EdTech Tulna EVALUATION REPORT

Avanti Sankalp
MATHEMATICS
GRADES 9-10

Evaluated in September 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

Avanti-Sankalp is an audio-visual learning app with the content mapped to the CBSE curriculum. The chapters are broken down into various sub-topics, with each subtopic having video lessons along with practice workbooks for learners. The practice workbooks are provided separately as PDF document files, which the learners can access outside the app. The primary language used in the content is Hindi, with the translation of content and certain terms available in English.
3. Executive Summary

Avanti Sankalp | Mathematics | Grades 9-10

Content Quality
Exemplary

Pedagogical Alignment
Valuable

Technology and Design
Valuable

Potential benefits of this product

● Users can be assured of the content correctness and alignment to National standards and curricula across Grades 9-10.
● Learners will be able to develop correct mathematical concepts since misconceptions or alternate conceptions were addressed in the videos.
● The learners are likely to stay engaged with the content due to excellent visual cues and conversational presentation style.
● The product’s design adheres to user-centered design principles, thus making it easy for learners to use.
● The learning units have appropriate images and visualizations that can enrich the experience of the learners.

Potential limitations of this product

● The absence of English-Hindi mapping of technical terms in the Hindi voice-overs could potentially lead to memorization of these terms and limit learners’ understanding and usage of these terms during a mathematical conversation.
● There is limited support given to learners as the assessment questions do not have detailed solutions.
● The absence of teacher support features could affect the quality of integration of the product into the teaching-learning process.
● The features such as transcript, caption, and audio support for assessment questions are absent, making the product inaccessible to diverse learners.
Avanti Sankalp (Grades 9-10): Summary of Review Ratings by Criteria

**Content Quality: Exemplary**

<table>
<thead>
<tr>
<th>C1. Content accuracy</th>
<th>Content is accurate and contains correct facts and examples.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2. Correctness and clarity in assessment</td>
<td>The assessment questions are correct, clear and unambiguous.</td>
</tr>
<tr>
<td>C3. Language comprehensibility</td>
<td>The sentences and vocabulary are easy to understand, and the phrasing is simple.</td>
</tr>
<tr>
<td>C4. Mathematics skill coverage</td>
<td>The content covers all the skills for Grades 1-2 that are recommended by NCF 2005 and NEP 2020.</td>
</tr>
<tr>
<td>C5. Curriculum alignment</td>
<td>The content is aligned to NCERT and the videos are logically sequenced accordingly.</td>
</tr>
<tr>
<td>C6. Inclusivity in representation of learners</td>
<td>Inadequate representation of relevant sections of Indian society across gender, religion, and socio-economic condition.</td>
</tr>
<tr>
<td>C7. Bilingual Use</td>
<td>Translation of Hindi and English is accurate but English and Hindi Math technical terms are not mapped to each other. Also, the assessment questions do not include English technical terms.</td>
</tr>
</tbody>
</table>

**Pedagogical Alignment: Valuable**

<table>
<thead>
<tr>
<th>P1. Constructivist approach</th>
<th>Some elements of the constructivist approach, such as reflection spots are present. However, reflection spots were inconsistent in terms of quality. In some cases, the videos appeared to be just transmitting the information, thus deviating from the constructivist approach.</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2. Addressing learning gaps/ alternate conceptions</td>
<td>The content allows the learners to identify and address learning gaps</td>
</tr>
<tr>
<td>P3. Content in context</td>
<td>Relevant and sufficient context is provided across the product, wherever required.</td>
</tr>
<tr>
<td>P4. Learner scaffolding</td>
<td>Learner scaffolding is present in the videos by means of content organization from lower to higher levels of difficulty. However, adequate support for assessments is missing.</td>
</tr>
<tr>
<td>P5. Cognitive engagement</td>
<td>Essential points in the content are highlighted, and the content presentation style is conversational.</td>
</tr>
</tbody>
</table>
### Executive Summary

**Summary of Review Ratings by Criteria**

*Only relevant criteria have been included in the evaluation*

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<table>
<thead>
<tr>
<th><strong>P7. Logical Chunking and Connectedness</strong></th>
<th>The AVs are chunked logically and associated practice questions are available.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P8. Learning objective – assessment alignment</strong></td>
<td>All learning objectives have assessment questions aligned at corresponding cognitive levels.</td>
</tr>
<tr>
<td><strong>P9. Pedagogy – assessment method alignment</strong></td>
<td>The pedagogical strategies and assessment methods are aligned to each other for all the topics.</td>
</tr>
<tr>
<td><strong>P10. Cognitive levels covered</strong></td>
<td>Higher Order Thinking Skills (HOTS) are sufficiently addressed in the content and assessment questions.</td>
</tr>
<tr>
<td><strong>P11. Feedback Quality</strong></td>
<td>Correct answers are provided for the assessment questions, but the steps to arrive at the correct answers or remedial videos for the learner to revisit are missing.</td>
</tr>
<tr>
<td><strong>P14. Teacher support</strong></td>
<td>No teacher support is provided.</td>
</tr>
<tr>
<td><strong>P15. Facilitating goal setting</strong></td>
<td>Learning units have meaningful titles, but there are no accompanying descriptions about the value of the task.</td>
</tr>
</tbody>
</table>

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### Technology and Design: Valuable 🌟

<table>
<thead>
<tr>
<th><strong>T1. Interface design: Enable intuitive use</strong></th>
<th>The interface is intuitive, all elements are clearly visible, and actions are mapped to their expected response.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T4. Universal Design – Content accessibility</strong></td>
<td>Features such as transcripts or captions are not included for catering to the needs of diverse learners.</td>
</tr>
<tr>
<td><strong>T8. Content type – Technology alignment</strong></td>
<td>Visualizations such as videos and diagrams are appropriately mapped to the content type.</td>
</tr>
</tbody>
</table>

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

4.1 Content Quality 🗼

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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 and bilingual use.

### 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>
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</table>

**Content accuracy (C1) is rated Exemplary.** Overall, the content was accurate, with correct facts, explanations, and examples across all the learning units and assessment questions. In the videos, content terminologies were precisely defined using appropriate diagrams.

**Illustrative example:** Topic: Measures of central tendency, Grade 9

The definitions of mean, median, and mode are explained accurately. Also, correct ways to represent these central tendencies are shown (e.g., \( \bar{x} \) for mean, \( \Sigma \) for summation).

**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 complete data required for problem-solving was provided. Solved examples were also provided in the introductory part of the assessment sheets. All the questions and solutions reviewed were complete and unambiguous. Answers were provided in the ‘Answer key’ section.

**Illustrative example:** Topic: Probability, Grade 9

**Question:** The record of a weather station shows that out of the past 250 consecutive days, its weather forecasts were correct 175 times.

I. What is the probability that on a given day, it was correct?

II. What is the probability that it was not correct on a given day?

**Solution:**

I. Probability that on a given day it was correct = No of days it was correct/Total number of days 
   \[ = \frac{175}{250} = 0.7 \]

II. Number of days it was incorrect = 250-175 = 75

   Probability that it was not correct on a given day = No of days it was incorrect/Total number of days 
   \[ = \frac{75}{250} = 0.3 \]
Language comprehensibility (C3) is rated Exemplary. The language used was easily understandable by 9th and 10th grade learners. Short and simple sentences were used (both on-screen and spoken) while explaining various concepts in the learning units. The vocabulary and accent used would be familiar to Indian learners, and likely to be easily comprehensible by a diverse group of Indian learners.

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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</table>

Mathematics skill coverage (C4) and Curriculum alignment (C5) are rated Exemplary. All the topics and sub-topics covered in video units were aligned with the content of the CBSE board for Grade 9-10. The content covered all the Mathematics skills recommended by NEP 2020 and NCF specifically for the secondary stage (Grades 9-10), such as argumentation, mathematical modeling, data analysis and interpretation, reasoning about shapes.

Illustrative example: Topic: Construction of Tangents, Grade 10

All the sub-topics are aligned to the NCERT and are logically sequenced as well. All 3 cases of tangent construction were discussed - point inside the circle, on the circle and outside the circle.

Illustrative example: Topic: Measures of Central Tendency, Grade 9

The content provides the learners with correct terms and concepts, uses appropriate symbols to represent mean, median, summation, nth term and frequencies. The learners are also presented with proper argumentation and reasoning while comparing different measures of central tendency.
4.1.3. Inclusivity in Content Representation

Inclusivity in the representation of learners (C6) is rated Potential to Improve. The product did not attempt to include content related to different sections of society across gender, caste, socio-economic class, religion, look, etc. In a few learning units, names like John and Jivanti appear to include learners of different religions. However, such instances were very few and there was no conscious effort for inclusivity in learner representation.

Illustrative example: Topic: Solution of a quadratic equation by factorization, Grade 10
Two names (John and Jivanti) were used to explain the examples for the formation of Quadratic equations.

4.1.4. Bilingual Use

Bilingual use (C7) is rated Valuable. English was used to refer to technical terms, mathematical equations and operations in videos. But intersentential code-switching was missing in voice-over for many learning units, i.e., English technical terms were not used in voice-overs, which were completely in Hindi. However, the text on the screen appears in both English and Hindi, as shown below.

Illustrative example: Topic: Prop of quadrilaterals, Grade 10
The voice-over in the video is in Hindi with no intersentential code-switching. For example, mathematical terms such as ‘quadrilateral,’ ‘parallel,’ ‘triangle’ are only mentioned in Hindi.
Illustrative example: Topic: Heron’s Formula, Grade 9

The text on screen both for questions as well as explanation is provided in English and Hindi. But the accompanying voice-over is only in Hindi, with no mention of mathematical terms in English. For example, the on-screen text mentions the Hindi and English term for 'Semi perimeter,' but the voice-over only mentions the Hindi term for the same.
4.2 Pedagogical Alignment

**Pedagogical Alignment** 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. This dimension focuses on learner-centered pedagogy, enhancing learner experience, assessment of learning, and teacher support.

### 4.2.1. Learner-Centered Pedagogy

<table>
<thead>
<tr>
<th>Constructivist approach (P1)</th>
<th>Addressing learning gaps / alternate conceptions (P2)</th>
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**Constructivist approach in pedagogy design (P1)** is rated **Valuable**. The product’s design provided many opportunities for the learners to construct their knowledge of various math concepts. Such opportunities were seen through reasoning and argumentation in the videos, and various types of practice questions in the videos and the assessments. The main feature of constructivism observed in the product is the addition of reflection spots in the video.

**Illustrative example:** Topic: Some applications of Trigonometry, Grade 10

Concept of line of sight, angle of elevation, angle of depression were explained through various examples followed by questions. Questions were at the ‘Understand’ or ‘Apply’ level. For all questions, the answers were provided immediately.

1) The image below was shown to the learner with the following question - “If we look to the top of the pole, what would be the line of sight then?” This was followed by the explanation of the concept of line of sight.
2) A footballer was playing football and heading towards the goal post. This image was followed by this question - “What is the kind of angle made by a footballer?”

However, the implementation of reflection spots was not consistent throughout the product. Sometimes reflection spots asked learners to pause video and answer, while in some cases, there were questions posed, but learners were not asked to pause and answer. The quality of reflection spots was also inconsistent.

**Illustrative example: Topic: Solution of quadratic equation by factorization, Grade 10**

In the learning unit, a reflection spot question was given with pause instructions and a timer (10 counts) was set for learners to answer. The word problem was given to form and solve quadratic equations.

The altitude of a right triangle is 7 cm less than its base. If the hypotenuse is 13 cm, find the other two sides.

एक समकोण त्रिभुज कि ऊंचाई इसके आधार से 7 cm कम है। यदि कर्ण 13 cm का हो, तो अन्य दो भुजाएं ज्ञात कीजिये।
This question was at the ‘apply’ level, solvable in 2-3 minutes. The answer to the question followed immediately. The video explained the formation of quadratic equations for a given situation.

Some learning units concepts were explained with the help of diverse examples and a series of questions, but there were no instructions for learners to stop the video and answer the questions.

Illustrative example: Topic: Solution of quadratic equation by factorization, Grade 10

In the learning unit, the concept of forming quadratic equations was explained by posing the following question to learners but no pause instructions were given.

“John and Jivanti had a total of 45 marbles, both lost 5 marbles each, the multiplication of remaining marbles is 124. Can you tell how many marbles were there individually with John and Jivanti initially?

This question was a reflection spot question and at the ‘Apply’ level. The solution was immediately explained. It was solvable within 2-3 minutes.

In some learning units, the reflection spots needed a lot of time to solve and were difficult to complete within the recommended time for an in-video question, which is 2-3 minutes.

Illustrative example: Topic: Quadratic equation, Grade 10

The word problem was given as a reflection spot question. It was at the ‘Apply’ level, but not solvable in 2-3 minutes.
“The next part of the video explained the detailed solution of the equation; thus, immediate feedback was provided to complete the learning loop.

In many learning units reflection spot questions were in the form of practice questions.

**Illustrative example:** Topic: Solutions of linear equations in 2 variables using graph, Grade 10

After explaining the concept of consistency, the practice problem was given as a reflection spot question to learners, as shown below.

Find graphically whether the following equations are consistent?

\[ x + 3y = 6 \] and \[ 2x - 3y = 12 \]

Many such types of practice questions were present as reflection spots. Most of these needed significant time to solve.

Overall, the product has a good constructivist pedagogy, although some aspects of reflection spots and questions need improvement.

**Addressing learning gaps/alternate conception (P2) is rated Exemplary.** The product’s design included a variety of examples, both in the video and in the practice questions, to address learning gaps.

**Illustrative example:** Topic: Zeros of polynomial: Grade 9

In the practice assessment sheet, the following questions were given.

1. Number of zeroes of a non-zero constant polynomial is _______________.
2. Number of zeroes of a zero polynomial_______________.

These questions identify the concept of constant polynomial and its root. In the video, the concept of constant polynomials was explained. It was proved that the value of a constant polynomial remains constant for any value of X. Thus, reviewers noted that the product supported the identification and redressal of the learning gap.

**Illustrative example:** Topic: Some application of trigonometry, Grade 10

The video clearly explains to the learner that the angle of depression is always compared to the horizon and not the vertical object. It is illustrated through examples and associated diagrams.
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>Logical Chunking &amp; Connectedness (P7)</th>
<th>Facilitating Goal Setting (P15)</th>
</tr>
</thead>
</table>

**Illustrative example: Topic**: Measure of central tendency, Grade 9
- A real-life scenario is present where two characters are debating about who performed better in the test. One of them has a better mean, while the other has a better median and mode.
- Example for ‘Mode’: A manufacturer can look at the sales data of various sizes of shoes and decide which shoes to manufacture the most.

**Illustrative example: Topic**: Applications of Trigonometry, Grade 10
- Examples for the angle of elevation and depression: Footballer kicking a ball at an angle, a bird and kite flying, height of a chimney, and tracking ships from the top of a lighthouse.
**Learner Scaffolding (P4) is rated Valuable:** The product’s design included learner scaffolding, but it would be inadequate to form the mental model of the concept being taught. The scaffolds were mainly observed in content videos. The content videos were organized from lower to higher difficulty levels. Detailed problem-solving steps were provided in the video to help learners in the problem-solving process. But there were no scaffolds in assessment practices (e.g., no hints).

**Illustrative example:** Topic: Zeros of polynomials: Grade 9

The video explained the calculation of the zeros of the polynomial by equating the polynomial to zero. The video explained the calculation of zeros of different polynomials such as \( P(x) = 2x + 5 \), \( P(x) = cx + d \). The last video in the series explained the verification of zeros of polynomials for given roots, i.e., verify whether the following \( x = -1, 2 \) are zeros of polynomials \( p(x) = (x+1)(x-2) \).

![Illustrative example: Zeros of polynomials](image)

**Illustrative example:** Topic: Trigonometric Identities: Grade 10

The content videos in the learning unit were sufficiently scaffolded. The video explains the trigonometric identities and the angles for which the identities are true. These explanation videos are followed by solved examples and practice questions based on these identities. This progression provides the student with adequate support while learning. However, in assessments, no hints or remedial content was provided if learners faced any confusion or difficulty with the question.

**Cognitive Engagement (P5) is rated Exemplary.** The product’s design included both the features necessary for cognitive engagement, i.e., signaling and personalization. Signaling in the product was observed through visual and verbal cues. The different visual cues like putting boxes around important concepts, circling important steps, and highlighting texts were found in the videos. Verbal cues like stresses on important points in the audio were noted in the product.
Illustrative example: Learning Unit: Solution of a quadratic equation by factorization: Grade 10

The video explained the solution of the quadratic equation using the factorization method. In this video, the splitting of the middle term of the equation was explained. The term was highlighted and its factors were shown using arrows.

![Illustrative example](image)

Logical Chunking and connectedness (P7) is rated exemplary. The product included short videos of 5 to 6 minutes in each learning unit. The videos were logically structured, from introductory videos to complex problem-solving videos. There were associated practice problems for each learning unit based on content explained in videos.

Illustrative example: Topic: Different type of Numbers: Grade 9

Each video is of short duration and addresses one number type (rational, irrational, etc.) with appropriate examples and related assessment questions with solutions. Additionally, video chunking matches with natural pause points in the lecture. There are associated practices separately provided in pdf format.

Facilitating goal setting (P15) is rated Valuable. The learning units had meaningful titles such as “Solution of quadratic equation using factorization method” and “Trigonometric identities”. The learning units also included content aligned with the title. However, there was no accompanying description available about learning outcomes or utility of the unit, i.e., its task value was not provided. Making the task value available for the user (learner/teacher) helps them choose AVs mapped to their goals.
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 and practice questions. Learning objectives addressed by the video content were aligned with practice questions.

Illustrative example: Topic: Properties of Quadrilateral, Grade 9

The videos focus on explaining the midpoint theorem and its converse, followed by its proof. It engages the learner at an ‘Understanding’ and ‘Apply’ cognitive levels. The corresponding assessment questions also cover similar cognitive levels as shown in examples below:

The line segment joining the midpoints of any two sides of a triangle is equal to the third side (True/False) (Recall)

Let \( \triangle ABC \) be an isosceles triangle in which \( AB = AC \). If \( D, E, F \) are the mid-points of the sides \( BC, CA, \) and \( AB \) respectively, show that the segment \( AD \) and \( EF \) bisect each other at right angles. (Apply)

Pedagogy-assessment method alignment (P9) is rated Exemplary. The product’s design provided alignment between the pedagogy and assessment methods as per recommendations given by NEP 2020 for grades 9-10. As per these recommendations, learners should be presented with activities for mathematical concept visualizations in practical aspects (skill of experimentation and exploration).

Illustrative example: Topic: Some applications of trigonometry, Grade 10

The problem presented in the content is: "From a point on a bridge across a river, the angles of depression of the banks on the opposite sides of the river are 30 and 45 respectively. If the bridge is at a height of 3 meters from the bank, find the width of the river"
The problem presented in the assessment is: “The string of a kite is 100m long and it makes an angle of 60° with the horizontal. Find the height of the kite, assuming that there is no slack in the string.” (Take $\sqrt{3} = 1.73$)

Both the content and the assessment used problems in real-life situations where the mathematical concepts are applied. As a step towards problem-solving, in both content and assessment, learners were first expected to visualize (draw) the image describing the situation (with the angle of elevation/depression, lengths, etc.).

Many such instances were found in the product for alignment of pedagogy with the assessment based on NEP recommendations.

**Illustrative example:** Topic: Properties of Quadrilateral: Grade 9

Let $\triangle ABC$ be an isosceles triangle in which $AB = AC$. If $D$, $E$, $F$ are the mid-points of the sides $BC$, $CA$, and $AB$ respectively, show that the segment $AD$ and $EF$ bisect each other at right angles.

**Illustrative example:** Topic: Heron’s formula: Grade 9

Find the area of a triangle whose sides are 13 cm, 5 cm, and 12 cm. Hence, calculate the altitude using the longest side as the base. Leave your answer as a fraction.
Illustrative example: Topic: Some applications of trigonometry: Grade 10

A person standing on the river bank observes that the angle subtended by a tree on the opposite bank is 60°. When he retreats 20 m from the bank, he finds the angle to be 30°. Find the height of the tree and the breadth of the river.

Feedback Quality (P11) is rated Potential to improve: The assessment questions provided direct answers. In a few learning units, the answers were not provided at all. Thus detailed solutions or explanations were not available in the product.

4.2.4. Teacher Support

Teacher support (P14) is rated Potential to Improve. The product did not provide any teacher support.
4.3 Technology and Design

Technology and design measures how well the technological affordances & the user interface design integrate with the pedagogy and context to promote a meaningful learning experience for all learners.

4.3.1. User Interface Design

<table>
<thead>
<tr>
<th>Interface design: Enable intuitive use (T1)</th>
<th>Universal design – Content accessibility (T4)</th>
</tr>
</thead>
</table>

Interface design: Enable intuitive use (T1) is rated Exemplary. The product's design followed the visibility principles of user interface design. The user interface provided sufficient and clear cues for all visible elements. For example, the Video button, the Next button, the Play and pause in the video, etc. The functionality of all the buttons was consistent throughout the product.

**Illustrative examples:** Some applications of trigonometry, Grade 10

- The different icons like ‘share link,’ ‘go back,’ ‘Next,’ and ‘See answers’ were easily locatable and clearly indicated the action to be taken.
- The positioning of the “Play “button next to the video’s title was easy to locate.
Universal design-content accessibility (T4) is rated Potential to Improve. The product’s design did not provide features that ensure accessibility to diverse learners. The product did not include a transcript or audio description. Reviewers also noted inconsistent captions observed in video units throughout the product.

4.3.2. Technology for meaningful learning

Content type – Technology alignment (T8)

Content type - Technology alignment (T8) is rated Exemplary. The videos have a clear representation of content and they correctly map images to strengthen the content. The visuals supported the learner’s understanding of questions, facts, and explanations.

Illustrative example: Property of quadrilateral, Grade 9

The image supports the example on the screen.
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.