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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 3-5

Content Quality  
Exemplary

Pedagogical Alignment  
Exemplary

Technology and Design  
Exemplary

Potential benefits of this product

Schools and teachers can be assured of the correctness and accuracy of the content and learning activities, and can use the product for in-class teaching as well as assigning independent tests or activities to the students.

- Schools can be assured of the alignment of the content with national curricula.
- The product may be used to promote deep conceptual understanding as it helps address common learning gaps for students while following a constructivist pedagogy.
- The content is cognitively engaging and is likely to keep classes of various numbers of learners meaningful engaged.
- The product uses adequate real-life examples and scenarios for learners to relate Mathematical concepts to their day-to-day lives.
- The adoption and learning curve for the teachers and students would be likely smooth due to the intuitive nature of the interface.
- With appropriate interactive modules, visualizations, and mathematical tools, the product is likely to provide a very active learning and thinking environment for the learners.

Potential limitations of this product

Learners will likely face the following issues:

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

- Due to the lack of enough explicit scaffolds or hints in some activities, struggling learners might get stuck in case they are working independently on these activities.
- The lack of group activities or prompts might lead to low encouragement from the teacher for collaboration among learners.
- The lack of some key Universal Design features might make the product unsuitable for some sections of society.
HeyMath! (Grades 3-5): 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 is understandable by the Indian learner. Appropriate level of vocabulary and simple sentence structure is used.</td>
</tr>
<tr>
<td>C4 Mathematics skill coverage</td>
<td>Skills recommended by NEP for Primary Stage (Grades 3-5) 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>An attempt has been made to represent various sections of the society across gender and socio-economic class 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 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>Scaffolds are provided to help learners take on higher difficulty but some learning units lack sufficient support for a struggling learner.</td>
</tr>
<tr>
<td>P5 Cognitive engagement</td>
<td>Conversational tone and appropriate highlighting was present in most of the learning units.</td>
</tr>
</tbody>
</table>
## Executive Summary

### Summary of Review Ratings by Criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>P6 Motivational features</td>
<td>☑️</td>
<td></td>
</tr>
<tr>
<td>P7 Logical chunking and connectedness</td>
<td>☑️</td>
<td></td>
</tr>
<tr>
<td>P8 Learning objective – assessment alignment</td>
<td>☑️</td>
<td></td>
</tr>
<tr>
<td>P9 Pedagogy – assessment method alignment</td>
<td>☑️</td>
<td></td>
</tr>
<tr>
<td>P10 Cognitive levels covered</td>
<td>☑️</td>
<td></td>
</tr>
<tr>
<td>P11 Feedback Quality</td>
<td>☑️</td>
<td></td>
</tr>
<tr>
<td>P12 Opportunities for collaboration</td>
<td>☑️</td>
<td></td>
</tr>
<tr>
<td>P14A Teacher support for in class orchestration</td>
<td>☑️</td>
<td></td>
</tr>
<tr>
<td>P14B Teacher support to generate out-of-class activities</td>
<td>☑️</td>
<td></td>
</tr>
</tbody>
</table>

### Technology and Design: Exemplary

| Interface design: Enable intuitive use | ☑️     | The platform is very intuitive to use and all elements are clearly visible. |
| Interface design: Assess consequences of an action | ☑️     | Feedback is provided for some user actions, which makes them aware of the consequences of the action. |
| Learner navigation & pace               | ☑️     | It is easy to navigate between different lessons and activities. The learners can learn at their desired pace and sequence. |
| Universal Design                        | ☑️     | Some features of universal design are present, which make the product accessible to diverse learners. |
### Executive Summary

**Summary of Review Ratings by Criteria**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T5</strong> Analytics for learners’ progress</td>
<td>Teachers and learners both have access to relevant reports on progress and performance.</td>
</tr>
<tr>
<td><strong>T6</strong> Tools to support problem solving</td>
<td>Effective mathematical tools to aid problem solving are present.</td>
</tr>
<tr>
<td><strong>T7</strong> Meaningful interactivity</td>
<td>Appropriate features like input boxes, drag and drop, click to select, dropdowns, sliders and checkboxes were used wherever required.</td>
</tr>
<tr>
<td><strong>T8</strong> Content type - Technology alignment</td>
<td>Suitable Images, videos and animations are used depending on the topic.</td>
</tr>
</tbody>
</table>
4. Detailed Review

4.1 Content Quality

Content Accuracy and Clarity ................................................................. 9
Alignment to National Standards .......................................................... 10
Inclusivity in Content Representation .................................................. 10

4.2 Pedagogical Alignment

Learner-Centred Approach .................................................................. 11
Enhancing Learner Experience .............................................................. 13
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4.3 Technology & Design

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### 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), as well as Correctness and clarity in assessment (C2) are rated Exemplary. The reviewers observed that all of the content is accurate and the videos explain concepts clearly. The practice and assessment questions are clear and solutions contain accurate answers for all topics. The questions are unambiguous and clearly inform the learner on how to guide their own thinking and what is expected as a response. There were no inaccuracies observed throughout the product from either a conceptual viewpoint or in the representation of any content.

**Illustrative example:** Learning Unit: Basics of geometry: Grade 5

Differences between lines, rays, and line segments were clearly identified and explained with the use of clear examples. Distance between cities on a map points to a line segment, the sunlight as rays, and an infinitely extending 1-dimensional entity as a line.

**Illustrative example:** Learning Unit: Place Value

Learners were clear about what actions to take and the outcome to be achieved. For example, a number was to be represented on an abacus. It was clearly shown that the learner needs to drag and drop the beads on the abacus to represent the desired number. After the learner is done attempting, the correct answer is displayed. No ambiguity in the questions or solution was observed.

**Language Comprehensibility (C3) is rated Exemplary.** Across most topics, the language used is easily understandable by the learners of Grade 3 to 5. Simple, short, and easy-to-understand sentences are used. The reviewers found that the accent used was neutral in more than 80% of the sampled learning units. The vocabulary used is familiar. Wherever there are new vocabulary words required for the topic, they are well supported by images or animations which likely help the learners to comprehend the content.
It was observed that some content (in < 20% of the sampled units) has a foreign accent, which might require some effort from the learners to understand. However, this is unlikely to impact the overall learning experience significantly.

### 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 3-5. Within each chapter, all the different aspects of the topic were covered comprehensively with the videos as well as other learning activities.

### 4.1.3 Inclusivity in Content Representation

Inclusivity in the representation of learners (C6) is rated Valuable. The reviewers observed some evidence of inclusivity in representation from diverse sections of the society in terms of gender, religion, caste, color, and socio-economic backgrounds. The gender representation was fair, mostly indicated by the names used for the characters in the word problems. Some learning units also had a good representation in terms of color, religion, and relevance of the content to both urban and rural contexts.
Diverse Indian names like Ramesh, Parvathi, Annie, Anish, Leela, Manasa, Eva were used. They were also shown with varied skin colors.

A differently-abled person was included and was participating in a wheelchair Marathon.

Places like Kanha national park along with common animals and different Indian cities, railway stations, and other well-known places were used. Relevant foods like Samosa, Pizza, etc. were used.

However, the reviewers found that such attention to inclusivity was given only in a few learning units, while others lacked any systemic representation, particularly with respect to religious inclusivity. Some units also used contexts that would be likely foreign to the Indian learner.

In an animated Delhi metro scene shown, all characters are fair-skinned. No effort to include different religions is observed.

Some learning units had names like Jane, Jack, Alice, Tim, Ronnie, and animals like a hamster, which might not be completely relatable to the Indian learner.

4.2 Pedagogical Alignment

Pedagogical Alignment includes criteria focused on adaptivity, 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. The product helps the learners construct an understanding of the concepts, rather than merely participating in information transmission. This was done in various different ways across the grades. There were activities, questions, and games to support the learning in an interactive way, which engaged the learner in the discovery of the concept and building understanding through it.
Many content videos also had reflection spots that required the learners to apply the understanding of the concept. They were solvable within a couple of minutes. Immediate feedback showing the correct answer was available. Mathematical simulations were also present in the relevant learning units which aid in constructivism as the learner is able to experiment and play with the simulations. Some illustrative examples are shared below for the above observations.

Illustrative example: Topic: Shapes, Space and Patterns Grade 3

Ronnie’s adventure: In an interactive video, the character travels (in air and on-road) in a small vehicle and views objects from different perspectives. The video pauses at various places and asks learners to answer many questions like “What view of the flowers is visible to Ronnie now?”. Immediate feedback is provided for the learner’s response.

Illustrative example: Topic: Time, Grade 4

An intuitive sense of time is built by relating to daily activities. Enough interactive activities and practice questions were present to play around with an interactive clock, such as moving the hands to show and read different times.

Illustrative example: Topic: Fractions, Grade 4

An interactive activity helps learners make sense of different sizes of fractions. A whole is taken and divided into halves, thirds, quarters, and so on. Learners are asked to compare. The smaller parts move and overlap with the other parts of the whole, helping learners to make sense of the different comparisons.

Addressing learning gaps (P2) is rated Exemplary. The common learning gaps were identified and addressed very well in all the topics wherever there was a possibility. This was done either through presenting multiple ways to think about a concept or specifically addressing certain points.

Illustrative example: Topic: Division, Grade 3

Multiple ways of thinking about division were observed addressing any kind of alternate conceptions. Examples and practice questions were present for each of these:
- Repeated addition of what number leads to the desired result in a given number of times
- Reverse of multiplication
- Repeated subtraction from the dividend
- An interactive activity to divide objects into different groups and counting the objects in each group

Illustrative example: Topic: Data Handling, Grade 4

In pictographs, the use of the legend was clearly explained and some specific points were addressed very well.
- It’s better to have the size of symbols as similar if they show equal quantity
- Half of a symbol can be used to represent a quantity
- Each symbol can represent more than 1 item.
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. There were no in-built activities in the product which the learners could collaborate on, or perform in groups. There were also no prompt questions observed in the videos which suggest to the learners to discuss their response or engage with fellow learners in any way.

However, a couple of hands-on activities were observed in Grade 3, Division with instructions to be performed in a small group, which is worth mentioning.

Illustrative example: Topic: Data Handling, Grade 4
An activity is suggested in groups of 4 with instructions, to create word problems. Context cards and number cards are provided, along with clear instructions on the role of every member in the group.

But such clear collaborative activities were absent in most learning units.

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. Most of the topics have relevant and sufficient real-world context which aids in a better understanding of the topic. Mathematical problems are placed in various contexts and scenarios which are relatable to the learner. Different objects from the surroundings or the daily activities which the learner likely performs or observes around them were present sufficiently.

Illustrative example: Topic: Time, Grade 3

A clock is shown at different times during the day. As the clock represents a particular time, there are pictures and descriptions of activities that a person is likely to perform at that time. For example, waking up at 6 AM, recess time in school at 10.30 AM, playtime in the evening, and other activities.
Illustrative example: Topic: Basic of geometry (Lines and Angles). Grade 5

Real-world examples were used to help learners understand and differentiate between points, lines, line segments, and rays. For example, cities on a map were shown with points and airline routes between cities were shown to represent segments. For rays, a torchlight and rays of the sun were used.

Illustrative example: Topic: Data Handling, Grade 4

- Representing different animals spotted in a national park using a pictograph
- Representing trains passing on each day at a platform using a pictograph
- Keeping a record of fruits eaten on different days of a week using a bar graph

Learner Scaffolding (P4) is rated Valuable. The reviewers observed some aspects of scaffolding to be present in the product. The lessons and activities progress gradually helping the learners to take on higher difficulty levels. There were several games that had multiple levels of difficulty. In terms of the scaffolds within a particular learning activity, there was a lot of variation in terms of support available for a stuck learner. Some learning units had very helpful hints, prompts, or a breakdown into smaller parts while others completely missed these scaffolds.

Illustrative example: Topic: Division, Grade 3

There was sufficient scaffolding in the word problems. An accompanying help notebook is present which suggests different ways of thinking about the given problem. For example, ‘Dividing 9 flowers into 3 vases’. Different pages of an interactive hint notebook have different suggestions for the users to think in different ways. Some of these are:

- \(_+\_+\_\) = 9,
- \(_\times 3\) = 9,
- \(_\%\_\) = 
- \(_9-\_+\_+\_\) = 0
- Match the objects by dragging

Illustrative example: Topic: Data Handling, Grade 4

Learners were asked to answer questions based on a pictograph. As hints to any question, the relevant rows of the graph were highlighted which help to direct a learner’s attention to the correct place.

Since around 50% of learning units lacked such explicit support for a struggling learner, this is rated valuable and not higher.

Cognitive Engagement (P5) was rated Exemplary. The signaling in the product was exemplary. Appropriate highlighting and the use of different colors, borders, and animated arrows were created to engage the users. The tone was conversational in many of the learning units and learners were encouraged at times to think along or try out some activities along with watching the content.
In questions comparing different fractions, parts of a whole are highlighted in different colors. For example, one-fifth is highlighted in blue, and one-eighth is highlighted in green. When comparing two one-eighths with a one-fifth, the images are highlighted and overlapped, helping the learner visualize the comparison of fractions.

The tone is very conversational throughout. For example: "Let's try to place the rings on the abacus", "What number do you think this represents?"

On the other hand, the personalization and the conversational nature of the content were missing in some of the learning units like Subtraction, Grade 3 where the tone was mostly found to be robotic, or Area and Perimeter, Grade 4, where the tone was neutral and not very engaging for the learner. Despite certain units lacking in personalization, this criterion is still rated exemplary considering the low number of such occurrences.

Motivational Features (P6) was rated Exemplary. Throughout the product, the reviewers observed certain motivational features as part of the learning activities, quizzes, and games. A pleasant sound along with a visual, or stars, were awarded whenever a learner answers a question correctly. Phrases like 'well done', 'excellent', and 'brilliant' are used in many places. There was also an element of choice in the number of similar questions the learner wants to practice.

Some activities show visual progress. For example, There were 10 word problems. Every time a problem is answered correctly, a feather of a different color is added to a stick to show progress.

However, there were no motivational features observed at an overall product level, like the overall learning proficiency levels across a chapter or a grade for a child based on the attempts in the learning activities. They were present within a particular learning activity, but any explicit features that would encourage a learner to further explore the content (more chapters or other topics) were missing.

Logical chunking and connectedness (P7) is rated Exemplary. All the learning units were structured adequately to aid in a meaningful learning experience. They were chunked into small videos of 2-3 minutes duration on average. The videos sometimes have a reflection spot within them or are followed in a set of practice questions in different formats. Most of the content pieces were supported by either an interactive quiz, an activity, or a game that serve as formative assessments. The question banks for the teacher to create assessments and practice tests are also mapped with the topic names.
Illustrative example: Topic: Factors, Grade 4

Content and formative assessments: The topic began with a 2-minute introduction video for factors, and was followed by an activity and quiz, to help learners identify factors of different numbers. This was followed by an explanation of common factors, again supported with practice questions.

Mapping to the assessments: The topic has 3 subtopics: Factors and Common Factors, Multiples and Common Multiples, and Tests of Divisibility. The question banks for the individual subtopics are present separately for the teacher to create different types of tests and assessments.

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, formative quizzes, activities, and games were perfectly aligned to the stated learning objectives as well as the expected objective as per the National Curriculum. The cognitive levels in the practice activities were aligned with the content discussed in the videos.

Pedagogy-assessment method alignment (P9) is rated Exemplary. A pedagogical strategy is recommended for each grade group in NEP, 2020. According to NEP, 2020 - the pedagogical strategy recommended for Primary School (Grades 3-5) is Scenario based teaching - Giving real-life, relatable examples. (Making connections with daily life), Teaching by using Activities and Observation. The product had sufficient learning-by-doing activities, scenario-based problems, and relatable real-life examples to ensure alignment with the recommendations. The overall pedagogy of the formative assessments was largely activity-based rather than a formal test with marked questions and answers.

Illustrative example: Topic: Shapes, Space and Patterns, Grade 3

In one of the activities, the learners are asked to group, drag, and sort the various objects in the room according to the kind of surfaces they have: flat, curved, or both.

Illustrative example: Topic: Place value, Grade 3

A lot of evidence of activity-based learning was observed. For example:
- Placing beads on an abacus to represent different numbers
- A Kaun Banega Crorepati quiz game, in which learners go through different levels while solving problems related to place value.
Cognitive levels covered (P10) is rated Exemplary: The questions are present at various cognitive levels as required, ranging from understanding and identifying, to application and estimation. There is good coverage of Higher Order Thinking Skills (HOTS) questions in a lot of topics, going much beyond just recalling or identifying. Most HOTS questions are at an application level, but there are some instances of create-level questions as well. Most topics have problems where learners need to apply the concept, solve problems and make connections between different ideas. Many scenario word problems were present which help the learners to apply the concepts.

Illustrative example: Topic: Volume, Grade 5

- Questions involving combining different cuboids together, and finding the volume of the combined structure.
- Removing a volume from inside the cuboid, finding the dimensions and volume of the remaining piece.
- Making connections between the volumes of containers, and inferencing their sizes.

Illustrative example: Topic: Factors, Grade 4

A create level activity was included where the learners are required to create rectangles of a given area on a graph sheet, while also making connections between the factors of the given number and the sides of the possible rectangles.

Feedback Quality (P11) is rated Valuable. Correct and complete explanations with proper reasoning were present for the assessment questions and independent tests which the teacher can create and assign to the learners. Sometimes, different ways of thinking about the same problem are also discussed. Also, detailed step-by-step solutions to word problems are provided.

Illustrative example: Topic: Fractions, Grade 4

Question: There are 42 games in a system. Only 9/14 of them are played often. Find the number of games that are not played often.

Solution 1: 9/14 of 42 is calculated, which is 27. The remaining games are calculated by (42 - 27) = 15.

Solution 2: A visual representation is shown and the problem is solved using the unitary met
On the other hand, as part of the in-class formative assessments, many of the activities, quizzes, and learning activities have no explanations of the correct answers, and only a binary response (about correct or wrong) was provided, and a learner is prompted to try again if required. Upon answering a question incorrectly multiple times, the correct response was provided in most activities but without any explanations. There were no suggestions to revisit the related content if a learner answers several questions incorrectly.

Considering that the final assessment questions have detailed explanations while many of the formative activities (which lack detailed explanations) are likely performed in the class led by the teacher, the product is rated **valuable** for feedback quality.

### 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 Valuable.** The teachers are provided a small set of star lesson plans for some learning units which suggest some good practices for the use of the product in the classroom. The product company also claimed to provide teacher training and professional development workshops as a part of the school onboarding and engagement process. However, the product did not have any features to support teachers in lesson planning or using the learning material built into the product.

**Teacher support to generate out-of-class activities (P14B) is rated Exemplary.** The reviewers found that the teacher has a lot of flexibility in the creation of worksheets, practice tests, and different kinds of adaptive and personalized tests for the students. A teacher can choose the questions from various topics to include in a test, choose the number of questions of a similar type (which are automatically generated systematically), and assign different questions or tests to a desired set of students.

**Illustrative examples**

- In the type 'Adaptive tests’, a teacher can decide how many similar questions a student gets to attempt until they get them correct.
- Tests of varying difficulties can be created by filtering questions that are at a particular difficulty level, chosen from among easy/medium/hard.
- A test type called ‘Prasso’ can be assigned which the students can attempt directly on the platform and get immediate feedback and mastery levels.
- The teacher can create and assign worksheets to students, and the teacher also has access to worksheets created by other teachers on the platform from various schools which they can use for their own lessons.
## 4.3 Technology and Design

Technology & Design measures how well the technological affordances and the user interface design integrate with the pedagogy and context to promote a meaningful learning experience for all learners. The criteria in this dimension focus on user interface design and affordances that facilitate learning.

### 4.3.1 User Interface Design

<table>
<thead>
<tr>
<th>Interface design (T1 and T2)</th>
<th>Learner navigation and pace (T3)</th>
<th>Universal design (T4)</th>
</tr>
</thead>
</table>

**Interface design: Enable intuitive use (T1) is rated Exemplary.** The overall interface was very intuitive to use. All important buttons and links to various activities were clearly visible. Also, there was consistency in the way actionable elements are used and highlighted across the product. There was a clear mapping between control and effect, and expected responses were observed with user actions, like button clicks, link clicks, or scrolling.

**Illustrative examples:**

- The different buttons like ‘submit’, ‘check answer’, or ‘hint’ were highlighted in the activities giving a clear indication of an action to be taken.
- Different types of learning content like the main lesson, games, hands-on activities, and mathematical tools were placed in separate tabs.

Within a particular lesson, it was not initially intuitive how to move to the next part after one part ends. But this was a one-time easily learnable idea, which was pressing a button on the screen which toggles between the available content.

**Interface design: Assess consequences of an action (T2) is rated Valuable.** Sufficient feedback is provided for some user actions where required, which makes them aware of the consequences of the action.

**Illustrative example: Teachers assigning content**

A prompt message is shown once the teacher assigns the content to a selected set of students. Your reading assignment Time has been assigned successfully. You will be redirected to the summary page.
Since everything was very intuitive to use, all the actionable elements led to the expected response, and there was very little likelihood of any major unrecoverable error for a learner to make. However, there was no explicit feedback for learner actions, while starting a new topic or a prompt if the learner tries to exit a particular activity midway.

**Learner Navigation and pace (T3) is rated Exemplary.** It was very 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 can attempt the various activities, games, and quizzes at their own pace. Learners can also navigate across questions within a particular quiz or an activity. The videos can also be played at varying speeds without any restrictions.

### Illustrative examples

The learner can navigate between various pages in the activity. The learner is also free to start learning about any coin or currency note.

**Universal Design (T4) is rated Valuable.** Some features of Universal design were present like a voice-over for the text and the instruction in the quizzes, games, and in-lesson activities. Sufficient time is given to the users to read and understand the content. However, many important features of Universal design according to the WCAG design principles were found to be missing. Some of these include operability from a 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

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**Analytics for learners’ progress (T5) is rated Exemplary:** The product has a teacher dashboard which is very informative as well as actionable. The teacher can get valuable information about the class progress in multiple views and is potentially helpful in planning and managing the class.
Illustrative examples: Teacher Dashboard

- The teacher can get information about the time spent by each child on different lessons.
- The question-wise report on tests is also available and has multiple views, like a student-wise report or an overall class-level report.
- The teacher has the capability to assign various practice sets, tests, or questions individually to students or the entire class or any subset.

The product also has a useful dashboard for students, allowing them to check time spent, mastery levels, assigned lessons and tests, and also get an overview of the class reports.

Illustrative examples: Teacher Dashboard

- The learner can see the amount of time spent on each lesson as well the performance on assignments.
- Reports on different types of tests were sorted in different groups and were easy to navigate for the learner.
- In the case of different levels in a test, the learner can see their mastery on each level.
- A view to compare their mastery with the overall class performance on a particular test is also available.
- Details of the time spent on different topics and content pieces can be seen.

Tools to support Problem-solving (T6) is rated Exemplary. Mathematical tools are present in most of the topics wherever required.

Illustrative examples

- Place Value, Grade 3 has an interactive abacus.
- Time, Grade 3 has a tool for using clocks in the classroom. There are analogue and digital clocks and they can be customized to show 12-hour or 24-hour time as well as to show the time in seconds.
- A simulation tool to create cuboids based on the user input.

Meaningful Interactivity affordance of interface (T7) is rated Exemplary: The product has all the appropriate interactivity features which are meaningful for learning. The reviewers did not observe any superfluous interactivity features. Different features like input boxes, drag and drop, click to select, dropdowns, sliders, and checkboxes were used wherever they aid in a better understanding of the concept.

Illustrative examples: Time, Grade 3

Learners are able to drag and rotate the hands of the clock to show various times and visualize the change in time with changing the different hands of the clock.
Illustrative examples: Space & Patterns, Grade 3

Checkboxes were used to enable the learner to highlight (or not) various aspects of a 3D shape like faces, vertices, or edges. Also, drag and drop was used for learners to sort objects in different groups based on their properties. 3D shapes could also be rotated for visualization.

Content Type - Technology alignment (T8) is rated Exemplary. The visualizations used in the product map suitably to the content type. For example, simulations are used where learners are required to change some variables, and the corresponding effect is visible on the screen. Images and animations were also used appropriately to help learners visualize a process.

Illustrative examples: Volume, Grade 5

A simulation where learners can vary the length, breadth, and height of a cuboid using a slider and a cuboid is drawn on the screen accordingly. Another simulation involves learners filling a large cuboid with smaller cubes to find the volume of the larger cuboid.

Illustrative examples: Basics of Geometry, Grade 5

Animations were used to help visualize the rays, lines, and line segments. For example, a line extending infinitely in both directions, rays originating from the sun or a torch, and line segments running from 1 city to another city on a map.
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.