self-model serves as a code for the generation new texts. The code is the toolkit and the texts that could be generated in the future are classroom interactions. Classroom interactions themselves are polyglottic as they use various sign-systems like spoken and written language, drawings on blackboards, body language and gestures, object manipulation etc.

Based on the above, the concepts applied to answer each of the three research questions and the relevant research material for each follow.

3.1 How is Mission Prerna trying to change teachers' practice?

The concepts used to answer this question are core-periphery and the what-how-when framework of teaching-learning. The research question is answered by constructing and comparing two core-periphery maps. One map represents the status-quo (Figure 1) and the other representing the desired future state (Figure 2). Each map has various elements of

teaching-learning distributed across core-periphery. Each element is tagged with How-What-When. These maps are then compared against each other to reveal change from two perspectives. The first is change based on movement of elements (inward, outward and static). The second is change in each aspect of how-what-when.

For this, research material of two types was used. Interviews with members of organizations that conceptualized the toolkit and Documents from the creation phase of the project. The research material used is:

- 7 one-on-one interviews⁵ conducted with members of Central Square Foundation, Vikramshila and Samagra Governance.
- Project scope and vision document.
- My own meeting notes from discussions in the conception phase.

The interviews were conducted in a semi-structured manner in a mix of Hindi and English. Five were done in-person and two were done over video calls. The interviews were audio recorded and transcribed.

3.2 How is this “change” communicated in the toolkit resources?

The core-periphery map of the self-model for change from the previous research question is the starting point for answering this research question. The concepts used are polyglotism, specialized grammar of self-models and how-what-when of teaching learning. Elements on the map of the self-model of change are separated into plane of expression and plane of content (Figure 9) and their relationships mapped (Figure 10). Each relationship on the map is analyzed for the polyglottic codes used to establish it. Collectively, these form the specialized grammar of the self-model (Figure 21). The grammar is analyzed from the perspective of sign-systems used and from the lens of how-what-when of teaching-learning.

To answer this question, the research material used was documents that guided creation and the outputs of the creation phase. These are:

⁵ These were semi-structured interviews and the questions that guided this can be found in appendix 1.

- Design guidelines for graphic designers.
- Guidelines for content writers.
- 3 Teacher Guidebooks (One for each grade)
- 3 Student Workbooks (One for each grade)

Analysis of the material resulted in the creation of two maps. One was the core of the self-model for change with content-expression relations mapped. The second is the specialized grammar represented by a mapping of the polyglottic codes used tagged with what-how-when.

3.3 How do teachers react to the changes when they first encounter the toolkit?

The concepts used to answer this question are core-periphery, isomorphism and how-what-when of teaching learning. To answer this question, the research material used was transcripts and field notes from focus group discussions. Based on whether participants recognized, partial recognized or did not recognize the codes and relations as intended by the creators, the maps of the core of the self-grammar and self-model from the previous question were refined (Figure 23 and Figure 24). This resulted in a map of participants' perceptions of changes to status-quo that the toolkit proposes (Figure 25). This core-periphery dynamics of this map formed the basis of analyzing isomorphic tensions of accepting-resisting change that emerged in the focus groups. These isomorphic tensions are of two types. One due to the internal dynamics of the self-model for change and the second in relation to isomorphic "others" as perceived by teachers.

Focus group discussions: location and participants

Focus group discussions were conducted with 23 government primary school teachers in Shravasti district of Uttar Pradesh in March 2022. Covid-19 led to the sustained closure of primary schools across India for long periods between 2020-22. Covid also impacted my ability to travel from Estonia to India to conduct field work. In March 2022, I was able to travel to India to conduct fieldwork. Schools had just begun re-opening and Uttar Pradesh was amid elections. Due to these complexities, location and participants for fieldwork were

ambiguous and could not be planned with a great deal of specificity. There were two key enablers for this fieldwork, the first was the organization Vikramshila which is a collaborator on Mission Prerna and has been working with government schools across Uttar Pradesh for over a decade. The second was my maternal family which has its roots in Shrawasti and Behraich for multiple generations. It was my good fortune that Vikramshila had a network and experience working in Devi Patan block within which Shrawasti falls. The overlap of these two enablers was the key reason for conducting fieldwork in Shrawasti.

Shrawasti lies on the border of India and Nepal at the foothills of the Himalayas. Awadhi, which is a dialect of Hindi-Urdu is the dominant spoken language. The district was ranked by Government of India as among the 5 most backward districts of the country and the absolute last on the parameter of education (Niti Aayog 2018). Learning levels in Shrawasti are the lowest in the state (ASER 2016). Only 16.6% students in grade 3-5 can read a grade 1 level text and only 9.7% could do basic subtraction.

Focus group discussions: format and structure

Fieldwork fell in between two phases of polling. To facilitate elections, government schoolteachers are often called on to help the Election Commission administer polls. Due to this, the routine of schools that had recently re-opened was disrupted and teachers had a lot to do with unpredictable and limited time availability. For the focus group discussions, an invitation was circulated among teachers by the principal of a college. All teachers who turned up and handled grades 1, 2 or 3 were included in focus group discussions.

Focus group discussions were scheduled with options for multiple days during the post-lunch time when teachers are relatively less burdened by teaching and administrative duties. The participants included 9 female and 14 male teachers. No more than 2 teachers came from the same school. The participants had met each other over the past few years at various meetings and teacher professional development workshops. Their teaching experience ranged from 3 to 27 years. Five focus groups were conducted with 4 or 5 participants per group. The group composition was random and determined by timeslots that were convenient for different participants. Sessions were scheduled for 45min however, all went over an hour.

Each group began with a short introduction of the toolkit, the research and by requesting for consent of participants⁶. This was followed by participants seeking clarifications about the toolkit and research. After this, to initiate trust building, the vulnerabilities of being a researcher and conducting such research were shared. In response, the participants shared challenges and frustrations related to teaching. These included having had to bring LPG cylinders by cycling over 10Kms to keep the mid-day meal program running, lack of a functional toilet on school premises, not having a work-life balance and many more.

Once the bonding over shared frustrations has subsided, participants were given printed samples of the teacher guide and student workbooks. Participants were requested to explore the books individually for 15 minutes. During this time, I made notes on the pages and portions that participants were reading and the ones they skipped. This period was mostly silent with occasional questions from participants. Participants' questions were noted but not answered during these 15min. This was followed by a 10-15 min discussion where participants posed questions to each other and to the me. Participants were encouraged to respond to questions before I responded. The final 30-45 min was anchored by the following questions that I posed to the group:

1. Are there any aspects of the toolkit you would like to try out in your teaching practice? If yes, which ones and why?
2. Are there aspects of the toolkit you feel resistant to trying in your practice? If yes, which ones and why?
3. If you could change something about the toolkit, what would it be?
4. How would you introduce the toolkit to another teacher?
5. Close your eyes and imagine yourself using the toolkit. Describe how you saw yourself using the toolkit

The discussions were audio recorded and transcribed over the next one month. The transcripts along with my observation notes became the research material for this question. The cumulative concerns, affirmations and questions raised in groups can be found in appendix 5.

⁶ A sample of the consent form which includes the ethics and rights of participants can be found in appendix 4

4 How is Mission Prerna trying to change teachers' practice?

Transcripts of one-on-one interviews with team members that worked on Mission Prerna were examined to identify pedagogical principles and teaching-learning artefacts. These include elements that were described as current dominants and “new” ones that the project hopes to introduce through the toolkit⁷. Each element was tagged with combination of ‘What-How-When’ before distributing it across core-periphery. Elements have been distributed across three concentric zones based on the interviewees’ perceptions of dominant teaching practices. The most dominant are in the yellow core zone. Elements that the team felt do influence teaching but are not so dominant are in the intermediate grey zone. Lastly, practices that interviewees felt barely or do not influence teaching are in outermost peripheral white zone. This process was applied to create two maps. One for the status-quo and another for the desired future state.

It is important to note that these maps do not represent the reality of classroom practice. They represent the understanding of the toolkit creators. First drafts of maps were generated based on one-on-one interviews with creators. The drafts maps were then shown to interviewees and refined until consensus was reached in the group. This can be understood as representations of the thinking of the core at level two. They model a reality at level one that is far more complex and diverse than can be represented or comprehended.

4.1 Core-periphery of status-quo and desired future state

This first map (Figure 1) represents the status-quo of teaching. This can be understood a self-description of level one by the core of level two. The second map (Figure 2) represents the desired change in teaching-learning elements as described by members that conceived of the toolkit. This can be understood a self-model for change developed by the core of level two. The core of level two hopes that the future state of level one would be like this.

⁷ List of all elements along with short descriptions can be found in appendix 2.

Figure 1: Creators' understanding of status-quo of teaching-learning

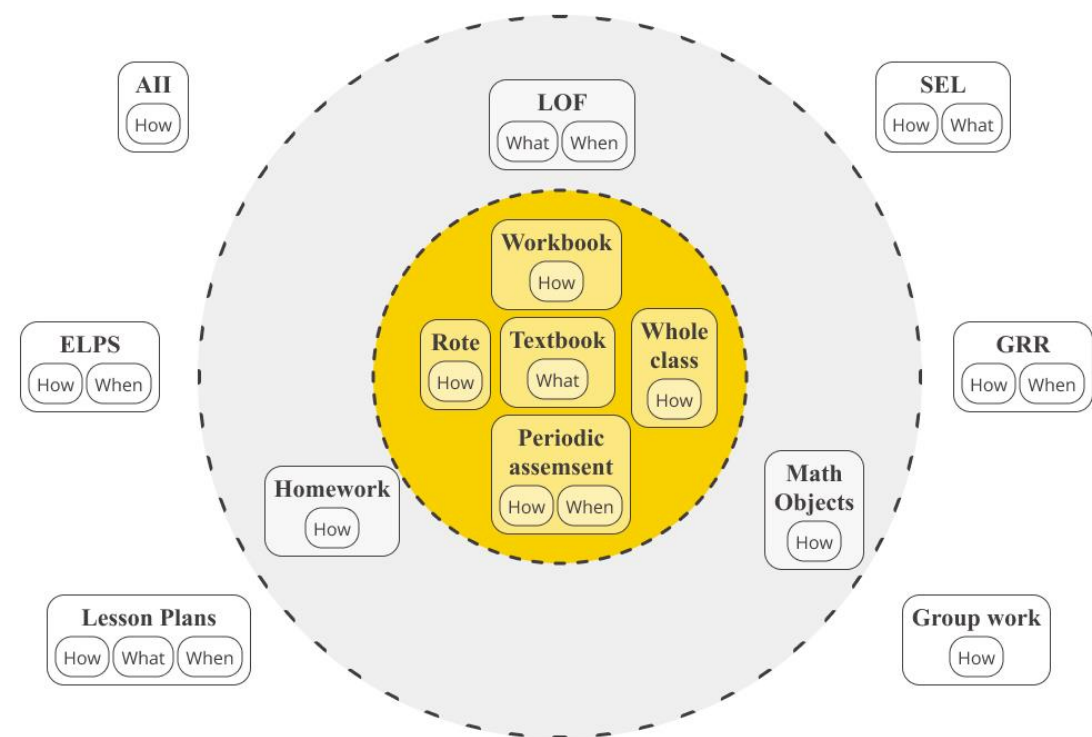
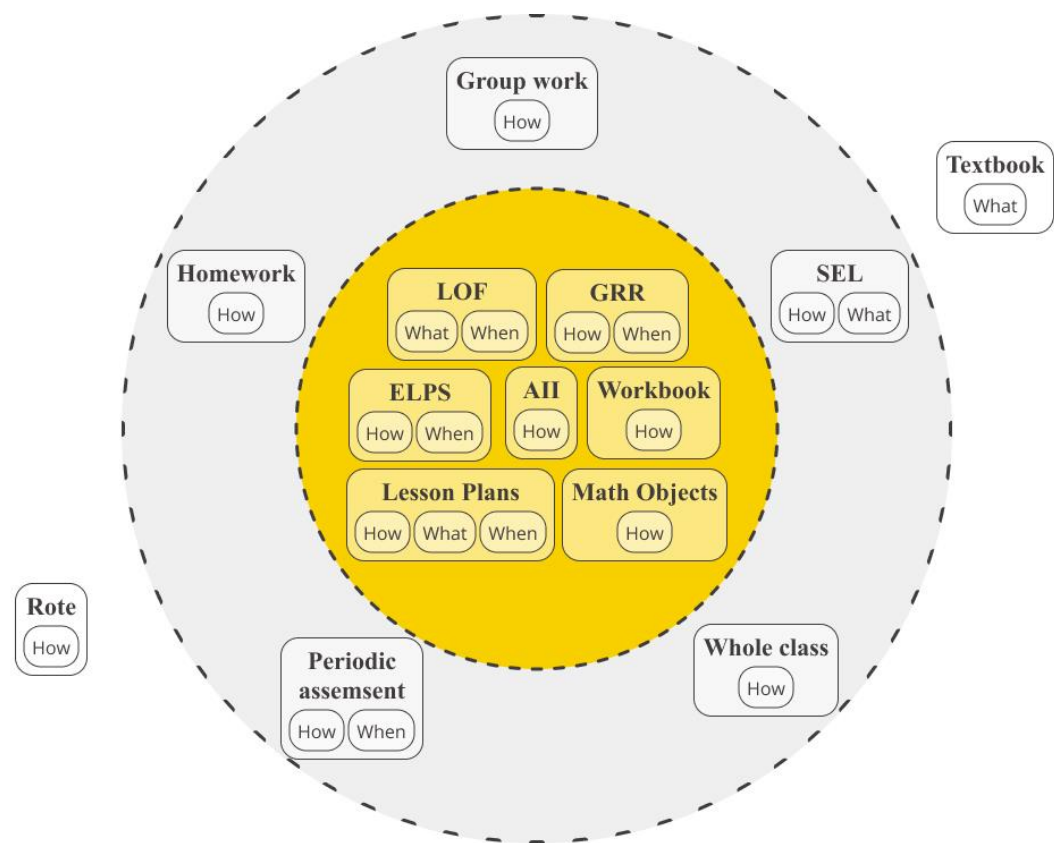


Figure 2: Map of self-model of change for teaching-learning

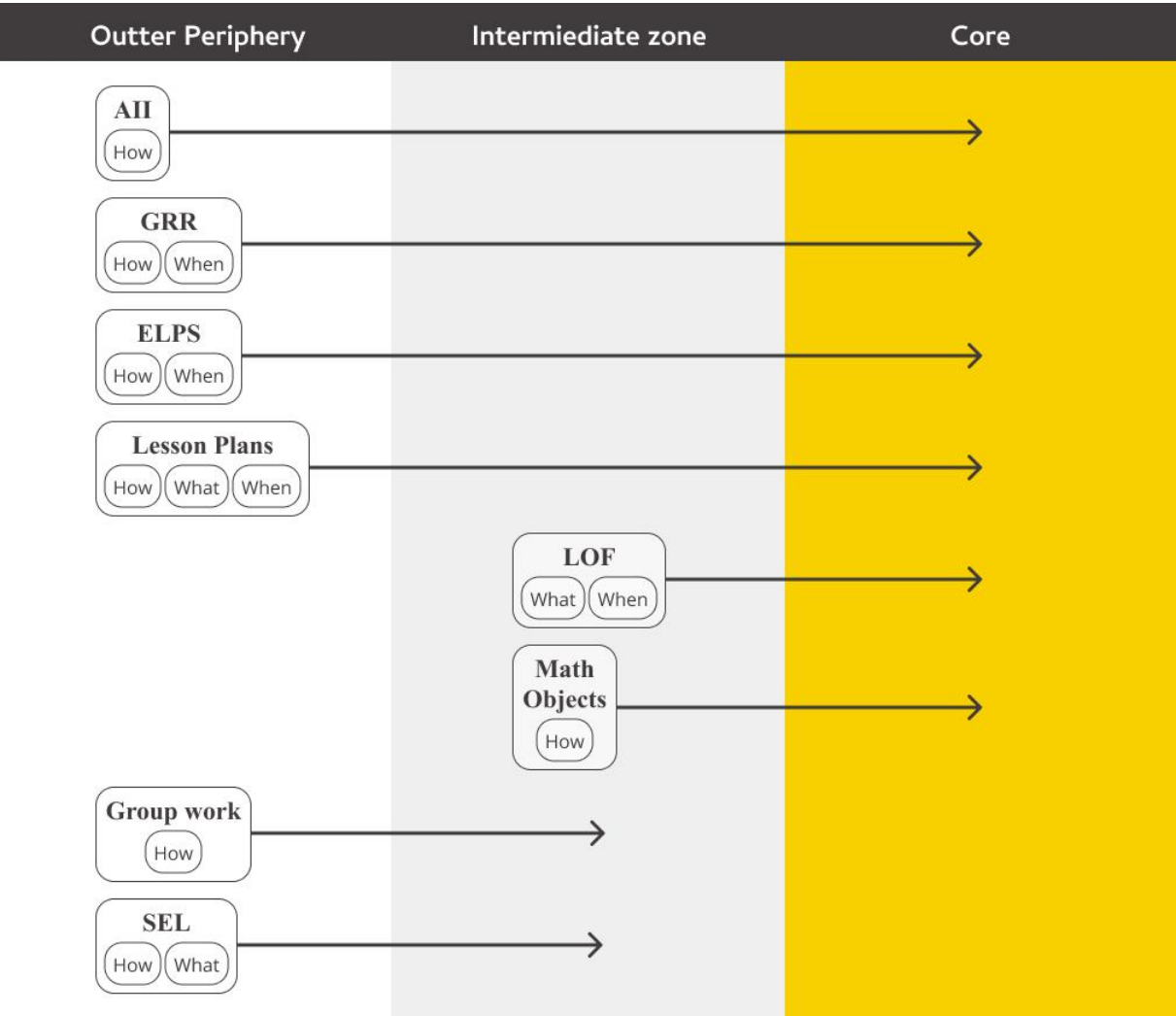


Change can be understood by analyzing the shifts in elements. These shifts from status-quo to self-model for change can be looked at in two ways. The first relates to the direction of movement of elements. The second relates to how-what-when.

4.2 Inward, outward and static movements

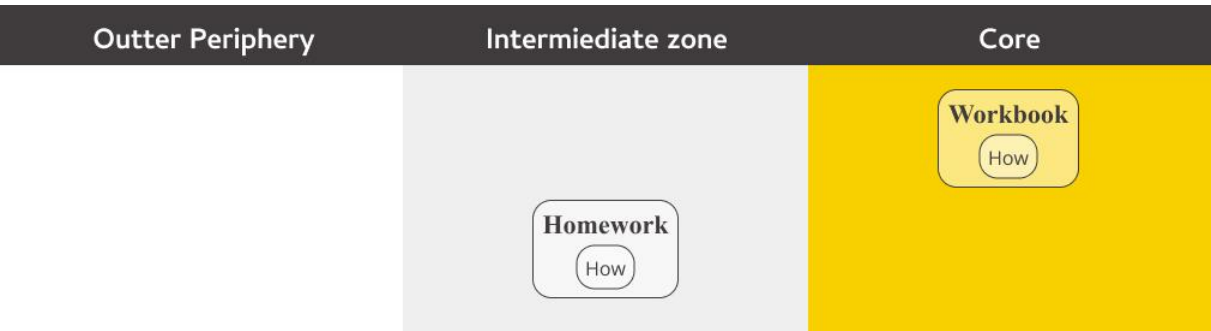
There are six elements in the outermost zone of the status-quo. All six have moved inwards. Four of these move into the core while two move into the intermediate grey zone. Two elements move into the core from intermediate grey zone. Six elements moved into the core.

Figure 3: Inward movement of elements from status-quo to desired future state



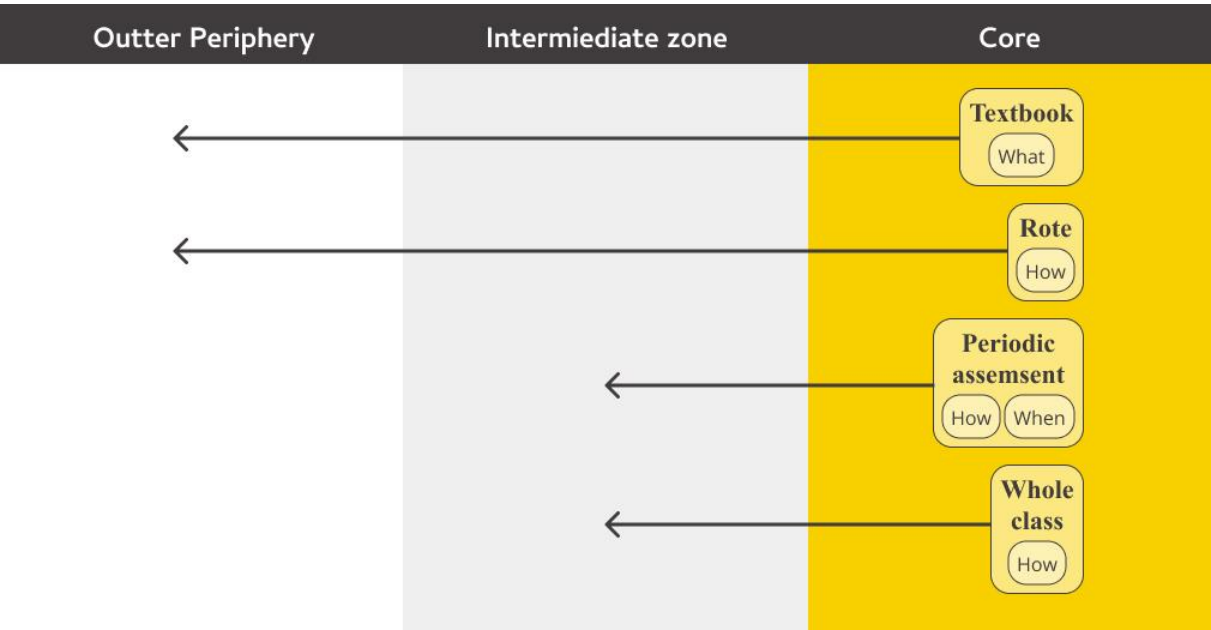
Only two elements are static in their zonal locations.

Figure 4: Static elements in status-quo and desired future state



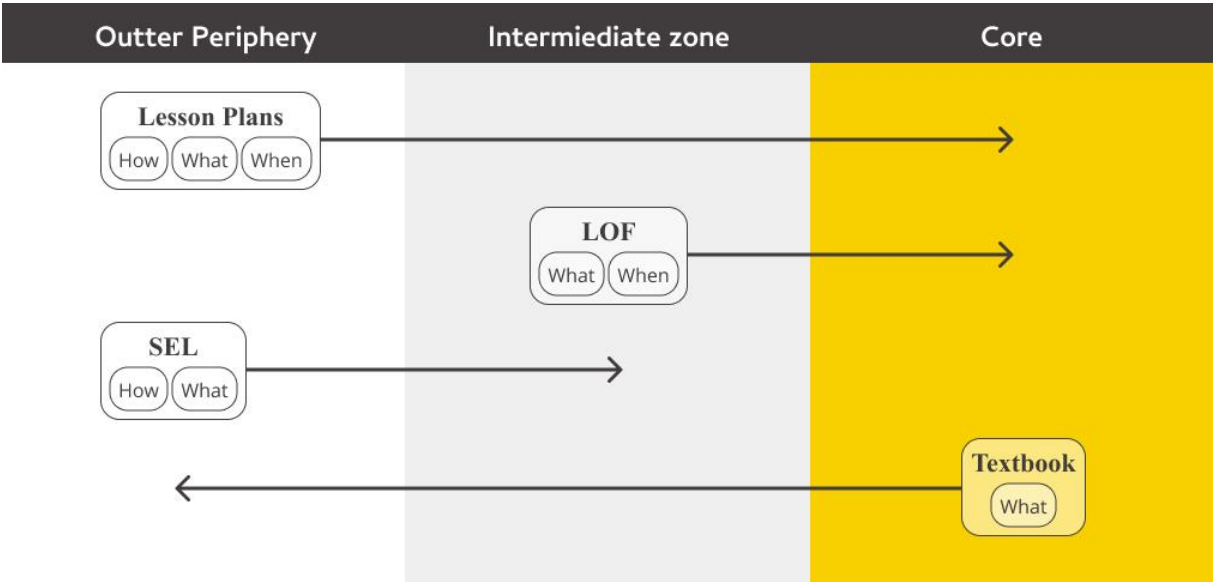
Four elements from the core are expelled out. Two of these shift to the extreme periphery while two move to the intermediate zone. Nothing from the grey zone moves out.

Figure 5: Outward movement of elements from status-quo to desired future state



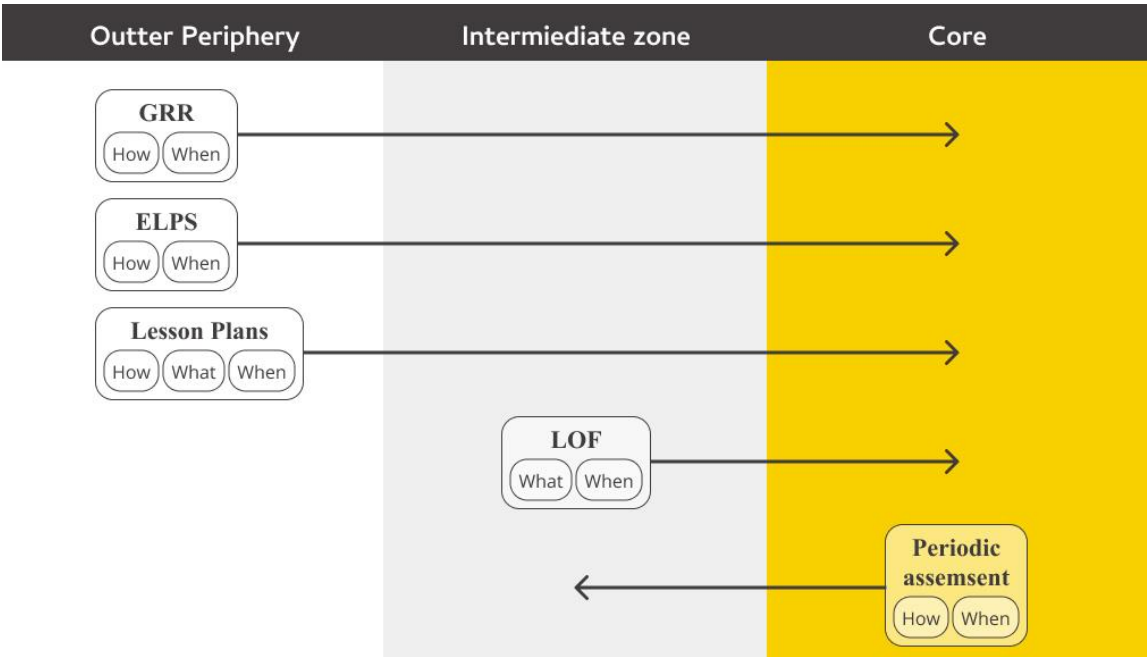
4.3 Shifts in What-How-When

Figure 6: Shifts in "What" of teaching-learning



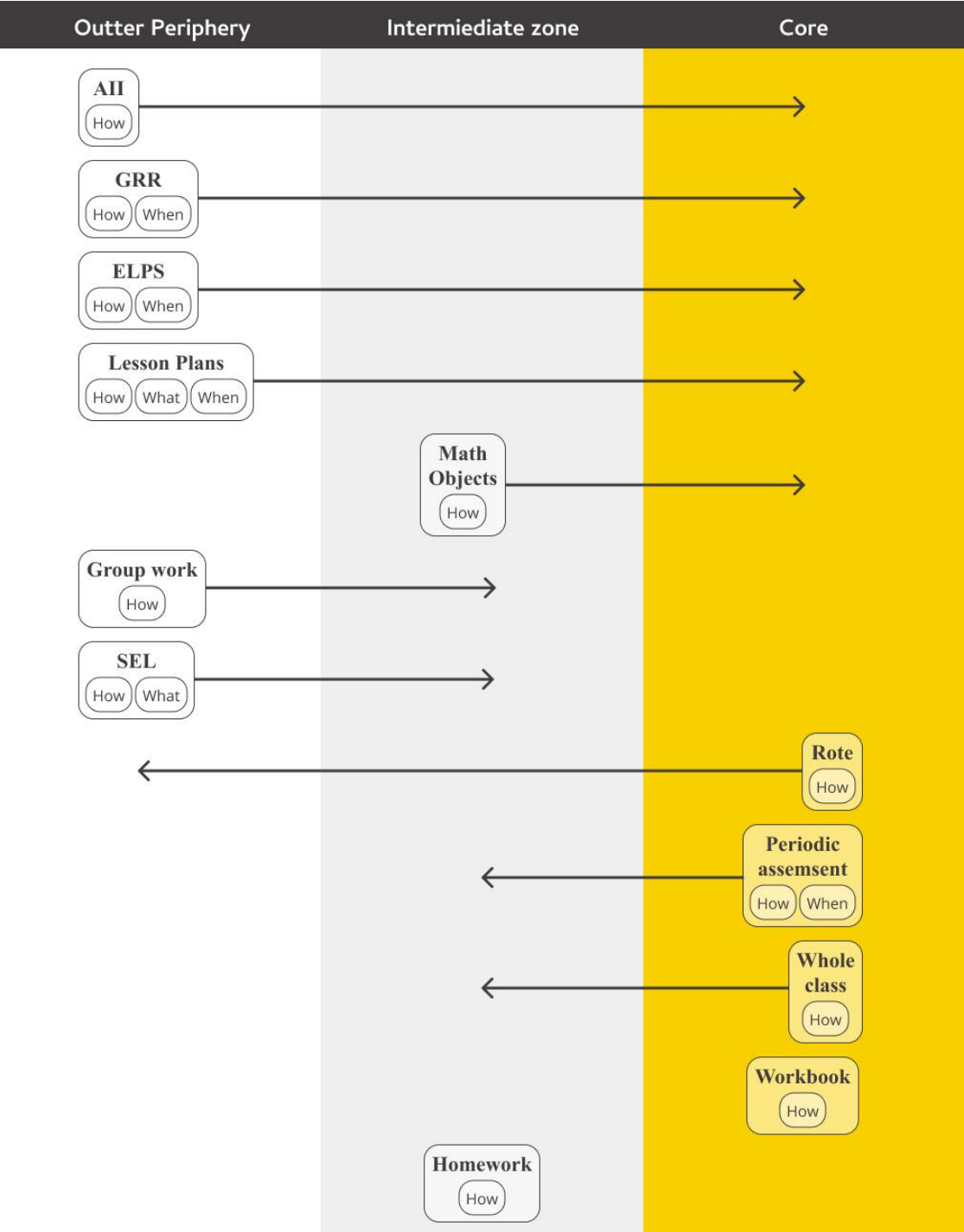
With respect to the “what” of teaching-learning, in the status-quo, only one element (textbook) was at the core. This element has been expelled to the extreme periphery in the desired future state. Two elements (lesson plans and LOF) have moved into the core. SEL moves in from the extreme periphery to the intermediate grey zone.

Figure 7: Shifts in "When" of teaching-learning



With respect to the “when” of teaching-learning, in the status-quo, only one element (periodic assessment) was at the core. This element has moved out to the intermediate grey zone. Four elements have moved into the core of “when”. Three from the extreme periphery (GRR, ELPS and Lesson Plans) and one from the intermediate zone (LOF).

Figure 8: Shifts in "How" of teaching-learning



With respect to the “how” of teaching-learning, the status-quo had four elements at its core. One of these (Rote learning) has been expelled to the outermost periphery. Two have moved into the intermediate grey zone (Periodic assessment and whole class). One element (workbook) remains at the core of “how”. Four elements (AII, GRR, ELPS and Lesson Plans) have been to the core from the extreme periphery and one element (Math Objects) has moved into the core from the intermediate grey zone. Two elements (Group work and SEL) have moved from the outermost to the intermediate zone.

Comparing the core-periphery maps of status-quo and desired future state, the change that creators of the toolkit hope to see are summarized below.

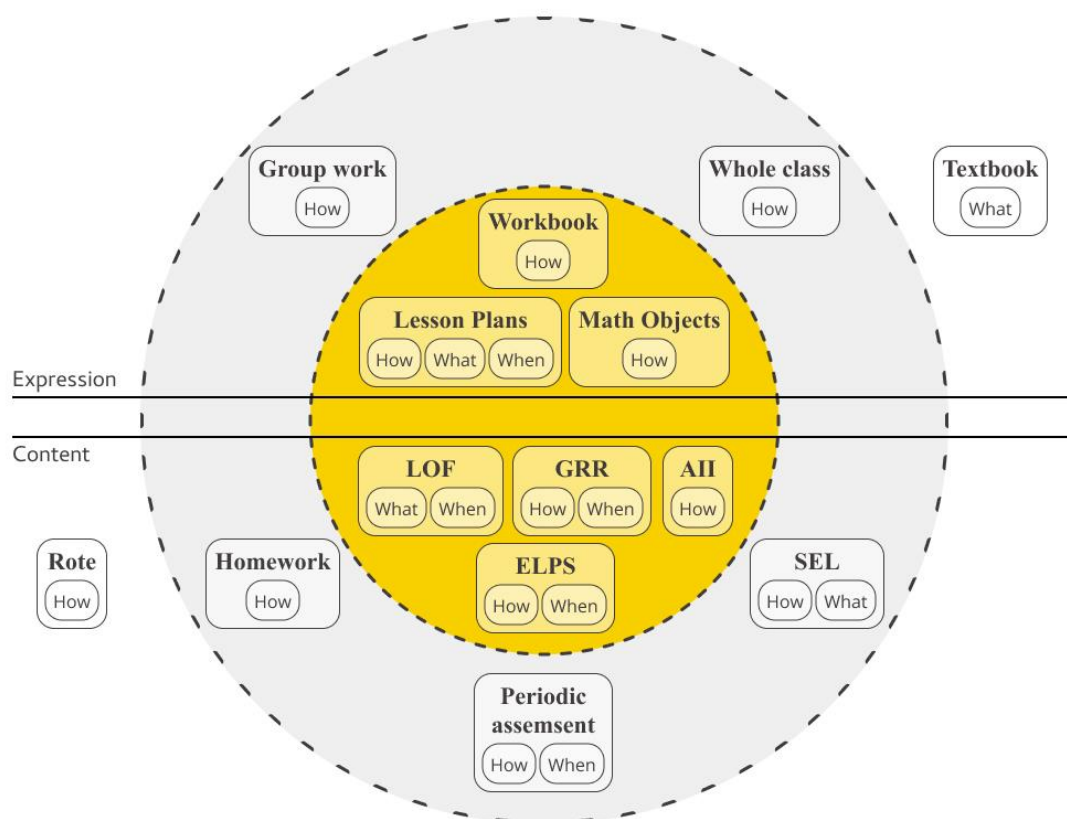
- **Additive model for change:** The change has more elements moving inward than outward. It is an additive model for change as it seeks to introduce far more than it removes.
- **Radical model for change:** The outermost zone is made-up exclusively of elements that were earlier a part of the core. Four out of seven elements in the innermost core came from the outermost zone. This movement of elements between the extremes of core and periphery and the fact that only two elements stay static make it a model for radical change.
- **Radical change in ‘What’ and ‘When’:** The earlier core of ‘what’ has been expelled to the outermost periphery while the earlier core of ‘when’ has moved to the intermediate zone. The new cores of ‘what’ and ‘when’ are made up dominantly of elements that came from the extreme periphery.
- **Complex change in ‘How’:** The change in ‘how’ is more complex. It is the only axis that retains an element (workbook) in its core. It is also the only axis that has static elements. It also has the largest number of new elements added to the core.

5 How is this change communicated in the toolkit?

Movement of elements across core-periphery was grouped as inward moving, static and outward moving in the previous chapter. The first observation is that there is no explicit communication of outward moving elements in the toolkit resources. They are neither negated, criticized, or even mentioned in any of the resources. This can be understood as communicating by absence or through silence. As a result, this chapter focuses on inward moving and static elements in the self-model for change. This is done in two sub-chapters. The first analyzes the specialized grammar of the self-model for change and the second analyses the communication of the how-what-when of teaching learning.

5.1 Specialized grammar of the self-model for change

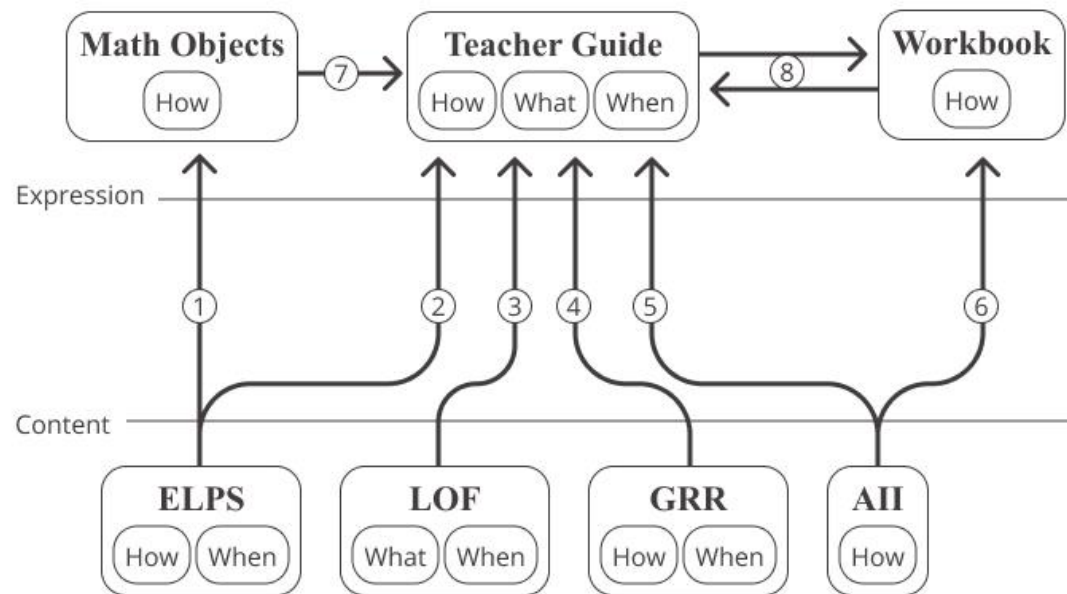
Figure 9: Content and expression planes in the self-model for change



In the figure above, elements in the self-model for change have been separated between plane of expression and plane of content. Moving forward, the analysis will focus on the seven

elements at the core of the self-model for change. The figure below maps the relations between these seven elements of the self-model. The elements on the plane of expression are the artefacts in the toolkit while those on the plane of content are pedagogical principles.

Figure 10: Content-Expression Relations at the core of the self-model for change



Pedagogical principles on the plane of content have been linked with those artefacts on the plane of expression that they are codes for the generation of. For example, AII regulates the design of both lesson plans and worksheets and has hence been linked to both. Within the plane of expression, an artefact is linked to another if it regulates the second's design. For example, set of math objects regulates the nature of activities recommended in lesson plans. Since the object set pre-dates the creation of lesson plan activities, it did not influence the objects chosen to be part of the math kit. Therefore, the link between math objects and teacher guide does not go both ways.

These relations are established using various sign-systems and collectively become the specialized grammar for the self-model of change. Each of the eight relations from Figure 10 are analyzed below. Three perspectives are used for this. The first is where and how often the relationship is established on the plane of expression. The second is whether a special repeating code is used to establish the relation. The third is, if a code exists, the sign-systems in the code that communicate the various facets of How-What-When are analyzed.

5.1.1 ELPS → Math Objects

Experience → Language → Pictures → Symbols (ELPS) is a pedagogical approach to teaching numeracy. In this approach, understanding of a concept or skill is built up in a sequence that starts by experiencing with concrete material objects and increasingly builds abstraction layers until it finally reaches mathematical symbols. The presence of an object kit which consist of 2D and 3D as a component of the toolkit as opposed to emphasizes the importance of learning through experience which is the first step of ELPS.

This relationship is established through sign-systems related to 2D and 3D objects like texture, shape, size, weight etc. which rely on visual and embodied experience of users. There is no specialized code used to communicate this relationship on the math objects kit.

5.1.2 ELPS → Teacher guide

The introductory section of every grade's teacher guide explains the ELPS principle in the upper section of one page (Figure 33). There are no special codes for ELPS used in the teacher guide. However, the influence of ELPS as a code on the teaching-learning activities in the teacher guide can be seen if we observe the sequence of LO's. For example, to teach the concept of "numbers 1 to 5", LO's progress from concrete to abstract numerals according to ELPS.

1. One to one mapping and grouping of objects
2. Quantitative understanding of numbers 1 to 5 (with concrete objects)
3. Quantitative understanding of numbers 1 to 5 (with pictures)
4. Understanding the numerals 1 to 5 and learning to write

5.1.3 LOF → Teacher guide

LOF can be thought of as a map of a learner's journey across the year with clearly marked milestones. Learning objectives are educational goals that explicitly state what student(s) will be able to do at the end of a class or course. Learning Objectives breakdown a concept into

bite-sized skills or competencies that can be learnt within a day. They guide the selection of appropriate content, design of classroom activities and instructional design. The set of all learning objectives for an academic year along with the sequence or progression that relates them is known as the Learning Objectives Framework (LOF). The learning objectives define the “What” of teaching-learning and their sequencing models the “When”.

The introductory section of every grade’s teacher guide articulates the LOF for the academic year in 4 pages (Figure 37). Each week focusses on three learning objectives. Each learning objective has associated lesson plans. The specialized grammar used to communicate the LOF combines the sign-systems of Hindi (natural language) and two visual icons.

Figure 11: Grammar for communicating LOF



The “When” aspect of LOF is communicated by a combination of icon + text. Similarly, the “What” aspect is also communicated by a combination of icon + text. These codes are used in the introductory section of teacher guides and are repeatedly used in the top band of every lesson plan page where the week number and learning objective are stated.

Figure 12: Abstraction of top meta-row in a Lesson Plan

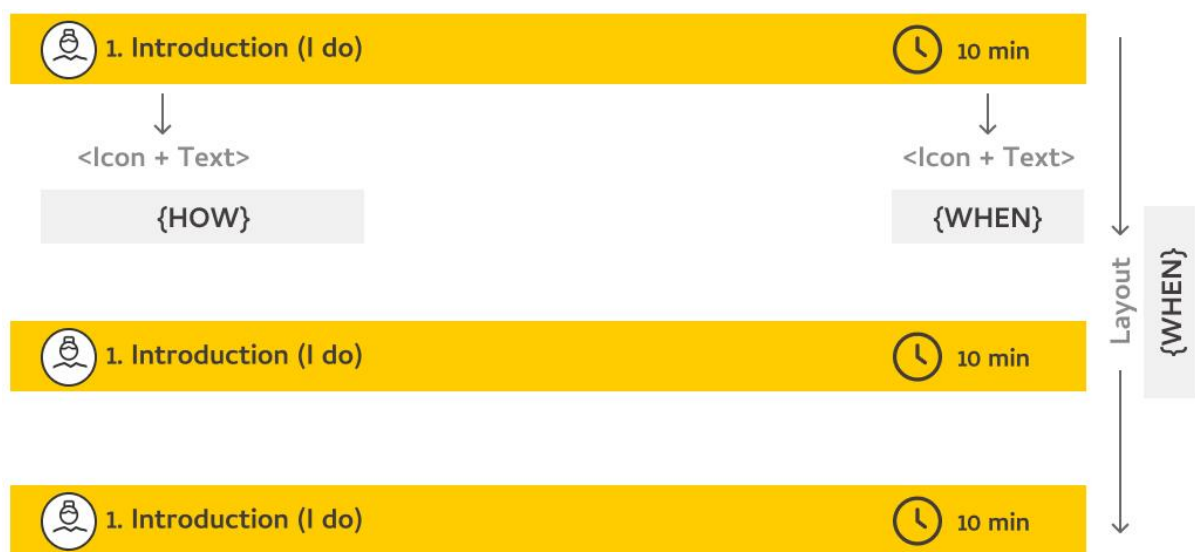


5.1.4 GRR → Teacher guide

GRR is a pedagogical principle where a learning objective is acquired in a manner where responsibility for working with it transfers from teacher to student. The learning process moves from educator led to educator-learner together to learner led. It is a principle applicable within a single classroom session and is also known as an I do – We do – You do approach.

The introductory section of the teacher guides explains the GRR principle in the lower section of one page (Figure 33). The principle is also explained in the self-descriptions of lesson plan types (Figure 41). The specialized grammar used to communicate GRR combines the sign-systems of Hindi (natural language), visual icons and page layout. These codes are used across every lesson plan page⁸.

Figure 13: Grammar for communicating GRR in a lesson plan page (Translation mine)



The element that deals with the “How” aspect of GRR is the left side of the yellow header bars which use a combination of icon + text. The “When” aspect is communicated in two ways. The first uses a combination of icon + text in the right side of yellow header bars. The second uses the sign system of page layout to vertically stack these one above another. This relies on readers’ assumption that time flows in the same direction as reading direction flows.

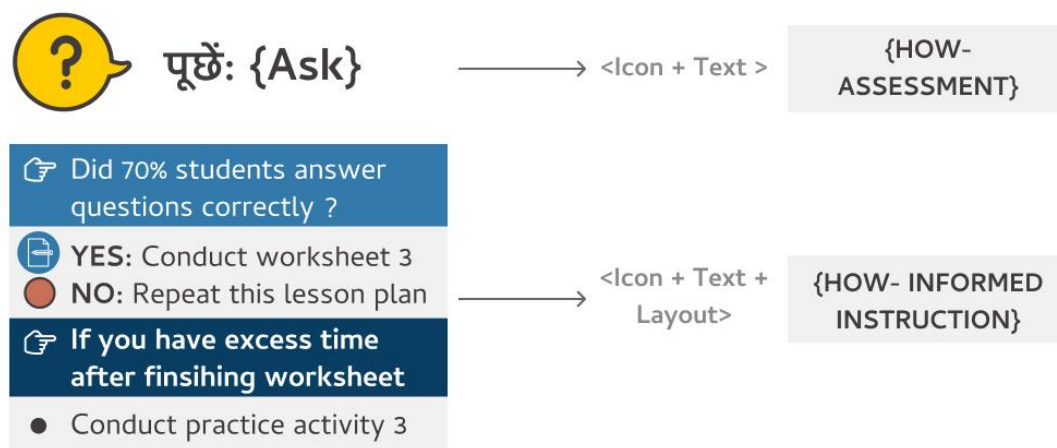
⁸ An abstracted lesson plan page design that brings out how GRR is communicated can be seen in Figure 45.

5.1.5 AII → Teacher guide

AII is a pedagogical principle where student assessment is viewed not just as an evaluation of learning but as active feedback to inform subsequent teaching. It has two components. One, an assessment technique and two, instructional decisions based on the assessment. It applies at three timescales: daily, weekly and annual. The introductory section of the teacher guide explains the AII principle at all three timescales in 3 pages (Figure 35). The concluding section of the has assessment trackers to aid weekly and annual AII (Figure 36). AII is expressed in the lesson plan pages with different codes for daily, weekly and annual AII.

For assessment, key questions for the teacher to pose are highlighted in lesson plans with an icon + text “Ask:”. The bottom right of the page has a box. It explains the decisions to be taken based on if more or less than 70% of students have answered the questions correctly. The specialized grammar used to communicate daily AII combines the sign-systems of Hindi (natural language), visual icons, page layout and color.

Figure 14: Grammar for communicating daily AII (Translations mine)

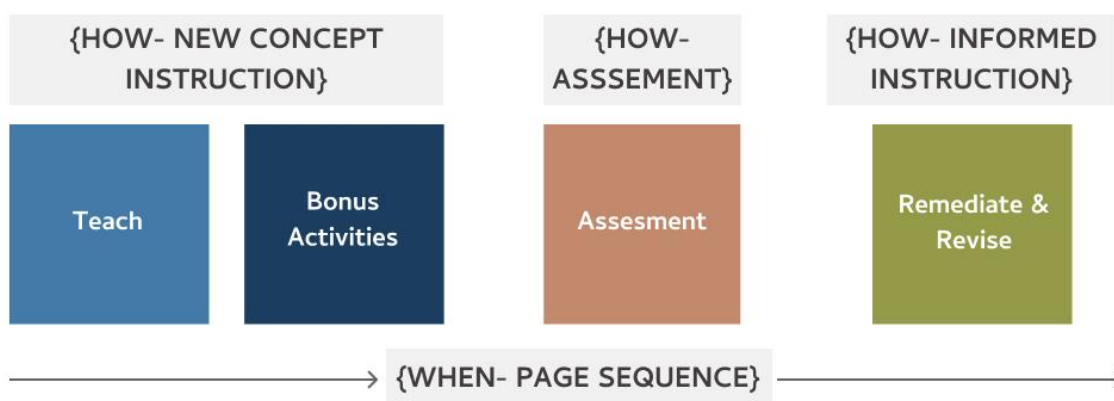


Both these elements deal with the “How” aspect of AII by using a combination of icons and text. The “When” aspect of AII is articulated in the positioning of these elements on the lesson plan page. The questions are positioned at appropriate locations in the flow of instructions while the decision block is positioned at the bottom right corner. Assuming readers go top to bottom and left to right, the bottom right maps to the end of the session.

Weekly AII is based on a weekly pedagogical routine which follows a 4+1+1 structure. The first four days of a week are for introducing new concepts while the 5th day is for assessment and the 6th day is for informed instruction (remediation/ revision). The weeks learning ends with a homework worksheet that students are asked to practice on at home.

Figure 15: Grammar for communicating weekly AII in teacher guides

Colour Coded Weekly A-i-i Routine



One week's Lesson Plans from Teacher Guide Book



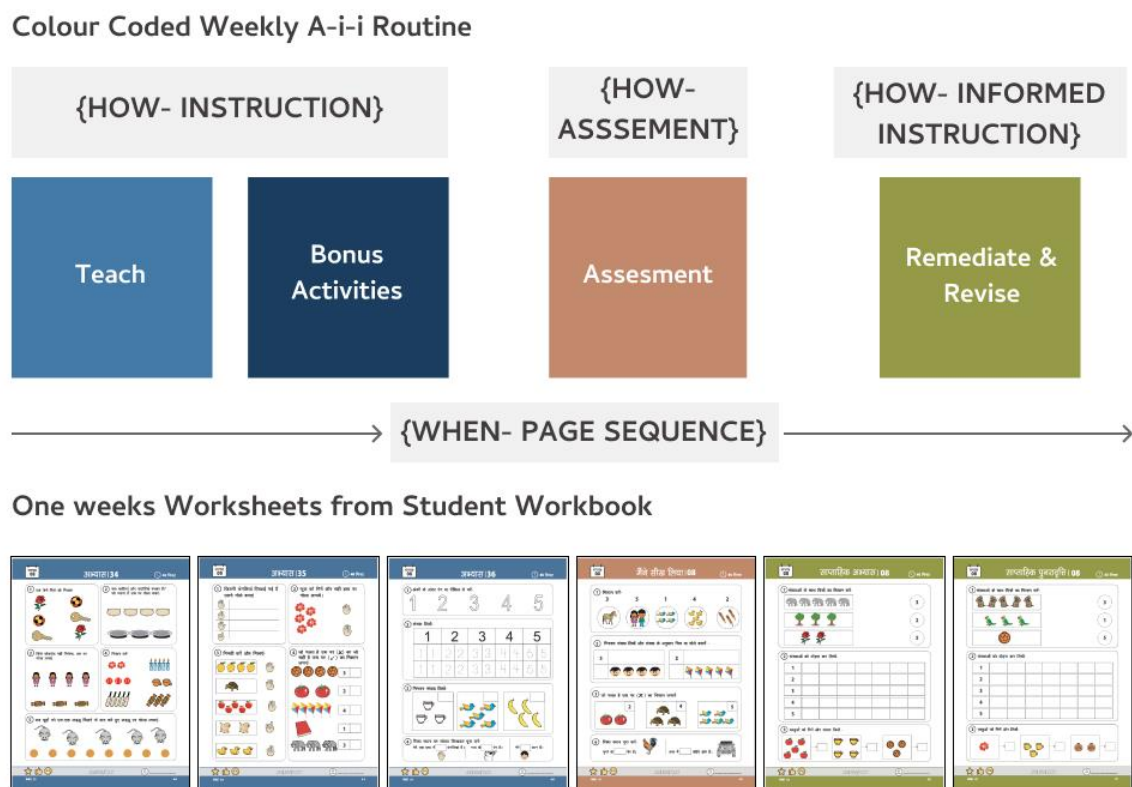
The specialized grammar to communicate this weekly routine uses color codes in combination with page sequencing. At a weekly level, the assessment component is signified with the red color for day five's lesson plan and worksheet. The green elements are the informed-instruction components that are in green color. Within the code for weekly AII, color communicates the 'How' aspect while page sequence communicates the 'When'.

Yearly AII involves assessing students twice a year in weeks 11 and 22. The purpose is to assess if students have learnt and retained concepts from the previous 10 weeks. Based on the assessment, teachers are expected to clarify misconceptions and re-teach based on need. There are no lesson plans for these weeks and only a separator page for the week (Figure 43).

5.1.6 AII → Workbook

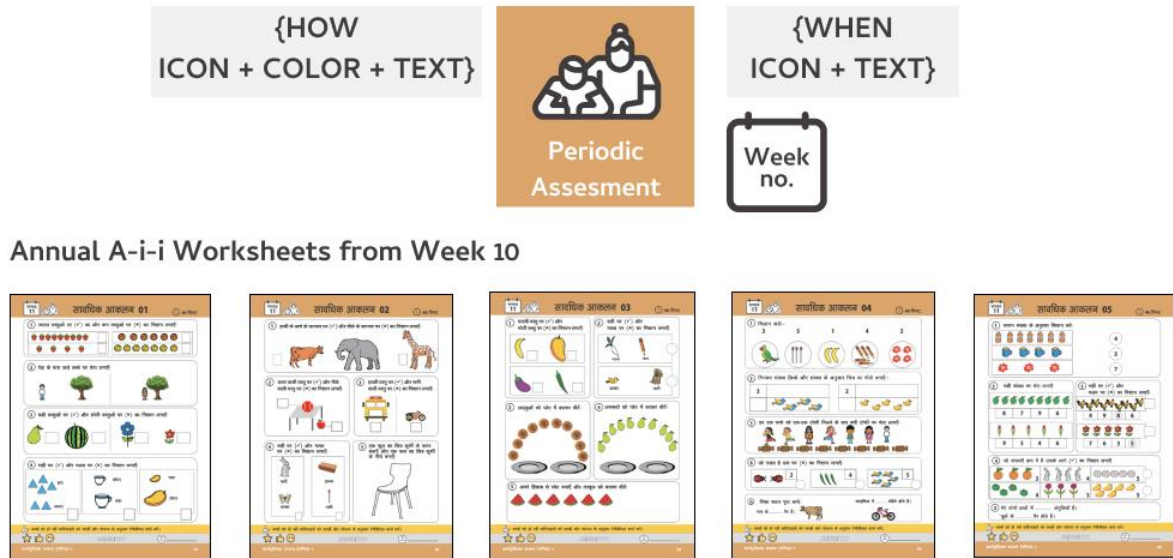
Daily AII does not rely on worksheets and is hence not expressed in workbooks. The weekly AII routine relies on usage of worksheets. The specialized grammar to communicate weekly AII in workbooks is the same as the grammar used in the teacher guides.

Figure 16: Grammar for communicating weekly AII in workbooks



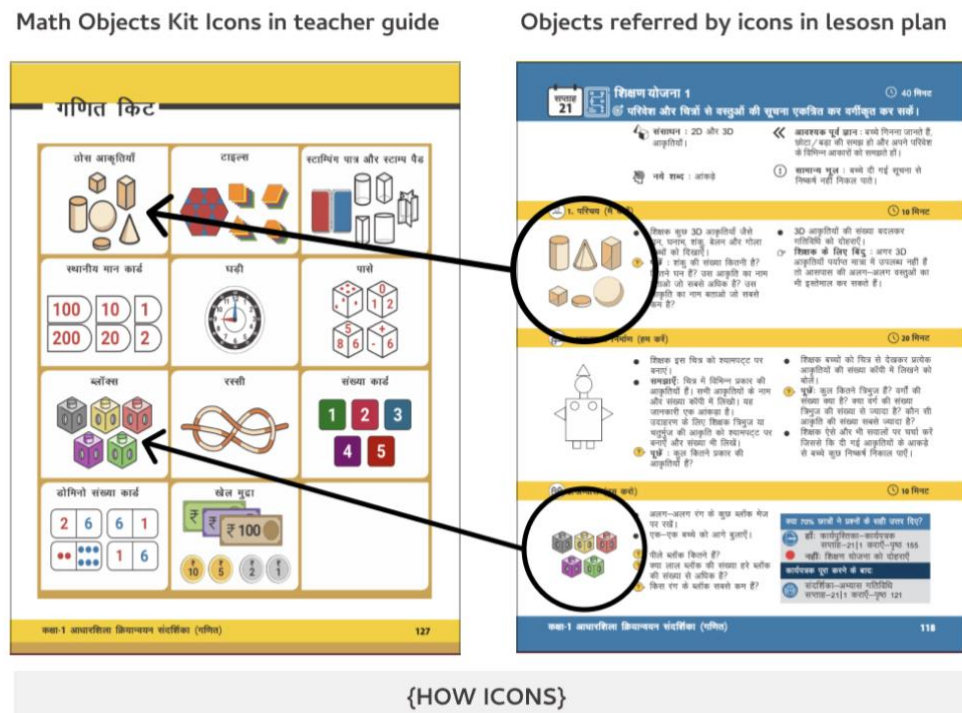
Annual AII is expressed in the workbook in the periodic assessment worksheets for weeks 11 and 22. The specialized grammar for yearly AII involves a combination of icons, color and text. Here, the how aspect is communicated through a combination of icon, text and color. The when aspect is communicated by the calendar icon with week number in text inside it.

Figure 17: Grammar for communicating annual AII in workbooks



5.1.7 Math objects → Teacher guide

Figure 18: Grammar for referencing math objects in teacher guide



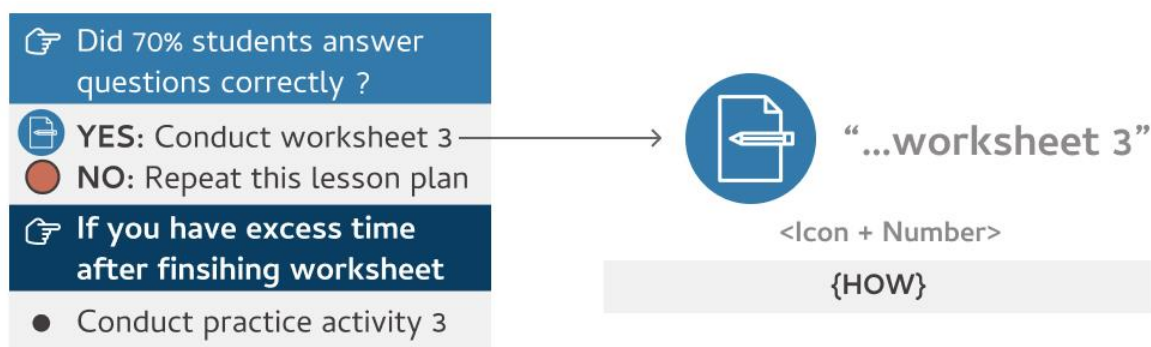
Math objects are referenced in the teacher guide in multiple places. The set is detailed in the concluding section of the teacher guide. In lesson plans, if an activity is based on objects from the kit, they are referenced by visual icons. This is the specialized grammar for referencing

math objects in the teacher guide. Math objects refer to the ‘How’ of teaching-learning and hence this grammar is used to communicate a part of ‘How’ in the teacher guide.

5.1.8 Teacher guide \leftrightarrow Workbook

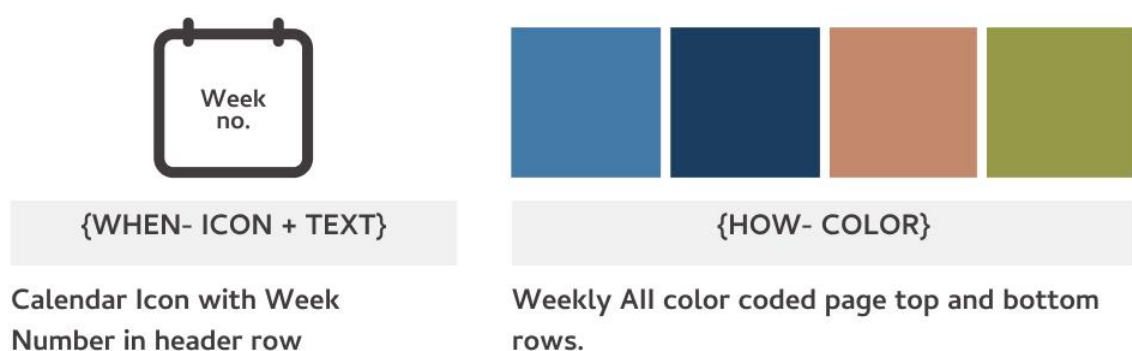
Also, the worksheet is also referenced in the lesson plans using an icon and worksheet number. This is contained within the decision block at the bottom right of a lesson plan.

Figure 19: Grammar for referencing worksheets in lesson plans.



The transmedial relationship between the teacher guides and lesson plans are setup by two elements in this specialized language. These are the icon + text that signifies the week number, and the weekly color codes. They serve dual purposes. The week icon communicates the When aspect of the Learning Objectives Framework and aids in perceiving the transmedial relationship between the teacher guide and workbook. Similarly, the weekly color codes communicate the how aspect of weekly AII and fosters the transmedial relationship.

Figure 20: Grammar that fosters transmedial links between teacher guide and workbook



Lesson plans in the teacher guide and worksheets in the workbook are coupled together by the use of two elements in both. The calendar icon with text within establishes a shared ‘When’ while the shared color theme of a lesson plan and worksheet page establish a common ‘How’.

5.2 Communicating What-How-When of teaching learning

At the level of whole, the eight relationships at the core of the self-model for change (Figure 10) together form the specialized grammar of the toolkit. The usage of various sign-systems to setup these relations can be tabulated as shown below.

Figure 21: Specialized grammar of the toolkit

Element	Teacher Guide			Workbook	Objects
	HOW	WHAT	WHEN	HOW	HOW
ELPS	No Code	--	No Code	--	No Code
LOF	--	Icon + text	Icon + text	--	--
GRR	Icon + text	--	Page layout	--	--
AII Daily	Icon + text	--	Page layout	--	--
AII Weekly	Color	--	Page sequence	Color + text	--
AII Annual	No code	--	Icon + text	Color + icon + text	--
Workbook	Icon + number	--	--	--	--
Math Objects	Icons	--	--	--	--
Teacher Guide - Workbook Transmedial Links					
	Color + text	No code	Icon + text		

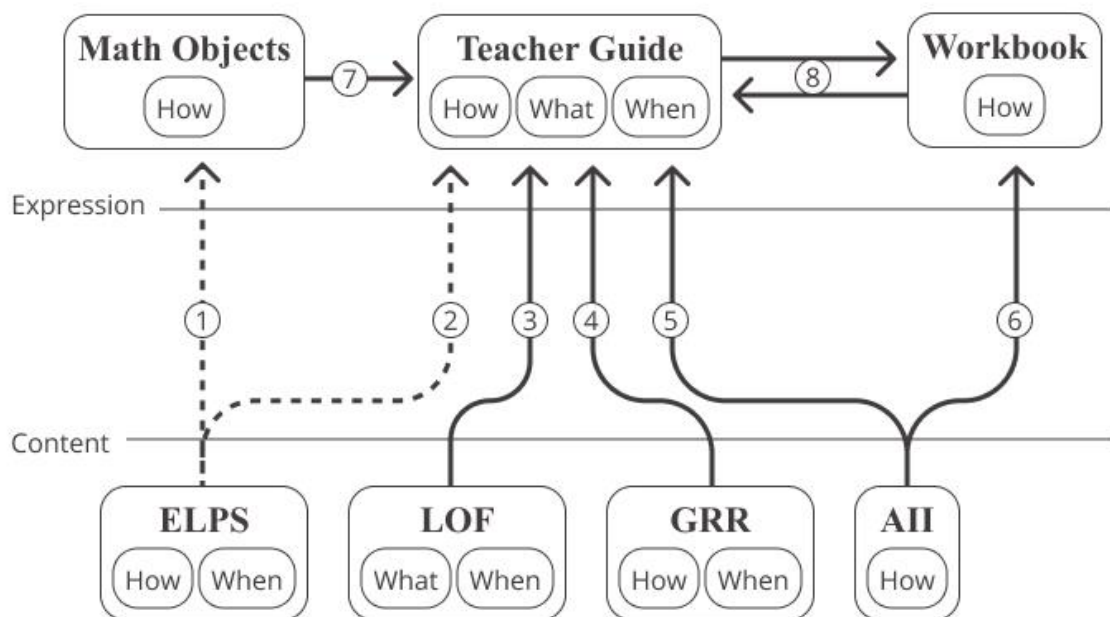
Based on the same, a few observations can be made.

1. ELPS can be seen as a covert principle as it does not have any specialized codes used to communicate it even though there are three opportunities to do so.
2. Elements that can foster transmedial perceptions are established only between the teacher guide and workbook. Also, this transmedial relation misses out on the What aspect and is established only in the How and When aspects.

3. Comparing How, What, and When, we can see that the specialized grammar of the self-model has developed mainly for the How and When aspects. To communicate When, the dominant sign system used in spatial arrangement or layout (within a page sequence of pages). The How aspect uses a more diverse set of sign systems colors, icons, and text in multiple codes.

Designers of educational interventions can choose the degree to which they make explicit the pedagogical principles they are using. In the development of this toolkit, a conscious choice was made to make the pedagogy explicit. However, all principles can't be equally explicit. Based on the techniques used to establish the eight relations at the core of the self-model for change, Figure 10 has been modified to show implicit relations with dashed lines.

Figure 22: Explicit and implicit relations at the core of the self-model for change



Three observations can be made based on the same.

1. The teacher guide is the integrating element of the toolkit. This is because all elements from the plane of content and expression are linked to it.
2. ELPS and AII are the elements from the plane of content that are expressed in more than one object on the plane of expression. This gives AII an integrative function between the

teacher guide and workbook. ELPS has a similar role of integrating the teacher guide with math objects. However, none of its relations are explicit.

3. From the lens of 'How-What-When' of teaching learning, the three are constructed by different kinds of relations between plane of content and plane of expression. What is constructed by a one (LOF) to one (teacher guide) relation. When is constructed by many (ELPS, LOF and GRR) to one (teacher guide) relation and, How by a many (ELPS, GRR, AII) to many (math objects, teacher guide and workbook) relation.

6 How do teachers react to the changes when they first encounter the toolkit?

Chapter 4 mapped the self-model for change and chapter 5 elaborated on the polyglottic codes that form the self-grammar of the core of the self-model. This chapter has two sub-chapters. The first focusses on the dynamics of recognition as observed in the focus group discussions conducted with teachers. The second sub-chapter focuses on the reasons for accepting and/or rejecting changes as observed in the focus group discussions.

6.1 Recognizing change

The focus group discussions were analyzed to understand the dynamics of recognition in each of the 8 relationships at the core of the self-model (Figure 10). Here, recognition implies recognition as intended by the creators of the toolkit.

6.1.1 ELPS → Math Objects

In the 15min given for exploring the toolkit, teachers in all groups did not spend anytime going exploring or going through the math kit. In-fact, the existing math kit in the classroom that had been received around a year back was still sealed and stored as received. In the discussions that followed, there was no comment, question or discussion relating ELPS and the math objects. Based on this, we can say that recognition of ELPS by the groups could not be observed. Given the covert nature of this principle, this is not surprising.

6.1.2 ELPS → Teacher guide

During the 15min given for exploring the toolkit, teachers in all groups spent between 5 and 10 seconds on the related pages in the introductory meta-layer of that detail ELPS. Teachers glanced at the page but did not spend enough time to read the explanation of ELPS in detail. During the discussions that followed, there was no instance of any comment or question

related to ELPS. Based on this, we can say that recognition of ELPS by the groups could not be observed. Given the covert nature of this principle, this is not surprising.

6.1.3 LOF → Teacher guide

In the 15min given for exploring the toolkit, all teachers dwelled on the related pages in the introductory meta-layer of the teacher guidebook (Figure 37) for 2-5 minutes. Some teachers flipped back and forth between these pages and lesson plans. Some compared these pages against the index pages of the textbook they currently use.

There were 37 instances of participants directly referring to learning objectives during the group discussions. In 18 of these, participants used either the week terminology in speech and/or tapping/ circling the week icon + text with their fingers. In 11 instances, participants pointed/ circled the objectives icon. In 12 instances, participants circled the top left of a lesson plan and stroked their finger under the LO text. There was no instance of a participant identifying a different icon, element or region on the page as referring to the LO. Based on this, we can say that both the codes associated with the principle of Learning Objectives Framework were recognized by the groups as intended.

6.1.4 GRR → Teacher guide

In the 15min given for exploring the toolkit, teachers in all groups spent between 5 and 10 seconds on the page in Figure 33 and 2 minutes on the pages in Figure 40 of the introductory meta-layer of the teacher-guide. In addition to this, teachers spent between 4 and 10 minutes on various lesson plan pages. The lesson plan pages have multiple principles articulated on each page and hence, this duration cannot be attributed to GRR alone.

During the discussions that followed, 13 instances of participants directly referring to gradual release of responsibility were observed. In all 13 instances, participants used the terminology of ‘I do, We do, You do’ to refer to the principle. In 7, this was accompanied by participants using their fingers to underline the text in the left of the header bars on lesson plan pages. In 5 instances, participants tapped the three header bars in quick succession from top to bottom.

There were no instance of participants talking about or pointing to the time in the right of the header bar. There were also no instances of participants referring to the introductory page during the discussions.

There was one alternate terminology participants used when discussion GRR. This was the terminology of “First activity, second activity and third activity”. It is interesting to note that while this terminology touches on the ‘When’ aspect of GRR, it does not capture the ‘How’. There was no instance of a participant identifying a different icon, element or region on the page as referring to GRR. Based on this, we can say that the grammar associated to GRR was recognized in the groups in varying degrees. The text component of “How” was recognized as intended while it is inconclusive if icon in “How” was recognized as intended. With respect to “When”, page layout was recognized as intended.

6.1.5 AII → Teacher guide

In the 15min given for exploring the toolkit, teachers dwelled on the AII related pages in the introductory section of the teacher-guide (Figure 35) for less than 30 seconds. Teachers of one focus group spent around 5 seconds glancing at the weekly assessments’ tracker pages (Figure 36) in the ending section of the teacher-guide. The remaining focus groups did not look at these pages. In addition to this, teachers spent 4 to 10 minutes on various lesson plan pages. The lesson plan pages have multiple principles articulated on each page and hence, this duration cannot be attributed to AII alone.

In the discussions that followed, 19 instances of participants directly referring to daily AII were observed. Of these, 12 were accompanied by teachers using their fingers to circle or tap the decision block (Figure 14). In 4 instances, participants used their fingers to point to the yellow question icon on the lesson plan page. There was no instance of a participant identifying a different icon, element or region on the page as referring to the daily AII.

The discussions also had a total of 23 instances of participants directly referring to weekly AII. Of these, in 6 participants opened corresponding lesson plan and worksheet pages side-by-side during discussions. In 2 instances, participants used the terminology of phases as

specified in the introductory pages. In 21 instances, the terminology of color names was used to refer to different phases of weekly AII. There was no instance of a participants using any other terminology or alternate colors to refer to phases of weekly AII. Based on this we can say that the codes for AII at both daily and weekly level were recognized as intended by the toolkit creators.

6.1.6 AII → Workbook

In the 15min given for exploring the toolkit, teachers dwelled on the AII related pages in the introductory section of the workbook (Figure 48) for less than 30 seconds. Groups spent 3-5 minutes looking at various worksheets in the student workbook. In the discussions that followed, 11 instances of participants referring to weekly AII in relation to worksheets were observed. Of these, 7 were accompanied by teachers using the terminology of colors (“blue day”, “red day”, “green day” etc.) to refer to the weekly routine. In 3 instances, participants used their fingers to group a set of one week’s worksheets.

With respect to annual AII, the color code was recognized in 5 instances. However, in all of instances naming the color was challenging for participants. A mix of color names including saffron, orange and reddish were used. The icon associated with worksheets for annual AII was not mentioned or pointed to during the discussion. There was no instance of a participant identifying a different color as referring to the weekly or yearly AII. Based on this, we can say that the codes for weekly AII were recognized as intended while codes for annual AII were partially recognized.

6.1.7 Math objects → Teacher guide

In the 15min given for exploring the toolkit, none of the groups looked at the page on math objects in the teacher guide (Figure 47). In addition to this, teachers spent 4 to 10 minutes on various lesson plan pages, some of which had references to math objects. In the discussions that followed, math objects were referred to in 9 instances. Eight of these were accompanied by participants pointing with their fingers to icons in the lesson plan. There was no instance of a participant identifying a different icon or illustration as referring to any of the objects. Based

on this, we can say that the codes for referring to math objects in the teacher guide were recognized by the groups as intended by the creators.

6.1.8 Teacher guide \leftrightarrow Workbook

In the 15min given for exploring the toolkit, groups spent around 2 minutes on the pages in Figure 40 of the introductory section of the teacher-guide. These pages explain the correspondence of lesson plans and worksheets. Also, groups spent 4-10 minutes on lesson plans in the teacher guide and 3-5 minutes looking at worksheets in the student workbook.

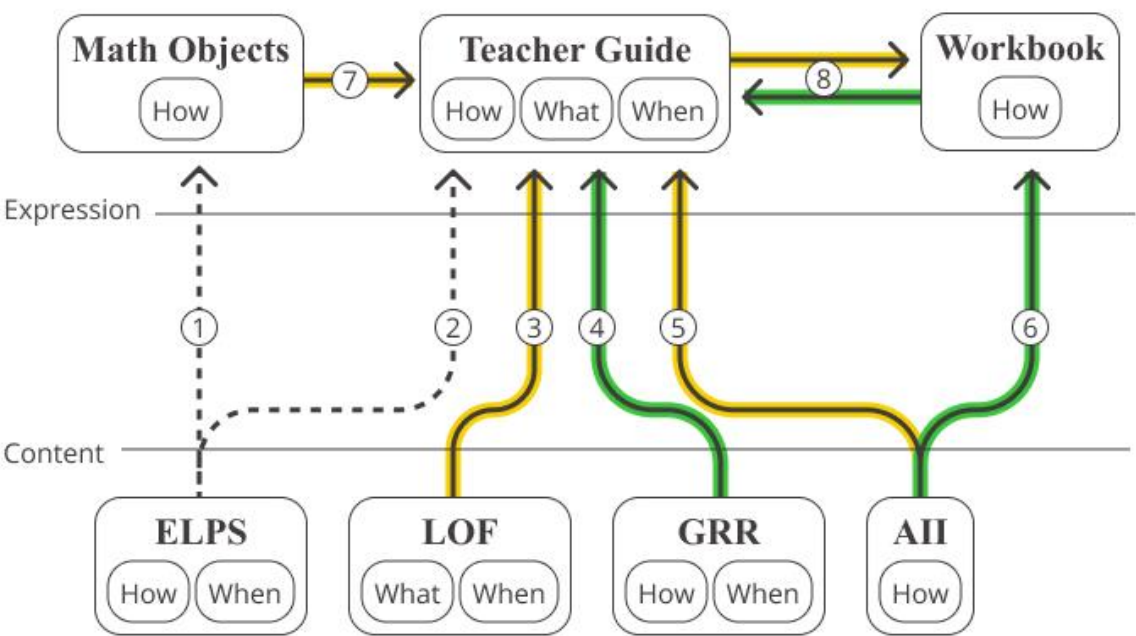
In the discussions that followed, there were 23 instances where the relationship between lesson plans and worksheets came up. In 11 of these, corresponding lesson plans and worksheets were opened side by side and placed next to each other. In 12 instances, participants tapped the week icon + text on the lesson plan and worksheet one after the other to indicate correspondence. In 15 instances, the correspondence was labelled by shared color codes (“red lesson plan and red worksheet”, “green plan with green sheet” etc.). In 4 of these, the week number was used along with the color name to indicate correspondence (“week 6 blue plan and worksheet”). There was no instance of the worksheet icon + number used to refer to the worksheets in the lesson plan being tapped or mentioned. Based on this, we can say that the codes that establish transmedial relations between the teacher guide and workbook (Figure 20) were recognized. However, recognition of the codes used to refer to the workbook in the teacher guide (Figure 19) was not observed.

These observations can be used to add recognition dynamics to Figure 21 from the previous chapter. Yellow colored cells are codes that were recognized, green cells are codes that were partially recognized or mis-recognized. The same can be done with Figure 22 to analyze recognition of the self-model for change.

Figure 23: Recognition of self- grammar of the toolkit

	Teacher Guide			Workbook	Objects
Element	HOW	WHAT	WHEN	HOW	HOW
ELPS	No Code	--	No Code	--	No Code
LOF	--	Icon + text	Icon + text	--	--
GRR	Icon + text	--	Page layout	--	--
AII Daily	Icon + text	--	Page layout	--	--
AII Weekly	Color	--	Page sequence	Color + text	--
AII Annual	No code	--	Icon + text	Color + icon + text	--
Workbook	Icon + number	--	--	--	--
Math Objects	Icons	--	--	--	--
Teacher Guide - Workbook Transmedial Links					
	Color + text	No code	Icon + text		

Figure 24: Recognition of content-expression relations at the core of the self-model



Some observations based on the above follow.

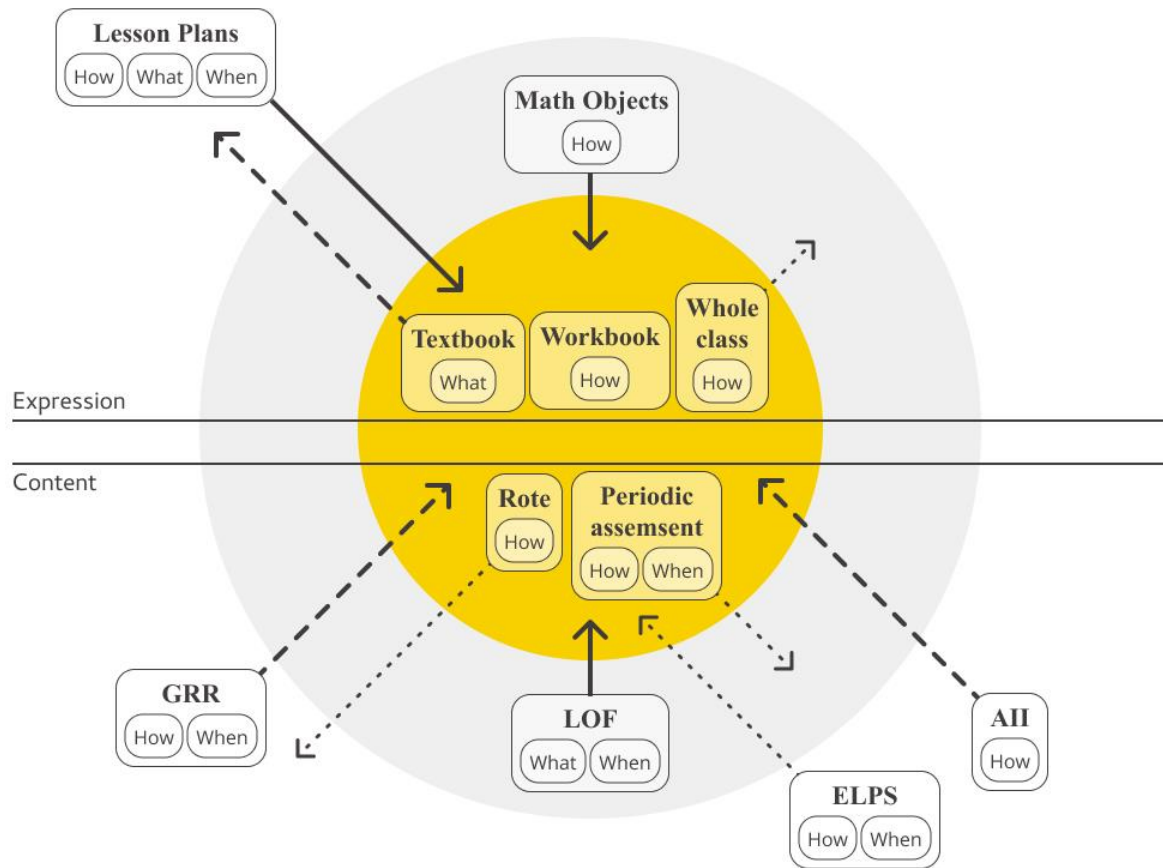
1. At the level of whole, of the 8 relations in the self-model for change, four are recognized quite strongly, three are partially recognized and the two implicit relations were not recognized.
2. From the plane of content LOF, daily AII and weekly AII were recognized most clearly. GRR and annual AII were only partially recognized. Recognition of ELPS which has no codes in specialized grammar was not observed.
3. The code to reference worksheets in the lesson plan was not recognized. However, this did not hinder participants from matching corresponding lesson plans with worksheets as the transmedial codes were well recognized.
4. All codes associated with the What and When of teaching-learning were recognized by participants. All the three codes that were partially recognized are associated with the How of teaching-learning.
5. Codes for pedagogical principles that used the sign-systems of color, text and layout (within a page and sequencing of pages) were recognized successfully while codes that relied on the use of visual icons were had mixed results. Some were recognized while others were partially or mis-recognized.
6. The three codes that were partially recognized use visual icons and are associated to the How of teaching learning. How has 5 codes associated with it that use visual icons. In contrast, What and When have only one visual icon each in their associated codes.

Participants' recognition and partial recognition of codes of the self-grammar shapes their understanding of the self-model for change. Some changes are perceived fully, some partially and some are missed out. Once perceived, participants compare their understanding of the self-model with the status-quo. In the figure below, the core-periphery map of the status-quo (Figure 1) has been modified to account for participants' perception of changes to status-quo that the toolkit recommends. Modifications made are based on the following:

1. Elements that were not recognized have been removed as have elements that do not belong to the cores of either status-quo or the self-model for change.
2. Remaining elements have been split between the planes of content and expression.
3. Arrows have been used to indicate the direction of shifts the self-model for change recommends. Solid lines indicate shifts that were recognized. Dashed lines

indicate shifts that were partially recognized or mis-recognized. Dotted lines indicate shifts that were not recognized.

Figure 25: Participants' perceptions of changes to status-quo that the toolkit proposes



Some observations based on the figure above follow.

1. None of the outward shifts at the core of the self-model for change were fully recognized. The expelling of whole classwork, periodic assessment and rote learning was not recognized. Chapter 5 observed that expelling of elements is communicated by absence or through silence. This could be one of the factors contributing to ineffective recognition. However, this is not the case with the outward movement of the textbook. This shift too is communicated by silence but was partially recognized.
2. The only inward moving shift that was not recognized is ELPS. Its covert nature in the self-model due to lack of codes in the specialized grammar contributes to this.
3. On the plane of expression, inclusion (teacher guide and math objects) and retention (workbook) of elements in the core is recognized successfully. In contrast, in the core of the plane of content, the inclusion of only one element (LOF) is recognized

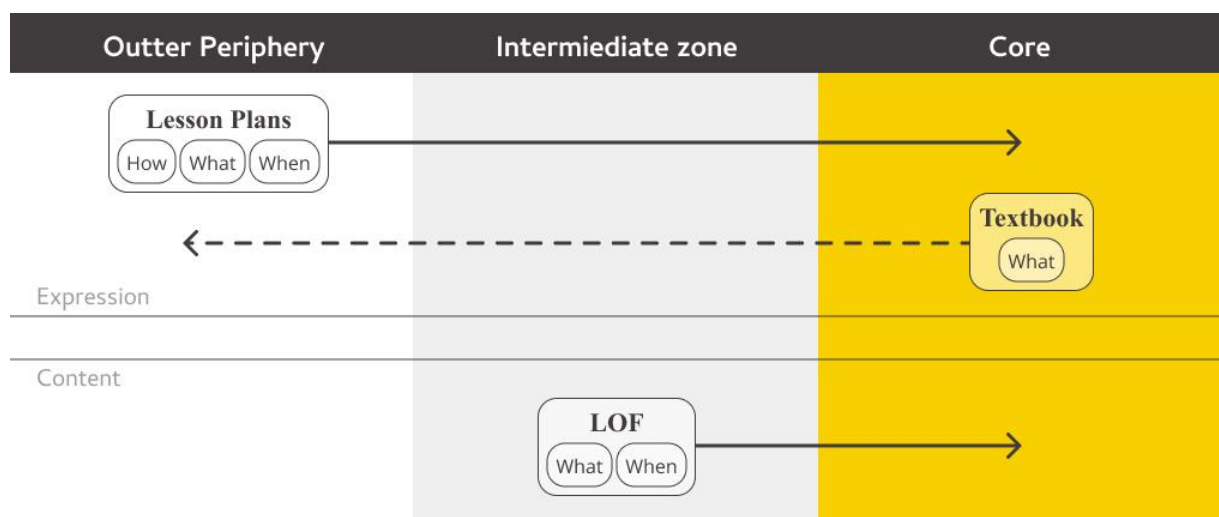
successfully while the inclusion of two (GRR and AII) is partially recognized and one (ELPS) is not recognized. Since participants had only about an hour of exploring and thinking about the toolkit, it is not surprising that changes on the plane of expression were more fully recognized and understood as compared to those on the plane of content.

6.2 Accepting-resisting change

During the focus group discussions, the tensions of accepting and resisting various facets of the perceived change were visible in many ways. There were a few instances of statements explicitly for or against an aspect of the toolkit. More often, the tensions were visible in the questions raised, clarifications sought, criticisms, hopes and fears of the groups. A collated list of affirmation and concerns that came up in the focus groups can be found in appendix 5. Analysis of four most prominent tensions follows below. These tensions exist within the group as a whole and need not reside in every participant equally.

Isomorphism of before-after (status-quo vs. future state): What of teaching learning

Figure 26: Participants' perception of change in 'What'



Teachers experienced a strong tension between the textbook and lesson plans. This was the strongest point of resistance to the toolkit. Textbook and lesson plans were understood as an

either-or choice, almost as-if they are in opposition to each other. Their relationship is perceived to be one of conflict due to four factors:

1. **Opposition due to replacement:** The desired change switches the core element on the plane of expression related to ‘What’ of teaching-learning.
2. **Opposition due to ambiguity:** The relationship of the textbook with the lesson plans is not articulated anywhere. This relates to silence being the technique to communicate expelling of elements.
3. **Opposition due to difference:** While LOF operates on the plane of content, it is expressed in the teacher guide and lesson plans. Its codes were also recognized quite clearly. The participants compared the learning objectives with the textbook syllabus and found that they were different. Cumulatively, the lesson plans covered lesser concepts than the textbook.
4. **Opposition to prescription⁹:** Lesson plans for daily teaching when perceived as being prescriptive were experienced by teachers as impinging on their freedom to teach. This was also experienced as disrespectful to their own expertise and experience¹⁰.

Acceptance to the change while not as strong as the resistance came from the perception that the toolkit could simplify would help in planning their teaching and ensuring the years learning goals are met. The factors contributing to this acceptance are:

1. **Receptiveness to gradual change:** Unlike lesson plans which the self-model tries to include from the outermost periphery, LOF is brought into the core from the intermediate zone. Participants were vaguely familiar with it and willing to make it a more central part of their teaching. As compared to previous years’ LOF, this year it was broken down into daily learning goals was key reason for this.
2. **Receptiveness to discretion:** Lesson plans when perceived as idea banks for teaching that could be used by teachers on their own discretion were appreciated.

⁹ Teacher’s perceived the toolkit in different ways on a spectrum of prescriptive to suggestive leading to differences in acceptance and resistance to adopting the toolkit.

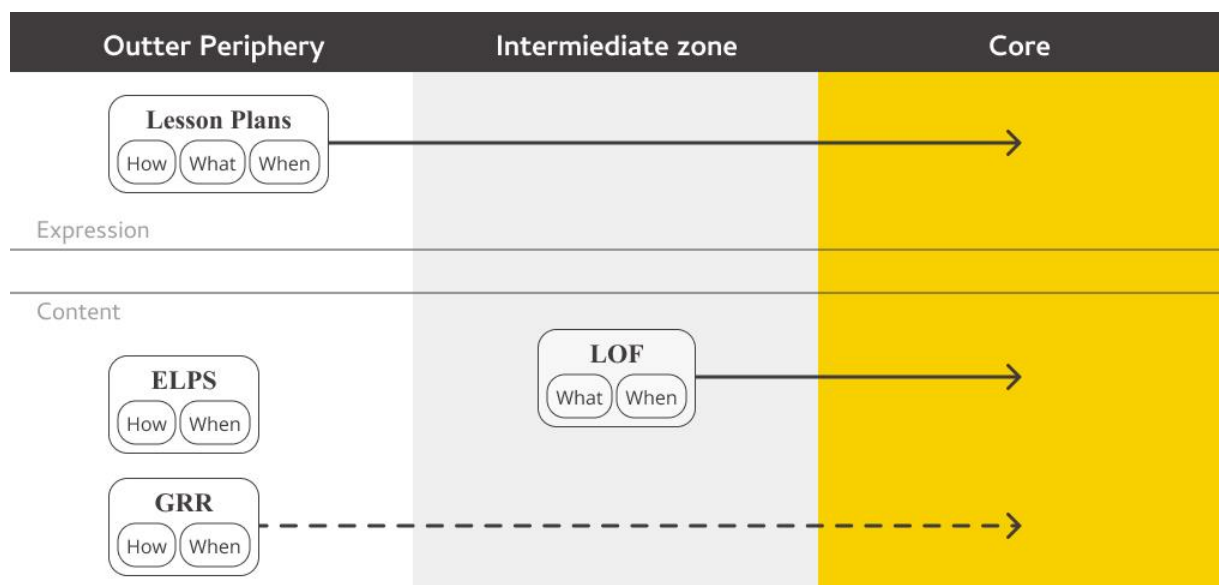
¹⁰ Becoming a government school teacher is a highly competitive and involves multiple competitive exams like TET and Super TET after completing a B.Ed degree. Teaching aspirants often prepare for multiple years before being recruited as public-school teachers.

This was experienced as an acknowledgement of the complexity of their work and an attempt to simplify their lives. This is due to the next point.

3. **Receptiveness to integration:** Teachers have a variety of teaching-learning materials available to them. However, deciding which resource to use for what concept and in what manner demands time and mental effort. Teachers' time and mental space have heavy demands. Thus, despite wanting to use multiple materials, teachers end-up relying on only the textbook. Lesson plans were perceived as tools that could change this in the future. Teachers perceived them as a single point of reference that integrates multiple resources and unlock their desire to make their classroom more engaging and dynamic.

Isomorphism of before-after (status-quo vs. future state): When of teaching learning

Figure 27: Participants' perception of change in 'When'



The tensions between acceptance and resistance to change in the When of teaching-learning has two facets to it.

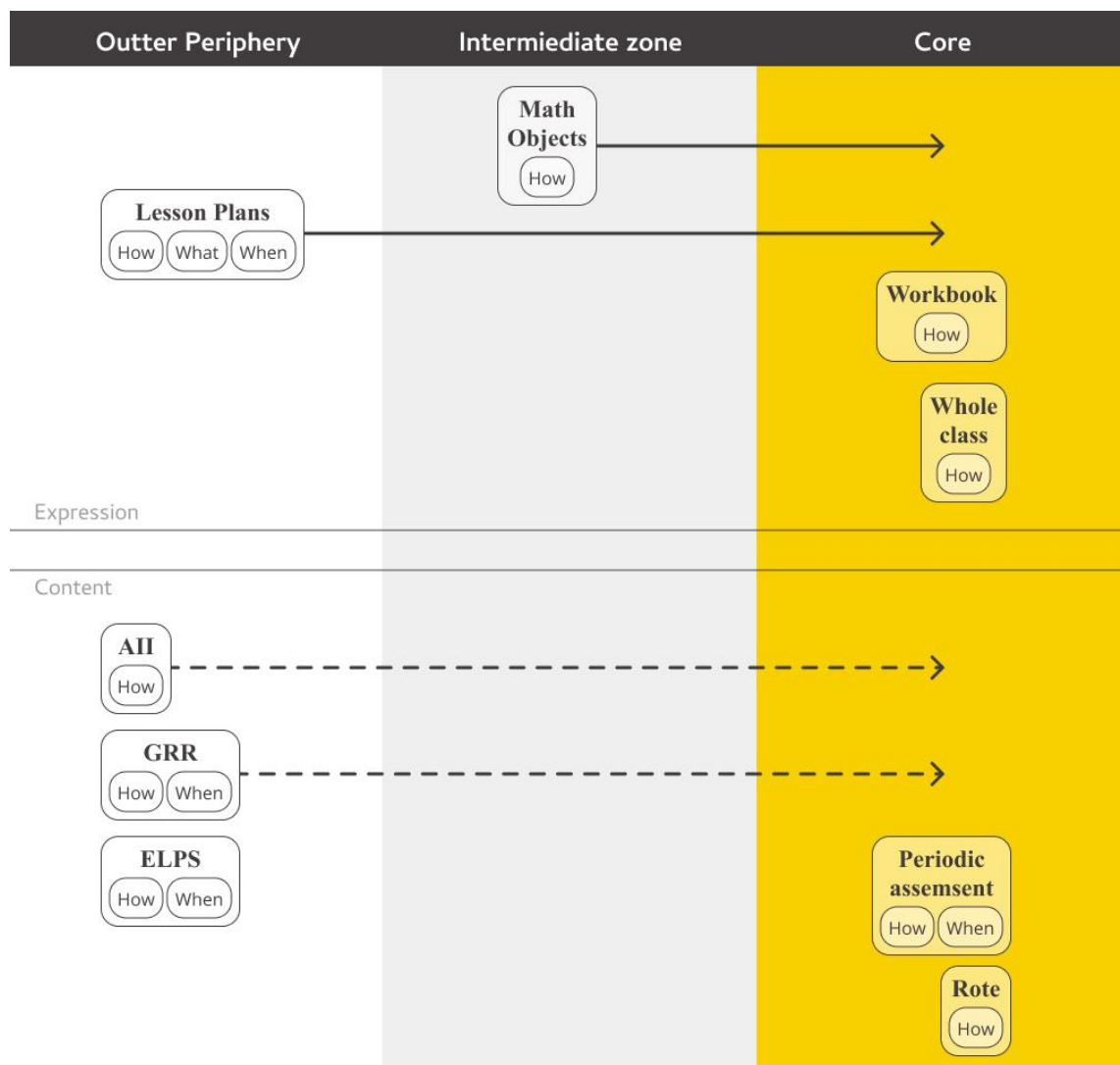
1. **Receptiveness to structure:** The core of the status-quo of when has no element to shape it. When introduction of elements to was perceived as adding some structure to this ambiguity, the toolkit was appreciated. The LOF in particular was perceived as

way to ensure learning was on track through the year as opposed to last minute rush to complete syllabus at the end of the year in the status-quo.

2. **Opposition to structure:** When the introduction of elements was perceived as an over structuring of teaching, it was met with resistance. This resistance was twofold. One is rooted in the experience of teaching weeks often being interrupted by vacations, potential lockdowns, election days etc. In such a scenario a week does not have 6 days. The design code of LOF which used a calendar icon + week number raised doubts about the suitability of such a structured system to a chaotic teaching calendar.

Isomorphism of before-after (status-quo vs. future state): How of teaching learning

Figure 28: Participants' perception of change in 'How'



The tensions of acceptance and resistance to change in the How of teaching-learning has four facets to it.

1. **Comfort with continuity:** Unlike what and when where no element in the core stays static, teachers' perceived continuity on the level of both content and expression¹¹. This was most strongly expressed in relation to the workbooks. The presence of the artefact was reassuring even though the worksheets within the artefact had been changed. Across groups, workbooks were the most popular tool that teachers could see themselves using in the classroom.
2. **Receptiveness to increased student engagement:** When groups recognized that worksheets have a lot more opportunities for student responses, they perceived workbooks as a low effort way to keep children meaningfully engaged.
3. **Opposition to demands on attention:** When the addition of 4 elements was perceived as adding too much, it was met with resistance. Teachers perceived that balancing so many pedagogical techniques would be a complex task. They feared this would demand too much of their attention while teaching thereby taking away their focus from being attentive to student learning.
4. **Opposition to confusion:** As observed in the previous chapter, all the codes that were partially recognized related to the 'How' of teaching-learning. Due to this, none of the elements added to the core on the plane of content were all recognized fully. This confusion was experienced by teachers as a source of additional chaos in their minds and the classroom.

Isomorphism of self-other (government vs. private schools): Toolkit as a whole

Government schoolteachers often perceived themselves as being in an isomorphic self-other relationship with private "convent" schools. At multiple points, the toolkit's objects and, the changes it recommends were contrasted against this "other". Teachers experience society as elevating private schools to a superiority status as compared to government schools. Features of the toolkit that heightened this sense of inferiority received more resistance from teachers.

¹¹ The self-model for change keeps only one element static (workbook) however, the expelling of whole class, periodic testing and rote learning was not recognized by focus groups.

At the level of the toolkit as a whole, tensions of acceptance-resistance were expressed by the groups when comparing the self-model against private schools. These include:

1. **Receptiveness to increased social status:** Teachers across all groups perceived that the teacher guide and workbooks were of high quality. This is rooted in print quality, paper thickness, rich use of colors and visuals in the books. Teacher felt that being seen with these books would increase the social status of government schools in comparison to private schools. This is shaped by teachers' past experiences of a marked difference in print quality and visual design of private schoolbooks vs. government schoolbooks. This was also experienced as
2. **Opposition to reduced social status:** Teachers across all groups perceived that the reduced syllabus recommended by the toolkit would reduce the social status of government schools. Teachers feared that this would be perceived by society in two ways. The first would be that government schoolteachers are not as capable as private school teachers. The second would be that smarter students should attend private schools.

Isomorphism of self-other (teachers vs. supervising officers): Toolkit as a whole

At the level of the toolkit as a whole, tensions of acceptance-resistance were expressed in relation to government officers like teacher mentors, administrators and principals. These include:

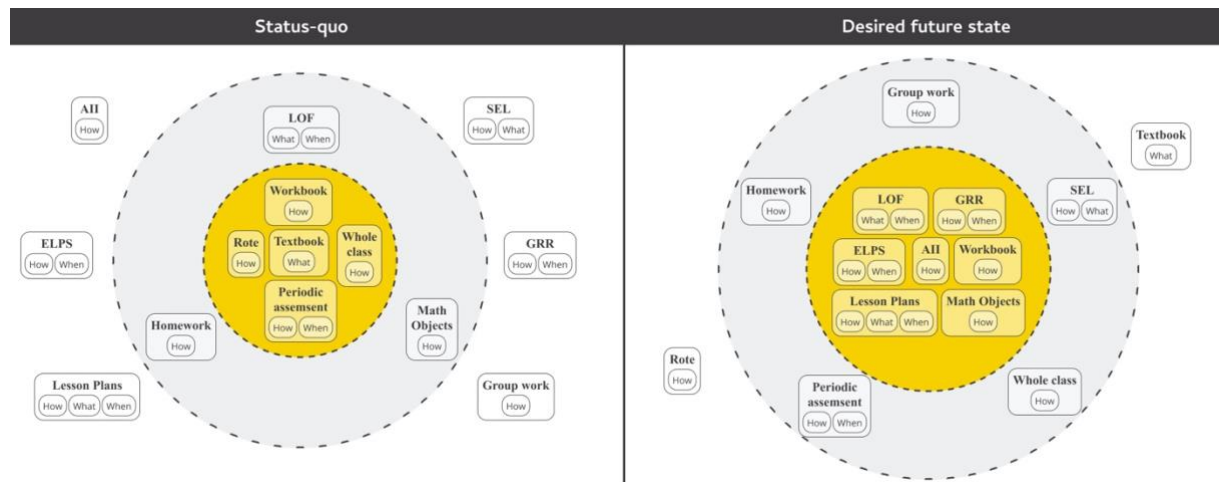
1. **Opposition to increased supervision:** Many of the fears and reservations expressed by teachers related to the impact of the self-model on how their performance would be judged by various officials with whom they exist in a power dynamic with. When the toolkit was perceived as giving supervisors far more factors to judge teachers on, it was met with strong resistance.
2. **Receptiveness to having responses:** On the other hand, when the toolkit was perceived as equipping teachers with the right answers to give supervisors, its acceptance increased.

7 Conclusions

7.1 Summary of results

How is Mission Prerna trying to change teachers' practice?

Figure 29: Core-periphery maps of status-quo and desired future state



By comparing the core-periphery maps of status-quo and desired future state, the change that creators of the toolkit hope to see was analyzed. Key results of the comparative analysis are summarized below.

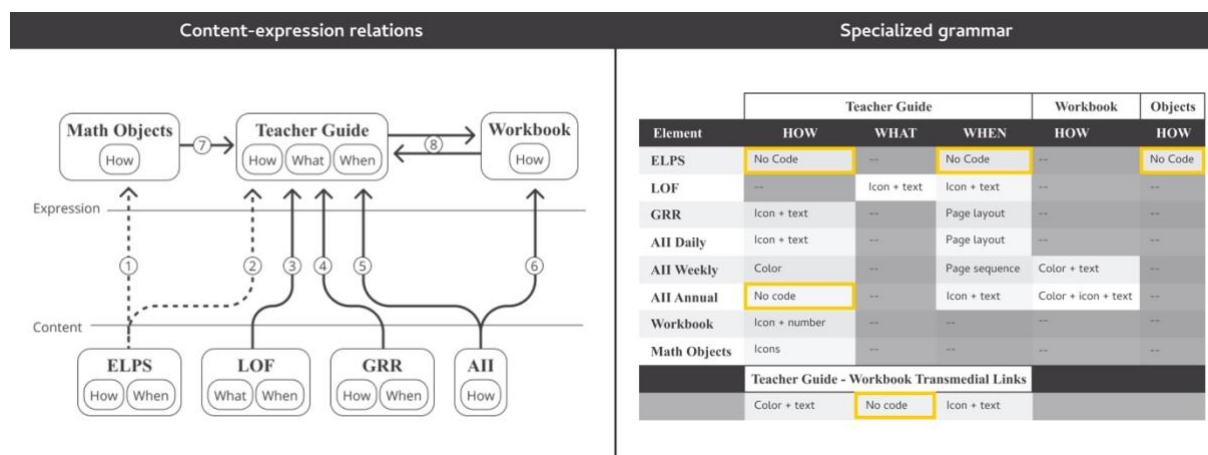
- **Additive model for change:** The change has more elements moving inward than outward. It is an additive model for change as it seeks to introduce far more than it removes.
- **Radical model for change:** The outermost zone is made-up exclusively of elements that were earlier a part of the core. Four out of seven elements in the innermost core came from the outermost zone. This movement of elements between the extremes of core and periphery and the fact that only two elements stay static make it a model for radical change.
- **Radical change in 'What' and 'When':** The earlier core of 'what' has been expelled to the outermost periphery while the earlier core of 'when' has moved to the intermediate zone. The new cores of 'what' and 'when' are made up dominantly of elements that came from the extreme periphery.

- **Complex change in ‘How’:** The change in ‘how’ is more complex. It is the only axis that retains an element (workbook) in its core. It is also the only axis that has static elements. It also has the largest number of new elements added to the core.

How is this change communicated in the toolkit?

Elements at the core of the self-model for change were split between planes of content and expression & the relationships among elements was mapped. The specialized codes used to establish each relationship were analyzed for sign-systems used and tabulated to present the specialized grammar of the self-model mapped with the how-what-when of teaching learning.

Figure 30: Content-expression relations and specialized grammar of the self-model for change



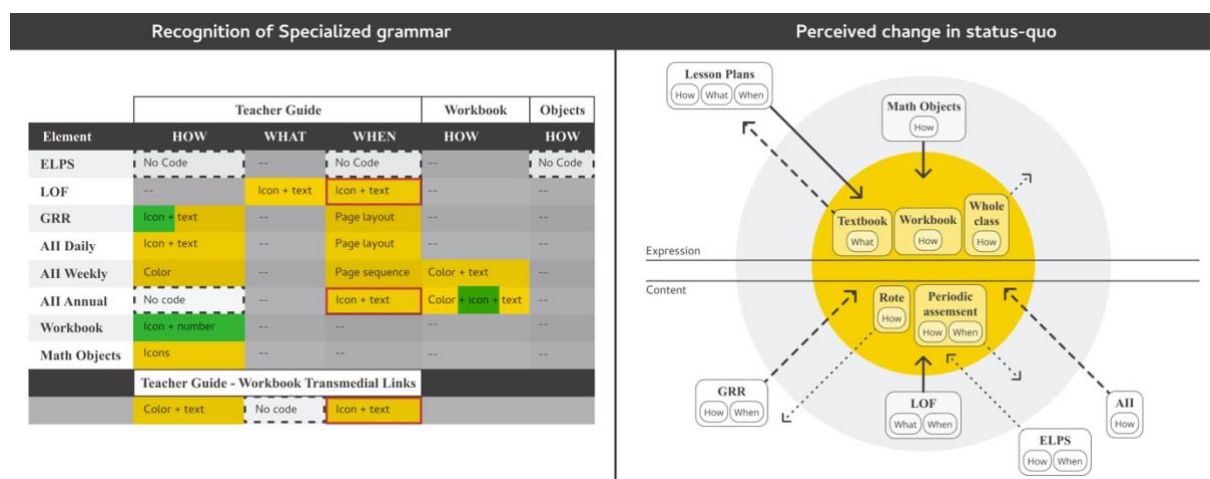
Key results of the analysis are summarized below.

- **Communicating through silence:** There is no explicit communication of elements expelled to construct the self-model for change. They are neither negated, criticized, or even mentioned in any of the resources. This can be understood as communicating by absence or through silence.
- **Covert and overt communication:** ELPS is a covert principle as it does not have any specialized codes used to establish its relations to the plane of expression. The other three elements (LOF, GRR and AII) from the plane of content are overtly communicated. Within the plane of expression, the relationship of the teacher-guide and workbook is more overtly communicated as compared to the relationship of the math objects and the teacher guide.

- **Constructing how-what-when:** The three facets of teaching-learning are constructed by different types of relations between plane of content and plane of expression. What is constructed by a one (LOF) to one (teacher guide) relation. When is constructed by many (ELPS, LOF and GRR) to one (teacher guide) relation and, How by a many (ELPS, GRR, AII) to many (math objects, teacher guide and workbook) relation.
- **Sign-systems of how-what-when:** The difference in types of relations that construct how-what-when is mirrored in the specialized grammar of the self-model. ‘What’ is communicated using a single code (icon + text) and is the simplest of the three. To communicate ‘When’, the dominant sign system used in spatial arrangement or layout (within a page sequence of pages). ‘How’ uses a more diverse set of sign systems colors, icons, and text in multiple codes.
- **Transmedial codes:** Two sets of codes serve a dual function. In addition to being a code for a pedagogical principle, they also setup transmedial relations between the teacher-guide and workbook. These two are the calendar icon + week number and the weekly AII color codes + text. With respect to how-what-when, transmedial codes are established in the how and when, but not the what.

How do teachers react to the changes when they first encounter the toolkit?

Figure 31: Participants' recognition of specialized grammar and perceived change to status-quo



Considering the dynamics in the focus groups, the maps of content-expression relations and the specialized grammar were modified to reflect participants' dynamics of recognition.

Taking these into account, a core-periphery map of participants' perceived changes to the status-quo as recommended by toolkit was created. This core-periphery map was used as ground for analyzing the affirmations and concerns raised in the focus groups to understand acceptance and resistance to change. Key results are summarized below.

- **Complexity of recognizing 'How':** All codes associated with the What and When of teaching-learning were recognized by participants. Three codes were partially recognized and all three are associated with the How of teaching-learning. These three codes use visual icons. How has 5 codes associated with it that use visual icons. In contrast, What and When have only one visual icon each in their associated codes.
- **Poor recognition of expelling:** None of the outward shifts at the core of the self-model for change were fully recognized. The expelling of whole classwork, periodic assessment and rote learning was not recognized. The expulsion of the textbook was partially recognized.
- **Textbook vs. Teacher Guide:** The strongest point of resistance came when groups perceived a conflict between these two artefacts. This was due to participants' opposition to replacing the core artefact of what, ambiguity around the role of the textbook, lesson plans being perceived as prescriptive and difference in the scope of the syllabus the two books covered.
- **Workbook acceptance:** The strongest point of acceptance came from groups' willingness to adopt the workbook. This is due to familiarity with such an artefact despite the changes made within it. The change of increasing the number of opportunities for student responses per sheet when recognized was perceived as a low effort way to keep children engaged in the class.
- **Isomorphic "others":** Resistance and acceptance was also informed by teachers' expectations of how the toolkit would change their perceived social status and power dynamics with respect to two sets of "others". Private schools and their own supervisors.

7.2 Recommendations

Suggestions for toolkit rollout

For the current academic year, the toolkit cannot be revised. At the time of writing this thesis, the process of printing and distribution is underway. In the fourth phase of the toolkit's evolution, workshops and ongoing mentorship will be undertaken using the train the trainer approach. The coalition will train and onboard master-trainers who will train teacher-coaches who will provide ongoing support to teachers. The following are key recommendations for addressing challenges to toolkit adoption.

1. **Enhance recognition of partially recognized codes:** This is especially relevant in relation to the 'How'. Reinforcing these codes during teacher training and ongoing mentorship can improve adoption due to two reasons. The first is that the self-model for change can be recognized more accurately and fully. The second is that this will address the resistance caused due to opposition to confusion.
2. **Explicitly communicate the expelling of elements:** Communicating expelling of elements through silence leads to ambiguity about the role of these elements in the toolkit. Since many of these are at the core of the status-quo, silence can be interpreted as no-change in their role. This is especially important in relation to the textbook as the strongest point of resistance to change comes from the tension between textbook and teacher guide.
3. **Prescriptive or Discretionary use:** Resistance to the toolkit adoption can increase when it is perceived as prescriptive and the toolkit can be more acceptable when it is understood to be for discretionary use of teachers. However, making it prescriptive makes monitoring and evaluation a more straightforward process for the state apparatus. Different elements of the toolkit might vary in this too. For example, the LOF might be more prescriptive as compared to ELPS. Clarifying where different elements of the toolkit lie on the spectrum between prescriptive and discretionary use can help balance this tension.
4. **Impact on teachers' performance review:** Supervisors of teachers including coaches, principals and bureaucrats must shift their parameters for teacher performance evaluation in response to the toolkit. Once the revised system is agreed

upon, it must be communicated to teachers to reduce their resistance to toolkit adoption.

Changes to the toolkit

For the subsequent academic years, the toolkit can be revised. At the time of writing this thesis, the process of reviewing and recommending changes for the session 2023-24 have begun. The coalition can revisit their approach at both the conception and creation stages based on the following recommendations:

1. **Sync textbook syllabus toolkit LOF:** The textbook is a core artefact around which teaching is organized. It is also the only element that regulates the ‘What’ of teaching-learning. Any discrepancies in the ‘what’ of the teacher guide and the ‘what’ of the textbook is source of resistance. Aligning these will reduce the perceived conflict between the two which is the strongest point of resistance to toolkit adoption.
2. **Shift textbook to intermediate zone:** Instead of completely expelling the textbook to the outermost periphery, an alternate strategy can be to move the textbook to the intermediate grey zone in the self-model for change. This can be done by building explicit links between the textbook and teacher guide. Some ideas for this include printing the same LOF in both books, referencing relevant lesson plans from the teacher guide at the start of each chapter of the textbook. Similarly, referring to the related textbook chapter number on each lesson plan.
3. **Establish transmedial ‘what’ between teacher guide and workbook:** Currently, codes that setup transmedial relations between lesson plans and worksheets are associated with the ‘how’ and ‘when’ of teaching-learning. A transmedial ‘what’ can be established by adding the learning objective icon & learning objective in text on each worksheet.
4. **Reduce the number of visual icons in the self-grammar of ‘How’:** How is the domain where changes the toolkit tries to bring is most complex and has the greatest number of elements. It also has the most complex set of codes in the specialized grammar. To simplify and aid in recognition of change as intended by creators, the visual components of GRR and annual AII can be dropped. The use of an icon + number to reference worksheets in lesson plans can also be altered. This is explained in the next point.

- 5. Numerical indexing of lesson plans and worksheets:** In its current form, worksheets are numbered while lesson plans are not numbered. Add a continuous numbering sequence to the lesson plans and use worksheet number and lesson plan number for cross-referencing. This will serve dual purpose. First, it will simplify the visual complexity of how as the worksheet reference icon can be removed. Second it will address the perception of incompatibility between the recommended academic calendar and the chaotic teaching calendar that the calendar icon + week number led to. The calendar icon + week number can be reduced in size and its location on the page shifted to reduce its prominence.

Suggestions for groups building similar interventions

For individuals and organizations that are working on educational interventions that aim to change the underlying pedagogy and/or instructional techniques of teachers, the following suggestions can help streamline work and pre-empt potential breakdowns in communication.

1. **Invest in creating core-periphery maps:** Core-periphery maps can serve as a tool for aligning various stakeholders like policy makers, pedagogy experts, designers and researchers who collaborate to create such interventions. These maps can be of value in the conception and evaluation phases.
 - a. **Status-quo of teaching practices:** In this research, the map of status-quo was constructed based on creators' understanding. Constructing such a map by using data from on classroom observations and interviews with teachers would be much better. Creators of such interventions are often captivated by the idealized future state which is the end goal. However, the starting point is often based on assumptions and anecdotal evidence. Such a core-periphery map can anchor and inform the conception stage. Once an intervention is rolled out, these maps can be updated based on new data from classroom observations and interviews. This way, the core-periphery maps can become a visual analytical tool to setup a feedback loop between teachers and designers of interventions.
 - b. **Idealized future state:** Plotting the composition of teaching-learning elements of the idealized future state on a core-periphery map can be an effective way for goal setting for two reasons. The first is that it forces creators to prioritize which elements are dominant. This counters the tendency of creators to

overload an intervention with an abundance of pedagogical principles and artefacts. The second reason is that it when viewed in relation to the status-quo, potential points of resistance to change can be preempted.

2. **Prioritize pedagogical principles that will be made explicit:** Pedagogy of an intervention is often based on multiple principles. Creators' desire to make pedagogy explicit stems from the notion that if teachers can understand the pedagogy, their teaching can change even if they do not use the intervention exactly as intended. However, making all pedagogical principles leads to a complex specialized grammar that can be confusing for teachers. While there may not be a clear hierarchy among principles at the level of content, creators can develop a spectrum for the degree to which various principles are made explicit. Doing this before the development of final designs would be very useful for creators.
3. **Map design codes of specialized grammar:** While prototypes of designs are being created, mapping the specialized grammar of polyglottic codes along with the what-how-when can be a useful exercise for two reasons. This can help creators identify which aspects among what-how-when would be the least and most complex for teachers to recognize. Based on this, the specialized grammar can be tweaked. The second benefit of this exercise is identifying areas that the grammar is under-developed in. For example, the lack of a transmedial 'what' in Mission Prerna is a missed opportunity that could have been identified before going into final production.

7.3 Theoretical reflections

Semiosphere as a tool to analyze educational interventions

The breadth of studies that apply disciplines like pedagogy, economics and psychology to education is vast. The utility of analyzing from these perspectives is immense. However, Lotman's conceptual framework from semiotics opens a few more possibilities for researchers studying of educational interventions. Reflecting on this research, I can identify three benefits.

1. Ability to analyze educational interventions as agents of change. Educational interventions are explicitly oriented towards change on varying kinds. Changing how teaching happens, changing individual students' learnings, changing what society

values as learning etc. Lotman's framework allows research to start from the particular kinds of change an intervention desires.

2. Ability to analyze how multiple artefacts function together in an intervention. Educational interventions are increasingly conceptualized as having multiple components. These can include multiple printed books, digital content like videos and websites, policy-led incentive frameworks, teacher training programs etc. Lotman's framework allows researchers to place such multiple artefacts, pedagogical principles and sign-systems within the same framework and analyze their relations.
3. Ability to research an intervention through its lifecycle from conception to creation to implementation. Research on educational interventions is often limited to one of these stages. Pedagogy and education theory might be used to analyze the conception stage, multimodality might be used to analyze the creation stage and randomized control tests to analyze the implementation stage. Lotman's framework allows researchers to operate from a unifying conceptual base for the entire journey of an educational intervention.
4. A valuable contribution to increasing the utility of semiosphere in educational analysis would be development of a methodology that can generate core-periphery maps based on data from classroom observations, interviews with teachers and focus group discussions.

Lotman's Typology of Change

Lotman's theoretical framework of cultural change locates self-descriptions and self-model oriented towards change at its core. Based on this case study, a few points can be made:

1. The construction of self-model involves self-description and by engaging in this act, the people and/or organizations involved become a meta-layer on a hierarchical level above. Self-models oriented towards change are often understood as attempts by the core to make the periphery more like it. In the case of Mission Prerna, the core is sought to be made more like the periphery. This can be interpreted in two different ways. One is that the core at level two created a self-model with the intention of make the core at level one more like the periphery. The second interpretation is that it is an attempt by the periphery of level one to replace the core.

2. A specialized grammar emerges to articulate a self-model oriented towards change. In this case study, we can see that the self-grammar develops to make the underlying pedagogical principles explicit to varying degrees. This can be understood as a system for readers to reinterpret culture in a ‘changed’ way. Self-descriptions of such specialized grammars can be a valuable site for research on culture change.

Conceptualizing transmediality

Reflecting on the nature of transmedial relations in the toolkit, one challenge and one extension can be proposed to how transmediality is theorized.

1. Theorizations of transmediality are often accompanied with the concepts of source and target text. In the case of this research, the perception of teacher guides and workbooks as belonging to a common whole challenge this notion. The guides were created together and will be distributed together. In the lives of these two texts, neither can be said to have come before the other. The concepts of source and target text seem inapplicable here. However, they were perceived by teachers as belonging to a common larger whole and this perception was aided by the repetition of codes across both texts. Removing the dependency of transmedia on the concepts of source and target texts can be an interesting way to evolve the concept.
2. In the toolkit, teachers perceived transmedial relations in three ways. Between a lesson plan and a worksheet, each weeks set of lesson plans and worksheets and, between the teacher guide and workbook. Here, transmediality operates at the level of single pages in two books, between a set of pages in two books and between two books as wholes. This is an example of transmediality perceived at multiple hierarchical levels. Interestingly, perceiving all hierarchical levels of transmediality relies on the same two codes.

Estonian Summary - Magistritöö kokkuvõte

Mission Prerna struktureeritud pedagoogika tööriistakomplekti semiootiline analüüs

Mission Prerna on Indias Uttar Pradeshis valitsuse juhitud programm arvutamise- ja kirjaoskuse põhioskuste parandamiseks. Olen osalenud disainerina missioonil Prerna, et luua struktureeritud pedagoogika tööriistakomplekte kirjaoskuse ja arvutusoskuse jaoks 1.–3. aastatel. aastatel. aastatel. See lõputöö on võimalus kriitiliselt mõtiskleda meie töö üle Mission Prernas ja koguda teadmisi selle arendamiseks. Kolmele uurimisküsimusele vastatakse Lotmani kultuurisemiootika traditsioonist tulenevate enesekirjelduse ja enesemudelite, tuumiku-perifeeria dünaamika, polüglotismi, tõlke ja transmediaalsuse mõistete abil. Õpetamise-õppimise mida-kuidas-millal raamistikku kasutatakse objekti tasandilt. Järgnevalt on toodud uurimisküsimused ja tulemuste kokkuvõte.

Kuidas üritab Mission Prerna muuta õpetajate praktikat?

Võrreldes hetkeseisu ja soovitava tulevase õpetamissituatsiooni tuumiku-perifeeria kaarte, saab muutust, mida tööriistakomplekti loojad näha soovivad, iseloomustada neljal viisil. Mission Prerna Toolkit on muudatuste jaoks plussmudel, kuna see toob palju rohkem sisse kui välja võtab. See on ka radikaalne muutus, sest suur osa õpetamispraktika tuumast püütakse asendada elementidega, mis on praegu äärmisel perifeerias. Muutuste radikaalsus puudutab rohkem õpetamise ja õppimise „mida” ja „millal”, samas kui muutus „kuidas” leiti olevat keerukas.

Kuidas tööriistakomplekti ressursid edastavad "muudatusi"?

See muudatus on esitatud tööriistakomplekti ressursides, kasutades mitut tehnikat. Vaikus on tehnika õpetamise tuumast eemaldatud elementide edastamiseks. Enesemudeli tuumaks olevatest pedagoogilistest põhimõtetest on üks edasi antud kaudselt, ülejäänud kolm aga selgesõnaliselt edasi antud polüglotkoodidega, mis moodustavad tööriistakomplekti erilise grammatika. Õpetamise-õppimise "mida" annab edasi ühtne kood (ikoon+tekst). "Millal" sõltub peamiselt paigutusest ja ruumilisest paigutusest. "Kuidas" on sellega seotud kõige rohkem koodi ning kombineerib nende koodide loomiseks visuaalseid ikoone, värvi ja teksti.

Kaks neist koodidest täidavad lisafunktsiooni transmeedia suhte loomisel õpetaja juhendi ja töövihikute vahel.

Kuidas õpetajad muudatustele reageerivad, kui nad esimest korda tööriistakomplektiga kokku puutuvad?

Tööriistakomplektiga esmakordsel kokkupuutel tuvastasid õpetajad koodid, mis on seotud õpetamise ja õppimise koodidega "Mis" ja "Millal", nagu loojad olid ette näinud. Mõned jaotisega "Kuidas" seotud koodid tuvastati ettenähtud viisil, teised aga ainult osaliselt.

Vaikuse kasutamine tööriistakomplektis väljapoole liikuvate elementide edastamiseks ei olnud edukas. See tunnustamise dünaamika kujundas õpetajate arusaama sihipärastest muudatustest tööriistakomplektis. Vastupanu tajutud muutustele oli kõige tugevam siis, kui õpetaja juhendi ja õpiku vahel oli tajutav konflikt. Muutuste aktsepteerimine oli töövihiku jaoks kõige tugevam. Lisaks õpetajate ettekujutusele tööriistakomplektist endast mõjutasid valmisolekut tööriistakomplekti kasutusele võtta ka kaks „teiste” rühma. Esimene rühm on õpetajate mentorid ja juhendajad. See, kuidas tööriistakomplekt mõjutaks õpetajate jõudünaamikat koos nendega, mõjutas nende aktsepteerimist ja vastupanuvõimet muutustele. Teine rühm on erakoolid. See, kuidas tööriistakomplekti kasutamine mõjutaks valitsuskoolide sotsiaalset staatust võrreldes erakoolidega, mõjutas ka tööriistakomplekti aktsepteerimist ja vastupanu.

Nende leidude põhjal koostatakse soovitusel, mis aitavad õpetajatel tuvastada muudatused, nagu loojad on kavandanud, ja suurendada tõenäosust, et õpetajad võtavad tööriistakomplekti kasutusele. Lõputöö lõppeb mõtisklustega semiosfääri kontseptsiooni kasulikkusest hariduslike sekkumiste uurimisel ning pakub välja laiendusi Lotmani kultuurimuutuste teooriale ja transmediaalsuse kontseptsioonile.

References

- Adler, Jill, and Zain Davis. 2011. Modelling teaching in mathematics teacher education and the constitution of mathematics for teaching. *Mathematical knowledge in teaching* 139-160.
- Afridi, Farzana. 2011. The impact of school meals on school participation: evidence from rural India. *Journal of Development Studies* 1636-1656.
- Agrawal, Tushar. 2014. Educational inequality in rural and urban India. *International Journal of Educational Development* 11-19.
- Ambedkar, Bhimaro Ramji. 1943. *Emancipation of the Untouchables*. Bombay: Thacker and Company Ltd.
- Andrews, Edna, and Elena Maksimova. 2008. Semiospheric transitions: A key to modelling translation. *Sign Systems Studies* 259-269.
- Angrist, Noam, Andreas de Barros, Radhika Bhula, Shiraz Chakera, Chris Cummiskey, Joseph DeStefano, John Floretta, Michelle Kaffenberger, Benjamin Piper, and Jonathan Stern. 2021. Building back better to avert a learning catastrophe: Estimating learning loss from COVID-19 school shutdowns in Africa and facilitating short-term and long-term learning recovery. *International Journal of Educational Development*.
- Angrist, Noam, Andreas de Barros, Radhika Bhula, Shiraz Chakera, Chris Cummiskey, and Joseph DeSte. 2021. Building back better to avert a learning catastrophe: Estimating learning loss from COVID-19 school shutdowns in Africa and facilitating short-term and long-term learning recovery. *International Journal of Educational Development*.
- Arzarello, Ferdinando, and Ornella Robutti. 2010. Multimodality in multi-representational environments. *ZDM* 715-731.
- Arzarello, Ferdinando, Francesca Ferrara, and Ornella Robutti. 2011. A tool for analysing multimodal behaviours in the mathematics classroom. *Proceedings of the 35th Conference of the International Group for the Psychology of Mathematics Education*. . 57-64.
- Arzarello, Ferdinando, Ornella Robutti, and Mike Thomas. 2015. Growth point and gestures: looking inside mathematical meanings. *Educational Studies in Mathematics*.

- Arzarello, Ferdinando, Ornella, Robutti Domingo Paola, and Sabena and Cristina. 2009. Gestures as semiotic resources in the mathematics classroom. *Educational Studies in Mathematics* 97-109.
- Arzarello, Ferdinando. 2006. Semiosis as a multimodal process. *Revista Latinoamericana de Investigación en Matemática Educativa RELIME* 9 267-299.
- Asadullah, M. Niaz, and Yalonetzky Gaston. 2012. Inequality of educational opportunity in India: Changes over time and across states. *World Development* 1151-1163.
- ASER. 2016. *Annual status of education report* . Survey results, New Delhi: ASER Centre.
- 2018. *Thirteenth Annual Status of Education Report*. Survey, New Delhi: Annual Status of Education Report and Pratham.
- Banerjee, Abhijit V., Rukmini Banerji, Esther Duflo, Rachel Glennerster, and Stuti Khemani. 2010. Pitfalls of participatory programs: Evidence from a randomized evaluation in education in India. *American Economic Journal: Economic Policy* 1-30.
- Banerjee, Abhijit, Rukmini Banerji, James Berry, Esther Duflo, Harini Kannan, Shobhini Mukherji, Marc Shotland, and Michael Walton. 2016. *Mainstreaming an effective intervention: Evidence from randomized evaluations of Teaching at the Right Level in India*. Impact evaluation, National Bureau of Economic Research.
- Bashir, Sajitha, Marlaine Lockheed, Elizabeth Ninan, and Jee-Peng Tan. 2018. *Facing forward: Schooling for learning in Africa*. Impact evaluation, World Bank Publications.
- Bezemer, Jeff, and Gunther Kress. 2015. *Multimodality, learning and communication: A social semiotic frame*. Routledge.
- Bhagavatheeswaran, Lalitha, Sapna Nair, Hollie Stone, Shajy Isac, Tejaswini Hiremath, T. Raghavendra, and Kumar Vadde. 2016. The barriers and enablers to education among scheduled caste and scheduled tribe adolescent girls in northern Karnataka, South India: A qualitative study. *International journal of educational development* 262-270.
- Bhat, Rouf Ahmad. 2015. Role of Education in the Empowerment of Women in India. *Journal of Education and Practice* 188-191.
- Borkum, Evan, Fang He, and Leigh L. Linden. 2012. *he effects of school libraries on language skills: Evidence from a randomized controlled trial in India*. Impact evaluation, National Bureau of Economic Research.

- Campbell, Cary. 2017. Learning that reflects the living: Aligning anticipation and edusemiotics. *Public Journal of Semiotics* 1-25.
- Chuang, Erica K., Barbara S. Mensch, Stephanie R. Psaki, Nicole A. Haberland, and Nicole A. Kozak. 2019. PROTOCOL: Policies and interventions to remove gender-related barriers to girls' school participation and learning in low-and middle-income countries: A systematic review of the evidence. *Campbell Systematic Reviews*.
- Chutani, Alka Mohan. 2012. School lunch program in India: Background, objectives and components. *Asia Pacific journal of clinical nutrition* 151-154.
- Dagenais, Diane, Kelleen Toohey, Alexa Bennett Fox, and Angelpreet Singh. 2017. Multilingual and multimodal composition at school: ScribJab in action. *Language and Education* 263-282.
- Deodhar, Satish Y., Sweta Mahandiratta, K. V. Ramani, Dileep Mavalankar, Sandip Ghosh, and Vincent Braganza. 2010. An evaluation of mid day meal scheme. *Journal of Indian School of Political Economy* 33-49.
- Desai, Sonalde, and Veena Kulkarni. 2008. Changing educational inequalities in India in the context of affirmative action. *Demography* 245-270.
- Dey, Priyadarshini, and Somprakash Bandyopadhyay. 2019. Blended learning to improve quality of primary education among underprivileged school children in India. *Education and Information Technologies* 1995-2016.
- Dubeck, Margaret M, and Yasmin Sitabkhan. 2021. Curriculum and Scope and Sequence Development for Literacy and Numeracy. In *Structured Pedagogy: A How to Guide*. RTI International.
- Dyer, Caroline, Archana Choksi, Vinita Awasty, Uma Iyer, Renu Moyade, Neerja Nigam, Neetu Purohit, Swati Shah, and Swati Sheth. 2004. Knowledge for teacher development in India: the importance of 'local knowledge' for in-service education. *International Journal of Educational Development* 39-52.
- Erstad, Ola, Øystein Gilje, and Thomas de Lange. 2007. Re-mixing multimodal resources: multiliteracies and digital production in Norwegian media education. *Learning, media and Technology* 183-192.
- Evans, David K., and Amina Mendez Acosta. 2021. Education in Africa: What are we learning?. *Journal of African Economies* (journal of African Economies) 13-54.

- Evans, David K., and Anna Popova. 2016. What really works to improve learning in developing countries? An analysis of divergent findings in systematic reviews. *The World Bank Research Observer* 242-270.
- Evans, David, and Fei Yuan. 2019. Equivalent years of schooling: A metric to communicate learning gains in concrete terms. *World Bank Policy Research Working Paper*, World Bank.
- Fleisch, Brahm, and Kerry Dixon. 2019. Identifying mechanisms of change in the early grade reading study in South Africa. *South African Journal of Education*.
- Fleisch, Brahm. 2016. System-wide improvement at the instructional core: Changing reading teaching in South Africa. *Journal of Educational Change* 437-451.
- Gandhi, Mohandas Karamchand. 1921. *Hind Swaraj or Indian home rule*. Madras: GA Natesan and Company.
- Ginsberg, Daniel. 2015. Multimodal semiotics of mathematics teaching and learning. PhD Thesis, Georgetown University.
- Goodnight, Melissa Rae. 2017. Critical race theory in India: Theory translation and the analysis of social identities and discrimination in Indian schooling. *Compare: A Journal of Comparative and International Education* 665-683.
- Gouda, Jitendra, Chandra Das Kailash, Goli Srinivas, and Maikho Apollo Pou Ladumai. 2013. Government versus private primary schools in India: An assessment of physical infrastructure, schooling costs and performance. *International Journal of Sociology and Social Policy*.
- Gregory, Laura, and May Bend. 2019. Modernizing curricula, instruction, and assessment to improve learning. *Expectations and aspirations: A new framework for education in the Middle East and North Africa* 161-182.
- Groff, Cynthia. 2017. Language and language-in-education planning in multilingual India: A minoritized language perspective. *Language Policy* 35-164.
- Jandrić, Petar, and Peter McLaren. 2021. From learning loss to learning opportunity. *Educational Philosophy and Theory* 1-9.
- Jha, Praveen, and Pooja Parvati. 2014. Assessing progress on universal elementary education in India: A note on some key constraints. *Economic and Political Weekly* 44-51.
- Joshi, Radhika. 2020. Can social integration in schools be mandated: Evidence from the Right to Education Act in India. *International Journal of Educational Development*.

- Joshi, Vijay, and Kishor Moharir. 2013. An empirical study of impact of Sarva Shiksha Abhiyan on the subject performance in rural and urban schools. *Abhinav: Journal of research in commerce & management*.
- Kremer, Michael, Nazmul Chaudhury, F. Halsey Rogers, Karthik Muralidharan, and Jeffrey Hammer. 2005. Teacher absence in India: A snapshot. *Journal of the European Economic Association* 658-667.
- Kress, Gunther. 2009. *Multimodality: A social semiotic approach to contemporary communication*. Routledge.
- Lotman, Yuri M. 1990. Semiotic Space. In: *Universe of the Mind, A semiotic theory of culture.*, by Yuri M. Lotman, 123-130. London: IB Taurus.
- 2000. Лотман, Юрий. О семиосфере. Культура и взрыв. Внутри мыслящих миров. Статьи. Исследования. Заметки. Санкт-Петербург: Искусство-СПб.
- 2005. On the semiosphere. *Σημειωτική-Sign Systems Studies* 205-229.
- 2009. *Culture and explosion*. De Gruyter Mouton.
- Maruyama, Takao. 2021. Strengthening Teacher Support for Students to Improve Math Learning: Empirical Evidence on A Structured Pedagogy Program in El Salvador. *Impact evaluation*.
- Milyakina, Alexandra, Maarja Ojamaa, Tatjana Pilipovec, and Merit Rickberg. 2020. Literature on screen: teaching adaptations in a multimodal course. *Media Practice and Education* 229-239.
- Ministry of Human Resource and Development,. 2020. National Education Policy. Government of India.
- Muralidharan, Karthik, and Michael Kremer. 2006. *Public and private schools in rural India*. Cambridge: Harvard University, Department of Economics.
- Muralidharan, Karthik, and Venkatesh Sundararaman. 2011. Teacher performance pay: Experimental evidence from India. *Journal of political Economy* 39-77.
- Nehru, Jawaharlal. 1937. The unity of India. *Foreign Aff.*
- Newfield, Denise, David Andrew, Pippa Stein, and Robert Maungedzo. 2003. No Number Can Describe How Good It Was': Assessment issues in the multimodal classroom. *Assessment in Education: Principles, Policy & Practice* 61-81.
- Niti Aayog. 2018. *Transformation of aspirational districts, baseline ranking*. Government baseline ranking, New Delhi: Niti Aayog.

- Nöth, Winfried. 2014. Signs as Educators. *Pedagogy and edusemiotics* (SensePublishers) 7-18.
- Ojamaa, Maarja, and Alexandra Milyakina. 2019. Teaching cultural literacies with films: Using the online platform Education on Screen in secondary school classrooms. *Film Education Journal*.
- Ojamaa, Maarja, and Peeter Torop. 2015. Transmediality of cultural autocommunication. *International Journal of Cultural Studies* 61-78.
- Ojamaa, Maarja, Peeter Torop, Alexandr Fadeev, Alexandra Milyakina, Tatjana Pilipovec, and Merit Rickberg. 2019. Culture as education: From transmediality to transdisciplinary pedagogy. *Sign Systems Studies* 152-176.
- Pesce, Sébastien. 2018. Signs, significance and semioses in the classroom: Multimodality, narrativity, dialogism and rhetoric as cornerstones of a fully semiotic perspective on teaching and learning. *Semiotic Theory of Learning* 158-173.
- Phutela, Nidhi, and Sunita Dwived. 2020. A qualitative study of students' perspective on e-learning adoption in India. *Journal of applied research in higher education*.
- Piper, Benjamin, Joseph Destefano, Esther M. Kinyanjui, and Salome Ong'ele. 2018. Scaling up successfully: Lessons from Kenya's Tusome national literacy program. *Journal of Educational Change* 293-321.
- Piper, Benjamin, Yasmin Sitabkhan, Jessica Mejia, and Kellie Betts. 2018. Effectiveness of teachers' guides in the Global South: Scripting, learning outcomes, and classroom utilization. *RTI Press*.
- Rai, Lajpat. 1920. *The Problem of National Education in India*. London: G. Allen & Unwin.
- Ramachandran, Vimala. 2004. *Gender and social equity in primary education: Hierarchies of access*. SAGE Publications.
- Rao, A. Giridhar. 2013. The English-only myth: Multilingual education in India. *Language Problems and Language Planning* 271-279.
- Sabena, Cristina, Ornella Robutti, Francesca Ferrara, and Ferdinando Arzarello. 2012. The development of a semiotic framework to analyze teaching and learning processes: Examples in pre- and post-algebraic contexts. *Recherches en Didactique des Mathématiques* 237-251.

- Saigal, Anju. 2012. Demonstrating a situated learning approach for in-service teacher education in rural India: The Quality Education Programme in Rajasthan. *Teaching and Teacher Education* 1009-1017.
- Sankar, Deepa, and Toby Linden. 2014. *How much and what kind of teaching is there in elementary education in India? Evidence from three States*. Research Report, New Delhi: World Bank.
- Semetsky, Inna. 2015. Edusemiotics: The tao of education. *Language and Semiotic Studies* 130-143.
- Shah, Manisha, and Bryce Steinberg. 2019. The right to education act: Trends in enrollment, test scores, and school quality. *AEA Papers and Proceedings*. AEA.
- Singh, Renu, and Sudipa Sarkar. 2015. Does teaching quality matter? Students learning outcome related to teaching quality in public and private primary schools in India. *International Journal of Educational Development* 153-163.
- Snilstveit, Birte, Emma Gallagher, Daniel Phillips, Martina Vojtkova, John Eyers, Dafni Skaldiou, Jennifer Stevenson, Ami Bhavsar, and Philip Davies. 2017. PROTOCOL: Interventions for improving learning outcomes and access to education in low-and middle-income countries: a systematic review. *Campbell Systematic Reviews* 1-82.
- Snilstveit, Birte, Jennifer Stevenson, Daniel Phillips, Martina Vojtkova, Emma Gallagher, Tanja Schmidt, Hannah Jobse, Maisie Geelen, Maria Grazia Pastorello, and John Eyers. 2015. *Interventions for improving learning outcomes and access to education in low- and middle- income countries: a systematic review*. Impact Evaluation, 3ie - International Initiative for Impact Evaluation.
- Stables, Andrew, Susannah Learoyd-Smith, Harry Daniels, and Hau Ming Tse. 2014. Schools and schooling as semiotic engagement: A focus on design. *Pedagogy and edusemiotics* 35-50.
- Stables, Andrew. 2006. Sign (al) s: Living and learning as semiotic engagement. *Journal of curriculum studies* 373-387.
- Tagore, Rabindranath. 2009. *The Oxford India Tagore: Selected writings on education and nationalism*.
- Torop, Peeter. 2005. Semiosphere and/as the research object of semiotics of culture. *Σημειωτική-Sign Systems Studies* 159-173.

- Unsworth, Len. 2008. Multimodal semiotic analyses and education. *Multimodal semiotics: Functional analysis in contexts of education* 1-12.
- Van Leeuwen, Theo. 2014. Critical discourse analysis and multimodality. *Contemporary critical discourse studies* 281-295.
- Velu, Ratika. 2015. Designing a qualitative and flexible case study to investigate the opportunities and challenges for primary education offered to first-generation learners in a rural community in the state of Maharashtra, India. *Support for Learning* 223-238.
- Walia, Kiran. 2004. Reform of teacher education in India. *Reform of teacher education in the Asia-Pacific in the new millennium*. Springer. 93-106.

Appendices

Appendix 1: Questions for one-on-one interviews

Semi-structured one-hour long interviews were conducted with members of the coalition that created the Mission Prerna Toolkit. The questions below served as a guide for the interviews.

1. Tell me about the first time you heard about Mission Prerna project
2. Tell me about your role in the development of Mission Prerna?
3. How do you feel about Mission Prerna?
4. Think of a time when you believed very strongly that this project could transform FLN and tell me about it.
5. Tell me about some features that really stood-out to you about Mission Prerna.
6. What is Mission Prerna trying to change about the status quo?
7. Which of these changes do you feel would be the most challenging for teachers? Why?
8. Tell me about some things that Mission Prerna is not trying to change
9. Imagine that it's 2023 & Mission Prerna has been an amazing success & you are presenting the project to teachers in a different state. What do you imagine you are saying?
 - a. Prioritize the successes you spoke about
10. Imagine that it's 2023 & Mission Prerna has been a colossal failure & you are presenting learnings to the education minister. What do you imagine you are saying ?
 - a. Prioritize the roadblocks you spoke about

Appendix 2: Elements of Teaching Learning

1. Artefacts

- a. Textbook: Teaching organized around the textbook. Learning organized by broad concepts in chapters.
- b. Workbooks: A collection of worksheets. Each worksheet has several questions that allow the student to practice concepts and skills.
- c. Math objects: Using objects like counting strings, dice, place-value charts, 3D shapes etc. to allow learning experientially through touch and feel.
- d. Lesson Plans: Teaching organized around a step-by-step plan for a single session in-class. Learning organized based on specific micro-competencies.

2. Pedagogical Principles

- a. Learning objectives framework (LOF): Broad concepts in chapters are broken down into skills and competencies. These are ordered in a logical progression for effective learning across year.
- b. Gradual release of responsibility (GRR): A pedagogical approach where the learning process moves from educator led to educator-learner together to learner led. Also known as an I do – We do – You do approach.
- c. ELPS: Experience → Language → Pictures → Symbols. A pedagogical approach to teaching numeracy. A concept or skill is built up in a sequence that moves from experiencing through concrete objects and eventually to abstract mathematical symbols.
- d. Assessment informed instruction (AII): An approach where student assessment is viewed not just as an evaluation of learning but as active feedback for customizing future teaching. It's meaning can range from teachers in daily classes all the way to state led yearly exams.
- e. Periodic assessment: Annual assessments conducted once or twice a year.
- f. Rote learning: Instructional technique dominated by students repeating after the teacher to memorize information.
- g. Whole class activities: Format where teacher addresses the entire class at once. Teacher works directly with the group.

- h. Group activities: Format where a class is split into groups. Children work primarily with each other and have secondary guidance from the teacher.
- i. Homework: Activities to do or problems to solve at home. These are done to involve parents in the learning process and for revision of concepts.
- j. Socio-emotional learning (SEL): Activities that aid in the development of self-awareness, self-control, emotional intelligence, and inter-personal skills. Often based on activities like role-play, group discussions and self-reflection.

These elements are not mutually exclusive and do not operate in isolation. For example, ELPS can include group-work and together, this can be described in a lesson plan. However, at the conception stage, these various elements have fuzzy relationships that stakeholders align on, and the actual relationships crystalize once content creation of the toolkit components takes place. Working definitions for the pedagogical principles at the core of the self-model for change follow.

Learning Objectives Framework {LOF}

The set of all learning objectives for an academic year along with the sequence or progression that relates them is known as the Learning Objectives Framework (LOF). For example, the teaching of “numbers 1 to 5”, is broken down into the following learning objectives:

1. One to one mapping and grouping of objects
2. Quantitative understanding of numbers 1 to 5 (with concrete objects)
3. Quantitative understanding of numbers 1 to 5 (with pictures)
4. Understanding the symbols of numbers 1 to 5 and learning to write (numerals)

The learning objectives define the “What” of teaching-learning and their sequencing models the “When”. Hence, it is a pedagogical principle related to both

Experience → Language → Pictures → Symbols

ELPS is a pedagogical approach to teaching numeracy. A concept or skill is built up in a sequence that starts by experiencing the concept with concrete material objects and increasingly builds abstraction layers until it finally reaches mathematical symbols. This can be observed in the learning objectives sequence described for teaching of “numbers 1 to 5”.

This technique informs the “How” of teaching-learning. While there is a sequential aspect to the principle that is critical, it has not been categorized as influencing the “When” of teaching-learning. This is because the sequencing is not related to a specific pattern of temporal units like day or week.

Gradual Release of Responsibility {GRR}

GRR is a pedagogical principle where a learning objective is acquired in a manner where responsibility for working with it transfers from teacher to student. The learning process moves from educator led to educator-learner together to learner led. It is a principle applicable within a single classroom session and is also known as an I do – We do – You do approach.

This shift in responsibility is best illustrated through an example. The lesson plan for the learning objective “Concept of zero” consists of three activities:

1. Teacher narrates a story of walking with 3 sweets in her hand. In the story as she walks, sweets keep dropping off one by one. After each sweet drops in the story, the teacher asks the students how many sweets she still has. Once all sweets have been dropped, the teacher emphasizes that “I don’t have even one sweet left. Not even one is what we call zero”.
2. Teacher calls a student to the front of the class and hands him three ice-cream sticks. Teacher asks the students “How many sticks does he have?” and writes the answer as a numeral on the board. The teacher takes away the sticks one by one, repeats the question and inscribes the students’ answer. Once the last stick has been taken away, the teacher waits for students’ answers, addresses any misconceptions and then writes ‘0’ on the board.

3. Teacher writes 3 single number subtraction problems on the board and asks students to solve these in their notebook. Teacher walks around checking students' answers and helping them as required.

Each lesson plan in Mission Prerna (40min) is structured as three activities that follow a similar transfer of responsibility. The three stages inform the “How” of teaching-learning and their timed sequence (10min → 20min → 10min) structure the “When” of teaching-learning in a classroom session. Hence, it is a pedagogical principle related to both.

Assessment Informed Instruction {AII}

AII is a pedagogical principle where student assessment is viewed not just as an evaluation of learning but as active feedback to inform subsequent teaching. It has two components. One, an assessment technique and two, instructional decisions based on the assessment. It can apply at multiple scales from daily within classes all the way to state led yearly exams.

In Mission Prerna, this is conceptualized on three levels, daily and weekly and annual.

1. Daily AII

- a. Assessment: Key questions the teacher poses to students while conducting learning activities from the lesson plan. Some are oral, some are written. Some are posed to groups and some to individual students.
- b. Informed Instruction:
 - i. If 70% or more students correctly answer the questions posed in the lesson plan, teacher asks students to practice the concept just learned with the worksheet associated with the lesson plan.
 - ii. If less than 70% students are able to answer the questions posed, teacher repeats the learning activities of this lesson plan. Teacher does not move to practice using the worksheet until 70% of the class has learned.

2. Weekly AII

- a. Assessment: The 5th day of every week focuses on consolidating the LO's learned in the previous 4 days. This is done using a consolidation lesson plan followed by a weekly assessment worksheet.
- b. Informed Instruction: Based on worksheet answers, teacher splits the students into two groups. Group A that needs further support and Group B that has successfully mastered the weeks LOs'. This is recorded in a weekly assessment tracker. On the 6th day of the week, teacher assists Group A using the remediation lesson plan while Group B works on the weekly practice worksheet. After Group A's misconceptions have been remediated, the entire class does the weekly revision worksheet.

3. Annual AII

- a. Assessment: Weeks 11 and 22 are periodic assessment weeks. These focus on assessing learning of concepts from the past 10 weeks. The assessment is done using 10 periodic assessment worksheets. One worksheet for concepts from each of the preceding 10 weeks.
- b. Informed Instruction: Similar to weekly AII, the teacher splits the class into two groups. This is recorded in the periodic assessment tracker. The teacher focusses on remediating misconceptions of students in Group A. In parallel, teacher gives activities related to the math objects kit for Group B to do.

These pedagogical routines inform the “How” of teaching-learning and the temporal levels (daily → weekly → annual) structure the “When” of teaching-learning. Hence, it is a pedagogical categorized as both How and When.

Appendix 3: Extracts and description of artefacts in the toolkit

Teacher Guides

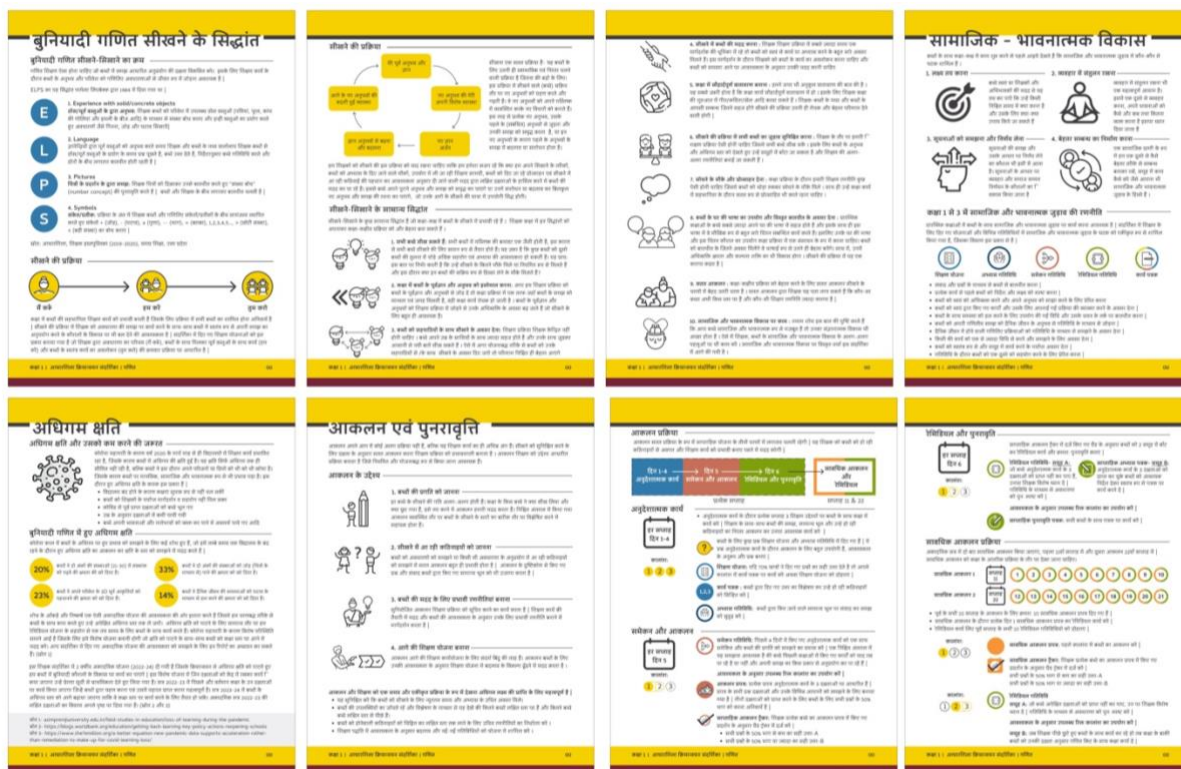
The toolkit has three teacher guidebooks. One for each grade (One to Three). Printed copies of each will be distributed to all primary school teachers. At the most rudimentary level, a teacher guidebook is a compilation of lesson plans for the syllabus of a particular grade.

However, in addition to the lesson plan pages, it contains additional information. Each teacher guide has three broad sections. Introduction, lesson plans and supplementary information.

The introduction section is 32 pages and belongs to the meta-layer of the toolkit. This meta-layer consists of four types of self-descriptions of the toolkit.

1. Self-description of the pedagogical principles the toolkit is based on.
2. Self-description of the syllabus the toolkit covers.
3. Self-description of recommended usage of the toolkit.
4. Self-descriptions of lesson plan pages and workbook pages.

Figure 32: Self-description of pedagogical principles



The topics covered in these pages include ELPS, GRR, principles of teaching-learning, SEL, changes to syllabus in response to covid and AII.

Figure 33: ELPS & GRR explained in upper section of a page in the introductory meta-layer of the teacher guidebook.

ELPS Explanation ←

GRR Explanation ←

बुनियादी गणित सीखने के सिद्धांत

बुनियादी गणित सीखने-सिखाने का क्रम

मौलिक शिक्षण पैराम होना चाहिए जो बच्चों में समग्र आपारितीय अनुपयोग की दृष्टात विकसित करे। इसके लिए शिक्षण कार्य के दौरान बच्चों के अनुभव और परितर को गतिविधि अवधारणाओं में जीवित रूप में जोडना अवसरक है।

ELPS का यह सिद्धांत पाठाला गिनेकक द्वारा 1984 में दिया गया था।

E

1. Experience with solid/concrete objects

ठोस/पुर्ण वस्तुओं के द्वारा अनुभव: शिक्षक बच्चों को परितर में उपलब्ध ठोस वस्तुओं (पतिया, चूना, कांच की गोमिया और इगली के बीज आदि) के सध्या से संख्या बोध करार और इग्ली वस्तुओं का प्रयोग करते हुए अवधारणा जैसे गिनकर, जोड और घटाव सिखाए।

L

2. Language

अनेदियुयों द्वारा पुर्ण वस्तुओं को अनुभव करते समय शिक्षक और बच्चों के मध्य वार्तालाप शिक्षक बच्चों से ठोस/पुर्ण वस्तुओं के प्रयोग के सधय प्रश्न पूछते हैं, बच्चे उत्तर देते हैं, मिडैरासुतय बच्चे गतिविधि करते और दोरे के बीच लगातार बातचीत होती रहती है।

P

3. Pictures

चित्रों के प्रदर्शन के द्वारा समग्र: शिक्षक चित्रों को दिखाकर उनसे बातचीत करते हुए "संख्या बोध" (number concept) की पुनरावृत्ति करते हैं। बच्चों और शिक्षक के बीच लगातार बातचीत चलती है।

S

4. Symbols

संकेत/प्रतीक: प्रक्रिया के अंत में शिक्षक बच्चों और गतिविधि संकेतों/प्रतीकों के बीच समतुल्य स्थितिगत करते हुए संकेतों = (जोड), - (घटाव), x (गुणा), ÷ (भाग), = (समता), 1,2,3,4,5,... > (जोडी संख्या), < (बेडी संख्या) का बोध करार।

ध्यान: आपारितीय, शिक्षक हस्तपुस्तिक (2019-2020), समग्र शिक्षा, उत्तर प्रदेश

सीखने की प्रक्रिया

मैं करूँ

हम करें

तुम करो

बच्चा मैं बच्चों की सहभागिता शिक्षण कार्य को पछाती बचती है जिसके लिए प्रक्रिया में सभी बच्चों का शामिल होना अधिकार है। सीखने की प्रक्रिया में शिक्षक को अवधारणा की समग्र पर कार्य करते के साथ-साथ बच्चों में स्वतंत्र रूप से आपारी समग्र का अनुपयोग करने के मौकानों के विचारण पर भी ध्यान देते हैं। अवधारणा के विरा राय शिक्षण योजनाओं को दूर प्रसार बनाना गया है जो शिक्षक द्वारा अवधारणा का परिचय (मैं करूँ), बच्चों के साथ शिक्षक पूर वस्तुओं के साथ कार्य (हम करें) और बच्चों के स्वतंत्र कार्य का अवसरक (तुम करें) की अवसरक प्रक्रिया पर आपारितीय है।

कक्षा 1 | आपारितीय क्रियाचरन दर्शिका | पतित


00

Figure 34:: Self-description of syllabus

2022-23 के लिए लक्षित दक्षताएं	वार्षिक योजना	मासिक शिक्षण योजना	विषय
<p>दक्षताएं: 2022-23</p> <p>एक शिक्षक को एक वर्ष के अंत में बच्चों की दक्षताओं को मापना और उनसे निपटार करना है।</p> <p>लक्षित दक्षताएं:</p> <ul style="list-style-type: none"> बच्चा एक संख्या को एक संख्या से जोड़ सके। बच्चा एक संख्या को एक संख्या से घटा सके। बच्चा एक संख्या को एक संख्या से गुणा सके। बच्चा एक संख्या को एक संख्या से भाग सके। बच्चा एक संख्या को एक संख्या से जोड़ सके। बच्चा एक संख्या को एक संख्या से घटा सके। बच्चा एक संख्या को एक संख्या से गुणा सके। बच्चा एक संख्या को एक संख्या से भाग सके। 	<p>वार्षिक योजना</p> <p>एक शिक्षक को एक वर्ष के अंत में बच्चों की दक्षताओं को मापना और उनसे निपटार करना है।</p> <p>वार्षिक योजना:</p> <ul style="list-style-type: none"> बच्चा एक संख्या को एक संख्या से जोड़ सके। बच्चा एक संख्या को एक संख्या से घटा सके। बच्चा एक संख्या को एक संख्या से गुणा सके। बच्चा एक संख्या को एक संख्या से भाग सके। बच्चा एक संख्या को एक संख्या से जोड़ सके। बच्चा एक संख्या को एक संख्या से घटा सके। बच्चा एक संख्या को एक संख्या से गुणा सके। बच्चा एक संख्या को एक संख्या से भाग सके। 	<p>मासिक शिक्षण योजना</p> <p>एक शिक्षक को एक मास के अंत में बच्चों की दक्षताओं को मापना और उनसे निपटार करना है।</p> <p>मासिक शिक्षण योजना:</p> <ul style="list-style-type: none"> बच्चा एक संख्या को एक संख्या से जोड़ सके। बच्चा एक संख्या को एक संख्या से घटा सके। बच्चा एक संख्या को एक संख्या से गुणा सके। बच्चा एक संख्या को एक संख्या से भाग सके। बच्चा एक संख्या को एक संख्या से जोड़ सके। बच्चा एक संख्या को एक संख्या से घटा सके। बच्चा एक संख्या को एक संख्या से गुणा सके। बच्चा एक संख्या को एक संख्या से भाग सके। 	<p>विषय</p> <p>एक शिक्षक को एक विषय के अंत में बच्चों की दक्षताओं को मापना और उनसे निपटार करना है।</p> <p>विषय:</p> <ul style="list-style-type: none"> बच्चा एक संख्या को एक संख्या से जोड़ सके। बच्चा एक संख्या को एक संख्या से घटा सके। बच्चा एक संख्या को एक संख्या से गुणा सके। बच्चा एक संख्या को एक संख्या से भाग सके। बच्चा एक संख्या को एक संख्या से जोड़ सके। बच्चा एक संख्या को एक संख्या से घटा सके। बच्चा एक संख्या को एक संख्या से गुणा सके। बच्चा एक संख्या को एक संख्या से भाग सके।


[illegible]

Figure 36: Weekly Assessments tracker pages from teacher guide



एन सी ई आर
विभाग

साप्ताहिक आकलन ट्रैकर 1



प्रत्येक पंक्ति को एक साप्ताहिक अवकाश के रूप में ध्यान रखें। प्रत्येक के अनुसार चिह्न डालें।

- A-सभी पंक्ति के 100% भाग में सच का स्कोर प्राप्त करें।
- B-सभी पंक्ति के 100% भाग का अवकाश का स्कोर प्राप्त करें।

अवकाश	पंक्ति के नाम	अवकाश										
			1	2	3	4	5	6	7	8	9	10
1												
2												
10												
15												
20												

अवकाश	पंक्ति के नाम	अवकाश										
			1	2	3	4	5	6	7	8	9	10
25												
30												
35												
40												
45												

पृष्ठ 1 | असाधारण शिक्षण के माध्यम से शिक्षण | पृष्ठ 1

पृष्ठ 1 | असाधारण शिक्षण के माध्यम से शिक्षण | पृष्ठ 1

90

Figure 37: Week wise list of learning objectives in the introductory meta-layer of the teacher guidebook

Figure 38: Close-up of LOF introductory page. (Translation mine)

Week	Weekly Learning Objectives	Page numbers
<div>Week 1</div> <ul style="list-style-type: none"> Understanding less-more. Understanding near-far. Understanding small-big. 		<div>00 to 00</div> <div>00 to 00</div> <div>00 to 00</div> <div>00 to 00</div> <div>00 to 00</div>
<div>Week 2</div> <ul style="list-style-type: none"> Understanding front-back. Understanding up-down. Understanding light-heavy. 		<div>00 to 00</div> <div>00 to 00</div> <div>00 to 00</div> <div>00 to 00</div> <div>00 to 00</div>

Figure 39: Self-description of toolkit usage

These pages present an idealized flow of how different artefacts are to be used on a daily weekly and yearly basis. The first two pages are trackers for teachers to tick-off as they progress through the years syllabus.

Figure 40: Self-description of lesson plan and worksheet pages



These pages describe the different types of lesson plans and worksheets. Lesson plan and worksheet pages are deconstructed and labelled with what information can be found at various locations on the page. It also includes the sequence to use these various types of pages.

Figure 41: GRR explanation in the self-description of lesson plans in the introductory section of the teacher guidebook

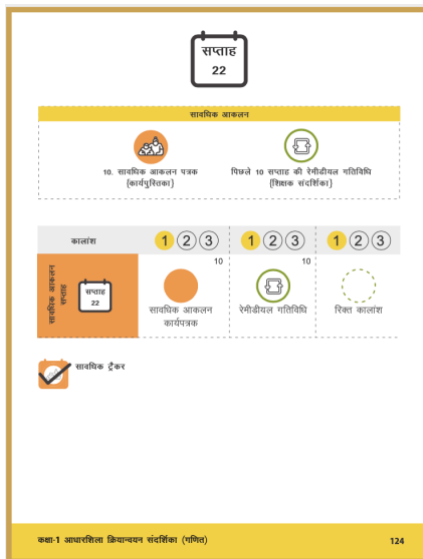
The introductory section of the teacher guide is followed by lesson plans for 20 weeks of teaching. Each week has 6 pages of lesson plans for it.

Figure 42: Six 6 pages of lesson plans for a week.



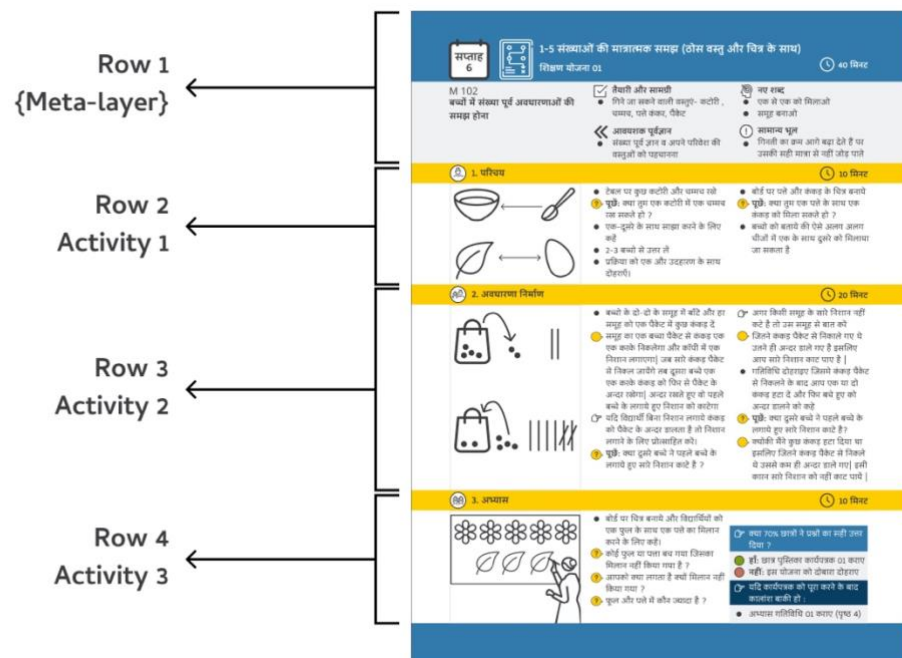
For weeks 11 and 22 which are for yearly periodic assessment, there are no lesson plans and only a separator page.

Figure 43: Separator page for weeks 11 and 22



Each lesson plan page in a week¹² can be further broken down into 4 rows.

Figure 44: Four parts of a lesson plan page



The first row of each lesson plan belongs to the meta-layer of this page as it covers information like week number, lesson objective, preparation needed, common mistakes to

¹² The exception to this structure is the 4th page of a week on bonus activities.

expect and necessary prior knowledge. The next three rows give step by step instructions for conducting learning activities. Thus, each week has six pages, and each page has four rows.

Figure 45: Abstracted Lesson Plan Page Design (Translations mine)

<div>Week no.</div> <div>Lesson Plan <Number></div> <div>Learning Objective</div> <div>40 min</div>	
<About the lesson plan & preperation>	
<div>1. Introduction (I do)</div> <div>10 min</div>	
<I do visual>	<I do: Step by stepy instructions>
<div>2. Concept Building (We Do)</div> <div>20 min</div>	
<We do visual>	<We do: Step by stepy instructions>
<div>3. Practice (You Do)</div> <div>10 min</div>	
<You do visual>	<You do: Step by stepy instructions>
Class 01 Book Name	
01	

Figure 46: Abstracted lesson plan page design with AII elements

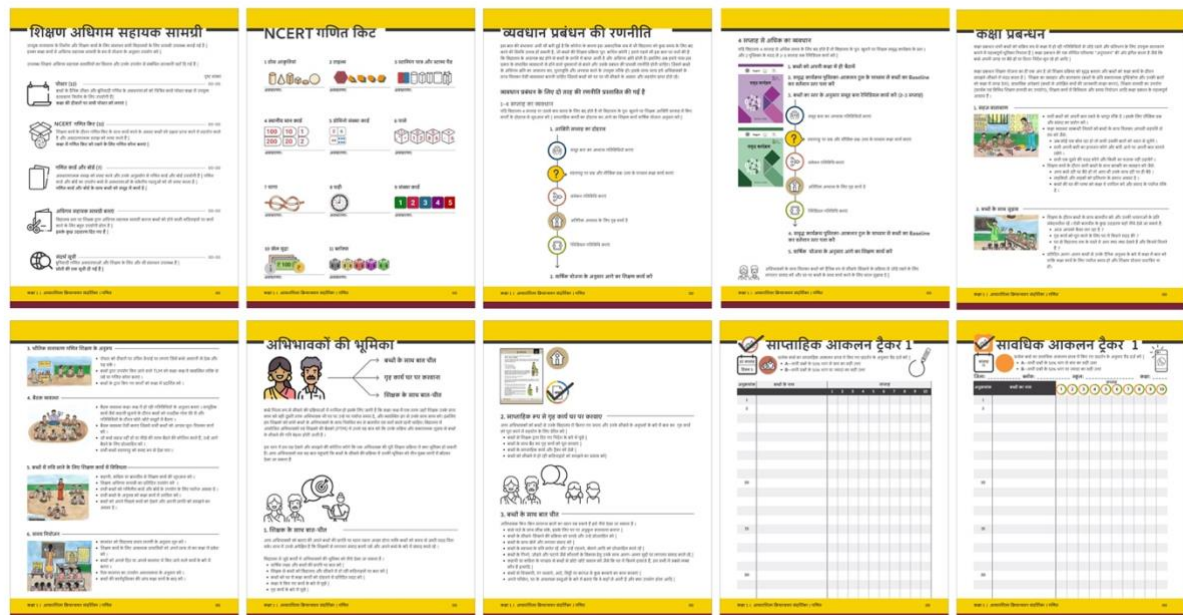
<div> <div>Week no.</div> <div>Lesson Plan <Number></div> <div>Learning Objective</div> <div>40 min</div> </div>	
<About the lesson plan & preparation>	
<div> <div>1. Introduction (I do)</div> <div>10 min</div> </div>	
<div><I do visual></div>	<div> <div><Instruction></div> <div> <div>?</div> <div>पूछें: <Ask:></div> </div> <div><Instruction></div> <div><Instruction></div> <div><Instruction></div> <div><Instruction></div> </div>
<div> <div>2. Concept Building (We Do)</div> <div>20 min</div> </div>	
<div><We do visual></div>	<div> <div><Instruction></div> <div><Instruction></div> <div><Instruction></div> <div><Instruction></div> <div><Instruction></div> <div> <div>?</div> <div>पूछें: <Ask:></div> </div> </div>
<div> <div>3. Practice (You Do)</div> <div>10 min</div> </div>	
<div><You do visual></div>	<div> <div><Instruction></div> <div> <div>?</div> <div>पूछें: <Ask:></div> </div> <div> <div>?</div> <div>पूछें: <Ask:></div> </div> <div> <div>?</div> <div>पूछें: <Ask:></div> </div> </div> <div> <div>Did 70% students answer questions correctly ?</div> <div>YES: Conduct worksheet 3</div> <div>NO: Repeat this lesson plan</div> <div>If you have excess time after finishing worksheet</div> <div>Conduct practice activity 3</div> </div>
<div>Class 01 Book Name</div> <div>01</div>	

After lesson plans for 20 weeks¹³, the teacher guidebook ends with pages with supplementary information which also belongs to the meta-layer of the toolkit. It consists of the following types of self-descriptions:

¹³ The toolkit is planned for 22 weeks. Of these 2 weeks are kept aside for periodic assessment and do not have lesson plans for them.

1. Self-description of math objects kit and posters/ charts to be used along with the toolkit.
2. Self-description of role of parents and how to involve them with the toolkit.
3. Self-description of recommended toolkit usage.

Figure 47: Ending pages of teacher guide with additional layers of self-descriptions

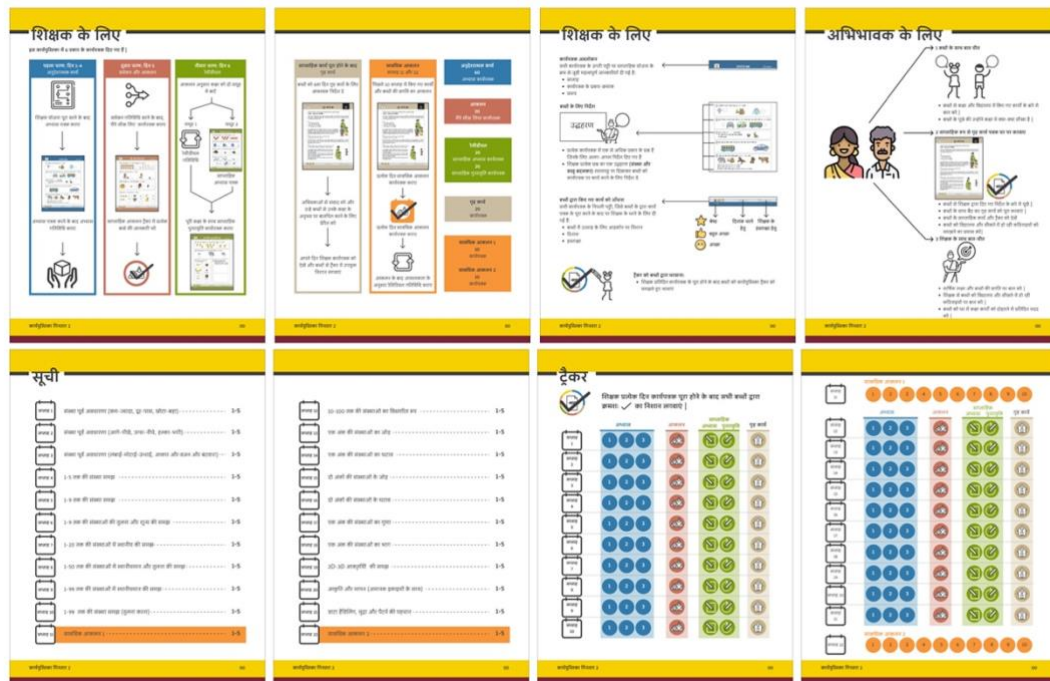


Student Workbooks

The toolkit consists of three student workbooks. One for each grade. A similar approach to the previous sub-chapter can be used to analyze the student workbook to give the following results:

1. Each workbook has two broad sections. An introductory set of pages that belong to the meta-layer followed by worksheets for the year.
2. The years' worksheets are broken down into week-wise sets.
3. Each week is a set of 7 pages. Each page is one worksheet.
4. Each worksheet has three rows. Rows one and three belong to the meta-layer of the page while row two consists of the practice questions students are to solve.

Figure 48: Self-description in introductory section of workbooks

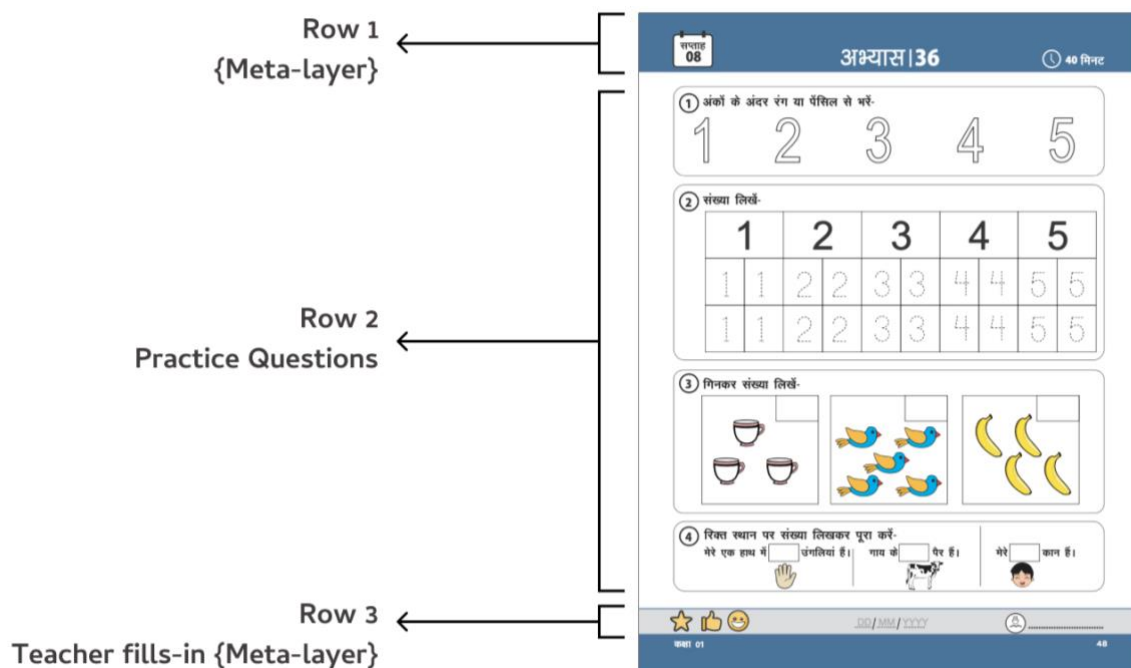


These pages describe the relationships of worksheet with lesson plans in the toolkit, have a map of what information can be found on a worksheet page layout, instructions for parents, week-wise index of concepts and a tracker for students to tick-off.

Figure 49: Set of seven pages for a week in workbooks.



Figure 50: Three parts of a worksheet page



The first row has details of week number, worksheet number, worksheet type and estimated time. The bottom row is a meta-layer to be filled-in by the teacher after students have completed the questions. It includes encouragement symbols (star, thumbs-up and, smiley face), a space to fill-in the date and a space for the teachers' signature.

Math Objects Kit

The third object on the plane of expression in the toolkit is the NCERT Maths Object kit. It consists of 11 object sets.

1. 6 3D Objects
2. 20 colored tiles. 4 shapes (square, triangle, hexagon and rhombus) in 5 colors each and a hexagonal base plate.
3. Stamp pad with 5 stamps.
4. Place value chart cards
5. Dominos
6. 4 types of dice
7. String

8. Clock
9. Number cards
10. Demo currency notes and coins
11. Blocks

The object kit does not have a meta-layer detailing possible uses or other information.

Few conclusions:

1. Meta-layers are built into various hierarchical levels of the teacher-guide and the workbook while there is no meta-layer in the object kit.
2. The meta-layer of the toolkit as a whole resides only in the teacher guide. The workbook contains a sub-set of this meta-layer.

Appendix 4: Sample consent forms

Consent for participation in research interview

Date: _____

1. I have received sufficient information about this research project & agree to participate in an interview conducted by Kaustubh Khare, student at the University of Tartu.
2. My participation as an interviewee is completely voluntary. There is no explicit or implicit coercion whatsoever to participate.
3. I allow the researcher to take notes during the interview.
4. I may also allow the recording of the interview by audio and/or video. It is clear to me that in case I do not want the interview to be recorded I am fully entitled to demand for no recording to take place.
5. I have been given the explicit guarantee that the researcher will not identify me by name or function in any reports using information obtained from this interview, that my confidentiality as a participant in this study remains secure.
6. If I consent to a recording, a transcript, without my name, will be kept until the research is complete. The transcript can be accessed only by Kaustubh.
7. All recordings and transcripts will be erased once Kaustubh's dissertation is accepted.
8. I have the right not to answer questions. If I feel uncomfortable in any way during the interview session, I have the right to withdraw from the interview and ask that the data collected prior to the withdrawal will be deleted & my responses be ignored for the research project.
9. Personal data will be processed in full compliance with the University of Tartu's Data Protection Policy.
10. I have read and fully understood this form. All my questions were answered to my satisfaction.

Signature: _____

Name: _____

(Interviewee)

Signature: _____

Name: Kaustubh Khare

(Researcher)

Appendix 5: Affirmations and concerns from focus-group discussions

Concerns: Clarifying and/or questioning the principle.

1. In the past 4 years this is the third framework for objectives or learning outcomes we have been given. How long will this new one stay constant for?
2. The total scope of learning objectives in the teacher guide seems lesser as compared to current textbook. Why is this?
3. The difference in scope is most in Grade 3. This toolkit stops at grade 3 but children will go to Grade 4. Won't this leave them underprepared for grade 4?
4. Does this cover the mandated curriculum for each grade?
5. The sequence of learning objectives deviates from the textbook at times. Why?
6. The syllabus in private and convent schools is more extensive as compared to this toolkit. Won't this send a message that the capabilities of government school students and/or teachers is lesser than private and convent schools?
7. I usually start classes with a small game all children play in a group. This way students get energized at the start of class. If we start with 'I do' section, it'll be a dull start to class. Why can't we start with 'We Do' instead?
8. In both 'We Do' and 'You Do' sections of the lesson plans, teacher and student are working together. I can't see a clear difference between the two. What is the difference?
9. Some concepts are learning counting 1 to 10 is effective with just 'We Do' where we ask students to repeat after us. Is this to teach all types of concepts?
10. At the end of a lesson plan, the checkpoint is if 70% of students have answered correctly. Is this referring to all the questions in the lesson plan? Or only the questions in the 'You Do' activity?
11. Students and parents get stressed out the moment assessment is mentioned. By including weekly assessment, won't we be increasing this pressure?

Concerns: Impact on how teachers will be evaluated and monitored.

12. When mentors and administrators review the progress of our class, will we be asked how many week's LOs from the teacher guide have been completed? Or will be asked how many chapters from the textbook have been completed?

13. Parents will not have the teacher guide and will monitor progress based on textbooks.
How shall we answer their questions on how much progress has been made in the textbook?
14. If I deviate from the lesson plan, will I be penalized or reprimanded?
15. When mentors conduct classroom observations, will I be reprimanded if I don't follow this approach?
16. If we are not teaching using the lesson plans, how will someone observing our class decide if we are in 'I do', 'We do', or 'You do' phase?
17. Will weekly assessment results become another parameter on which our teaching prowess is evaluated? Is this why the weekly assessments tracker is given?

Concerns: Challenges in translating the self-model for change into their classroom instruction and practice.

18. The toolkit wants us to work on 3 learning objectives in a week. If my class is not able to learn these in the given time, how many extra days can I take?
19. If due to holidays or breaks for other reason, my week doesn't start on Monday, how should I plan?
20. We have not received the teacher guides yet. In-case we don't receive them soon, we will start teaching using the textbook. It seems complicated to transition from teaching using the textbook to teaching using the lesson plans. How will this be possible?
21. Attendance on Fridays and Saturdays tends to be lower than at the beginning of the week. Allotting these days for assessment and remediation might reduce the number of students who can be a part of this.
22. During remediation when we split the class into two groups. Teachers can focus on group A (need support with concept) only if the group B is self-engaged and silent for at least 20-30minutes. The weekly practice sheet seems like it won't be able to achieve this since it is very similar to other worksheets in the week. Students that know the concepts will solve these questions very quickly. It would be better if this sheet had questions of a higher difficulty level. This will challenge group B and keep them engaged for longer.

23. We already have several registers and records to update. Why are we adding more trackers? It will be easier to just sort the workbooks into two piles for groups A and B while evaluating them.
24. There is too much information in the introductory pages of the teacher guide. Not many will have the time to patiently read through it all.
25. It is not clear what the role of the textbook is. We have been teaching based on the textbook for years and are not sure if it is to be discarded or how it links with this toolkit.
26. Government schoolteacher is a highly competitive job to with multiple rounds of exams. After all this preparation and competition, does the government think we don't know how to teach? Why don't they just trust us to do our job?
27. We already have a lot of materials and trackers for teaching and administrative responsibilities. Attendance registers, textbooks, workbooks, charts, exams, report cards, calendars etc. The teacher guidebook is an additional item being added. Adding more material complicates things, why can't we reduce to simplify?
28. This approach is new in many ways & we need to understand it well to be able to implement in class. Will we get the printed copies well before the session starts so we can go through it on our own?
29. Following the expectations of the toolkit very strictly is tough to do and I am not fully convinced of all its aspects.
30. Referring to the teacher guide consistently on a daily basis is challenging as we are very stressed for time.

Affirmations: Conceptually affirming elements in the self-model for change.

1. Textbook chapters are at a broader level. Breaking them down into daily work requires time and finding time is a challenge for teachers. This can save our time and mental effort.
2. Breaking down learning objectives to micro-steps gives a clear goal for the period which I can work towards.
3. These can be a guide for understanding day to day progress which is currently vague and tough to gauge.

4. Classrooms always have two types of students. One group picks up concepts quickly while the other takes a long time to learn. Splitting the class for remediation matches this reality of our classrooms.
5. In numeracy concepts build on each other like a pack of cards. If a base level concept is weak then many subsequent concepts are also misunderstood. Having daily and weekly checks is a good way to minimize this.
6. Assessments are usually treated as a tool to pass judgement on students and/or teachers. This approach of treating it as feedback for teaching is much healthier.

Affirmations: Translating the self-model into classroom practice can enhance their classroom instruction and practice.

7. The sequence of learning objectives seems more sensible than teaching in the chapter sequence. Better to teach one set of numbers and work on addition subtraction with just these few numbers instead of teaching entire set of numbers 1-100 and then moving to number operations.
8. Usually at the end of the year I realize that a lot is left and am forced to rush through concepts to finish curriculum on time. By mapping learning objectives with weeks, it is much easier to know if I am lagging in annual curriculum completion.
9. Even if I don't follow the lesson plans and stick to my existing approach to teaching, LOF makes it easy for me to look for ideas I need help with. If my class gets stuck at a particular concept, I can easily search for the specific learning objective & maybe get some ideas on how to teach it differently.
10. Primary grade students often learn by copying teachers. GRR builds on this to create a systematic teaching technique.
11. In class if students are not responsive to prompts, default approach is to stay in 'I do' phase by narrating stories or examples and then move directly to 'You Do' by giving problems to solve. Lesson plans can give ideas for activities for the 'We Do' phase where interaction with students is most.
12. As of now assessment happens once in 3 to 4 months. Post this when we identify students who are struggling, too much time has been lost to provide effective support to them. With weekly assessment worksheet as a tool, I can catch the misconceptions early and address them before moving on to subsequent concepts.

13. Finding time on a daily or weekly basis for assessments is usually tough. By making daily assessment based on simple questions and integrating weekly assessment into the workbook it becomes much easier for assessment to be integrated into teaching. It's seamless and easy to do as opposed to separate activity that we need to make special arrangements for.
14. Clarifying misconceptions requires almost one-to-one attention to effectively support each student. By segregating the class into two groups, the possibility of giving individualized attention increases. Currently, we usually ask students who are struggling to stay back for extra time after school hours to provide this attention. If remediation in groups works out, it will save time for both teachers and students.
15. The teacher-guide and workbooks are well designed, colorful, visual and have good print and paper quality. For the first time, our books will be at par if not better as compared to what private convent schools have.
16. I will rely on the toolkit when my current way of teaching is not producing results. This seems like a great source for new ideas.
17. I will read the teacher-guide at the end of the week to prepare for the next week.
18. The workbooks are very nice as the number of opportunities per sheet that a student has for answering is quite high. This helps us get better insight into child's learning and will keep them engaged in class for longer durations.
19. Even if teacher guide is not followed, the workbook can still be used in class independently.
20. We already have a lot of materials, books and trackers for in-class teaching. The teacher guide is like a one-stop from where I can easily find out what material to use when and how to use it.

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