

DIGITAL TOOLS FOR ASSESSMENT OF HISTORY LEARNING

INTERACTION DESIGN - PROJECT III

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Approval Sheet:

The Interaction Design Project iii titled “Digital tools for assessment of history learning” by Nazreen O Nizam (Roll Number 156330011), is approved, in partial fulfilment of the ‘Master in Design’ Degree in Interaction Design at the Industrial Design Centre, Indian Institute of Technology Bombay.

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Declaration:

I declare that this written document represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea, data, fact or source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

A handwritten signature in blue ink, appearing to read 'Nazreen', is written over a light blue rectangular background.

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Interaction Design

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Interaction Design

Abstract

History education in India is still dependent on the bookish way of learning. The syllabus based learning is not effective enough to validate historical thinking among students. Hence a design led intervention by which a digital assessment system could promote better historical understanding and learning among students in middle school is the goal of the project.

The assessment system in a digital platform, aims at creating better historical thinking within the framework of existing textbook chapters. For this the potential knowledge bank of the textbooks were evaluated on the basis of existing learning strategies and frameworks in historical learning. From this possible question types were identified which could be looked at through a digital platform. After this the additional or supporting tools for the questions were designed. The assessment system aims at creating a better classroom

interaction among teachers and students to promote history as more than just an hypothetical and non concrete subject. Furthermore the tool intends to create an answering space to use visual, textual and timeline components. This to grasp how better historical thinking inculcated in a classroom over the existing practices mainly which are from textbooks.

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1. Introduction

1.1. Background

Education system is in a steep paradigm shift this century. Many education theories and technology framework is trying to develop the skills, capabilities and attitude of students. Different systems varying from *content centric learning model* to *student centric learning models* is being used in different ways to transform the prevailing instructional practices.

Assessment system is a inevitable key factor that plays a vital role in student learning environment. One could start by addressing questions like what is the sole purpose of assessment. Does assessment display the right grasp of the subject? Or even what happens after an assessment?. The model of assessment in learning environments is being reframed. The new framework visualizes how computers may disrupt completely the manner in which education is imparted today. Disruptive innovation may proceed in two stages. The first stage is the introduction of computer

based learning. The next stage would be the deployment of student centric technology. Assessment hence is a sector which holds great potential in evolution of learning.

1.2. Motivation

Assessment has always been a separate section in a classroom. The teacher performs assessments after covering certain chapters of the syllabus. In subjects like history the summative assessment models are not clearly indicative of the historical understanding in students. The attempt of this design project is to understand how incorporating an assessment system which could encourage historical thinking among students. Also give direct analytics on what the class has understood in terms of historical concepts and to promote more classroom based discussions on the basis of the assessments conducted.

Project idea:

**How more
assessment
systems can
bring about
better historical
thinking among
students**

2. Education in History

History opens to students the great record of human experience, By studying the choices and decisions of the past, students can confront today's problems and choices with a deeper awareness of the society that they live in. History opens to students opportunities to develop a comprehensive understanding of the world, and of the many cultures and ways of life different from their own[5].

Indian syllabus of history education:

In CBSE education system, the subject history starts from the 6th standard with textbook named "*Our past part 1*". The history education in our country covers content from pre-historic period which includes the great civilizations of Harappa to the Freedom struggle of our country. In global context, the content covered includes the civilizations of Egypt, trade routes etc. Primary focus of the history education is on national prosperity before colonial rule and

the national freedom struggle during the colonial period.

2.1. Content Analysis

As the project idea was to explore how assessments in historical learning can bring a difference in the thinking capability of students, one has to move forward to structure what sort of content is to be studied. To narrow down the search standard 7 CBSE was chosen. From available resources these are the potentials looked:

1. NCERT textbooks
2. CCE exam papers
3. Online mock exam papers
4. Online solved exam papers

Apart from this other referral like Khan Academy and so on were looked at. This followed by a study section which discusses different researches and articles that deal with an ability of creating content for different assessments and its dependence on education and instruction content.

Appendix 1:
A detailed list and analysis on
the content of history from
class 6 to class 10 is given.

2.2. Understanding history assessment

In conventional problem solving that is in school subjects like maths and science, we are given a question and we use a set of procedures or processes to find a solution. In history, we are given a question of which we already know the outcome and the learner has to reconstruct the objective [10]. Hence historical understanding clearly can be derived from the reconstruction objective in the historical assessments in schools.

This can be better explained by role of factual knowledge and conceptual frameworks in understanding:

Let's take the case in quantitative courses such as physics, students simply focus on formulas which are derived from laws, for example $\text{Force} = \text{Mass} * \text{acceleration}$ is derived from Newton's laws. For any question in assessment like:

State laws of motion..

Or applying the formula to any statement problem can give the right cognition capacity of the student.

1. Deciphering the problem

2. Concept \ law application

3. Solving the variables

4. Numerical answer

This also makes it easy for the teacher to point out where the student is struggling, is in in factual knowledge or conceptual framework. Now when it comes to a subject like history sometimes knowing the factual knowledge itself does not ensure that the student has conceptual clarity.

Let's take a question:

What are the causes of revolt of 1857?

The student can answer this question in facts but again the teacher might fail to understand if the student know what is a “revolt”. This helps in understanding between cause of event and concept of event.

2.3. Content consumption in history

Before even going to the assessment part we need to discuss the goals of learning history. For this the reference was done from the National centre for history learning (NCHS)

by the Department of history by UCLA. There is a determining amount of work done in the area of “significance of history learning for the educated”[13]. This study is curated by historians, instruction design experts and history educators\teachers around US.

The study of history, as noted earlier, rests on knowledge of facts, dates, names, places, events, and ideas. In addition, true historical understanding requires students to engage in historical thinking[8]. Historical understanding also requires that students thoughtfully read the historical narratives created by other sources which could be textbooks, movies, internet etc. to promote essential skills in historical thinking. These are the the five essential layers to historical learning designed by the National center for History in schools, by the department of UCLA department of history [12]:

1. Chronological Thinking
2. Historical Comprehension
3. Historical Analysis and Interpretation
4. Historical Research Capabilities
5. Historical Issues-Analysis and Decision-Making

Since the focus of the project is on an assessment tool which helps bring out better historical thinking among students. Hence the study was concentrated more on the first two being chronological thinking and historical comprehension.

2.4. Chronological thinking

Chronological thinking is the first developmental way to define historical thinking. Chronological thinking predominantly understands the temporal sense of event occurrence. Temporal sense leads to better historical comprehension (discussed in section below) with respect to pre event occurrences, causatives and outcomes [5].

Students should also be able to analyze patterns of temporal order, for example, in the development, over time, beginning with trade among settlements of the Harappa and Mohenjodaro to continuing through the growth of the great land empires of Sultanate, Mughal, World Wars and so on. According to history educators the role of time is very important in History. Therefore chronological thinking would be a

mandate during learning. Chronological events may not necessarily mean linking up of events with date but rather the play of sequence in learning.

For example: When did Mahatma Gandhi die?

A: On January 1948

B: On January 1948 after India was partitioned.

Out of the two answers historical thinking is more evident in the second answer in relation with chronological thinking.

2.5. Historical comprehension:

Historical comprehension can be defined as grasping the essence from historical narrative with historical reasoning. The UCLA states that “historical narratives also have the power to disclose the intentions of the people involved, the difficulties they encountered, and the complex world in which such historical figures actually lived” [11]. Comprehension is the reconstruction of historical event which is the crux of history education. The problem with history education is that one often confuses “mugging up” or memory learning with historical reconstruction.

The UCLA structure essentially tries to point out how there is confounded difference

between temporal order memorization and historical comprehension of any historical narrative. These skills include:

- 1) Identifying the central theme of the historical narrative;
- 2) Defining the purpose, perspective, or point of view from which the narrative has been constructed;
- 3) Reading the historical explanation or analysis with meaning which could be causatives, successions etc;
- 4) Recognizing the author's point of organization of narrative [5].

The student comprehends a variety of historical sources:

Therefore, the student is able to stated by NCHS [2,11]:

- Identify the author or source of the historical document or narrative.
- Reconstruct the literal meaning of a historical passage by identifying who was involved, what happened, where it happened, what events led to

- These developments, and what consequences or outcomes followed.
- Identify the central question(s) the historical narrative addresses and the purpose, perspective, or point of view from which it has been constructed.
- Differentiate between historical facts and historical interpretations but acknowledge that the two are related;
- Read historical narratives imaginatively, taking into account what the narrative reveals of the humanity of the individuals and groups involved their probable values, outlook, motives, hopes, fears, strengths, and weaknesses.

2.6. Learning structure:

Conventional problem solving, we are given a question and we use a set of procedures or processes to find a solution. In history, we are given a question of which we already know the outcome and the learner has to reconstruct the objective and state of the event by engaging with the data.

What is a historical event?

Historical event as a mental construction:

- The beginning
- The middle

- The end

Historical event as a mental reconstruction:



Figure 2: Structure of classification

This depicts the basic classification of event reconstruction in historical thinking. now we could look at an example,

Of the papers surveyed for historical problem solving six of the solutions were based on paper-based activities and three were based on the use of technological tools to support learning of the required sub-skills. The non-technological approach required active involvement of the teacher with the students. The strategies included reading multiple documents and writing opinion pieces [14], thinking aloud [15], the use of annotations, highlighting, marking and

notes with a combination of individual and group. Apart from creating an event the in an assessment, historical comprehension involves understanding concepts and reusing event data to determine the concept that are taught to students. Example of a historical concept:

'culture', 'democracy', 'freedom', 'the state'

From the examples of historical event, 'revolt', 'independence' and 'war' would also be considered historical concepts.

Figure 2: Example with the classification



The above section summarizes the importance of historical learning and comprehension. assessments prove to be a direct indicator of historical learning and understanding. The challenge now is creating the right assessment tool to improve historical thinking

3. Perspectives on learning environments

3.1. What are learning environments

There are three perspectives from which educators look at learning environments [4]:

1. The learner-centered lens encourages attention to preconceptions, and begins instruction with what students think and know.
2. The knowledge-centered lens focuses on what is to be taught, why it is taught, and what mastery looks like.
3. The assessment-centered lens emphasizes the need to provide frequent opportunities to make students' thinking and learning visible as a guide for both the teacher and the student in learning and instruction.

4. The community-centered lens encourages a culture of questioning, respect, and risk taking.

Assessments are a central feature of both a learner-centered and a knowledge-centered classroom. Once the concept framework to be taught in class or to be learned is well defined, assessment system is required to monitor student progress. The goal of the assessment system is to analyse and give an output that is responsive to student progress [4,6].

3.2. Focusing on assessment centered learning

There are two assessment patterns derived by educators which are followed in classrooms:

Formative assessment

Ongoing assessments designed to make students' thinking visible to both teachers and students are essential. An environment of formative assessment is one designed to provide continual feedback performances to both learners and instructors. The feedback from formative assessments can also help instructors or teachers by suggesting ways they might improve their instruction and by identifying where and how specific learners need further help [7].

Summative assessment:

Summative assessments are used to evaluate student learning, skill acquisition, and academic achievement at the end of an academic term which typically at the end of a project, unit, course, term or school year.

An important feature of the assessment-centered classroom is assessment that

supports learning by providing students with opportunities to revise and improve their thinking in [1]. Thus, formative assessment

might be viewed as part of the learning strategy itself which gives the student a better way of learning, whereas summative assessment be a visualization of the academic concept that provides summarized value of what the progress of learning in a given time period. Formative assessment centered classroom features include [3]:

1. "Developing students' abilities to take some measure, over time, of what they have learned and what they are struggling with.
2. Involves learning to recognize and differentiate between the strategies that are working well for their own problem-solving and those that are not as effective.
3. Helping learners to develop their met cognitive abilities means helping them to develop areas that will allow them to consistently assess and improve their own learning process."

To summarize the research on assessment centric learning, the two models need to be consulted with teachers to understand what model would work best with the goal to promote historical thinking among students.

4. From our textbooks

4.1. How CBSE textbooks are structured:

Information and study resources can be classified into:

TEXTUAL

VISUAL - TEXTUAL

**VISUAL - TEXTUAL -
TIMELINE**

Types of answering techniques in an assessment:

TEXTUAL:

This model is the typical model with which the existing question papers are set in CBSE exam. The disadvantage of such a model is that the effort is focussed on framing the content (language) that the content itself.

VISUAL - TEXTUAL:

In history answering the use of resource like maps and images are used for answering

questions which help students visualize more attributes in chronological thinking.

VISUAL - TEXTUAL - TIMELINE:

Is high order thinking which uses three attributes of answering they are place, people. Event and location. How chronological ordering of events affect historical thinking.



Figure 3: From chapter 4 Mughal Empire

The above given image is of mansabdar from the Mughal empire collecting tax from a peasant which can be easily recollected by

the student. The image portrays various concepts like hierarchy, feudalism which could be derived from an image. This a very useful insight even in developing an assessment tool.

The content if we analyse from the principles of historical thinking, the reconstruction which incorporates all three would be the highest comprehension level:

Historical event can be reconstructed as:

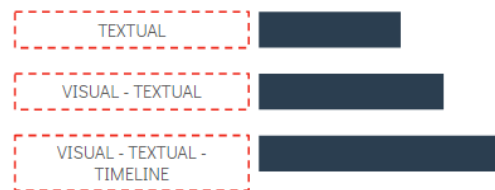


Figure 5: Historical event reconstruction

4.2. Structuring of History textbook:

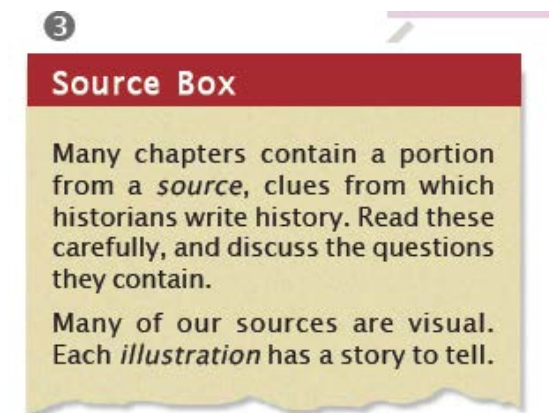
There are ten chapters which cover Indian history from pre Delhi Sultanate era to Eighteenth century political transformations. The content within these chapters are partially structured in chronological thinking. But is

some chapters important rulers or events grab more space.

Additionally to this there are:

1. Definition boxes.
2. Additional information
3. Source boxes
4. Maps
5. Activities
6. Elsewhere
7. Imagine
8. Keywords
9. Let's recall

Eg: For a Source box



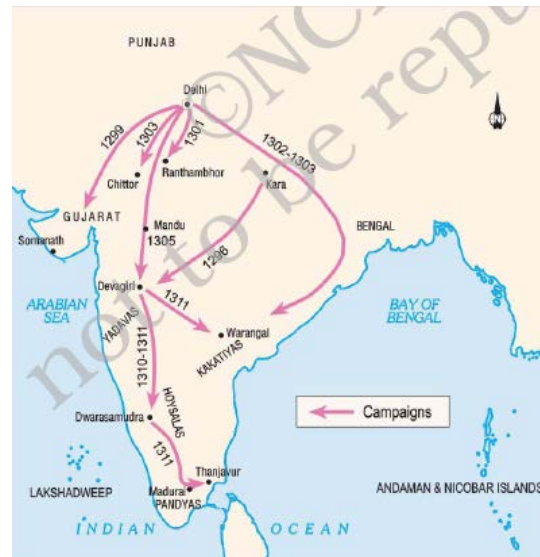
Fakhr-i-Mudabbir wrote a piece on circle of justice. This could be a visual depiction like drawing a circle and marking the points.

The strategies included reading multiple documents and writing opinion pieces (Stahl et al., 1996)

So if the student is asked what the circle of justice, maybe a flow diagram would be a convenient means of answering and also better understanding of the system.

Example 2: Maps

Explain Alauddin Khilji's campaign into south india.



This is the campaign which is diagrammatically represented for the

question. In the diagram the important points are dates and cities conquered. These cities are mostly capital cities of different princely states which were captured in war.

But the students tend to memorize the dates or cities captured. Often fail because visual memory could be stronger.

Example: Cross chapter reference

Compare Muslim mosques from the sultanate and Mughal dynasty period.

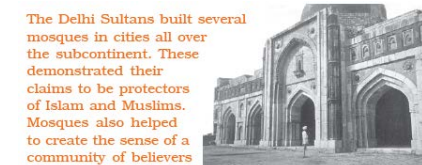


Fig. 4
Moth ki Masjid, built in the reign of Sikandar Lodi by his minister.



who shared a belief system and a code of conduct. It was necessary to reinforce this idea of a community because Muslims came from a variety of backgrounds.



Fig. 5
Mosque of Jamali Kamali, built in the late 1520s.

Compare Figures 2, 3, 4 and 5. What similarities and differences do you note amongst the mosques? The mosques in Figures 3, 4 and 5 show an evolution in architectural tradition that culminates in Shah Jahan's mosque in Delhi (see fig 7 in Chapter 5).

This question is given before the mughal empire chapter is taught. This question has visual and textual references and gives ample opportunity text if students go back

forth in chapters to make cross connections. Making cross connections is a strike feature of historical comprehension.

Example 4: Definition boxes

What is the role of Zamindars in Mughal administration?

Creating a persona of an unknown character from the past. This could have similarities with people existing today. Hence this also kind of gives an opportunity to have exploratory space in answering.

Key Insights:

Questions in NCERT textbooks can be ordered under the the three categories of mentioned above.

Content can be adapted with the NCHS guidelines for historical thinking.

There are potential question categories within the textbook to be converted to assignments. Hence teachers creating questions again for the assessment is not required. We can use the same database of questions and categories to create the assessment tool.

CBSE textbooks have variety options in Q&A section of the textbook. But the textbook itself does not have space to do these answers. The teachers don't have a separate tool to do these sections in textbooks

5. How do teachers look at assessments

5.1. Focussing how history assessments are conducted:

For this I went to AlAmeen Public School which is located in Edapally, Cochin. I sat through 3 classes of history and assisted teacher during the setting up of internal exam for 7th standard.

5.2. Sitting in classroom

The classroom period was for 40 mins. The teacher started class from where they had stepped of the last class. There was a smart TV in the classroom. The textbook reading and highlighting of important names and years were done by some student. Occasionally one or two questions were asked by the teacher from the previous chapters like,

“.. Name the ruler who also had a strategy of marrying between communities other than Shah Jahan?”

The diagrams in the textbooks were discussed in detail like

“.. how many of you have been to Delhi or Agra?! Who has seen the Taj Mahal?..”

The teacher in the second half of the period distributed an outline map of India to each student and asked them to represent the extent of Mughal empire in the country.

Even though no instruction was given the student performed this task using hatching technique to highlight the answer. While most kids used circle or spots to mark the territory. Then theses sheets were collected for assessment.

Looking through the class assessment:

The teacher did not immediately go through this exercise sheets collected as she had another class in the next hour. Sometimes they have continuous classes. During the afternoon session was when the teacher sat down to look at these assignments. Remarks on answer on the maps were:

1. This person has marked the maximum cities.
2. Shaded area marks the correct territory
3. Positions of cities are wrong.
4. Names got interchanged.

Breakdowns:

- There is no genuinity to understand how much the child has learned.
- There is a fear of poor performance of students.
- More importance is given to students who have achieved than the number of people who did not get the answers right.
- The presence of outside person knowing how well the class is performing was affecting the teacher.

- All answer sheets were not spent with equal amount of time. There was a hurry to finish the correction process.

Insights:

The result of the class clearly reflects the performance of the teacher in some way. The motivation of using an assessment system could be in improving how this data of students performance is represented.

Time period to look through each assessment was very critical. Teachers hardly have free time and hence to look through all activities performed in class.

The environment change definitely does affect assessment. During the assessment the teacher said “ Rishni has got the question wrong should have corrected immediately.” Scope for immediate feedback or responding to pupil was also a scope identified.

CBSE's old pattern of only one test at the end of the academic year, the CCE conducts several. There are two different types of tests. Namely, the formative and the summative. Formative tests will comprise the student's work at class and home, the student's performance in oral tests and quizzes and the quality of the projects or assignments submitted by the child. Formative tests will be conducted four times in an academic session, and they will carry a 40% weightage for the aggregate. In some schools, an additional written test is conducted instead of multiple oral tests. However, at least one oral test is conducted.

[9]

5.3. Setting of question paper / assessments

The school followed CCE assessment system, So hence I was part of setting up of a quiz for history . There are two teachers taking history for 4 division of 7 standard. So they meet up during a convenient time to set the paper.

Factors discussed before the test:

- Content covered by each teacher in their respective classes.
- Refer previous year quiz sets.
- Frequently asked questions in the summative test.
- Also referred question given in the textbooks.

Goal of quizzes\classroom tests:

When these teachers were asked what are the goals of the quiz/test?

Answers:

“Formative tests are mandatory. These quizzes are to be done as a part of CCE system. Students don't even refer to them for their final exams.”

“Sometimes having both these tests take up too much time. Tests will not produce effective results till we get to discuss them with students.”

Teachers themselves were not clear on the need of formative assessment system and how it could benefit the students.

Insights:

Research and observations from the field point to the existing systems having failed the teachers and they end up being unable to understand what requirements of formative assessment system is. We further theorise that it is the assessment methodology and the teacher's' mindset that needs a change in direction that enables teacher to understand the learning curve of kids. Although the existing textbooks provide plenteous opportunity to guide historical thinking among students. There is a need to help teachers make assessments serve the purpose and more valuable to the students contributing to their learning environment. Teachers have come to accept their roles as mere instructors rather than active practitioners of their crafts.

The assessment criteria needs to be rethought, based on the the goals of learning environment. The contextual usage of assessment tool needs to address the problems that are learned from the classroom. The exploration of a newfangled possibility of assessment in schools from the above groundwork.

6. Mixed bag of new ideas

6.1. Khan Academy

The Khan academy does both content videos and assessment model. They have restricted answering method to choosing the right option. Student can go back to the video or use a hint to solve the question. There are three tries you can take at the question.

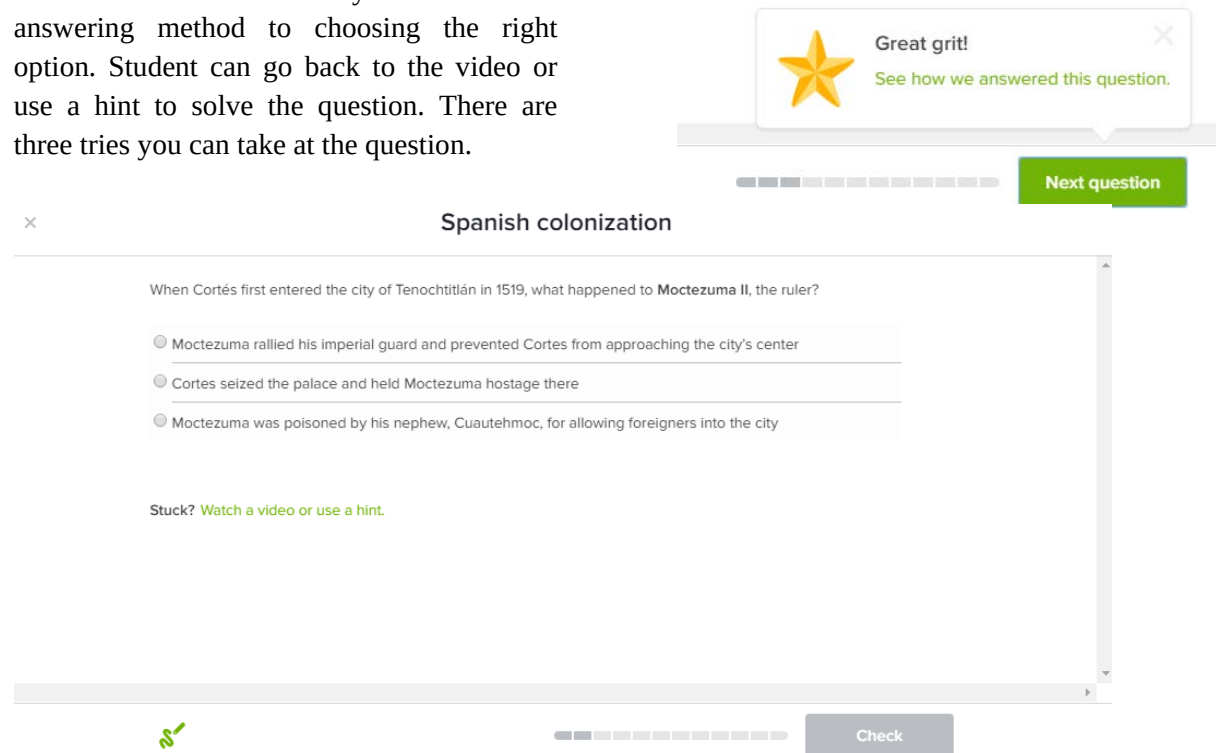


Figure 7: Merit system

Once the question is answered an incentive of star system is given as motivation to continue the test. There is also a progress bar.

The videos follow the usual blackboard system of Khan academy. But the content is chunked with TEXTUAL-VISUAL-TIMELINE elements.



Drawing over real world maps, showing pictures are all done on the virtual blackboard which proves as an advantage. Also seeing how the question could be answered after giving the correct answer is also.

6.2. Iken edu



Figure 8: Screen of content

How Iken edu works:

Animations: Elaborating on critical concepts with animations in 2D and 3D based on day-to-day situations.

After the video students are allowed to visualize their findings through a mind map.

Mind Maps: Visual summarization of topic contents for introduction or recapitulation. There are tools like Iken eboard which helps them do this. After the mindmap a revision presentation is given.

Presentations: Interactive slide-shows elaborating on the crux of content.

How does this impress kids?

Story Based learning: In history it is more important to understand different aspects which might not be clear through just oral teaching. The videos are well chunked with definitions and details. The kids can empathize by going to a Mughal court or sitting in the Khilji dynasty mosque.

More information on: <http://www.mexuseducation.com/>

6.3. CrashCourse



Figure 8: Screen of content

Online videos which explain history through rulers perspectives. There is a teacher narrating this story with different visuals to support his visuals.



The videos are not to be refereed for chronological thinking but more for historical comprehension. In the video about the mughal empire they raise questions which of Akbar and Aurangzeb were better rulers?

They also give thinking nudges to kids to explore other facts which are not just positive about the dynasty . The comment section provoked discussions not Aurangzeb txp policies versus Akbar's tax policies.

For more info:
<https://goo.gl/4LZRD2>

Summing up

The recurring concern we encounter in texts discussed above is the inefficiency of schools systems in assessments as a part of classroom learning. We have earlier discussed the theories of historical learning as both chronological thinking and historical comprehension. Later we have moved to different assessment centric learning system can contribute classroom learning. The design aim is to combine both these studies for appropriate and convenient tool which could be used in classroom. From studies and readings it shows how formative assessments can affect the learning of the kids. The role of the tool will be too imbibe historical thinking through formative assessment.

7. Areas of Intervention

7.1. Concerns

The condition is the availability of a digital device to be available to every student in class. The potential environment that is being looked at is how well a digital tool can be integrated to the classroom. The primary goal is that the tool should not be considered as an add on or skippable part, which is the case with formative assignments in general. Looking at the factors influencing historical thinking through an assessment method, formative assessment pattern seems to be an engaging teaching tool. There is also fair amount of difficulty with content itself. Hence the project makes the most out of the content within the NCERT textbooks.

7.2. Approaches

The research findings had suggested avenues for design intervention in digital medium. Initially when the project started out as a

students centered design project, but by the middle it was clear that both teachers and students needed to be part of the system contributing equally. Assessment systems clearly have teachers contributing uniquely to enhance student development. It was found not advisable to remove these practises from the system but give more leverage to this. Acceptability of any such intervention would depend on respecting existing work-flows and known ways of conducting classes. Hence scenario documentation of how assessments were conducted in classrooms became more relevant. This system could come with some disadvantages. Teachers are speculative about sudden visualizations how much students have learned from their class. If the results point out negative always there could be demotivation in the system. Also when a new system keeps monitoring (big brother like) feeling which could also be demotivating to use the system. Hence a steady growing and positive outcome sense need to be the goal of the project.

8. Goals

8.1. Design goals

Our primary goals are to make exercises help children in historical thinking. As part of the research goals which reinstated our design brief was the role of teacher in assessment. There were positive feedbacks about how tools for assessment was a good start to understand how children understand history. *I have classified the goals of the product to two categories:*

8.2. Learning goals

Encouraging historical thinking among students in classroom environment.

Providing content based answering techniques

Expressing answers in all three techniques of visual, visual- textual and timeline.

Providing opportunity for understanding history as a subject which requires understanding than memory power.

Additionally, giving a tool to know how history is directly with your surroundings.

8.3. Teacher goals

The project gives emphasis on how a teacher plays an important role in subject like history. The narrative of the subject plays a great in historical understanding. And also the assessment of subjects which are not having numerical input is a laborious task. Here is subjective factors involved which might shadow the learning curve. The claim is not that this the most potential tool for bringing about historical thinking in students. But it as an effort to combine both ordinary assessments and historical thinking in a platform. The role of teacher in this tool is not to prove her efficiency in teaching but to use the help tool to improve historical thinking of her class.

9. Device selection

9.1. Device Selection:

All teachers that were interviewed had some computer knowledge. Two of them had used Khan academy to see videos. They are smartphone users with task completion in video downloading, online shopping and instant messaging. This gives us an insight to use an interface more along the material design guidelines that a web page design.

The term smart classroom was familiar to them. This basically meant using videos in class to teach content. Smart classroom was restricted to using internet as a hub of knowledge. They had used some system like digital report cards (to enter and save grades of children). Digital exams was also not a new concept as there are many online tests available these days. Online tests were mainly quoted or classified as multiple answer questions. Online tests basically had no teacher input as all answers were computer generated. The tool idea did not completely automate the process of assessment because it could take away from the process of historical thinking.

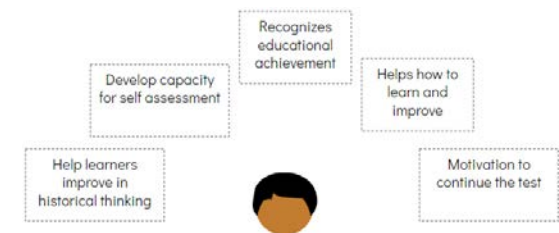


Figure 9: Goals with product

10. Prototyping of ideas

10.1. Structure of assessment:

From the CCE exam pattern, there are two models which are given by:

Summary model:

In *summary* question paper model, the kids get an overview of the type of questions

Choosing to answer the questions that they are well versed with gives us a disadvantage of testing their historical thinking. This does not give us a chance to test temporal thinking or historical concepts among students.

In *question after question* model:

The demotivation factor could set in if the initial questions are hard.

Less ownership with less control over the assignment. Hence in the structure we have combined both these models to tailor to the requirement. This method is followed by the Khan academy.

This model also gives motivation and inquisitiveness in students. Also by each passing question the students tendency to interact with different tools offered by the system could increase. This could be a hinderance in summary model.

10.2. 'Understanding' over memory learning

The tool is to promote better historical thinking among students. The initial idea is that different types or sets of questions might bring out better perspectives in students from the historical narratives that they have looked through. The question set should aim more towards concept clarity than memory learning.

Teachers also play a crucial role in. The structure should also point fairly to how teachers can contribute and leverage the

students historical thinking. In the initial design even though the role of teacher was quite vague, after research and classroom findings it is quite clear that the teacher plays an important role in bringing out better historical thinking.

10.3. Defining 'answering' techniques

Answering technique directly links to the historical thinking of the student. As per earlier discussions in the research side innovative ways to answer questions brings out a varied learning . Hence answering techniques is a fresh breath to the whole process. The challenge was that it should be done more in plus than the digital medium being more of constraint.

Since we did analyse the CBSE textbook questions, to start with trying them digitally. First we tested **textual resources**. The existing assessment has more than 75% of the questions promoting textual answering. In this also there different techniques like match the answer or multiple choice questions. But a same question cannot be answered in different ways. A second degree question arises that will different technique of answering bring any difference to students. For this a mock study was conducted and the whole process will be explained below:

(it was conducted with students of not the teacher with whom the interviews were conducted. The reason being there would be emotional factor involved in how the assessment goes!)

Exercise 1a:

Exercise 1: This is question which appeared in CCE exam 2015 and also given in the NCERT textbook. 5 students were asked to write the answer as well as asked to mark the correct answer in the textbook.

After this we evaluated the answer given by the students. The keywords to be presented in the answer was revenue, tax, rates, zabt.

Results - The teacher was asked to give feedback on each answer:

The answers were vague. All keywords were present in some of the answers which would ideally prompt the teacher to give more marks. But here after the discussion of historical thinking the teacher was not sure if the students understood how Zamindars fit into the Mughal empire.

Exercise 1

What was the role of Zamindar in Mughal administration?

Q: 5
 Page: 58
 CBSE Our Past - 2

After this they were asked to describe the relation under each connecting line.

Remarks:

It was the first time when so many points were combined to one answer. Also it was the first time that one answer was leading to the other. The teachers felt there was less writing than the preliminary test. They could also pinpoint what term is missing along with the connection.

There were students who filled four of the circles, 3,2,1... which was a direct indicator of how much they knew.

Students feedback:

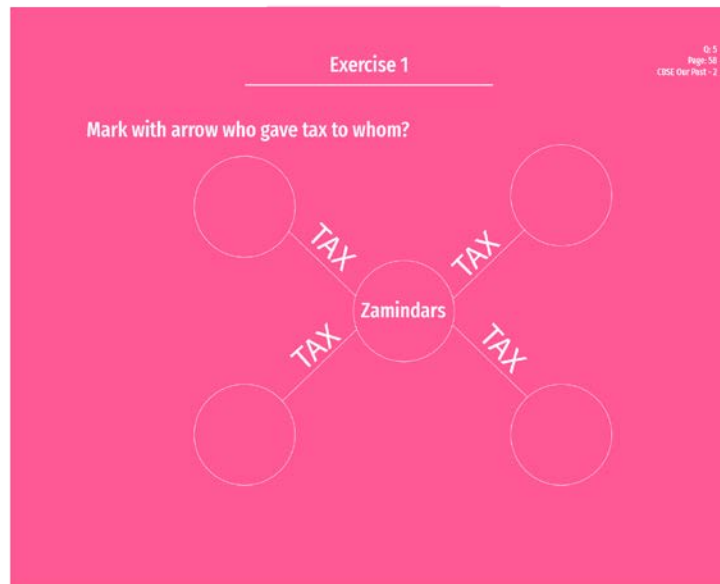
“Less writing”

“All connecting threads are through tax”

“ if we don't know all the terms it becomes evident in this test”

Insights:

Each of these feedbacks were indicative of different insights. Less writing in exams were always favoured by students. There was an indication of how “tax” was important in the answer. This clearly was a positive sign that was an aim of the test. The motivation factor was yet again questioned. The questions start requiring more precision which is different from their existing assessment patterns. This would need to some on boarding problem initially. *Eureka moment:* The teacher was asked to take a test with the same question in an upcoming class test. Out of the 5 students who attended the test 4 of them did the same bubble diagram in the answer sheet for the same question. This was a strong inclination to experimenting with answering techniques.



Exercise 2a:

Exercise 2a: This question is given in the NCERT textbook. 2 students were asked to take this question. One student automatically divided the answer space into two columns then answered the question. The other student wrote this an essay.

Despite the fact that question required a tool which enabled multiple inputs the students still restrict themselves within this answer sheets.

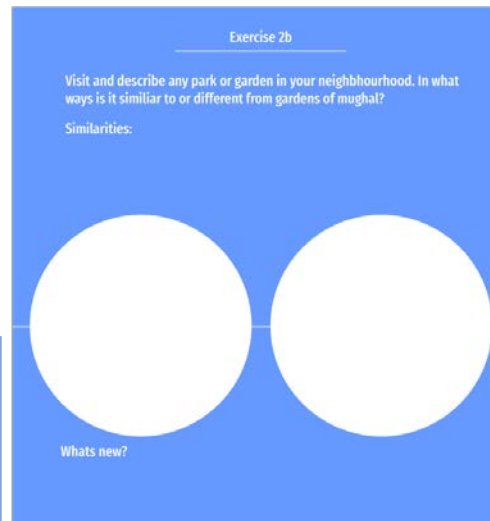
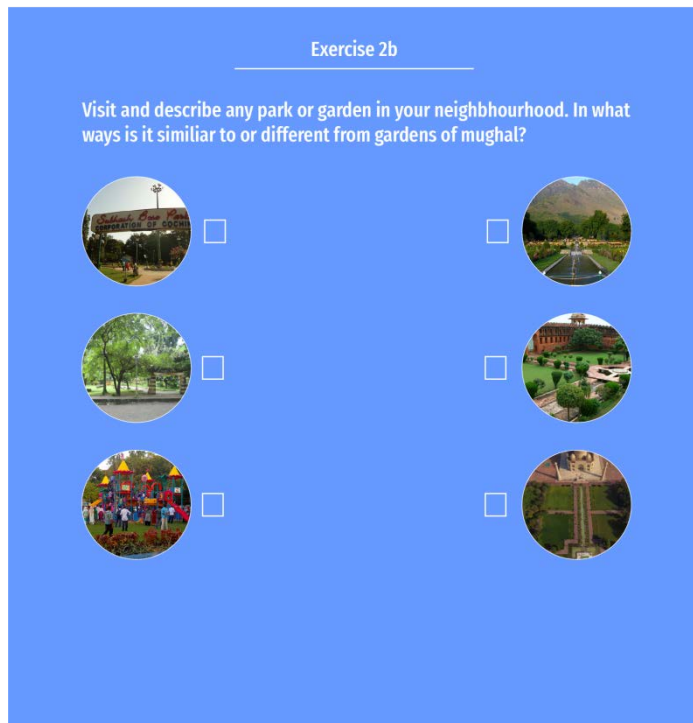
Exercise 2a

Visit and describe any park or garden in your neighbourhood. In what ways is it similar to or different from gardens of Mughal?

Q: 11
Page: 74
CBSE Our Past - 2

Exercise 2b:

Exercise 2b: Picking an image helps them in their visual thinking. Both students chose the image with Taj in it because they were familiar with the building than other images. The local parks that they chose were different. Then the students were given the second part to answer.



There was a space given then to draw similarities and writing key words. The answers when corrected gave some interesting insights

“ parks today have less AREA than in Mughal period”

“Geometric patterns are not there in today's parks”

“Parke were associated with palace at that time and is associated with space for kids now.”

The number of points given by students were far more relatable to historical thinking. Breaking down questions giving them other visual prompts were bringing out better answers in students.

10.4. Inferences from the pilot testing

Newly defined system got teachers also engaged into how students are responding to questions. The tasks were performed with less than 6 students as compared to a class of 36-42 students. Thus a new arrangement had to be given on how teachers should look at the answers.

10.5. Workflow

There were quite a few challenges in designing the work. After the exercise apart the important insight was that teachers felt the tool required to give indicators on how to look at answers and give valuable feedback to students.

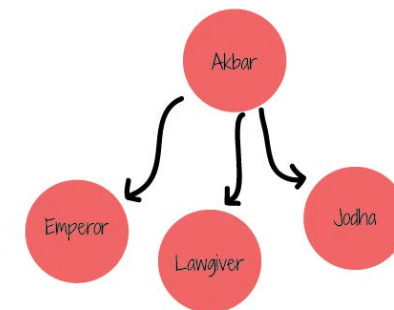
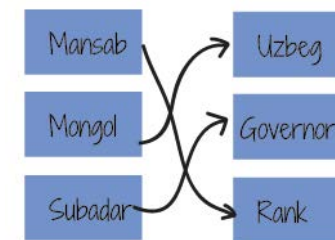
Hence there are three important parameters that are coined:

1. **Answering techniques**
2. **assessment indicators**
3. **Result grid**

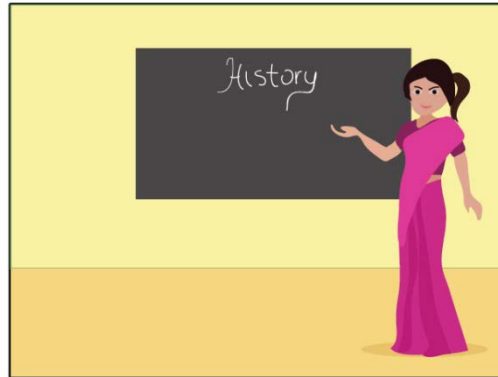
Answering techniques:

Word to word connection:

Match the following if the exercise that is already existing in exam papers. The tool could introduce flow diagrams, reirarchy diagrams and connection diagrams.

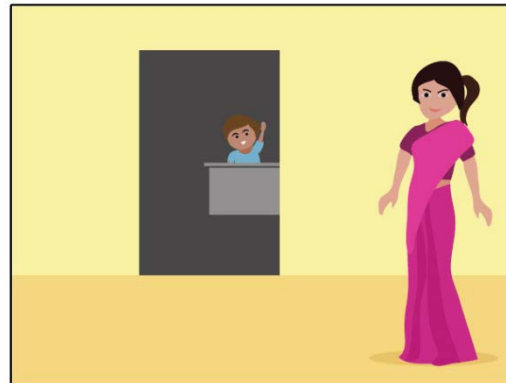


10.6. A classroom scenario

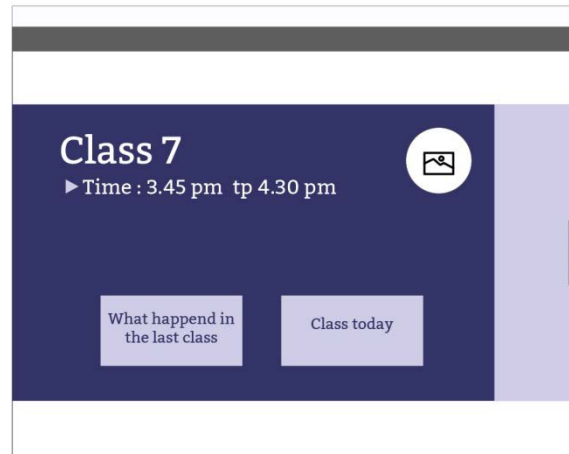


Teacher scenario

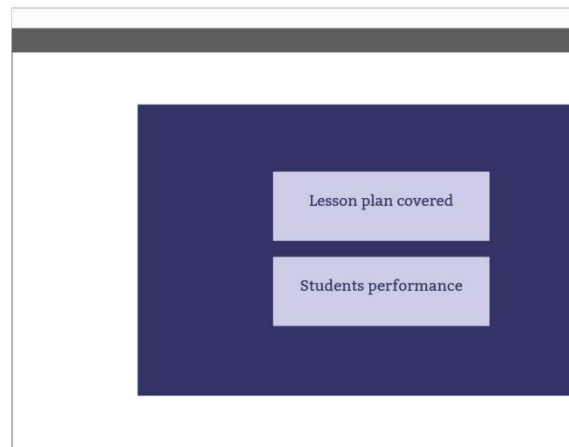
Mrs. Sunita is a history teacher and a learning methodology enthusiast. She adheres to the CBSE textbooks.



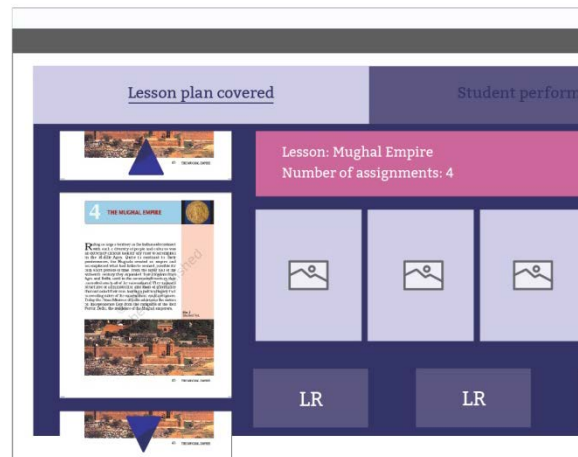
Sunita prepares for each class before her hour. She notes down from where she had left and what she aims to cover during the class. The introduction of the tool is to save time on this data and add more information before the class.



The teacher is given two options to choose before the class. Update on previous class and run through of upcoming class.



Within previous class a brief on lesson covered and students performance so far can be viewed by the teacher

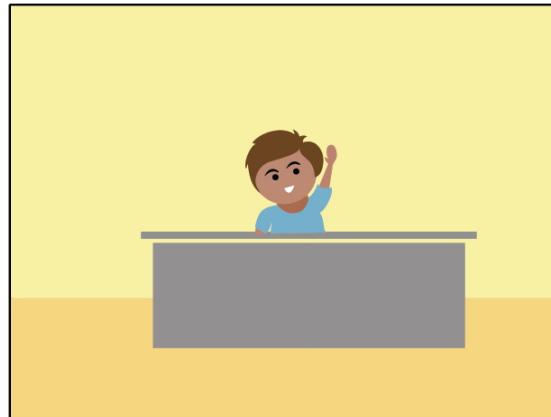


The lesson plan has three modules

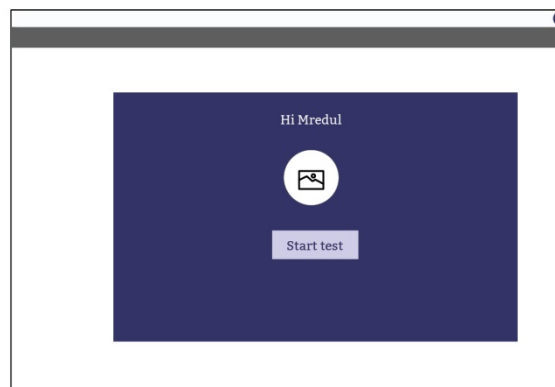
1. Section which has the content
2. Assignments with status done or not done
3. Lesson resource which are helpful videos or content additional to support historical thinking



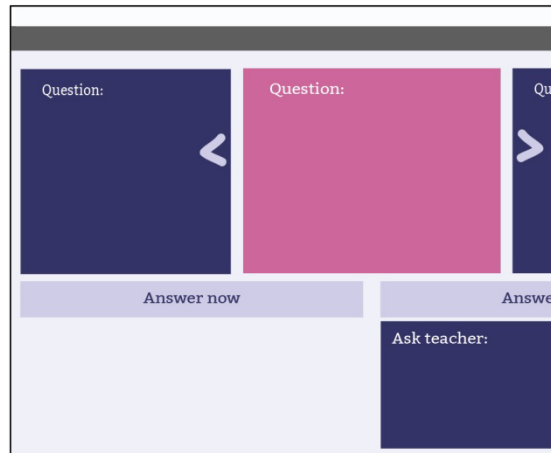
The introductory part before the class helps the teacher understand the learning pattern of the class. It also gives an understanding of how to plan classes as she might have time constraints. The time constraints should not get her to neglect formative assessments, hence the tool provides learning resources which then leads to the assignment.



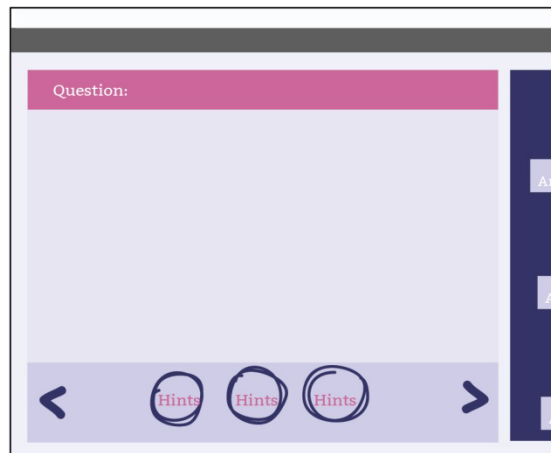
Mredul is a student of class 7. He has been scoring averagely in history exams. He feels history exams are very boring as he has to write a lot and remember. Sometimes the same answer can be repeated in multiple questions as well. He also feels history is not important as it cannot be used to make objects. He also complains that history classes can get sleepy.



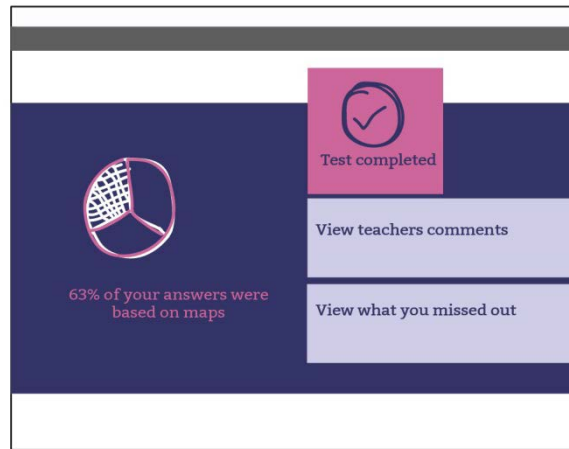
The student profile is already created. Once the teacher decides to start the test then the student screen changes to this. The students are not given permission to start a test.



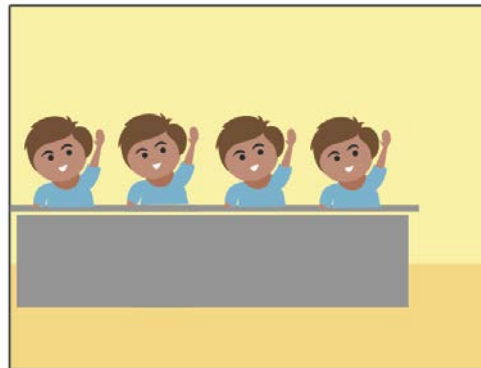
Once the test starts the question to question model is formed. At a time a three question screen space is allowed. The student has an option to immediately alert the teacher if the question is not clear. These are features which support more classroom interaction that substitution of teacher.



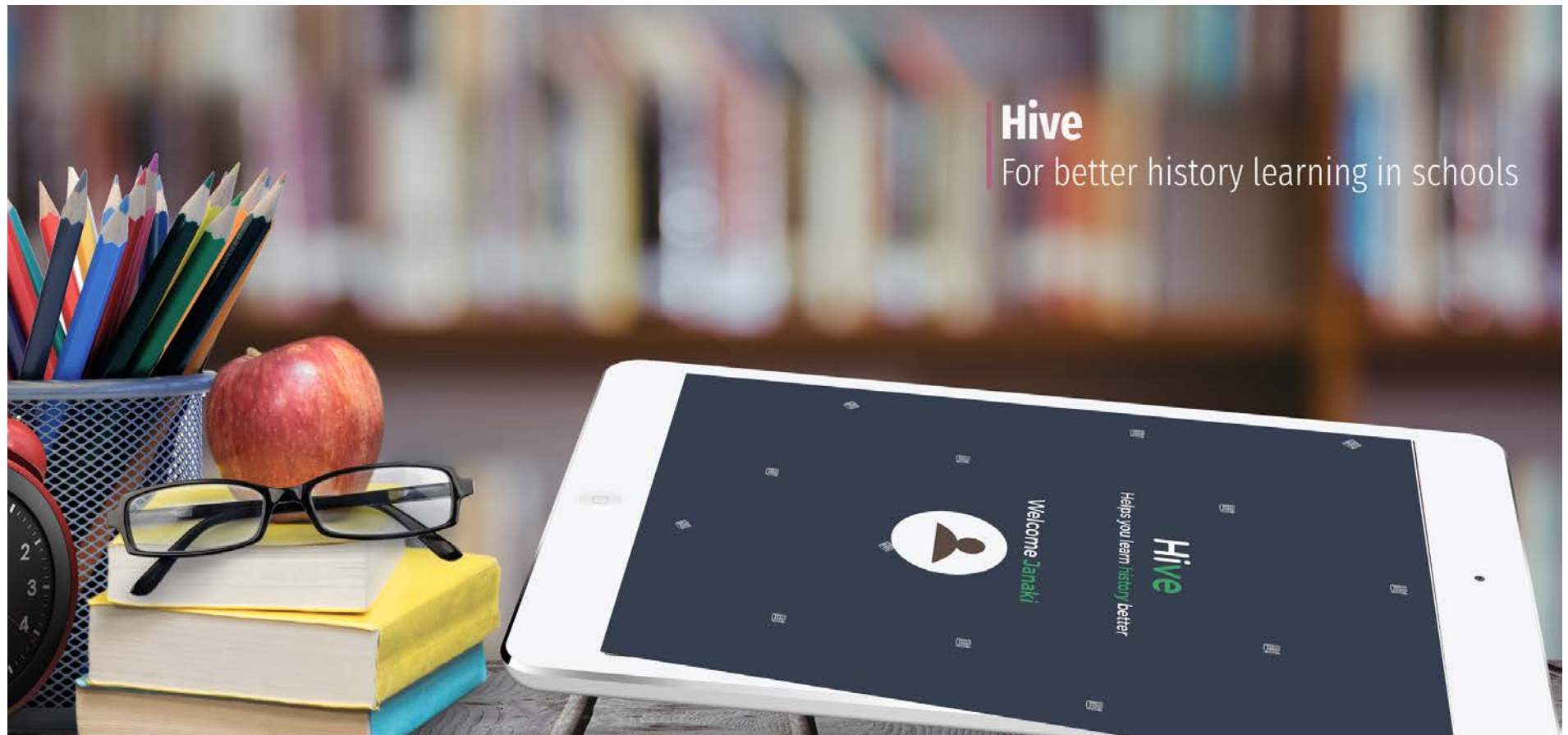
The answering technique and hints are designed to support historical thinking. Hence the question model will also allow multiple techniques to be used in the tool. It is important that historical thinking is evident from the answers. The hints provided will be indicated to this direction.



At the end of the assessment, data of what happened in that particular class is given. Relative data from what has been happening and some trends in answering will also be given to the student.

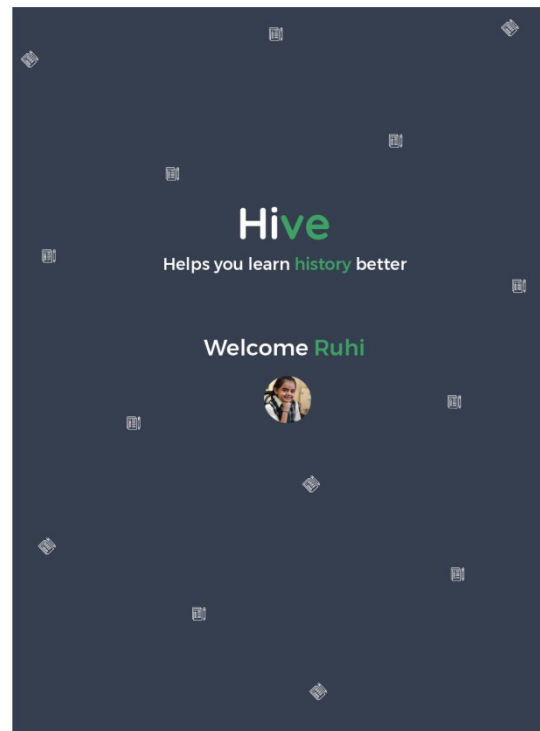


There are multiple students in the class hence the result grid will be a combination of automated learning analytics and assessment which are done by the teachers also. This thereby gives chance to better assessment indicators.



11. Design

For the final design I took up detailing of three question types which uses the techniques derived from primary and secondary study.

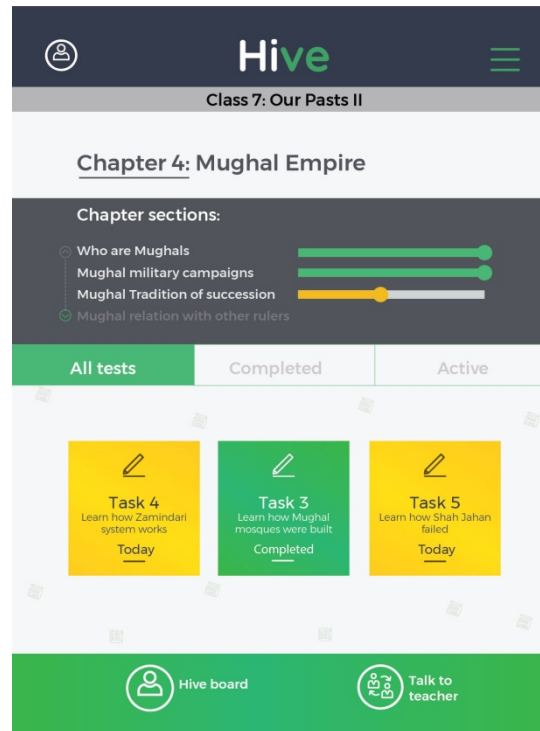


The entry screen follows the same order as textbook content to match the student model of using the tool.



The pointer always gives where exactly the chapter is.

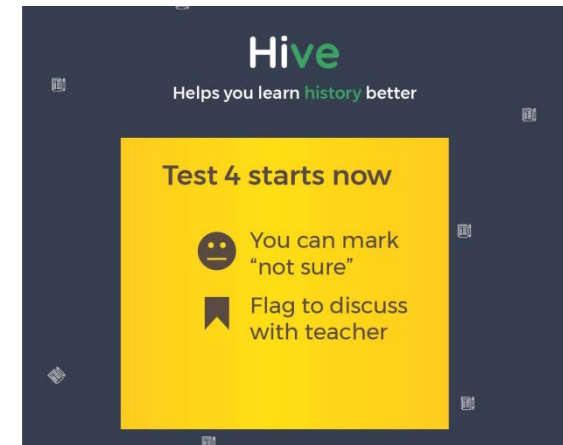
The sections within each chapter when covered each test gets activated.

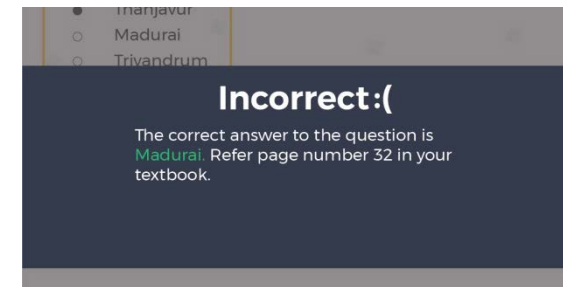
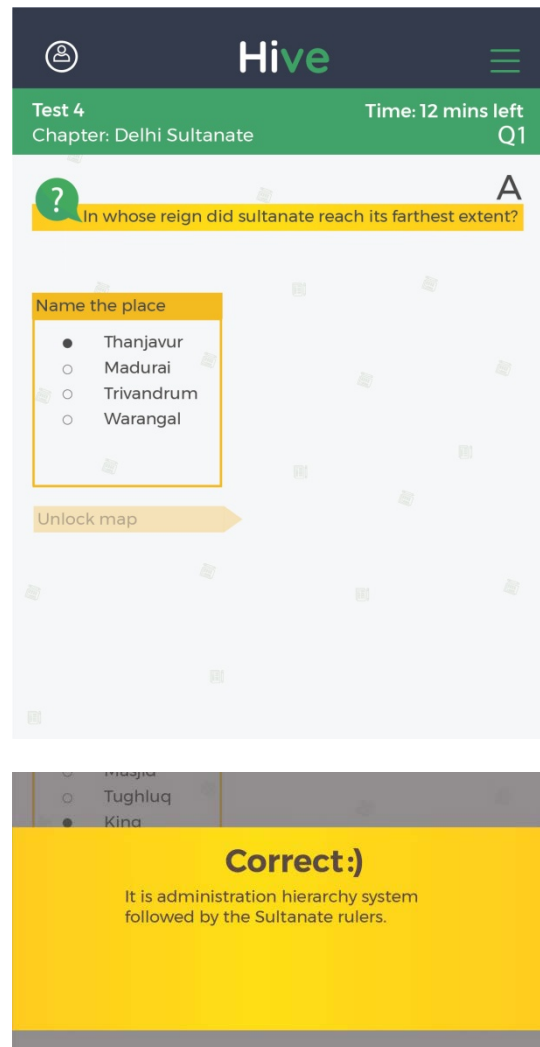


The test has option to mark the answers as as not sure or discuss with teacher.

Design decisions:

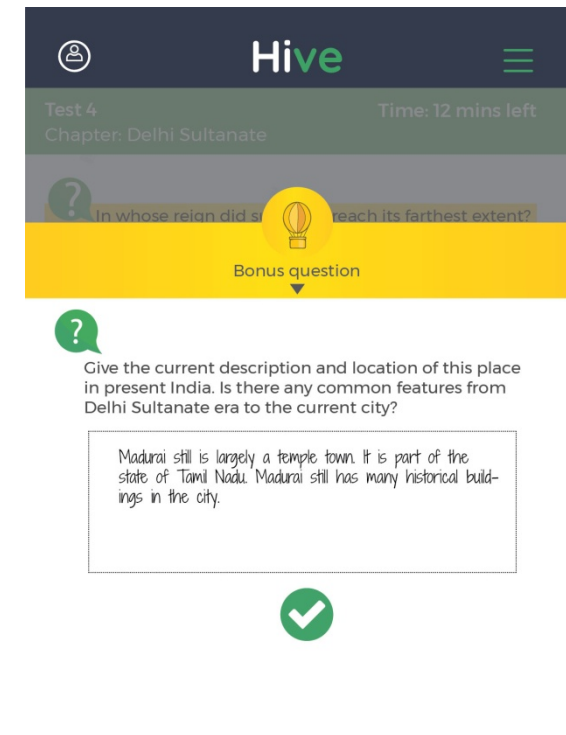
- There are in totality 4 tests for each chapter.
- They are a combination of questions from the existing text book questions.
- The tests provide answering techniques and additional feedbacks to encourage historical thinking.
- The test also gives a summary to what content is covered
- Eg: “learn how Zamindari system works.”





Design decisions:

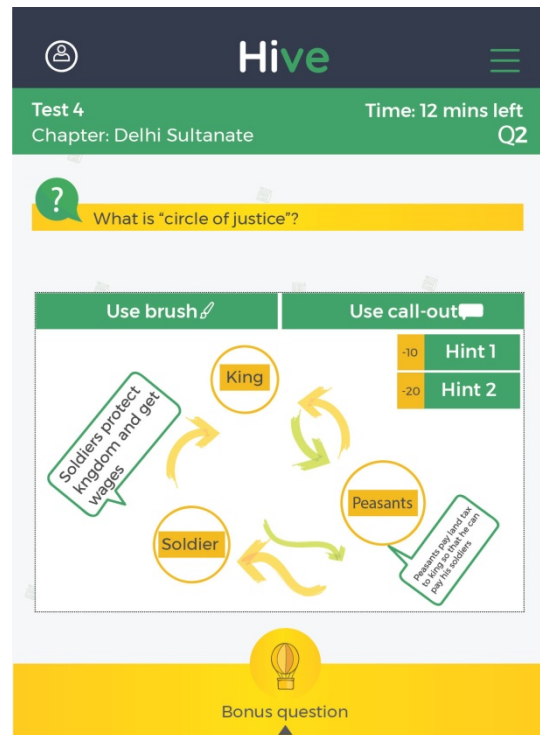
- The test started with a multiple choice question set. Now instead following the same question type, the additional question in the set is a map based question.
- The map based question is a continuation question based on the previous question itself.
- The question gives immediate feedback and connection to textbook.
- From this a bonus question is given which could relate the past and the present of the content.
(relating past and the present is one additional feature which is at present not done in the CBSE textbook).



Design decisions:

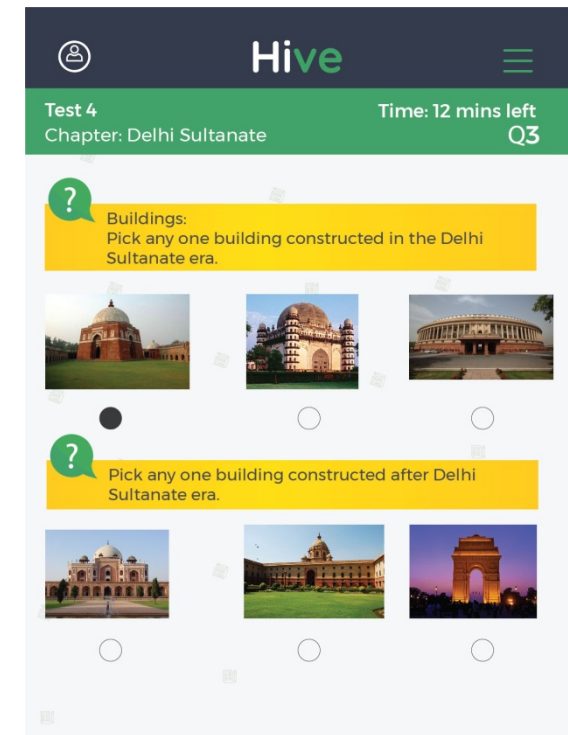
- Using textual; and visual elements to improve historical thinking was discussed in our historical thinking theories.

The bonus question is a feature to provide a discussion platform in class. This could give better opportunity for teachers to discuss beyond textbook points in classroom.



Design decisions:

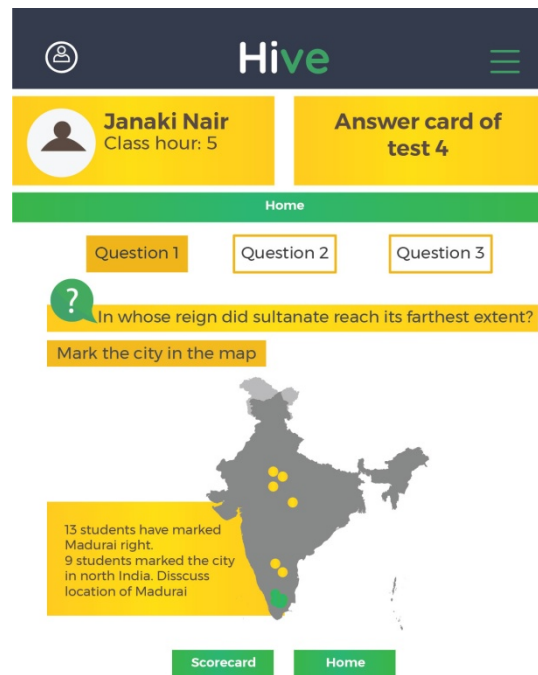
There are different answering techniques introduced within the application are mainly structure diagrams and callouts. These are basically to help the child reflect and answer questions.



Also we have introduced pictures in questions which cannot be provided by textbooks or in existing practices. This helps in visual thinking which is an advantage the application will bring in as a digital platform.

12. Teachers application

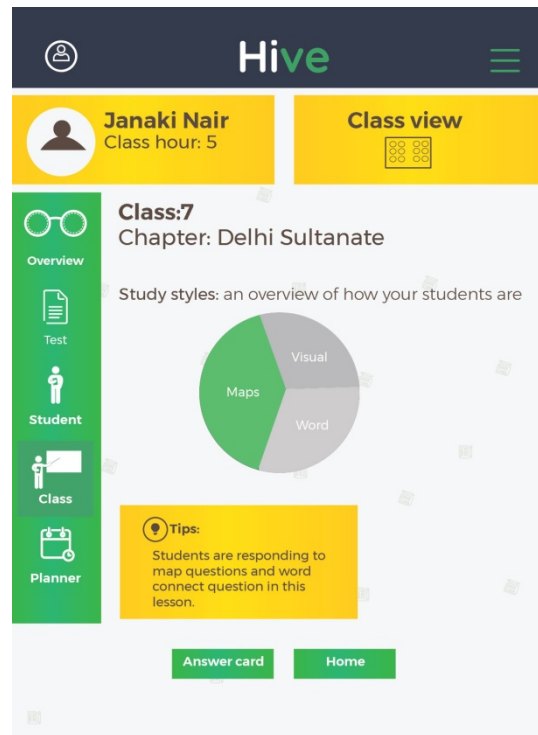
The teachers side of the application is aimed at bringing better ways to visualize how students in their classroom are understanding historical context put to them.



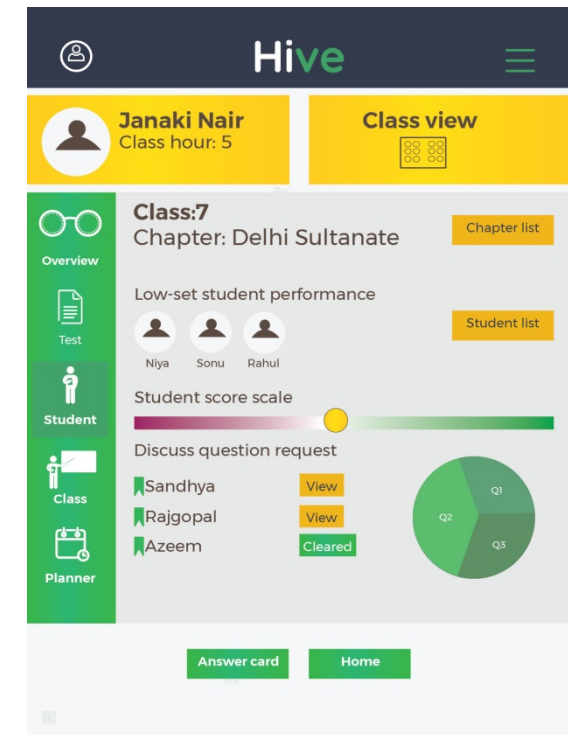
Design:

Map indicators:

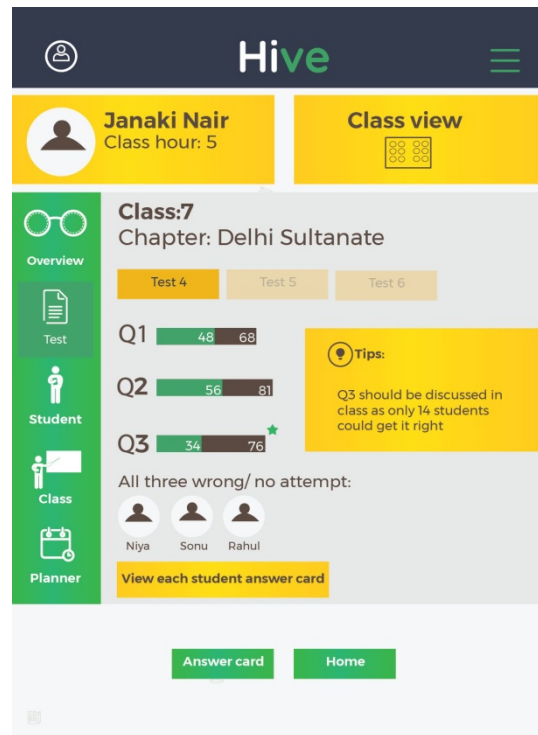
In map based questions the teachers get visibility to how far the points within the map are marked by each student. The teacher gets some affirmative evidence how places are perceived within the country. Right now existing method of maps the teacher goes through each map and then gives comments. This is marked as a tedious task by the teacher. This way the teacher gets a perspective about the class itself.



Since in the application we are giving different tools to answer the questions, the teacher should know how the class performs with each answering technique. Hence an analytics section is given in the application about how the class performs. Do they enjoy maps? Do they like doing more word based exercises?



Students performance based on each chapter is given helping the teacher focus on what the class needs. Since the assessment is thought of as a formative learning platform, the focus is on student and content on that particular week of the class.



Since the teachers do not have an opportunity to discuss all questions with students, the application could give suggestions on what discussions are to be conducted in class.

13. Feedback

After presentation of the design prototype, there were comments given on application design and instruction design details:

- S1: How do you know that you have achieved the goals through the design?
 - ◆ The goal of the project is an exploration of better practises compared to the existing system in the classroom. This cannot be nailed as an ideal solution in this area.
- S2: Is the tool more of a revision tool or learning tool?
 - ◆ Formative assessment methods are more of a learning tool than a revision tool. To use the tool within the learning process itself and help in better student attainment in historical thinking.
- S3: Is the questions justified to the theories of historical thinking given in the research section?
 - ◆ The usage of historical thinking with features like text, visual and time is not very a explored area. The advantage of using a digital medium where we can jump within these tools.
- S4: Can you term the product as more of evaluation tool or a learning tool?
 - ◆ The focus is on learning and feedback more than the tool being an evaluation tool.
- S5: Can teachers create questions?
 - ◆ This option was not included in the previous version. But from a list of questions the teachers should be able to pick the questions for each test. This might give the

◆ Currently the application includes dot or position marking which could be hard in accuracy. Adding more map types questions is a possibility to be explored in the application.

→ S7: Is bonus question more of a burden to the children? Is there a better structure possible for the application?

◆ The existing format of questions need to be restructured and a motivation factor needs to be added to the test. The bonus question idea need to be the best way for child to answer the questions. Restructuring of the test is required and more features to give historical reasoning should be added.

→ S8: Can more variety of questions be attempted to see if the variety fits into the design?

◆ The focus was to detail out sample questions from different types, the initial prototype did not concentrate

on variety of questions within the framework.

→ S9: Micro interactions play an important role in the progress or answering of the questions?

◆ The More focus should be given is the micro interactions especially in areas like maps. Even in the intuitiveness of answering could be played with the micro interactions in the application.

14. Design changes

teachers more control and interest over their exercises.

→ S6: Can more options be explored in maps?

Adding more tools to the map:

Looking at more formative ways to submit answers through the map is one prime focus of the project. Also arrangement or sequencing of the questions. There should also be focus on giving visual feedback for maps.

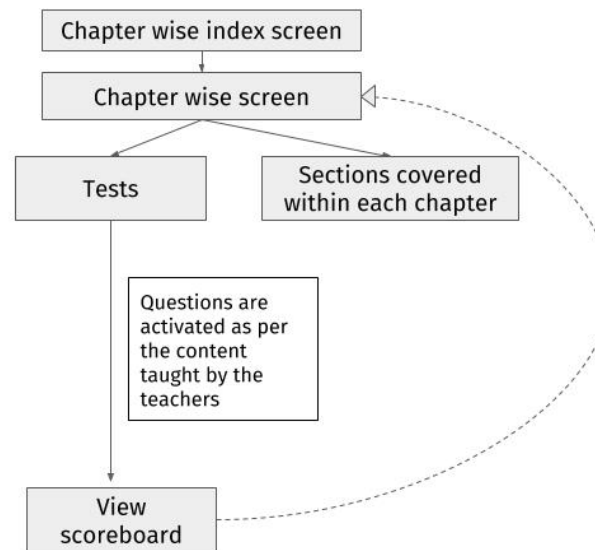
The UI focuses to unify the product in answering techniques, where the student in 2-3 answers understands the model of the

Looking at map based questions:

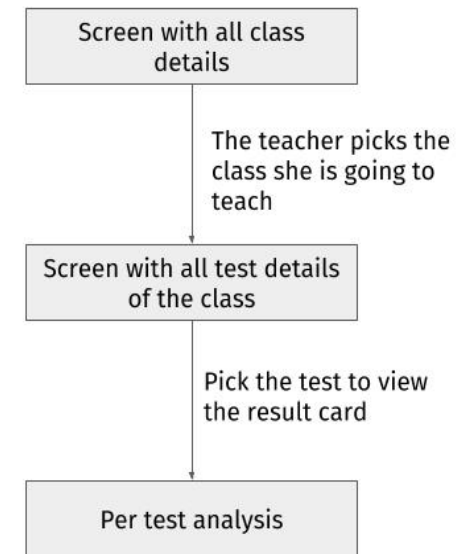
In the existing map based questions the application uses dot based inputs. This might not be sufficient for a map based exercise, mainly as accuracy in mapping a point is a difficult task. There are other widely used techniques such as map hatching which could be explored in the project.

questions. The sequence is also set in loop answer format that the student finally gets the correct answer.

The design also focuses on giving formative learning based feedbacks to students. The application follows the same order as the textbook so that the student can refer to content from the textbook.

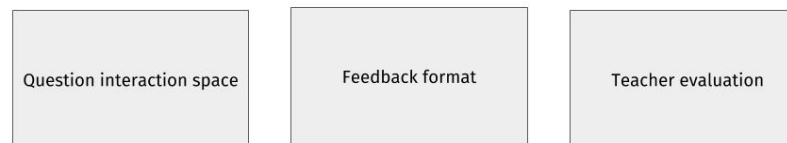


Flow of the application from the student side.

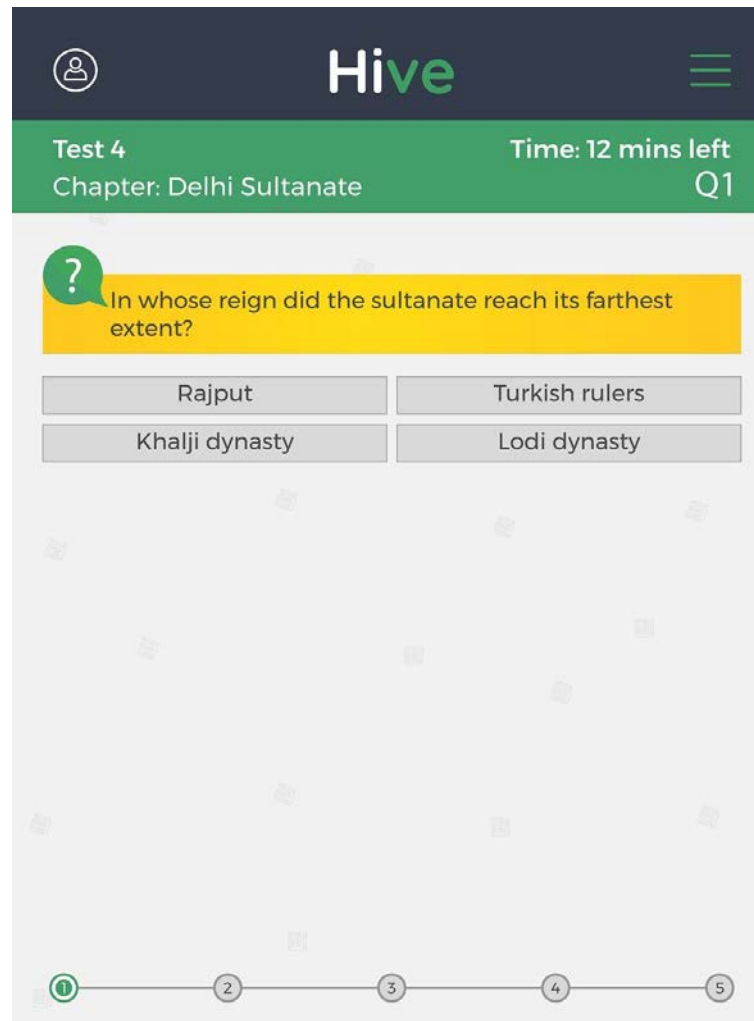


Flow of the application from the teachers side.

Main area of focus:



14.1. Question screens for MSQ/MCQ:



The screenshot shows the Hive app interface. At the top, there's a dark blue header with a user icon, the 'Hive' logo, and a menu icon. Below this is a green bar with 'Test 4' and 'Chapter: Delhi Sultanate' on the left, and 'Time: 12 mins left' and 'Q1' on the right. The main question area has a yellow background with a question mark icon and the text: 'In whose reign did the sultanate reach its farthest extent?'. Below the question are four buttons: 'Rajput', 'Turkish rulers', 'Khalji dynasty', and 'Lodi dynasty'. At the bottom, there's a progress bar with five numbered circles, where the first circle is highlighted in green.

→ The question types are multiple select and multiple choice questions which give a feedback on entering an option.

Incorrect

The Lodi dynasty was ruling during the declining period of Sultanate

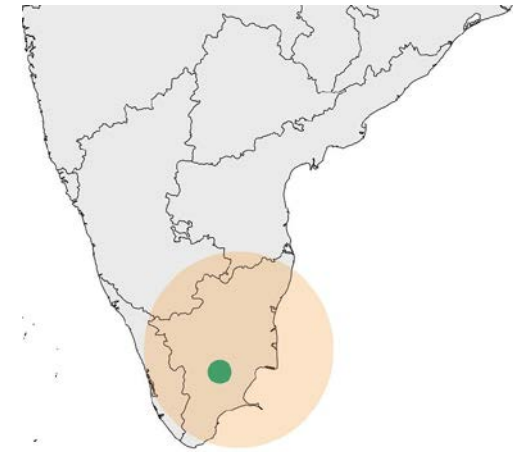
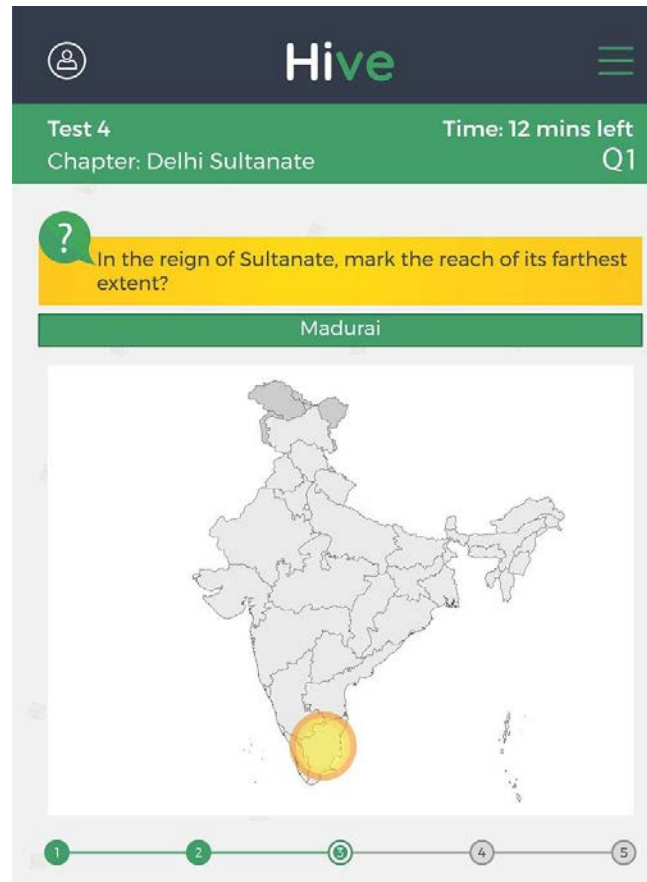
Try again with the given information

Correct

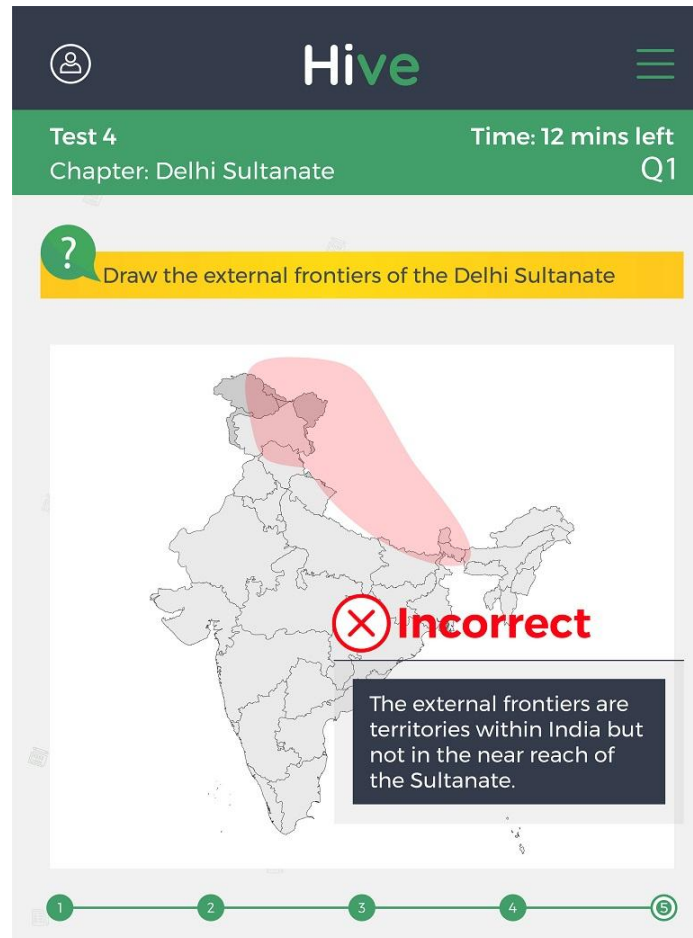
They conquered and reached the southern part of India

Mark the city in the map

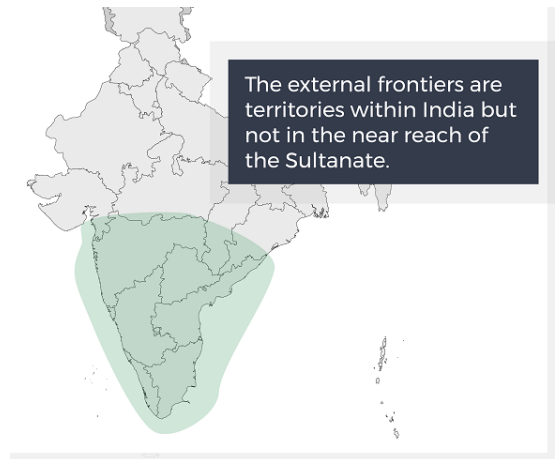
14.2. Question screens for Map based questions:



To mark a place first the region should be clicked. This could be south India. From there it zooms into the area and then we can mark the place. This gives the student feedback based on details from the past and present.

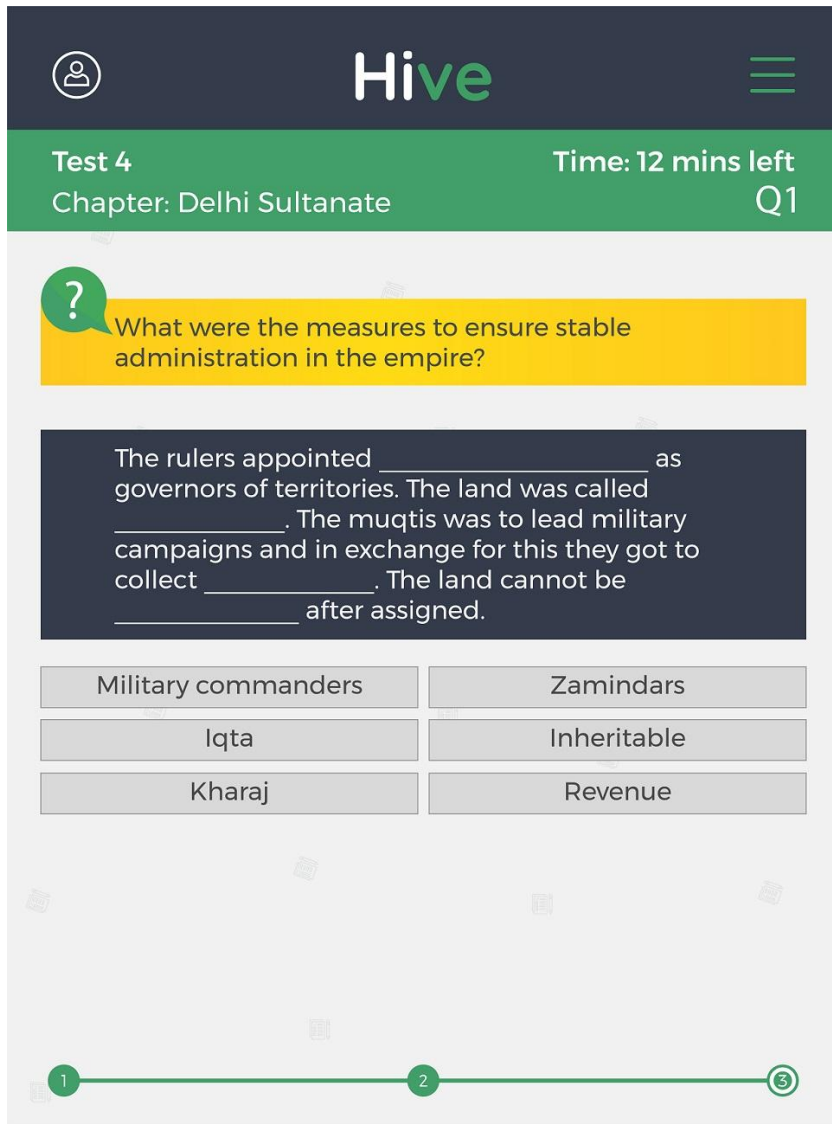


the map you can automatically see the correct answer. There are also other possibilities like overlaying the map with present map and map of the past which could also generate better historical thinking.



Here we can show maps of different timelines to generate multiple feedbacks.

The tool uses draw over the region to shade the mark territories for the answer. Then in



The screenshot shows the Hive app interface. At the top, there's a dark blue header with a user icon, the 'Hive' logo, and a menu icon. Below this is a green bar with 'Test 4' and 'Chapter: Delhi Sultanate' on the left, and 'Time: 12 mins left' and 'Q1' on the right. The main content area has a yellow question box with a question mark icon: 'What were the measures to ensure stable administration in the empire?'. Below this is a dark blue text box with a fill-in-the-blanks question: 'The rulers appointed _____ as governors of territories. The land was called _____. The muqtis was to lead military campaigns and in exchange for this they got to collect _____. The land cannot be _____ after assigned.' Below the text box are six buttons arranged in a 3x2 grid: 'Military commanders', 'Zamindars', 'Iqta', 'Inheritable', 'Kharaj', and 'Revenue'. At the bottom, there's a progress bar with three circles, the second of which is highlighted with a green dot.

These techniques of answering has been detailed out with effective feedback systems in the application.

The feedback in MSQ is why this answer is a better fit than the other terms given in the choice. This could be contextual to a time period or geographical location.

15. Conclusion

The framework for selecting questions was inspired by the goals stated in the UCLA framework. The constructive suggestion was to look and incorporate other learning theories to provide a refined format. The format of following NCERT questions alone is not sufficient to bring out the aim of the project. The areas that could be explored more are basically how a teacher could set these questions, should it be done in groups and as individual activity etc.

In the present design incorporated map based questions and multiple answer questions. The feedback system for both are designed is homogeneity - giving the same style of feedback in each of the answers. The better approach with the digital platform could be heterogeneity - exploring the platform with variety answering and feedback methods and also looking diverse ways of inducing historical thinking. Also the map answering methods might not be sufficient to answer different types of questions as of now. There could also be incorporating of other teaching techniques like timeline.

The potential was identified as the flexibility that the platform gives on handling different

question types and switching between them. The system ensures feedback to each student on the basis of the answer. Incorporating such a tool in the classroom ensures going through questions which could potentially be skipped during the academic course. Also ensuring this as a formative assessment system in a classroom environment will be beneficial for students and teachers because of the immediate response. The teacher gets progressive feedback per student and as a class on the whole. And the student gets feedback on the answering pattern.

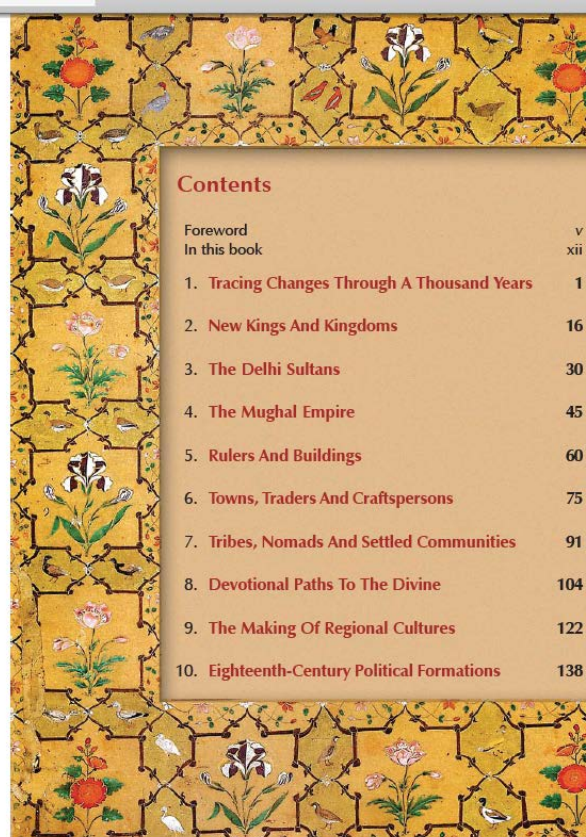
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17. Appendix

Section 1: Content of 7th History



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Figure: NCERT Textbook 7th standard content.

About NCERT textbooks:

These aims imply considerable change in school routines and mode of functioning. Flexibility in the daily time-table is as necessary as rigour in implementing the annual calendar so that the required number of teaching days are actually devoted to teaching. The methods used for teaching and assessment will also determine how effective this textbook proves for making children's life at school a happy experience, rather than a source of stress or boredom. Syllabus designers have tried to address the problem of curricular burden by

restructuring and reorienting knowledge at different stages with greater consideration for child psychology and the time available for teaching. The textbook attempts to enhance this endeavor by giving higher priority and space to opportunities for contemplation and wondering, discussion in small groups, and activities requiring hands-on experience.

18. Standards in historical thinking

18.1. STANDARD 1:

CHRONOLOGICAL THINKING

- A. Distinguish between past, present, and future time.
- B. Identify the temporal structure of a historical narrative or story.
- C. Establish temporal order in constructing historical narratives of their own.
- D. Measure and calculate calendar time.
- E. Interpret data presented in timelines and create time lines.
- F. Reconstruct patterns of historical succession and duration; explain historical continuity and change.
- G. Compare alternative models for periodization.

The student thinks chronologically:

Therefore, the student is able to:

- Distinguish between past, present, and future time.
- Identify the temporal structure of a historical narrative or story: it's beginning, middle, and end (the latter defined as the outcome of a particular beginning).
- Establish temporal order in constructing their [students'] own historical narratives: working forward from some beginning through its development, to some end or

outcome; working backward from some issue, problem, or event to explain its origins and its development over time.

- Measure and calculate calendar time by days, weeks, months, years, decades, centuries and millennia, from fixed points of the calendar system: BC (before Christ) and AD (Anno Domini, "in the year of our Lord") in the Gregorian calendar and the contemporary secular designation for these same dates, BCE (before the Common Era) and CE (in the Common Era); and compare with the fixed points of other calendar systems such as the Roman (753 BC, the founding of the city of Rome) and the Muslim (622 AD, the hegira).
- Interpret data presented in timelines and create time lines by designating appropriate equidistant intervals of time and recording events according to the temporal order in which they occurred.
- Reconstruct patterns of historical succession and duration in which historical developments have unfolded, and apply them to explain historical continuity and change.

- Compare alternative models for periodization by identifying the organizing principles on which each is based.

- A. Identify the author or source of the historical document or narrative and assess its credibility.
- B. Reconstruct the literal meaning of a historical passage.
- C. Identify the central question(s) the historical narrative addresses.
- D. Differentiate between historical facts and historical interpretations.
- E. Read historical narratives imaginatively.
- F. Appreciate historical perspectives.
- G. Draw upon data in historical maps.
- H. Utilize visual, mathematical, and quantitative data.

the student comprehends a variety of historical sources:

Therefore, the student is able to:

- Identify the author or source of the historical document or narrative.
- Reconstruct the literal meaning of a historical passage by identifying who was involved, what happened, where it happened, what events led to these developments, and what consequences or outcomes followed.
- Identify the central question(s) the historical narrative addresses and the purpose, perspective, or point of view from which it has been constructed.
- Differentiate between historical facts and historical interpretations but

acknowledge that the two are related; that the facts the historian reports are selected and reflect therefore the historian's judgement of what is most significant about the past.

- Read historical narratives imaginatively, taking into account what the narrative reveals of the humanity of the individuals and groups involved--their probable values, outlook, motives, hopes, fears, strengths, and weaknesses.
- Appreciate historical perspectives--the ability (a) describing the past on its own terms, through the eyes and experiences of those who were there, as revealed through their literature, diaries, letters, debates, arts, artifacts, and the like; (b) considering the historical context in which the event unfolded--the values, outlook, options, and contingencies of that time and place; and (c) avoiding "present-mindedness," judging the past solely in terms of present-day norms and values.
- Draw upon data in historical maps in order to obtain or clarify information on the geographic setting in which the historical event occurred, its relative and absolute location, the

14.3 STANDARD 2 : HISTORICAL COMPREHENSION

distances and directions involved, the natural and man-made features of the place, and critical relationships in the spatial distributions of those features and the historical event occurring there.

- Utilize visual and mathematical data presented in graphs, including charts, tables, pie and bar graphs, flow charts, Venn diagrams, and other graphic organizers to clarify, illustrate, or elaborate upon information presented in the historical narrative.
- Draw upon the visual, literary, and musical sources including: (a) photographs, paintings, cartoons, and architectural drawings; (b) novels, poetry, and plays; and, (c) folk, popular and classical music, to clarify, illustrate, or elaborate upon information presented in the historical narrative.