EVALUATION REPORT

EdTech Tulna

HEYMATH!
MATHEMATICS
GRADES 6-8

Evaluated in June 2021
## Contents

1. What Does This Report Contain? ........................................ 3
2. Overview of the Product .................................................... 3
3. Executive Summary .......................................................... 4
4. Detailed Review .................................................................. 7
   4.1 Content Quality ........................................................... 8
   4.2 Pedagogical Alignment .................................................. 10
   4.3 Technology and Design ................................................. 18
Appendix ................................................................................. 21
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

HeyMath! is a digital classroom product developed to support students and teachers. Each learning unit in the product contains a set of animated lessons, interactive videos, games, activities and mathematical tools. Students have access to all the content for their grade and a previous grade. Various types of assessments and practice tests are also present, which can be customized by the teachers and assigned to the students.
3. Executive Summary

**HeyMath! | Mathematics | Grades 6-8**

*Content Quality Exemplary*  
*Pedagogical Alignment Exemplary*  
*Technology and Design Exemplary*

The product is beneficial for learning and applying concepts in mathematics for grades 6-8 and aligned with national standards. The product is an effective teaching tool for teachers to support learners’ learning and monitor their progress.

**Potential benefits of this product**

Schools and teachers can be assured of the correctness of the content and all the learning activities. They can use the product for in-class teaching and assign independent tests or activities to the students.

- Teachers will likely be able to use this product in their classrooms as the content and assessments provided are accurate and aligned to the national curriculum.
- Teachers can track class performance as well as individual learners’ progress. Thus they will likely use the product to create and assign homework for learners.
- The learners can engage in active learning due to the product’s constructivist approach embedded within its videos and activities and appropriate animations and simulations provided in topics. Such active learning might help build a solid conceptual understanding amongst students.
- The product is likely to provide an enhanced learning experience through its diverse real-life scenarios across various contexts and the use of appropriate visual and verbal cues.

**Potential limitations of this product**

Learners will likely face the following issues:

The design of the product may lead to the following limitations in the teaching-learning experience using this product.

- Teachers may get stuck since there is no guidance for in-class components such as lesson plans.
- The learners might find some of the content challenging due to foreign accents and some examples that might not be relatable to Indian learners.
- The learners might struggle while solving assignments and homework due to the lack of explicit scaffolds or hints in some activities.
- The lack of group activities or prompts might lead to low participation and collaboration amongst students.
## HeyMath! (Grades 6-8): 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 language used can be understood by the intended learners with some effort. The accent might be difficult to follow.</td>
</tr>
<tr>
<td>C4 Mathematics skill coverage</td>
<td>Skills recommended by NEP for Primary Stage (Grades 6-8) are covered.</td>
</tr>
<tr>
<td>C5 Curriculum alignment</td>
<td>The content is aligned to NCERT and sequenced logically.</td>
</tr>
<tr>
<td>C6 Inclusivity in representation of learners</td>
<td>Various sections of society across gender and socio-economic class are represented to some extent in some learning units.</td>
</tr>
</tbody>
</table>

### Pedagogical Alignment: Exemplary

<table>
<thead>
<tr>
<th>P1 Constructivist approach</th>
<th>The product helps the learners construct an understanding of the concepts, rather than merely doing information transmission.</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 better understanding of the concept.</td>
</tr>
<tr>
<td>P4 Learner scaffolding</td>
<td>Some scaffolds help learners solve complex problems, but some learning units lack sufficient support for struggling learners.</td>
</tr>
<tr>
<td>P5 Cognitive engagement</td>
<td>Conversational tone and appropriate highlighting was present in most of the learning units.</td>
</tr>
<tr>
<td>P6 Motivational features</td>
<td>Sufficient motivational features like stars and motivational features are present within practice activities.</td>
</tr>
<tr>
<td>P7 Logical chunking and connectedness</td>
<td>The content in any learning unit is chunked in smaller pieces of appropriate duration, which are well connected to each other.</td>
</tr>
</tbody>
</table>
### Technology and Design: Exemplary

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P8 Learning objective – assessment alignment</strong></td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>The learning objective and cognitive levels of the assessments are aligned to the content as well as the National curriculum.</td>
<td></td>
</tr>
<tr>
<td><strong>P9 Pedagogy – assessment method alignment</strong></td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>Activity and scenarios based pedagogy is used as recommended by NEP.</td>
<td></td>
</tr>
<tr>
<td><strong>P10 Cognitive levels covered</strong></td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>Questions and activities engaging learners in Higher Order Thinking Skills are sufficiently present.</td>
<td></td>
</tr>
<tr>
<td><strong>P11 Feedback Quality</strong></td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>Detailed explanations are present for assessment questions, but there is a lack of opportunities to revisit the related content.</td>
<td></td>
</tr>
<tr>
<td><strong>P12 Opportunities for collaboration</strong></td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>The product lacks any clear opportunities for group activities for the learners.</td>
<td></td>
</tr>
<tr>
<td><strong>P14A Teacher support for in-class orchestration</strong></td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>Teacher training and sample lesson plans are provided to the partner schools.</td>
<td></td>
</tr>
<tr>
<td><strong>P14B Teacher support to generate out-of-class activities</strong></td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>Teachers can create customized tests and worksheets as well as assign content and activities to learners.</td>
<td></td>
</tr>
</tbody>
</table>

### Executive Summary

**Summary of Review Ratings by Criteria**

<table>
<thead>
<tr>
<th>Technology and Design</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T1 Interface design: Enable intuitive use</strong></td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>The platform is very intuitive to use and all elements are clearly visible.</td>
<td></td>
</tr>
<tr>
<td><strong>T2 Interface design: Assess consequences of an action</strong></td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>The interface provides appropriate responses to learner’s actions with the interface by informing them about what action has been done and what has been accomplished.</td>
<td></td>
</tr>
<tr>
<td><strong>T3 Learner navigation &amp; pace</strong></td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>It is easy to navigate between different lessons and activities. The learners can learn at their desired pace and sequence.</td>
<td></td>
</tr>
<tr>
<td><strong>T4 Universal Design</strong></td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>Some features of universal design are present, which make the product accessible to diverse learners.</td>
<td></td>
</tr>
<tr>
<td><strong>T5 Analytics for learners’ progress</strong></td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>Teachers and learners both have access to relevant reports on progress and performance.</td>
<td></td>
</tr>
<tr>
<td><strong>T6 Tools to support problem solving</strong></td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>Effective mathematical tools to aid problem solving are present.</td>
<td></td>
</tr>
<tr>
<td><strong>T7 Meaningful interactivity</strong></td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>Appropriate features like input boxes, drag and drop, click to select, drop-downs, sliders and checkboxes were used wherever required.</td>
<td></td>
</tr>
<tr>
<td><strong>T8 Content type – Technology alignment</strong></td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>Suitable images, videos and animations are used depending on the topic.</td>
<td></td>
</tr>
</tbody>
</table>
4. Detailed Review

4.1 Content Quality

Content Accuracy and Clarity ................................................................. 8
Alignment to National Standards .......................................................... 9
Inclusivity in Content Representation .................................................. 9

4.2 Pedagogical Alignment

Learner-Centred Approach .................................................................. 10
Enhancing Learner Experience .............................................................. 11
Assessment of Learning ...................................................................... 15
Teacher Support .................................................................................... 17

4.3 Technology & Design

User Interface Design ........................................................................... 18
Affordances that Facilitate Learning .................................................... 19
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

Content Accuracy (C1) is rated Exemplary. The product consisted of learning materials for each chapter. There were a set of videos, hands-on activities, games, and printable worksheets for each chapter. The concepts and examples covered in the videos were realistic and correctly explained.

Illustrative example: Integers, Grade 7

In this chapter, negative and positive integers are explained clearly through examples like changing weather and how temperature varies according to seasons. There is a hands-on activity on using a thermometer that helps understand negative integers.

Illustrative example: Mensuration, Grade 8

In each of the videos, in the beginning, it starts with real-life context (e.g., a star, a train, a tractor, a signboard, etc.), which then goes to explain an abstract shape like a trapezium or a rectangle. Then the formula of finding the area of the corresponding shape is presented using appropriate highlighting and examples.

Correctness and clarity in assessment (C2) is rated Exemplary: The assessment questions provided during practice and unit tests were accurate and unambiguous. The solutions were correct, clear, and precise, with clear explanations and steps provided.

Language Comprehensibility (C3) is rated Valuable: The language and vocabulary used in the videos and practice questions were simple, and the sentences were short and easy to comprehend. The reviewers observed that the accent varies throughout each video. In many videos, the accent was foreign and might have been difficult to understand for all learners, whereas in some videos, the accent was neutral/Indian and comprehensible. By ensuring all the remaining videos also follow a similar Indian or neutral tone and accent, the product can ensure improved language comprehensibility for all learners.

Illustrative example: Chapter: Integers, Grade 6

The accent during the first concept, ‘Introducing Integers’ was Indian and comprehensible. In contrast, the next two concept videos - 'Practical Use of Negative Numbers’ and ‘Absolute Value of an Integer’ - had a foreign accent.
Overall, reviewers observed that almost 50% of the sampled units used foreign accents, and thus, learners might require some effort to comprehend the language.

### 4.1.2. Alignment to National Standards

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

Mathematics skill coverage (C4) and Curriculum alignment (C5) are rated Exemplary.

Reviewers observed that most of the topics and sub-topics covered aligned with the NCERT textbooks for Grade 6-8. The chapter names and topics are aligned and similar to ones present in the NCERT textbook. The reviewers observed that these topics were covered comprehensively through conceptual videos, hands-on activities, printable worksheets, and games.

The overall Mathematics mindset and skills required for grades 6-8 (recommended by NEP 2020 and NCF) such as understanding abstract concepts like integers, fractions, and geometry, representing and visualizing data, observing geometrical properties and associating formulas and properties with shapes, introduction to using algebraic notation, and observing patterns across numbers, were covered through topics like Ratio and Proportion, Lines and Angles, Algebraic Expressions, Introduction to Graphs, Practical Geometry and Mensuration, and Simple Equations.

### 4.1.3 Inclusivity in Content Representation

Inclusivity in the representation of learners (C6) is rated Valuable:

The reviewers observed that the product attempts to include content relatable to diverse learners regarding gender, religion, caste, color, and socio-economic backgrounds. The gender representation was fair, as indicated by the names used for the characters in the word problems. Some units also had a good representation of color, religion, and relevance of the content mapping to urban and rural contexts.

**Illustrative example:**

- Units included names like Gopi, Ragu, Malini, Rita, Murali, Shaurya, and Raman.
- Units covered religious minorities and darker skin colors.
- Units also included examples from the Indian context like the santoor instrument and cooking items like chaat masala, papdi, and bhel puri.

However, the reviewers observed high inclusivity in some topics like Ratio & Proportion in Grade 6. Still, there were many units with examples from foreign contexts or no systematic focus on inclusivity across all topics. For example, some topics used names like Thabo, Angelina, Gates, Christina, Big Daddy, and Snapper.
4.2 Pedagogical Alignment

Pedagogical Alignment focuses on learner-centred 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-Centred Approach

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

Constructivist approach in pedagogy design (P1) is rated Exemplary. There are sufficient activities relevant to the content that allow learners to construct their understanding in various ways. The product included interactive videos, activities, and games that helped learners apply their knowledge and form a robust mental model of the concept. Many topics included good reflection spots that prompted learners to apply their knowledge quickly. The product then provided immediate feedback to the learners. The concepts were well-sequenced, and the product provided multiple examples and opportunities for practicing each of these concepts. For many topics like practical geometry, data handling, and algebra, the product included simulations that allowed the learner to experiment, modify different variables, try out various permutations, and observe their results. Below are some illustrative examples.

Illustrative example: Chapter: Basic Geometrical Ideas, Grade 6

There are hands-on activities where the learner has to drag and drop the appropriate polygon into the right set of properties. Also, there is good sequencing of concepts, from point to line to the relationship between lines. Some activities help in the construction of perpendicular and parallel lines to help understand these concepts. Similar activities are present in the circle as well.

Illustrative example: Chapter: Introduction to Graphs, Grade 8

There were hands-on activities to locate coordinates in the x,y graph and check whether the points were marked correctly or not. This experimentation allowed the learner to monitor their performance. Upon completion of the three sets of coordinates, it forms a ‘HEY.’ The figure (fig. 1) marked below showcases the stage where the learner has completed one question, and hence an ‘H’ is displayed.

Figure 1 - Making a ‘HEY’ using different sets of coordinates
Addressing learning gaps/ alternate conceptions (P2) is rated Exemplary. The product had identified the usual learning gaps as well as addressed them well in many topics. While explaining new topics or concepts, common misconceptions or learning gaps are often addressed by providing multiple examples, explaining concepts in various ways, or providing different points for the learner to note.

Illustrative example: Chapter: Algebraic Expressions, Grade 7

Concepts like variables, constants, and like terms were explained well using concrete examples. In the topic ‘Algebra and Formulae’ - there is a note around unit conversion while solving problems around how everything needs to be converted into kilometers and hours before performing any calculations.

Illustrative example: Chapter: Practical Geometry, Grade 6

The visual way of measuring distance on a compass or drawing a line using a math tool likely helped clear doubts regarding using protractor, scale, set square, etc. For example, while showing the videos on construction, measuring a line from the ‘0’ mark is displayed at all points.

Opportunities for collaboration (P12) is rated Potential to Improve. The reviewers did not find enough evidence for activities that could encourage collaboration among the learners. In Triangles and its properties in Grade 7, there was one instance where there was a group quiz where the teacher could divide the class into two teams for answering a question each. The teacher could also set rules and rate the group work using a rate board provided for both teams. However, there were no other activities or games present in any other chapter that allowed multiple students or groups to collaborate or work together.

4.2.2. Enhancing learner experience

Content in Context (P3) is rated Exemplary. Most of the topics had relevant and sufficient real-life context. These used excellent introductory examples and scenarios, which potentially helped the learner care about the topic. The product integrated diverse objects, events, and activities from daily life across various topics, which the learner was familiar with or had experienced firsthand.
**Illustrative example: Chapter: Ratio and Proportion, Grade 6**

This chapter is filled with great real-world examples. For instance, a flying saucer filled with five aliens has landed on Mars, and learners need to determine the ratio between the saucer and aliens. Other ratios asked are Cups and biscuits, Cows and sheep, Fruit games and toffees, and butterflies and flowers. In Problems of Ratios, orange juice had to be made by applying the concept of ratio using the right measures of orange concentrate and water. One of the activities gives the learner a recipe for making bhel puri. The learner needs to use proportions to decide the quantities of different ingredients to make bhel puri for any given number of servings. Another good example (Figure 2) includes the activity of purchasing items from a supermarket.

![Diagram of a receipt](image)

*Figure 3: Examples of real-life household items*

**Illustrative example: Chapter: Lines and Angles, Grade 7**

Multiple examples of angles being formed are shown. For instance, a gardener uses a pair of shears which are shown, and the angle formed is shown as well. Similarly, other examples like angles are formed at a road junction, a cricket shot played by Tendulkar, and the angle made by the cue ball while playing snooker are shown.

![Diagram of vertically opposite angles](image)

*Figure 4: Vertically opposite angles explained using pairs of shears*

**Illustrative example: Chapter: Mensuration, Grade 8**

Vital context for different shapes like trapezium, squares, and cylinders is provided through rich examples. For example, a paper plane thrown by a boy gets transformed into a trapezium, or pigs are shown drinking water from a cylindrical trough whose volume needs to be calculated.

![Diagram of a trapezium](image)

*Figure 5: A boy (on the left) throws a paper plane which is then shown as a trapezium*
Learner Scaffolding (P4) is rated Valuable: The reviewers observed that there was some level of scaffolding present across chapters. There was an option of labels for questions marked as easy, medium, and difficult, which the teacher could use while designing a test or an assessment. There were some games and activities which had levels of increasing difficulty. There were also some instances in activities where hints were present.

Illustrative example: Chapter: Ratio and Proportion, Grade 6

In the activity of finding the ratio of cow and sheep - when a question is answered wrong twice, there are a few prompts like “have you counted the cow and sheep correctly?” and “Have you canceled correctly?” come. Upon three wrong answers, the correct answer is shown. There are hints present in multiple activities in this chapter (e.g., for reflection spots and some activities within the video).

Illustrative example: Chapter: Algebraic Expressions, Grade 7

Suitable scaffolds were present at the beginning of the magic trick. As the magician performs a trick and correctly figures which number the learner guessed, it’s explained using a reflection spot. In order to break it down, each step is presented such that it is matched to a corresponding algebraic expression (Figure 6). This breakdown helps the learner understand how the magician performed the trick through simple algebraic form.

However, the reviewers observed that there were no hints present or support given to a learner in the case of the practice assessments and tests. There were many places in the activities and reflection spots where there was no support provided to the learner if they were stuck. Prompts like “Try again” or “Show correct answer” were directly shown, which didn't provide adequate support to the learner to figure out the answer independently. Due to this inconsistency across units and lack of hints or support in tests, the criteria were marked as valuable.
Cognitive Engagement (P5) is rated Exemplary: The reviewers observed that the product paid careful attention to engage the learners cognitively throughout their learning journey. This was done both through effective usage of verbal and visual cues and an informal conversational style by the speaker.

Cognitive engagement is exemplary for two main reasons:

1. **Personalization** - Throughout different chapters, there was the consistent use of active voice through the words 'I,' 'we,' 'us,' and 'you' and an informal tone. There were phrases like “let us see,” “here we go,” “notice that,” and “let’s work out” used throughout different topics. For example, in the chapter “Introduction to Graphs” in Grade 8, a bee on the screen asked the learner - “Can you describe my position?”. Such a conversational style made the content more inviting and engaging for the learner.

   Figure 9: A bee asking (in first person) to describe its position

2. **Signaling** - There was an excellent use of highlighting throughout all topics. In order to mark different values or concepts, different colors were used. Appropriate boxes and side notes were used to highlight any points to keep in mind and differentiate them from the actual content. There was also an excellent use of animations, borders, arrows, and text highlights.

   Figure 10: Appropriate highlighting and boxing being used to explain commutative property in Integers

However, in some videos, the voice is robotic, and there is scope for more human-like touch through appropriate stresses, pauses, etc. While such an improvement is desirable, the reviewers assessed that this shortcoming would not hamper the learning process.

Motivational Features (P6) is rated Exemplary: Throughout the product, the reviewers observed certain motivational features as a part of the learning activities, quizzes, and games. There were words like ‘good’ and ‘excellent’ when the correct answer was given. Also, there was a catchy and pleasant sound that was played when the answer was correct. The learner also got feedback like “Try the other questions” when only one part of the question was attempted. There was also an element of choice in the number of similar questions the learner wanted to practice.
Although such features were present within the learning activities, reviewers found them to be absent at an overall product level. For instance, the product could have motivational features such as displaying the overall learning proficiency levels across a chapter or grade based on the learner’s attempts in all the learning activities. Such features might encourage a learner to explore the content further (i.e., cover more chapters or other topics). That being said, since this product is a digital classroom (DCR) product, reviewers expect that the teacher can play this role in the classroom. Hence, this aspect of the product's design is unlikely to hamper the teaching-learning experience using the product.

**Logical chunking and connectedness (P7) is rated Exemplary:** All the learning units were structured adequately to aid in a meaningful learning experience. The topics were chunked logically into smaller videos of 2-6 minutes duration.

**Illustrative example:** Mensuration, Grade 8

The structure of the chapter is well-sequenced, with each video specifically addressing distinct concepts like area of a parallelogram, rhombus, volume of a cube, cuboid, etc. There were hands-on activities, quizzes, reflection spots, and games that served as formative assessments within or between these 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 reviewers observed that the learning objective of the content (videos) was aligned with the aim of formative assessments like activities, games, and practice worksheets & assessments provided for the learners. The cognitive level of the content covered was aligned to the assessments as well.

Pedagogy-assessment method alignment (P9) is rated Exemplary. Reviewers observed that the pedagogical strategy used in the product was as recommended for upper primary grades in NEP, 2020. According to NEP, 2020 - some of the pedagogical strategies recommended for Upper Primary Stages (Grades 6-8) are providing hands-on activities and real-life scenarios and interacting with students to elicit their understanding of abstract concepts. This was clearly demonstrated via the use of engaging hands-on activities provided for each chapter and also by introducing abstract concepts like shapes or integers through concrete examples from the surrounding or real-life scenarios.
Cognitive levels covered (P10) is rated Exemplary: The reviewers observed that there were questions present at various cognitive levels, ranging from understanding and identifying to application and analysis. There was extensive coverage of Higher Order Thinking Skills (HOTS) questions throughout the product within the activities, practice examples, and tests. For instance, in Ratio and Proportion in Grade 6, there were challenging word problems, especially in topics like unitary method, proportion, and equivalent ratios.

Illustrative HOTS question: Chapter: Ratio and Proportion, Grade 6

In a movie hall, class I has rows of seats with seats in each row. Class II has rows with seats in each row. When all the tickets were sold, the amounts collected for classes I and II were Rs. ___ and Rs. ___, respectively. Find the difference between the cost of one ticket for class I and one ticket for class II.

Illustrative HOTS question: Chapter: Triangle and its properties, Grade 7

Feedback Quality (P11) is rated Valuable: The reviewers observed that correct and complete explanations with proper reasoning were present for the assessment questions and independent tests, which the teacher could create and assign to the learners. However, there were no suggestions to revisit the related content if a learner answers several questions incorrectly. There was also no option for the teacher to integrate such remedial content along with the tests. Only a binary response (about correct or wrong) was provided in many activities, and a learner was prompted to try again. Upon doing a question incorrectly multiple times, the correct response was provided in most activities but without detailed explanations.

Feedback Quality (P11) is rated Valuable: The reviewers observed that correct and complete explanations with proper reasoning were present for the assessment questions and independent tests, which the teacher could create and assign to the learners. However, there were no suggestions to revisit the related content if a learner answers several questions incorrectly. There was also no option for the teacher to integrate such remedial content along with the tests. Only a binary response (about correct or wrong) was provided in many activities, and a learner was prompted to try again. Upon doing a question incorrectly multiple times, the correct response was provided in most activities but without detailed explanations.

Figure 11: Higher Order Thinking Skill (HOTS) question for Pythagoras theorem for Grade 7

Figure 12: HOTS questions for Angle Sum Property and Exterior Angle property for Grade 7

Figure 13: No option for students to revisit related content when the answer is incorrect.
4.3.4 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 Valuable: The reviewers observed that the product included different types of content like videos, activities, games, and printable worksheets that the teacher could integrate with their lessons. However, within the product, there were no guidelines or support present for the teacher on how to effectively integrate them together or execute a plan. However, the product company claimed that there was adequate teacher training and onboarding provided on how to use this product effectively through offline mediums. For example, star lesson plans are provided to teachers to showcase best practices. Since reviewers were unable to verify this claim within the product's design, this criterion has been rated Valuable.

Teacher support to generate out-of-class activities (P14B) is rated Exemplary: The reviewers observed that the teachers are provided with adequate support for out-of-class activities. The teachers can create customizable worksheets and tests for every student. They can assign specific questions of varying difficulty levels and select learning units and assignments based on the learner. The teachers could also access worksheets and tests created by other teachers for different topics and chapters using the same platform.
### 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 user interface followed Norman’s design principles for visibility, affordance, consistency, and mapping. The reviewers observed that the product was very intuitive to use, and all user events led to the expected effect. Different types of learning content like the main lesson, games, hands-on activities, and mathematical tools were placed in separate tabs. All necessary buttons and links to various activities were clearly visible and were placed in meaningful locations on the screen. All the grades and units were similar to a chapter list on the left side and videos/activities/games on the right side with a short description of the video or activity. The different buttons like ‘submit,’ ‘check answer,’ or ‘hint’ were highlighted in the activities, indicating possible actions to be taken. Also, there was consistency in the way actionable elements are used and highlighted across the product. Overall, the interface followed a consistent pattern for all actions.

**Interface design:** Assess consequences of an action (T2) is rated Exemplary: The interface did provide appropriate responses to learner’s actions through relevant text or visuals. There were warnings or prompts when the user performed specific actions like ‘Delete.’ For incorrect answers during an activity, a button ‘Try again’ was displayed. Such displays also allowed for recovery from error and helped the learner re-attempt the questions that they had previously attempted incorrectly. If the learner stopped the video in between, it could be resumed from where the learner had stopped. In some places, the reviewers observed that the text for the buttons was missing, but once the learner played with the buttons, it was easy to understand.
Learner Navigation and pace (T3) is rated Exemplary: The reviewers were able to navigate within and across the learning unit and at the pace that they desired. It was easy and intuitive to navigate between different content pieces across different chapters or various activities within a chapter. There were no restrictions placed on the learning path which a learner could follow. The learner could navigate across multiple activities, games, and quizzes at their own pace. Learners could also skip the videos or practice questions, move ahead to the next video/activity, and vary the video’s pace according to their convenience. They could also revisit the content as per their requirement. Thus navigation and pace through content were based on the learner's requirements.

Universal Design (T4) is rated Valuable. Several Web Content Accessibility Guidelines (WCAG) principles were followed. For instance, content was presented in different ways (e.g., textual, diagrams, and simulations) and content was designed to appear and operate in predictable ways. Some features of universal design were present, e.g., voice-over for the text and the instruction in the quizzes, games, and in-lesson activities. Sufficient time was given to the users to read and understand the content. However, the product did not have low entry barriers for diverse learners (learners with varying ability, special needs, or other characteristics). Many important features of universal design according to the WCAG design principles were found to be missing. Some of these include operability from the keyboard and captions for the video content. The hands-on activities also lacked audio for the instructions, while only text with background music was present.

4.3.2 Affordances that Facilitate Learning

<table>
<thead>
<tr>
<th>Analytics for learners’ progress (T5)</th>
<th>Tools 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 Exemplary: The product had a robust dashboard for students, allowing them to do tasks, check topic progress, and get an overview of the report. The teacher can get information about the time spent by each child on different lessons. The question-wise report on the tests is also available and has multiple views, like student-wise reports or overall class-level reports. Teachers could assign various practice sets, tests, or questions individually to students or the entire class or any subset.
The student dashboard was comprehensive as it allowed each learner to check assigned work, the amount of time spent on each lesson, and their performance on the assignments. There were reports available for different types of tests according to selected groups. In the case of different levels in a test, the learner could see their mastery level on each level. A view to compare their mastery with the overall class performance on a particular test was also available.

**Tools to support Problem-solving (T6) is rated Exemplary:** Mathematical tools were present for most topics. Tools for construction like a protractor, scale, set squares, compass, and appropriate algebraic and statistical tools are provided. The construction tool was robust and simulated real-life situations in terms of how the compass is held/placed, set squares were used, and the learner could use a protractor, scale, draw a line, line segment, or free sketch as well. Similarly, in algebra, there was a tool specifically provided for adding, subtracting, multiplying, and factorizing algebraic expressions. There were also tools provided for topics like fractions and data handling.

![Figure 20: Learners can play with tools like compass, set squares, scale, protractor, and construct their own shapes and figures.](image)

**Meaningful interactivity (T7) is rated Exemplary:** The overall product had most of the basic interactivity features which were used appropriately to help with learning in a meaningful manner. There was an option to play, pause, forward, or rewind as per the learners’ needs in the videos. There was also an additional feature to either increase or decrease the speed of the video, as per the learner’s requirement. In the activities and reflection spots, there were variations of multiple-choice questions, drop-down menus, checkboxes, input boxes, and drag-drop features that enable meaningful learning. The reviewers did not observe any superfluous features.

**Content Type - Technology alignment (T8) is rated Exemplary:** The visualization mapped suitably to the content type. Factual concepts like number line, abstract shapes were shown using appropriate diagrams, whereas processes were shown using animations and simulations. For instance, appropriate diagrams were used to highlight different parts of a circle, different quadrilaterals, and basic geometric terms. Appropriate animations were also used to show number line formation and explain concepts like the addition and subtraction of integers. In practical geometry and 3-D shapes, simulations were used to actually perform actions like drawing an angle or rotating a shape.
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.