Evaluated in June 2021
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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 9-10

Content Quality Exemplary
Pedagogical Alignment Exemplary
Technology and Design Exemplary

Overall, the product is extremely useful for learning and applying concepts in mathematics for grades 9-10 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

• Learners will likely be able to develop correct mathematical concepts which will help them to solve various types of questions from mathematics.
• Learners will likely be able to self learn mathematics and also may proceed to solve challenging questions as their misconceptions are thoroughly addressed
• Teachers will likely use HeyMath! content for classroom teaching as it is well chunked with hands-on activities and a large number of practice questions for chosen topics.
• Teachers will likely use the HeyMath! product in the classroom since it is aligned with national standards and most of the units/topics/chapters are as per NCERT books and it covers Maths skills recommended by NEP 2020.
• Teachers can track class performance and even individual learner’s learning progress. Thus they will likely use the product to create and assign homework for learners.

Potential limitations of this product

Learners will likely face the following issues:

• Learners may get disengaged or drop out from content due to lack of conversational style in presentation, lack of sufficient scaffolding, and unfamiliarity with accent and context.
• Learners may be frustrated as no hints are available while solving assignments.
• Teachers may get stuck with products since there is no guidance for in-class components such as lesson plans.
• This product mostly caters to foreign students as some of the examples were not relatable to the Indian context.
HeyMath! (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 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 Secondary Stage (Grades 9-10) 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>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>Highlighting of important concepts is provided for signaling, but a conversational style was missing in many learning units.</td>
</tr>
<tr>
<td>P6 Motivational features</td>
<td>Sufficient motivational features like stars 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.</td>
</tr>
</tbody>
</table>
### P8 Learning objective – assessment alignment
The learning objective and cognitive levels of the assessments are aligned to the content as well as the National curriculum.

### P9 Pedagogy – assessment method alignment
Activity and scenarios based pedagogy is used as recommended by NEP.

### P10 Cognitive levels covered
Questions and activities engaging learners in Higher Order Thinking Skills are sufficiently present.

### P11 Feedback Quality
Detailed explanations are present for assessment questions, but there is a lack of opportunities to revisit the related content.

### P12 Opportunities for collaboration
The product lacks any clear opportunities for group activities for the learners.

### P14A Teacher support for in-class orchestration
Teacher training and sample lesson plans are provided to the partner schools.

### P14B Teacher support to generate out-of-class activities
Teachers can create customized tests and worksheets as well as assign content and activities to learners.

## Technology and Design: Exemplary

### T1 Interface design: Enable intuitive use
The platform is very intuitive to use and all elements are clearly visible.

### T2 Interface design: Assess consequences of an action
Feedback is provided for some user actions, which makes them aware of the consequences of the action. But in some cases like a reversal of action, no feedback is provided.

### T3 Learner navigation & pace
It is easy to navigate between different lessons and activities. The learners can learn at their desired pace and sequence.

### T4 Universal Design
Some features of universal design are present, which make the product accessible to diverse learners.

### T5 Analytics for learners’ progress
Teachers and learners both have access to relevant reports on progress and performance.

### T6 Tools to support problem solving
Effective mathematical tools to aid problem solving are present.

### T7 Meaningful interactivity
Appropriate features like input boxes, drag and drop, click to select, dropdowns, sliders and checkboxes were used wherever required.

### T8 Content type - Technology alignment
Suitable Images, videos and animations are used depending on the topic.
4. Detailed Review

4.1 Content Quality

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Alignment to National Standards ............................................................ 9
Inclusivity in Content Representation .................................................... 9

4.2 Pedagogical Alignment

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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

| Correctness Accuracy (C1) | Correctness and clarity in assessment (C2) | Language comprehensibility (C3) |

Content Accuracy (C1) is rated Exemplary: Overall, the content was accurate and contained correct facts, explanations, and examples across all learning units like concepts, hands-on activities, games, etc.

Illustrative example: Learning Unit: Statistics-Assumed mean: Grade 10

The learning unit explained the effect of deviation in the data set on the mean using an example. The example explained the calculation of the mean length of 7 planks of wood with given lengths. The detailed calculation of the mean was explained in the video. The next step was to cut 60 cm from each plank and recalculate the average length. Thus, variation in the data set was provided and the calculation of new lengths for each plank was shown in the diagram and new average calculations were explained. In the last step, the comparison was explained and the effect of deviation in the data set on average was summarized. All the calculations shown in these learning units were accurate.

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 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 comprehend for all learners, whereas in some videos the accent was neutral/Indian and comprehensible.

Illustrative example: Learning Unit: Probability: Grade 9

The concept of sample space was explained in the unit and many times the word “all” was pronounced as “ul” which was difficult to comprehend for learners. While in the next videos, both the activity provided to find the sample space for two rolling dice and the instructions thereof were comprehensible. Overall, it was observed that across ~40-50% of the sampled units, a foreign accent was being used. Therefore, the learner might require some effort to comprehend the language.
4.1.2. Alignment to National Standards

Mathematics skill coverage (C4) and Curriculum alignment (C5) are rated Exemplary: The reviewers observed that, broadly, all the topics and sub-topics covered were aligned with the content of the CBSE board for Grades 9-10. They also observed that content covers all the Mathematics skills recommended by NEP 2020 and NCF specifically for the secondary stage (K9-10) such as argumentation, mathematical modeling, data analysis and interpretation, and reasoning about shapes.

Illustrative example: Statistics, Grade 10

The chapter covers all different aspects like calculation of mean, median and mode were explained with appropriate examples and the topics covered are as per CBSE board for grade 9-10.

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, caste, socio-economic class, religion, looks, etc.

Illustrative example: Introduction to trigonometry, Grade 10

Explaining the concept of the Tan ratio in a learning unit: The example showed how the length of the shadow of the stick changes with the time of day. In the figure, a particular time of day is considered when sun rays are making a 30-degree angle with the ground (Fig 1). Learners were required to change the height of the stick, observe the change in the shadow and find whether the ratio of their lengths change.

This example was a common example and familiar to all learners irrespective of gender, caste, socioeconomics status, looks etc.

However, the reviewers observed that there was inconsistency in the examples provided in the content videos and activities. Some of the examples might be unfamiliar to Indian students such as the one below. “Little Teti the builder has to find the height of the Great Statue of Pharoah Rameses”. All learners might not be familiar with those monuments. Thus reviewers found that even though the product’s design attempted inclusivity, the efforts were not uniform throughout the product.
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: The Review team observed that many opportunities were provided for learners to construct their knowledge of various math concepts. The Product's pedagogy design showed evidence of constructivism through very well-sequenced sets of multiple examples, reflection spots in content videos, and simulations in hands-on activities.

One example of a well-sequenced set is explained in the following example:

Illustrative example: Topic: Surface areas and Volumes, Grade 10

The topic had multiple examples to calculate the volume of a combination of solids (e.g. cone, sphere, cylinder, etc.). The examples were explained in a higher order of difficulty levels to the learners.

Reviewers also observed the reflection spots in content videos for some of the topics like “Introduction to trigonometry, Probability.” They found the reflection spots were at the “Apply” cognitive level and could be answered within 1-2 mins. The immediate feedback was present within the content video.

The reviewer team observed that simulations were provided to the learners to try various permutations in the hands-on activities.

Illustrative example: Topic: Arithmetic Progression, Grade 10

Learners were provided with an opportunity to vary the first term, the number of terms, and the difference to calculate the last term and sum of series as shown in fig. 2:
Addressing learning gaps/ alternate conceptions (P2) is rated Exemplary: The reviewer team found that the product’s pedagogy design addressed the learning gaps through various diverse examples and adaptive practices.

Illustrative example: Topic: Linear Equations in 2 variables, Grade 10

The concept of a vertical line parallel to the Y-axis and its equation was explained using diagrams and showing corresponding coordinates on the line and equation of the line. (Fig 3):

Fig.3. Graph of a vertical line

The team observed that in the assignment tab of the product, provision was made for adaptive practice sessions. In the adaptive practice session, the questions were presented to the learners as a practice assignment. In this assignment, if learners answered one question wrongly, they were presented with similar types of questions until they exhausted the number of maximum attempts. The product’s design provided a redressal of the learning gap through adaptive practice sessions.

Opportunities for collaboration (P12) is rated Potential to Improve: Reviewers did not find any opportunities for group activity in the product. The product had individual learning activities like problem-solving activities, but group collaboration opportunities were not observed in the content videos or the associated activities.

4.2.2. Enhancing learner experience

Content in context (P3) is rated Exemplary: The product included relevant and sufficient context using either a motivational introductory scenario or a real-life application of the topic. Reviewers observed for most of the topics real-life examples were explained for both algebra and geometry.
Illustrative example: Topic: Linear Equations in 2 variables, Grade 9

The introductory scenario was presented to explain the concept of x and y variables and their relationship. In this scenario, the conversation between the two persons was presented. One person was climbing the steps and another person was measuring the height of the steps from the ground. The data were tabulated as the number of steps climbed (x) and the height of the step from the ground (y). Then the meaning of x and y variables and their dependencies on one another were explained.

Illustrative example: Topic: Real Numbers, Grade 10

Euclid’s Lemma and division algorithm was explained using the famous puzzle (Fig.3) of broken eggs. The seller asked the puzzle to find the number of broken eggs.

![Fig. 3. Puzzle for explaining Euclid’s Lemma and division algorithm](image)

Learner Scaffolding (P4) is rated Valuable: Reviewers observed that there was inconsistency in learner scaffolding across various learning units. In some of the learning units like “Trigonometry,” hints were observed in the form of formulas to calculate the trigonometric ratio in the given problem. The team observed that option boxes (drag-and-drop) were provided to select appropriate terms in the polynomial division process (Figure 4).

![Fig.4. Polynomial division](image)

But overall reviewers found that there were no scaffolds in most of the learning units. Reviewers also found that for assignment questions, learners were directly provided with answers with an explanation similar to the solved problems in the books. But no hints were provided for learners to come out of sticky situations.
Detailed Review: Pedagogical Alignment

Cognitive Engagement (P5) is rated Valuable: The review team observed that the product’s design incorporated cognitive engagement using effective signaling, but inconsistent personalization. In all the learning units, visual cues were provided such as highlighting the text, animating important concepts, etc.

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

Examples to calculate the surface area of complex figures such as a combination of cone and cylinder were explained in the unit. The steps of solutions were explained as shown in Fig. 5, wherein callout was used to point out dimensions of the cylinder, and boxing was used to highlight the formula for surface area to engage learners with important concepts during the problem-solving activity.

![Fig. 5. Highlighting the text](image)

However, the personalized conversational style was not consistent across the learning units. In some of the units, efforts to use words like “we” or “let’s see” were observed. But in most of the units, the video voice-over read the content on the screen without considering the learner’s presence.

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. A pleasant sound along with a message is 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.

Illustrative example: Topic: Coordinate geometry, Grade 9

Learners were provided with the activity of plotting a given set of points. If learners plotted the points correctly the graph showed figures like fish, or boats bearing the HeyMath! flag, etc.

Illustrative example: Topic: Probability, Grade 9

In the topic of “Probability,” the learners are provided with a problem-solving activity. Learners rolled dice and filled the sample space. If learners filled the sample space correctly they were encouraged with words like “Well done.” 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 learner 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. Being a DCR product, it is expected that the teacher can play this role.
Logical chunking and connectedness (P7) is rated Exemplary: Reviewers observed that learning units were structured adequately for meaningful learning. The content videos were smaller and at the most 2-3 min long. The content videos were chunked logically. The team also observed the presence of associated activities within the chapter in the form of hands-on activities, practice examples, or quizzes.

Illustrative example: Topic: Probability, Grade 9

Content and formative assessments: The topic began with a 1-minute introduction video on the concept of sample space. It was followed by an activity for learners to find the sample space for a given event (i.e. rolling of two dice). The next two activities were also for finding sample space for different events related to rolling of dice (e.g. addition and subtraction of rates on two dice), finally followed by a quiz.

Illustrative example: Topic: Probability, Grade 9

Mapping to the assessments: The topic has 2 subtopics: Understanding, sample space, and combined events. The question bank for the topic was presented to teachers to create associative practice sessions for learners.

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: Learning objective alignment of the product was evaluated for content videos, hands-on activities, problem-solving activities, and assignment questions. The team observed that the learning objectives addressed by video content were aligned with hands-on activities and problem-solving practice activities as well as adaptive practices.

Pedagogy-assessment method alignment (P9) is rated Exemplary: Reviewers observed that the pedagogy and assessment methods were aligned in the product. The alignment observed is as per recommendations given by NEP2020 for Grades 9-10.

Illustrative example: Topic: Statistics, Grade 10

A video explained the plotting of a graph for a given equation as shown in fig.7. A Math tool was provided in the learning unit for experimentation with various equations as shown in the figure. The tool contains many options for selecting slope and intercepts and learners would get different lines. (fig.8)

Fig.7: Plotting of graph
Cognitive levels covered (P10) is rated Exemplary: The review team found that overall, the product demonstrated higher cognitive levels. The video content showed a range of cognitive levels from “Recall” (introductory video) to “Apply” (application problems) for most of the topics. Concepts in the topics were further strengthened through Math lab activities, which helped learners to design assets based on concepts of videos. Thus those activities are also designed at a higher cognitive level. The assessment questions (present in the assignment tab) were designed from “Recall to Analyze" cognitive level.
Illustrative example: Topic: Polynomial, Grade 9

Standard identities like \((a-b)^3,(a+b)^3,(a+b+c)^2\) etc. were explained using algebraic expansions (Recall level), but the same identities were also explained using geometric visualizations like using sides of the cube. Thus the video unit also demonstrated higher cognitive levels. In addition, this team also observed supportive activity known as math lab activity. In this activity learners made cubes of given lengths and arranged them to mimic the expansion of identities. This activity was again at a higher cognitive level. (Apply)

Feedback Quality (P11) is rated Valuable: The review team found that the feedback in the product was presented in two ways 1) In the form of complete solutions 2) In the form of worked examples. They found that complete solutions were provided to the assignment questions (adaptive practice, standard practice, test, etc.). Those solutions contained correct steps and appropriate reasoning.

Illustrative example: Topic: Introduction to trigonometry, Grade 10

Question: A tree is broken by the wind. The top of the tree touches the ground and makes an angle of 60 degrees with it. If the top of the tree touches the ground 70 m away from its foot, then find the actual height of the tree.

However, if learners wanted to know which part they should revisit to get correct answers, no guidance was provided.

There were some practice problem activities on the topic of “Probability”. The feedback for those activities was binary, while complete solutions in the form of worked examples were shown to learners. Here no reasoning is provided for wrong answers or no guidance for revisiting the content. Thus reviewers observed inconsistency as well as missing guidance for revising the content in feedback.
4.2.4 Teachers 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 product had concept videos, related hands-on activities, math lab activities, and assignments. All those assets had self-explanatory procedures built within the units themselves.

The reviewers observed that those procedures help teachers to conduct class activities using the product. But they observed that there were no stepwise guidelines to integrate the video content in class or use activities in class. In-class support for teachers to integrate content in the classroom for an enhanced learning experience was found missing.

However, offline, the teachers are provided a small set of star lesson plans for some learning units which suggest some good practices for use of the product in the classroom. The production company also claimed to provide teacher training and professional development workshops as a part of the school onboarding and engagement process.

Teacher support to generate out-of-class activities (P14B) is rated Exemplary: Reviewers found that teacher support for out-of-class components adhered to research-based guidelines. The product’s design allowed teachers to create assignments at various levels such as standard practices, adaptive practices, quizzes, tests, etc. The product included a repository of questions for all topics at various levels of difficulty (low, medium, high). The product also provided question papers from previous examinations. Product design provided flexibility to teachers to choose learning units as well as create worksheets as per their choice. The product's design allowed teachers to assign homework as per requirements from the available question repository.

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 (T1 and T2) Learner navigation and pace (T3) Universal design (T4)
Interface design: Enable intuitive use (T1) is rated Exemplary: The reviewers found that visual elements like concepts and activities were logically placed together so that learners could access them easily. Thus the product followed the visibility principle of user interface design. The product incorporated sufficient and clear cues for all visible elements.

Illustrative example:
1) Self-explanatory buttons like “Submit, Check, View example” were seen in hands-on activities.
2) In math lab activities, visual elements like up and down keys adhered to the mapping principle and showed natural mapping of increase and decrease in the selection of variable values.
3) The functionality rules of all visual elements like concept, hands-on activities, math lab, etc. were consistent throughout the product.

Thus reviewers observed that the user interface followed principles for visibility, affordance, consistency, and mapping. Hence the criteria were rated exemplary.

Interface design: Assess consequences of an action (T2) is rated Valuable: An appropriate response is observed for some of the user’s actions, which make them aware of the consequences of their action.

Illustrative example: Warning message
There were warnings or prompts when the user performed certain actions like ‘Delete’. The message appeared “Are you sure you want to delete?”
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.
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.

Learner Navigation and pace (T3) is rated Exemplary: The user had adequate control in navigation. They were able to navigate within and across the learning unit, and at the pace that they desire. There were no restrictions placed on the learning path which a learner could follow. 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 example: Triangle, Grade 9
Learners were free to choose any concept based on their requirement (Fig. 9)
If the learner were to choose the concept of inequalities of a triangle, then, within the concept, learners would be provided with three examples with the option of picking up any sequence to learn the concept. (Fig.10)

Universal Design (T4) is rated Valuable: Several Web Content Accessibility Guidelines (WCAG) principles have been followed like content being presented in different ways (both textual, diagrams, and simulations) and allowing content to appear and operate in predictable ways. However, the product does not have low entry barriers for diverse learners (learners with varying ability, learners with special needs, or other characteristics).

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 reviewers observed that the teacher dashboard was actionable in terms of the information presented to the teacher. They also observed that the dashboard provides information on individual performance as well as class-level performance.

Illustrative example: Teacher Dashboard

- The teacher can get information about the time spent by each learner on different lessons.
- The question-wise report on the tests is also available and has multiple views, like student wise report or an overall class-level report.
- The teacher can 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 example: Student Dashboard

- The learner can see the amount of time spent on each lesson as well as the performance of the assignments.
- Reports on different types of tests were sorted in different groups and were easy to navigate for the learner.
- In 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: For relevant learning units like probability, trigonometry, reviewers found that tools like sample space grid, trigonometric ratio table, etc. were provided. The tools are intuitive to use, excellently designed, and supported by helpful visual aids.

Illustrative example: Topic: Introduction to trigonometry, Grade 10

To solve the trigonometry equations related to special angles like 30 degrees, 60 degrees, the ratio values were provided. (Fig.12)

Meaningful interactivity (T7) is rated Exemplary: The product was rated as exemplary on the interactivity affordance of the interface. Reviewers observed that all necessary interactivity features are included in the content activities as per the topic requirement. The team observed Interactivity features like text input, drag-and-drop box, slider bar in the product. The good examples of interactivity feature observed in the product such as slider bar to vary values (Arithmetic progression), drag and drop box to select terms in the polynomial division.

Illustrative example: Topic: Triangle, Grade 9

In the given example learners were supposed to vary the length of two sides of a triangle and their lengths will be displayed in a box at the right top most corner. When the sum of two sides became greater than the third side, the triangle would be formed. (Fig.11)

Content Type - Technology alignment (T8) is rated Exemplary: The visualization mapped suitably to the content type. Factual concepts like surface area calculations, trigonometric ratio calculations were shown using appropriate diagrams. Animations were used to show the plotting of cumulative frequency curves, histograms, coordinates on graphs etc. Simulations were provided in the division of polynomials, in the calculation of the nth term of Arithmetic progression where the process of pr was given.
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.