EVALUATION REPORT

iPREP DIGITAL CLASS
MATHEMATICS
GRADES 9-10

Evaluated in July 2021
Contents

1. What Does This Report Contain? .................................................. 3
2. Overview of the Product ............................................................ 3
3. Executive Summary ................................................................. 4
4. Detailed Review ........................................................................... 8
   4.1 Content Quality ................................................................. 9
   4.2 Pedagogical Alignment .......................................................... 12
   4.3 Technology and Design ........................................................ 23
Appendix ....................................................................................... 26
1. What Does This Report Contain?

The section, 'Overview of the Product', provides a brief description of the product and its key features to give the context for the evaluation. The two sections following that present the findings from the evaluation. The Executive Summary provides the overall rating and offers implications in terms of benefits and limitations for teachers and learners. The Detailed Review section provides an in-depth evaluation of the product, categorized under three dimensions (or constructs) – Content Quality, Pedagogical Alignment, and Technology & Design. For each dimension, the product is reviewed on the criteria along with explanations for the rating, and grouped into clusters. Specific examples have been provided in this report to support and elaborate on the evaluation ratings.

The terms, ‘Exemplary’, ‘Valuable’, and ‘Potential to Improve’, used in the report refer to the rating scale for evaluating the product.

- **‘Exemplary’** indicates that the product has been designed as per recommended learning theories and research-based evidence.
- **‘Valuable’** indicates limited adherence of the product’s design to the recommended learning theories and research-based evidence.
- **‘Potential to Improve’** indicates unsatisfactory or lack of adherence of the product’s design to the learning theories and research-based evidence.

2. Overview of the Product

iPrep Digital Class is a digital classroom learning solution with a curriculum mapped to the CBSE board. The product contains animated videos and practice questions for each learning unit, along with DIY project videos for some topics. Teachers can use the content to supplement their teaching in the classroom or assign different videos or practice tests to students. The English version of the product has been evaluated in this report.
3. Executive Summary

iPrep Digital Class | Mathematics | Grades 9-10

Content Quality  
Exemplary

Pedagogical Alignment  
Valuable

Technology and Design  
Valuable

Potential benefits of this product

- Students, teachers, and parents can be assured of the correctness of the content and all the learning activities.
- Schools can be assured of the alignment of the content with the national curriculum and can use it for core teaching purposes.
- Learners will likely be able to develop correct mathematical concepts, which will help them solve various types of questions from mathematics.
- Learners will likely be able to interpret mathematics concepts independently and proceed to solve challenging questions as their alternate conceptions are thoroughly addressed.
- Learners are provided sufficient opportunity to practice problems on their own and receive accompanying explanations.
- Teachers will likely be able to apply smaller learning units and provide associated practice tests to learners as learning units are well structured.

Potential limitations of this product

The effectiveness of the learning experience may be negatively impacted in the following ways:

- Due to insufficient explicit scaffolds or hints in some activities, the struggling learners might get stuck when working independently on the activities.
- The lack of group activities or prompts might lead to low encouragement from the teacher for collaboration among the learners.
- The lack of some key Universal Design features might make the product unsuitable for some learners.
### iPrep Digital Class (Grades 9-10):
### Summary of Review Ratings by Criteria

#### Content Quality: **Exemplary**

<table>
<thead>
<tr>
<th>C1. Content accuracy</th>
<th>All content is accurate and explained clearly.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2. Correctness and clarity in assessment</td>
<td>All assessment questions in practice tests or associated activities and their solutions are correct and unambiguous.</td>
</tr>
<tr>
<td>C3. Language comprehensibility</td>
<td>The sentences and vocabulary are easy to understand, and the phrasing is simple.</td>
</tr>
<tr>
<td>C4. Mathematics skill coverage</td>
<td>Skills recommended by the NEP like graphical representation, abstract concepts, understanding shapes &amp; patterns are covered well.</td>
</tr>
<tr>
<td>C5. Curriculum alignment</td>
<td>The content is aligned to NCERT and logically sequenced.</td>
</tr>
<tr>
<td>C6. Inclusivity in the representation of learners</td>
<td>An attempt has been made to represent various sections of society across gender and socio-economic class in some learning units.</td>
</tr>
</tbody>
</table>

#### Pedagogical Alignment: **Valuable**

<table>
<thead>
<tr>
<th>P1. Constructivist approach</th>
<th>The content allows the learners to construct ideas of the topics, but some of the essential features of constructivism are missing.</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2. Addressing learning gaps/alternate conceptions</td>
<td>Potential learning gaps in different topics are identified and well addressed.</td>
</tr>
<tr>
<td>P3. Content in context</td>
<td>Most of the learning units have relevant and sufficient real-world context, which aids in a better understanding of the concept.</td>
</tr>
<tr>
<td>P4. Learner scaffolding</td>
<td>The product does not provide the learners with incremental support to take on problems with more difficulty.</td>
</tr>
<tr>
<td>P5. Cognitive engagement</td>
<td>Highlighting of important concepts is provided for signaling, but the conversational style was inconsistent.</td>
</tr>
<tr>
<td>Criteria</td>
<td>Rating</td>
</tr>
<tr>
<td>----------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>P6. Motivational features</strong></td>
<td>😞</td>
</tr>
<tr>
<td><strong>P7. Logical chunking and connectedness</strong></td>
<td>😏</td>
</tr>
<tr>
<td><strong>P8. Learning objective-assessment alignment</strong></td>
<td>😏</td>
</tr>
<tr>
<td><strong>P9. Pedagogy-assessment method alignment</strong></td>
<td>😞</td>
</tr>
<tr>
<td><strong>P10. Cognitive levels covered</strong></td>
<td>😏</td>
</tr>
<tr>
<td><strong>P11. Feedback quality</strong></td>
<td>😊</td>
</tr>
<tr>
<td><strong>P12. Opportunities for Collaboration</strong></td>
<td>😞</td>
</tr>
<tr>
<td><strong>P14A. Teacher support for in-class orchestration</strong></td>
<td>😞</td>
</tr>
<tr>
<td><strong>P14B. Teacher support to generate out-of-class activities</strong></td>
<td>😊</td>
</tr>
</tbody>
</table>

## Technology and Design: Valuable

| Interface design: Enable intuitive use | 😌 | The platform is easy to use, and the elements are clearly visible. |
| Interface design: Assess consequences of an action | 😃 | The interface provides an appropriate response to the learner’s action. |
| Learner navigation & pace | 😃 | It is easy for the learners to navigate within and between learning units, but they can watch the videos only at a certain pace. |
**T4. Universal Design**
Essential features of universal design are not present, which would make it difficult to be used by diverse learners.

**T5. Analytics for learners’ progress**
The dashboard provides easily interpretable learners’ progress but does not provide sufficient guidance on where to put in additional effort.

**T6. Tools to support problem-solving**
Mathematical tools which would enhance the learning experience were not observed.

**T7. Meaningful interactivity**
Interactive features like drag and drop or slider bars were not present.

**T8. Content type - Technology alignment**
There is a perfect match between the visualization type present in the learning units and the content type.

*Only relevant criteria have been included in the evaluation*
4. Detailed Review

4.1 Content Quality 🧑‍🏫
- Content Accuracy and Clarity ........................................ 9
- Alignment to National Standards .................................. 10
- Inclusivity in Content Representation ............................. 11

4.2 Pedagogical Alignment 😊
- Learner-Centred Approach ........................................... 12
- Enhancing Learner Experience ...................................... 16
- Assessment of Learning .............................................. 19
- Teacher Support ......................................................... 22

4.3 Technology & Design 😊
- User Interface Design ............................................... 23
- Affordances that facilitate learning .............................. 24
4.1 Content Quality

Content Quality measures the accuracy and content/skill coverage for the grade targeted and the specific domain. This dimension focuses on content accuracy and clarity, alignment to national standards, and inclusivity in content representations.

4.1.1 Content Accuracy and Clarity

<table>
<thead>
<tr>
<th>Content Accuracy (C1)</th>
<th>Correctness and clarity in assessment (C2)</th>
<th>Language comprehensibility (C3)</th>
</tr>
</thead>
</table>

Content accuracy (C1) is rated Exemplary. The reviewers observed that all the content was accurate. The video content included accurate definitions, diagrams, facts as per the topic's requirement.

Illustrative example: Learning Unit: Coordinate Geometry, Grade 9

Videos started with basic information about the cartesian coordinate system and then slowly progressed towards the plotting of points using (x,y) coordinates. The information in the video was accurate.

Illustrative example: Learning Unit: Arithmetic Progression, Grade 10

The video explained the correct definition of sequence, common difference, arithmetic sequence, etc. Videos also explained the process of calculation of nth term with correct examples.

Correctness and Clarity in Assessment (C2) is rated Exemplary. The wording of the assessment questions conveyed the intended meaning and clearly stated what was expected from the learner. The solutions provided were complete with appropriate explanations.

Language comprehensibility (C3) is rated Exemplary. The language was easily understandable by the learners of Grade 9 -10. Simple, short, and easy-to-understand sentences were used. The reviewers found that the accent used was neutral in more than 80% of the sampled learning units. The vocabulary used was familiar.
4.1.2. Alignment to National Standards

<table>
<thead>
<tr>
<th>Mathematics Skill coverage (C4)</th>
<th>Curriculum alignment (C5)</th>
</tr>
</thead>
</table>

Mathematics skill coverage (C4) and curriculum alignment (C5) are rated Exemplary. The reviewers found that, broadly, all the topics and sub-topics covered were aligned with the content present in NCERT textbooks for Grade 9-10. Within each chapter, all the different aspects of the topic were covered comprehensively with the short informative videos.

Illustrative example: Surface area and Volumes, Grade 10

The chapter introduced the concept of surface area and volume through conversation between two friends. (fig.1) followed by various combinations of solids and calculation of surface area and volumes of a combination of solids.

Fig.1-Topic of surface area and volumes

The overall Mathematics mindset and skills required for grades 9-10 (recommended by NEP 2020 and NCF ) such as argumentation, mathematical modeling, data analysis and interpretation, reasoning about shapes. The content was sequenced logically across the grade ranges in alignment with the national curriculum.
4.1.3. Inclusivity in Content Representation

Inclusivity in the representation of learners (C6) is rated Valuable. Reviewers observed that product attempts to include content relatable to diverse learner groups in terms of gender. Still, there were no efforts to include names from different religions, socio-economic classes or caste, etc.

Illustrative examples

In most of the learning units introduction of the topic was through a classroom room setting. In this setting, the teacher asked questions or explained the scenario. The classroom included an equal number of boys and girls (Fig. 2). It was also observed that in the conversation, boys and girls were given equal opportunities to answer those questions.

Fig. 2. Showing inclusivity in gender

There were learning units in which scenarios were presented as a conversation between two students. But there was no diversity in the names of students in terms of religion.
4.2 Pedagogical Alignment

Pedagogical Alignment focuses on learner-centered pedagogy, enhancing learner experience, assessment of learning, and teacher support. It measures the extent of alignment of the pedagogical strategies with national educational policies, Learning Sciences theories, and design principles to create a meaningful learning experience.

4.2.1. Learner-centered Approach

<table>
<thead>
<tr>
<th>Constructivist approach (P1)</th>
<th>Addressing learning gaps / alternate conceptions (P2)</th>
<th>Opportunities for collaboration (P12)</th>
</tr>
</thead>
</table>

Constructivist approach in pedagogy design (P1) is rated Valuable.

The review team observed that even though an attempt was made to promote a constructivist approach, some of the important features of the constructivist approach were missing in the product. In most of the learning units, videos transmitted textbook information, and there were no activities followed by videos to help learners make sense of the content. However, in most of the learning units, the topic was introduced through conversation-based scenarios. Scenarios included question prompts, and those prompts were helpful for learners to construct their understanding of the topic. The review team observed stem projects where some hands-on activities were provided to build understanding. But those are for limited topics only. Thus for a given topic, learners could construct an understanding of the initial definition due to the question-answer type of conversation. But, later, it would be hard for learners to understand the content on their own as only textbook information was transmitted.

**Illustrative example: Arithmetic progression, Grade 10**

The unit started with a conversation between two students where they discussed holes in honeycomb and its pattern and similar types of patterns in nature (Fig.3). The exchange prompted learners to think about the similarity in the pattern but abruptly turned it into a definition of arithmetic progression. Thus even though the learner was prompted to think about similarity, there was no reflection spot for learners to make sense of information.
**Illustrative example: Coordinate Geometry Grade 9**

In this chapter, the conversation between the teacher and student was presented to find the definition of geometry and various types of geometry. This conversation may not help learners to construct knowledge of coordinate geometry on their own. However, diverse examples were explained using animated visuals. E.g., plotting of a point in the coordinate plane, calculation of the perpendicular distance of a point, finding the coordinates of a point, etc.

**Illustrative example: Polynomial, Grade 9**

The concept of polynomials was explained through a conversation between two students. In the conversation, step by step process of polynomial formation like "you have x number of books, multiply x by itself, then multiply x by two and add two to it" was explained. In this process, there was a scope for learners to build their expression. Thus in the chapter, the introductory video was helpful for learners to make sense of concepts on their own. But the remaining learning units were explained in information transmission mode.

There is also a section for 'Stem Projects' in the product, which has videos demonstrating some hands-on activities for learners to try out for various topics. These activities were present for around 20% of the topics in the grade range. They could aid in helping the learners build an intuitive understanding of various ideas.
**Illustrative example: Surface area and volumes, Grade 10**

There were many activities to form various shapes learned in the video content and also to find the relation between volumes of various shapes. Tetra packs were used with given dimensions to create a cone, and a film can was used as a cylinder. The cone was filled with sand, and the cylinder was filled using a cone. The number of cones required to fill the cylinder was calculated and used to find the relation between the volume of the cone and cylinder. (fig.4)

![Materials Image]

> there is a distinct relationship between a cylinder and a cone, for this you require

![Video Clip]

> again pour out the second one it will be 2/3rd and when you pour the third one then you will

Fig.4. Stem project
Addressing learning gaps/ alternate conceptions (P2) is rated Exemplary. The review team found that the product’s pedagogy design addressed the learning gaps in most learning units, wherever there was a possibility. The gaps were addressed using a variety of examples in the video, in practice assessment, in stem projects.

Illustrative example: Topic: Linear equations in two variables, Grade 9

The content video explained that there is an infinite number of lines that can pass through a single point using examples. In the practice session, the question based on this concept was presented as “How many linear equations can be satisfied by x=1 and y=2?” It was a multiple-choice question, and for every answer, the explanation was provided as “There are an infinite number of linear equations that can be satisfied by the point x=1,y=2. One way to think of this is that x=1 and y=2 is a point represented by the coordinate (1,2), and there is an infinite number of lines that can pass through the given point”. Thus detailed explanations helped address learning gaps.

Illustrative example: Topic: Circle, Grade 10

There are two tangents parallel to any circle, as explained in the video using appropriate diagrams. There was a question based on the same concept in the practice session “A circle can have---parallel tangents at the most.” For any chosen answer, the explanation is given as “A circle has two parallel tangents lying at the two ends of its diameter.”

Illustrative example: Topic: Surface area and volumes, Grade 10

Many examples were provided to explain the concept of the combination of solids using many different examples such as cars, vessels, toys, etc. Many different examples were provided to find the volumes of a combination of solids. A combination of solids included an ice cream cone which is a combination of cone and hemisphere. The solution to calculate the volume of ice cream cones was explained in the video by breaking the ice cream cone into a hemisphere and a cone. The volume of cone and hemisphere was calculated, and the two volumes were added to get the final volume of an ice cream cone. The review team found that the STEM project section of the product helped learners understand the concept of volume calculation by building those solids using tetra pack materials. Those hands-on activities helped redress the learning gaps.
Opportunities for collaboration (P12) is rated Potential to Improve. The reviewers did not find any evidence for suggested activities which could encourage collaboration among the learners. There were also no prompt questions observed in the videos, which could suggest that learners discuss their responses or engage with fellow learners in any way. There were no in-built activities in the product which the learners could collaborate on or perform in groups.

4.2.2. Enhancing Learner Experience

<table>
<thead>
<tr>
<th>Content in Context (P3)</th>
<th>Learner scaffolding (P4)</th>
<th>Cognitive Engagement (P5)</th>
<th>Motivational features (P6)</th>
<th>Logical chunking and connectedness (P7)</th>
</tr>
</thead>
</table>

Content in Context (P3) is rated Exemplary. The product included relevant and sufficient context using conversations between learners, or teacher and learners. Reviewers observed that introductory conversations were presented in all the chapters to motivate learners. In problem-solving activities, sufficient examples from familiar objects were provided, such as ice cream cones, circus tents, etc.

Illustrative example: Topic: Introduction to trigonometry, Grade 10

The chapter started with a conversation between two learners standing on the balcony of a tall building and observing a ship at sea. In the conversation, the question was posed by Anvesha (one of the learners) to her friend Vedika. “What is the height of the building if the distance of building from the ship is 10m and line of sight is 45 °.” (fig.5) Then Vedika explained that using trigonometry ratios, one could find the height of the building.

Fig.5. Introductory scenario to explain trigonometry ratios
Illustrative example: Topic: Arithmetic progression, Grade 10

The chapter started with a conversation between two learners related to holes in the honeycomb. The learner asked his friend to notice the pattern of holes in the honeycomb and also gave an example of a pattern of pine cones. Further, he connected the pattern with a pattern of arithmetic progression taught by a math teacher in class. The context added in the learning process can motivate learners to study the topic in detail further.

Illustrative example: Topic: Statistics, Grade 10

The chapter started with the teacher counting the number of students scoring a different range of marks (how many ranked between 10 and 20, how many ranked between 20 and 30). Then the teacher asked the learning how this data could be represented. This led to the introduction of the concept of statistics to represent the data.

Learner Scaffolding (P4) is rated Potential to Improve. The product lacks any scaffolds or support for the learners, which could either help them come out of a stuck situation or take on higher difficulty challenges in a progressive manner. The assessment questions do not provide hints or prompts to a learner who might be stuck or struggling to figure out the correct response or make sense of the question. The questions also lack any supporting visuals where required.

However, the product attempts to adapt the questions based on the user’s performance, but it is not very effective. This is because the learner gets stuck in a loop of very few questions (sometimes around only three questions) if they answer incorrectly.

Cognitive Engagement (P5) is rated Valuable. The review team observed that the product’s design incorporated inconsistent personalization and inadequate visual cues.

All chapters included the initial video as an introductory conversation and were helpful in cognitively engaging learners with the topics. In the given chapter, 50% of learning videos catered to personalization, while in the remaining videos, there was no conversational style at all.

Illustrative examples (Introductory conversations)

- See those holes on the honeycomb? Have you noticed holes have patterns? (Arithmetic progression)
- Hey Neeta, have you ever wrapped a birthday gift? (Surface area and volumes?)
Illustrative examples (Personalisation)

Many conversational phrases like the following were consistently used, which invite the learner to engage with the content.

- “Let us understand grouped data.”
- “Let’s summarize what we just learned.”
- “Let us begin our introduction to trigonometry with trigonometry ratios.”

But those were examples from only 5% of learning videos. While in other learning units, it was reading of text presented on screen without the use of “let us see.”

Similarly, in 50% of learning units, the team found that the text, formula, steps, etc., were highlighted. But in the remaining learning units, no visual cues were found.

Illustrative example: Topic: Coordinate Geometry, Grade 9

The distance of a point from the X and Y axis was explained using graph paper, and the distance was highlighted. Also, the solution steps were boxed to show the calculations.

Illustrative example: Topic: Statistics, Grade 10

In this chapter, while explaining the grouped mean, there was no highlighting of formulae or data represented in the tables. It was a basic step-by-step presentation that might disengage learners from the content.

Motivational Features (P6) is rated Potential to Improve. There were not enough motivational features observed in the assessments or the content videos, which would motivate the learner to explore the content further. There were no opportunities observed for a higher skill level learner to progress to a greater difficulty by unlocking challenging questions or higher difficulty levels. The product also lacks any motivational cues for a struggling learner.

No progress indicators or proficiency levels were available for a learner at an overall product level. However, there is a mastery bar when attempting a practice test, which indicates the mastery in the current practice session based on the learner’s performance. But it is likely ineffective, especially for a struggling learner since it was observed that the mastery sometimes drops to 0 from a high number when a learner just answered 1 or 2 questions incorrectly.
Logical chunking and connectedness (P7) is rated Exemplary. The review team observed that learning units were structured adequately for meaningful learning. The content videos were smaller and usually 2-3 min long. Content videos were chunked logically, i.e., most of the video units address only one concept at a time or one problem solution. In almost all units introductory video for the topic was available, followed by the learning objectives. In all the chapters, summary videos were presented to highlight essential concepts in the chapter. This entire learning unit structure was useful for learners to extract meaningful information. The practice tests were mapped precisely to the content video and topic names. Practice tests were helpful as associated activities with content videos and were helpful for testing the content learned in the videos.

4.2.3. Assessment of learning

<table>
<thead>
<tr>
<th>Learning objective – assessment alignment (P8)</th>
<th>Pedagogy-assessment method alignment (P9)</th>
<th>Coverage of cognitive levels (P10)</th>
<th>Feedback Quality (P11)</th>
</tr>
</thead>
</table>

Learning objective - assessment alignment (P8) is rated Exemplary. The videos and the practice tests were broadly aligned to the stated learning objectives and the expected objective as per the National Curriculum for all the topics.

Illustrative example: Topic: Statistics, Grade 10

Learning objectives:-Find mean of grouped and ungrouped data
Assessment Question as shown in fig.6

Find the average of all numbers between 6 and 34 which are divisible by 5.

25
15
20
19

Fig.6.Question
Pedagogy-assessment method alignment (P9) is rated Potential to Improve. A pedagogical strategy is recommended for each grade group in NEP, 2020. According to NEP, 2020 - the pedagogical strategy recommended for the Higher Secondary stage (Grades 9-10) is the opportunity to integrate multiple concepts, mathematical modeling, data analysis by providing real-life relatable content, etc. Pedagogy expected as role-play may be presented in the form of animated stories, activities etc. In the content videos, even though topics were motivated through role-animated conversations, remaining units were plain text book representations. Thus there was no alignment with NEP guidelines. Similarly in the assessment there were some questions based on integration of multiple concepts but largely direct questions and answers were provided.

Cognitive levels covered (P10) is rated Exemplary. The questions were present at various cognitive levels as required, ranging from Recall to Analyse levels. In most learning units, at least one question was at the Higher Order Thinking Skill level.

Illustrative example: Surface area and volumes, Grade 10

A spherical iron ball has been melted and recast into smaller balls of equal size. If the radius of each of the smaller balls is 1/4th the radius of the original ball, how many such balls are made? This question was at an analysis level.

Illustrative example: Real numbers, Grade 10

If two positive integers p and q can be expressed as p=ab^2 and q=a^2b (a,b are prime numbers) then LCM of(p,q) is
Illustrative example: Coordinate Geometry, Grade 9

Fig. 7. Assessment question at a higher level

Feedback Quality (P11) is rated Valuable. The review team found that the feedback in the product was in the form of a solution to practice problems. In most learning units, practice questions were in the form of Multiple Choice Questions (MCQ). The team observed that for all chosen options, the same statements appear in the solution. Also, if learners wanted to know which part they should revisit to get correct answers, then no guidance was provided. Only if the learner performed poorly in the test (all questions or 90% questions attempted wrongly) the message appeared to revisit the content of the entire chapter.

Illustrative example: Surface area and volumes, Grade 10

Question: Right circular cylinder of radius r and height h just encloses a sphere of diameter=?
Answer: For a sphere just enclosed in a cylinder, its diameter is equal to the diameter of the cylinder, which is 2r.
The solutions provided reasoning for the answer but did not guide learners to revisit the content.
Illustrative example: Surface area and volumes, Grade 10

Question: From a sphere of radius 10 cm, a right circular cylinder diameter of whose base is 12 cm is carved out. Calculate the volume of the right circular cylinder.
Answer: \( OB^2 = OA^2 + AB^2 \) or \( OA = (10^2 - 6^2)^{1/2} = 8 \) cm
Height of cylinder = \( 2OA = 16 \) cm.
Volume of cylinder = \( \pi r^2 h = \frac{22}{7}(36)(16) = 1810.29 \).
The solution was step-by-step problem-solving but relevant images and reasoning for the selected formula were missing. Also, there was no guidance for revisiting the content.

Thus even though the feedback was not binary and an explanation was present for answers, it was not elaborated with appropriate reasoning.

### 4.2.4. Teacher Support

| Teacher support for in-class orchestration (P14A) | Teacher support to generate out-of-class activities (P14B) |

Teacher Support for in-class orchestration (P14A) is rated Potential to Improve. The product did not have any features built in the product to support teachers in lesson planning or using the learning material.

Teacher support to generate out-of-class activities (P14B) is rated Valuable. The reviewers found that the support for teachers was present to some extent. The teacher can connect with the learners using a separate “Coach App” and can assign the already available lessons and practice tests to individuals or groups of students.

However, a teacher cannot create customized worksheets or practice tests for their class. There is no option available to either select particular questions from a question bank for a specific chapter or to create worksheets by picking questions across various chapters.
4.3 Technology and Design

Technology & Design measures how well the technological affordances integrate with the pedagogy and content to promote a meaningful learning experience for all learners. This dimension focuses on user interface design and affordances that facilitate learning.

4.3.1. User Interface Design

**Interface design: Enable intuitive use (T1)** is rated **Exemplary**. The overall interface was very intuitive to use. Different types of learning content like the videos, assessments and projects were placed separately, with clear icons. Easily operable buttons helped the learners to change the class or navigate to the desired content type.

The important buttons like “Start Practice Tests”, or the button tiles to “play the videos” or “Next video”, were clearly visible and consistent throughout the product. The practice questions were intuitive and easy to answer, with large “option” boxes for MCQs and a clear submit button. The play/ pause and fast forward/ rewind buttons were clearly visible in the videos.

**Interface design: Access consequences of an action (T2)** is rated **Exemplary**.

There were sufficient prompts for different user actions wherever required, making the learner aware of the consequences of their action.

For example, If a learner presses the “back” in the middle of the assessment, there is a prompt asking whether the learner wants to close the assessment midway or continue to improve content mastery. If the learner wants to retake a completed test, the prompt informs the learner that the last recorded mastery will be erased should she/ he choose to retake the test and provides the learner an option to go back on the decision. In case the learner chooses to quit midway, the test starts from the previously ended point.
**Learner Navigation and pace (T3) is rated Valuable.** The product offers complete flexibility to the users to learn at their own pace and sequence. The learners can navigate freely to the desired class, topic, or practice test. Videos can be paused, fast-forwarded, and quit at any time. There were no restrictions on the amount of time needed to spend on different practice questions.

However, the videos could not be played at varying speeds based on a learner’s preference. Another missing aspect of navigation in the practice tests was the inability to navigate between questions in a particular practice test. Once an answer is selected and submitted, the learner cannot revisit the question after seeing the solution. Also, there was no possibility to skip any questions.

**Universal Design (T4) is rated Potential to Improve.** The learners had sufficient time to read and understand the content. However, many important features of Universal design according to the WCAG design principles were found to be missing. There were no written captions for the video content. The questions of the assessments could only be read, and the answers could be operable through the touch screen input. There was no alternate option like audio instructions, voice-over for questions, or audio input.

### 4.3.2. Affordances that facilitate learning

<table>
<thead>
<tr>
<th>Analytics for learner’s progress (T5)</th>
<th>Tool to support problem-solving (T6)</th>
<th>Meaningful interactivity (T7)</th>
<th>Content type - Technology alignment (T8)</th>
</tr>
</thead>
</table>

**Analytics for learners’ progress (T5) is rated Valuable.** The product allows the learners to view progress reports related to video lessons and practice tests. The learners can get information about the amount of time spent watching different content videos, and number of attempts and percentage mastery level in a particular practice test. However, the dashboard does not identify the specific learning objectives in which the learner would need additional support or practice. It also lacks any actionable elements which can prompt the learner to revisit certain content pieces or tests based on the presented information.

There is a separate dashboard for the teacher as well, on the “Coach App”, where the teacher can view similar statistics about mastery levels and the amount of time spent watching the different content pieces.
Tools to support Problem solving (T6) is rated Potential to Improve. Mathematical tools were not present in the topics that were reviewed. For instance, different tools for measuring length were shown in the video but there was no way a learner could interact and use the tools to practice measurement.

Meaningful Interactivity (T7) is rated Potential to Improve. The product only has basic interactivity features like simple buttons or radio buttons which help the learners to select the answers and navigate through the content. There were no other interactivity features observed which could aid in the learning or understanding of various concepts. Some of the possible interactivity features applicable for different learning units include drag-and-drop, drag-and-rotate, text inputs or sliders.

Content type - Technology alignment (T8) is rated Exemplary. The visualizations used in the product map suitably to the content type. Process images or simple animations are used wherever required.

**Illustrative example:** Coordinate geometry, Grade 9

The video explained the process of locating coordinates of points in the given cartesian system. Animation is used to show the distance of a point from the X and Y axes.

**Illustrative example:** Arithmetic Progression(AP), Grade 10

The step-by-step process of finding the sum of AP and nth term in AP was explained in the video. This helped the learner to understand the problem-solving process. Thus mapping of process type content with appropriate visualization was observed in the product.
Appendix

How does the EdTech Tulna evaluation work?

FRAMEWORKS

EdTech Tulna frameworks define a set of standards for quality design of EdTech products. A rigorous and research-backed process is established and applied for the creation of various nuanced frameworks. These frameworks are use-case specific to enable transparent and precise, high-stakes decision making. The process includes considering existing research literature, feedback from the ground on multiple stakeholder needs and an appreciation for the quality of solutions currently supplied in the ecosystem.

The frameworks are categorized along the three dimensions of Content Quality, Pedagogical Alignment, and Technology & Design to capture a holistic view of the quality of the product design. The frameworks are also made available at varying levels of depth for varying stakeholder needs and range from supporting governments and institutions in making high-stakes, rank-based, adoption decisions, to providing a brief overview of the key criteria to be considered while designing a product.

TOOLS

Each Tulna framework is accompanied by a toolkit that is specifically designed to guide experts to evaluate EdTech products. These toolkits are customized to the type of EdTech solution, grades, subjects, to drive meaningful and nuanced evaluations. The tools are informed by research as well as iterative empirical study and tested for inter-rater reliability and validity. A typical toolkit consists of rubrics and reviewer guidelines to enable evaluators to interpret the framework and conduct unbiased evaluations. Each criterion within the framework is rated along a three-point rating scale - ‘Exemplary’, ‘Valuable’, and ‘Potential to Improve’ - indicating the level of alignment with expectations laid out in the framework. Toolkits include supporting materials - videos, templates, and example illustrations - to guide experts while conducting evaluations.

PROCESS

Each product goes through a rigorous review process that takes approximately 160 hours for four grade ranges K-2, 3-5, 6-8, and 9-10. Each review team is designed to be independent and neutral. A typical expert review team consists of 3-4 members who are subject matter experts, instructional designers, user-interaction experts, user-experience design experts, and professionals with experience in teaching and implementing EdTech in field settings. Each review team has an anchor of at least one experienced evaluator.

Each member of the expert review team undertakes a two-week long intensive training on understanding the frameworks and the subsequent application of its toolkits to conduct evaluations. For each product, the review team applies a systematic sampling strategy and decides the representative learning units that will be reviewed. The team collectively reviews a subset of the learning units to check for convergence and establish inter-rater reliability. Team members then individually review the remaining learning units. The team finally meets to synthesize key points and takeaways of each review and elaborates their reviews into an in-depth report, which is overseen by the experienced evaluator.

The role of the product company is limited to an initial demo which supports the review team to deepen their appreciation of the intended use of the product, and its scope. The product company is then provided the final reviews and their unedited responses are published alongside the expert evaluations on the Tulna evaluation center.
Website: https://edtechtulna.org/
Contact us at: Tulna.Help@gmail.com