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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

TicTacLearn is an online interactive audio-visual learning solution with a curriculum mapped to the CBSE board. The product contains short, animated, engaging videos and practice questions for each learning unit. TicTacLearn content is available for Math (Grades 1 to 10) and Science (Grades 3 to 10). This report evaluates the English version of TicTacLearn for Maths for Grades 1-2. Teachers can use the content to supplement their teaching in the classroom or assign different videos or practice tests to students. Students can learn from the content in and outside the classroom, whereas parents can help their children visualize concepts and address their learning gaps.
3. Executive Summary

TicTacLearn | Mathematics | Grades 9-10

Content Quality: Exemplary
Pedagogical Alignment: Valuable
Technology and Design: Valuable

Potential benefits of this product

Learners will likely be able to:

- Develop correct mathematical concepts since misconceptions or prior conceptions are addressed explicitly through videos.
- Solve difficult or challenging questions as their prior conceptions get thoroughly addressed.
- Engage effectively with the content due to excellent visual cues and conversational style of presentation.

Teachers will likely be able to:

- Use TicTacLearn content as a resource in class as it is aligned with the national standards, most of the units/topics/chapters are as per NCERT books, and it covered Maths skills recommended by NEP 2020.
- Assign relevant homework or classwork to individual learners due to the availability of practice questions.
Potential limitations of this product

Learners will likely face the following issues:

- Get disengaged due to lack of scaffolding, lack of accessible content, and insufficient feedback.
- Find difficulty in learning new topics by themselves.
- Find some of the examples irrelevant because these might not be relatable to certain sections of society.

Teachers will likely face the following issues:

- Have difficulty with setting goals due to lack of description of corresponding learning outcomes.
# TicTacLearn (Grades 9-10): Summary of Review Ratings by Criteria

**Content Quality: Exemplary 😊**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C1. Content accuracy</strong></td>
<td>😊</td>
</tr>
<tr>
<td>The content is accurate and all learning units contained correct facts, explanations, and examples including video content and practice questions.</td>
<td>😊</td>
</tr>
<tr>
<td><strong>C2. Correctness and clarity in assessment</strong></td>
<td>😊</td>
</tr>
<tr>
<td>All questions and solutions are complete and unambiguous.</td>
<td>😊</td>
</tr>
<tr>
<td><strong>C3. Language comprehensibility</strong></td>
<td>😊</td>
</tr>
<tr>
<td>The sentences and vocabulary are easy to understand and the phrasing is simple.</td>
<td>😊</td>
</tr>
<tr>
<td><strong>C4. Mathematics skill coverage</strong></td>
<td>😊</td>
</tr>
<tr>
<td>Skills recommended by the NEP like graphical representation, abstract concepts, understanding shapes &amp; patterns are covered well in this product.</td>
<td>😊</td>
</tr>
<tr>
<td><strong>C5. Curriculum alignment</strong></td>
<td>😊</td>
</tr>
<tr>
<td>The content is aligned to NCERT and logically sequenced.</td>
<td>😊</td>
</tr>
<tr>
<td><strong>C6. Inclusivity in representation of learners</strong></td>
<td>😊</td>
</tr>
<tr>
<td>An attempt has been made to include representation of relevant sections of Indian society across gender, religion, socio-economic class, etc. However, the inconsistency of representation leads to inadequate representation.</td>
<td>😊</td>
</tr>
</tbody>
</table>

**Pedagogical Alignment: Valuable 😊**

<table>
<thead>
<tr>
<th>Pedagogical Criteria</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P1. Constructivist approach</strong></td>
<td>😊</td>
</tr>
<tr>
<td>Some elements of the constructivist approach are present such as reflection spots. However, such an approach is inconsistent, both in terms of quality as well as quantity.</td>
<td>😊</td>
</tr>
<tr>
<td><strong>P2. Addressing learning gaps/alternate conceptions</strong></td>
<td>😊</td>
</tr>
<tr>
<td>There is a separate video in most of the learning units to address potential learning gaps.</td>
<td>😊</td>
</tr>
<tr>
<td><strong>P3. Content in context</strong></td>
<td>😊</td>
</tr>
<tr>
<td>Relevant and sufficient context is provided across the product.</td>
<td>😊</td>
</tr>
<tr>
<td><strong>P4. Learner scaffolding</strong></td>
<td>😊</td>
</tr>
<tr>
<td>Learner scaffolding is seen in the video content by organizing content from lower to higher levels of difficulty but no support for assessment is present.</td>
<td>😊</td>
</tr>
<tr>
<td><strong>P5. Cognitive engagement</strong></td>
<td>😊</td>
</tr>
<tr>
<td>Appropriate visual cues are provided and conversational style is present.</td>
<td>😊</td>
</tr>
<tr>
<td><strong>P7 Logical chunking and connectedness</strong></td>
<td>All learning objectives have assessment questions aligned at corresponding cognitive levels.</td>
</tr>
<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 used in the product and the assessment methods used are aligned to each other across all the topics.</td>
</tr>
<tr>
<td><strong>P10 Cognitive levels covered</strong></td>
<td>Higher Order Thinking Skills are not being sufficiently addressed in the content or activities.</td>
</tr>
<tr>
<td><strong>P11 Feedback quality</strong></td>
<td>Appropriate feedback is provided through complete explanations but no guidance is provided to revisit the relevant content.</td>
</tr>
<tr>
<td><strong>P14 Teacher support</strong></td>
<td>There is no teacher support to use the content.</td>
</tr>
<tr>
<td><strong>P15 Facilitate goal setting</strong></td>
<td>Learning units are provided with meaningful titles but lack an accompanying description of their task value.</td>
</tr>
</tbody>
</table>

**Technology and Design: Valuable 😊**

| **T1. Interface design: Enable intuitive use** | The platform is easy to use and the interface elements are clearly visible. |
| **T4. Universal Design - Content accessibility** | Essential features of universal design like captions at all places are not present which would make it difficult to be used by diverse learners. |
| **T8. Content type - Technology alignment** | There is a perfect match between the visualization type present in the learning units and the content type. |

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

### 4.1 Content Quality

<table>
<thead>
<tr>
<th>Category</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content Accuracy and Clarity</td>
<td>8</td>
</tr>
<tr>
<td>Alignment to National Standards</td>
<td>10</td>
</tr>
<tr>
<td>Inclusivity in Content Representation</td>
<td>10</td>
</tr>
</tbody>
</table>

### 4.2 Pedagogical Alignment

<table>
<thead>
<tr>
<th>Category</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learner-Centred Approach</td>
<td>12</td>
</tr>
<tr>
<td>Enhancing Learner Experience</td>
<td>16</td>
</tr>
<tr>
<td>Assessment of Learning</td>
<td>19</td>
</tr>
<tr>
<td>Teacher Support</td>
<td>21</td>
</tr>
</tbody>
</table>

### 4.3 Technology & Design

<table>
<thead>
<tr>
<th>Category</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Interface Design</td>
<td>22</td>
</tr>
<tr>
<td>Technology for Meaningful Learning</td>
<td>22</td>
</tr>
</tbody>
</table>
4.1 Content Quality

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

4.1.1. Content Accuracy and Clarity

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

Content Accuracy (C1) is rated Exemplary. Overall, the content was accurate and all learning units contained correct facts, explanations, and examples including video content and practice questions. In the video, terminologies were precisely defined using appropriate diagrams.

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

Terminologies like point-of-view, line of sight, angle of depression, angle of elevation were precisely defined and explained using accurate diagrams.

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.

Illustrative example: Topic: Introduction to probability, Grade 10

A cultural committee of 2 members is to be formed from 3 boys (B1, B2, B3) and 3 girls (G1, G2, G3). The committee can have 2 boys or 2 girls or 1 boy and 1 girl. Write the number of elements in the sample space n(S).

(1) n(S) = 10
(2) n(S) = 9
(3) n(S) = 15
(4) n(S) = 6
Solution:
Correct Option: 3
B1, B2, B3 are the three boys and G1, G2, G3 are the three girls. Out of these boys and girls, a committee of two members is to be formed.


n(S) = 15
So the correct option is Option 3.

Here, both the question and solution are unambiguous.

Language comprehensibility (C3) is rated Exemplary. The language used would be easily understandable by the learners. Simple sentences and phrasing were used in all the learning units reviewed. The accent was neutral and the vocabulary used was familiar.

4.1.2. Alignment to National Standards

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 grades 9-10. The content covered all the Mathematics skills recommended by NEP 2020 and NCF for grades 9-10, such as argumentation, mathematical modeling, data analysis and interpretation, and reasoning about shapes.

4.1.3. Inclusivity in Content Representation

Inclusivity in the representation of learners (C6) is rated Valuable. The product attempted to include content related to different sections of the society across gender, caste, and socio-economic class. However, this attempt was limited and inconsistent. Reviewers also observed gender bias when the audio script referred to the learner as “he is observing.”
Illustrative example: Topic: Introduction to probability, Grade 10

In this topic, three examples were provided to explain the concept of probability. Examples included conversations between boys and girls, but two examples referred to boys’ conversation while only one example referred to girls’ conversation. Moreover, the examples that included boys pertained to tasks that are stereotypically associated with them. For instance, in order to explain terminologies like sample space, outcome, and event, the game of cricket was used as an example. In this example, two boys discussed the probable outcome of the game; suggesting a stereotypical association between gender and task.

In the same unit, to further strengthen the concept of probability, smartphone text prediction was used as an example. Rural students might find such references challenging to relate to.
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 Approach

<table>
<thead>
<tr>
<th>Constructivist approach</th>
<th>Addressing learning gaps / alternate conceptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>(P1)</td>
<td>(P2)</td>
</tr>
</tbody>
</table>

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. However, there was inconsistency in the implementation of constructivist approaches across various learning units. The product included a constructivist approach mainly through reflection spots. But reviewers observed that the addition of reflection spots within videos was not uniform and the quality of reflection spots was inconsistent. In some units, quality reflection spots were present. These reflection spots were at the ‘Understand’ or ‘Apply’ level of Bloom’s taxonomy and were solvable quickly. The feedback for the reflection spot question was immediate within the same video.

Illustrative example: Topic: Side-Angle-Side criterion of congruent triangles, Grade 9

This unit constructed an understanding of the side-angle-side (SAS) congruence theorem by providing a reflection spot in the video. The question in the video showed two triangles ABC and PQR. Learners were provided with data for two equal sides of the triangle, i.e AB=PQ and AC=PR. The reflection spot question was as follows.

“Under what conditions Will BC=QR?”

This reflection spot is at the ‘Understand’ level as the concept of congruence was explained in the previous units. It was solvable in two minutes. The video also displayed the feedback immediately after the reflection spot.

But in some units, even though reflection spots were present, the quality of reflection spots was inconsistent.
Illustrative example: Topic: Quadratic equation, Grade 10

In this learning unit, the first two videos explained the process to find the solution of quadratic equation using the factorization method and in the next video, the question was posed on screen as follows.

“Solve given quadratic equation -5x+2x²=3 using factorization method.”

Options were provided and learners were asked to pause the video and find the solution.

The reflection spot question was at the ‘Apply’ level and was solvable in 2 minutes. The next part of the video explained the detailed solution of the equation; thus, immediate feedback was provided to complete the learning loop.

But in the same learning unit, another reflection spot question was at ‘Recall’ level and thus did not follow the quality requirement recommended for reflection spot questions. An example is explained below.

Illustrative example: Topic: Quadratic equation, Grade 10

The topic was the formation of a quadratic equation for a given situation.

“The cost of one sculpture = number of sculptures made in one day - 70. On a particular day, the total construction cost = 1800. How many sculptures were made on that day? The next part of the video showed how to assign variables as follows.

Let the number of sculptures created that day = x

Hence the cost of each sculpture created that day = x-70,

Therefore the total cost of sculptures created that day = x(x-70). We need to write a quadratic equation.

Then the reflection spot question was as follows - “Write the equation from given data and match your equation.”

Even though the question was solvable in 2 mins and feedback followed the reflection spot, the cognitive level of the question was ‘Recall.’

The learning unit on ‘Solution of Quadratic equation’ was rated as valuable on constructivist approach due to such inconsistent quality of reflection spots. Further, no reflection spots were observed in learning units like Construction, Measure of central tendency, and Surface areas and Volumes. Overall, the product’s design followed an inconsistent approach for constructivism and thus rated Valuable.
Addressing learning gaps/alternate conceptions (P2) is rated Exemplary. The product’s design included a separate video as well as practice questions in the Multiple Choice Question (MCQ) form to address potential learning gaps amongst learners.

Illustrative example:
Topic: Side-Angle-Side criterion of congruent triangles (SAS criterion) | Part 1, Grade 9

In this topic while explaining the criteria for SAS in the video, various possible wrong options while doing the congruence test was explained.

1. Will the congruence test be applicable if one side and one angle are equal (Fig.1)?

![Fig.1. Condition for congruence](image)

The video then explained why it was not a valid condition for congruence.

1. Will SSA (two sides are equal and angle which was not embedded within the two equal sides is equal) lead to congruence test of two triangles (Fig.2)?
Fig. 2. Congruence condition

The video explained why this was not a valid congruence condition.

1. There was an activity for the learners related to the SAS congruence test. Learners were asked to cut the paper as shown below and they were asked to separate the two resultant triangles and stack them on one another to verify congruence (Fig. 3).

Fig. 3. Activity diagram

Thus the learning gaps related to the SAS test were identified and addressed in the given unit.
4.2.2. Enhancing Learner Experience

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

Learners’ common misconception related to the marking of the angle of depression was addressed in a separate video through examples and appropriate diagrams.

Example: According to the security in the new hotel, a rope is tied to the top of the 3rd and 5th floors of the five-floor building from a point placed 30m away from the base of the building. The rope has elevation angles of 45° and 60° respectively. What is the length of the rope?

While solving this problem, the two learners marked the angle of depression as shown in Fig.4.

![Fig.4. Marking of the angle of elevation](image)

The video then explained the correct and incorrect ways of marking the angle and the reason why it was wrong. Thus, the common misconception was identified and resolved through explanation.

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

In order to explain the calculation of the n\textsuperscript{th} term using the formula, meaningful contexts such as the number of students standing in rows in the playground, calculation of monthly rent, daily collection of money in the piggy bank were provided to learners.

Illustrative example: Topic: Probability, Grade 10

In order to explain the concept of probability, examples like the prediction of success in exams, prediction of the cricket match result, prediction of success of the film, etc were used. The concept of uncertainty and the possible outcome was explained using the above events. Since those were the known routine examples learners were able to connect to the topic easily and motivate learners to learn about concepts in probability.

Learner Scaffolding (P4) is rated Valuable: The product’s design included learner scaffolding in the content videos to some extent. But no learner support was observed in the assessment. Video content was organized in ascending order of difficulty i.e., from lower to higher difficulty level. In some of the learning units, the summary section was included either at the beginning of a chapter or at the end of the chapter which simplified the learning task.

Illustrative example: Topic: Real Numbers: Grade 10

Video presented summary at the end of each video in the form of flow chart e.g., in summary, the formula stating relation between the product of numbers and HCF and LCM. This formula was applied to solve examples in the next video.

But there was no support (e.g., Hints) in assessment to help learners to come out of a stuck-up situation.

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. Different visual cues like highlighting important concepts by surrounding them with boxes, circling important steps, highlighting texts, etc. were found in the videos. Verbal cues like stresses on important points in the audio were observed in the product.
Logical chunking and connectedness (P7) is rated exemplary. The product included short videos of 5 to 6 min in each lesson. 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 the videos.
4.2.3. Assessment of learning

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 video content were aligned with practice questions.

Facilitate goal setting (P15) is rated Valuable. The learning unit had meaningful titles such as ‘Surface area of the right circular cylinder’ and ‘Application of trigonometry.’ The learning units also included videos aligned with the title. But there was no accompanying description available about learning outcomes, utility of the unit, etc. i.e. information about the task value was not available for the user (learner/teacher) while selecting audio-visuals mapped to their goals.

Illustrative example: Topic: Surface area of right circular cylinder Part 1: Grade 9

For this topic, there were three videos available. The first video was an introductory video in which learners were introduced to the shape of the right circular cylinder through an example along with the formula to calculate surface area. This video was approximately 5 minutes long. In the second video, various real-life examples were explained to calculate the surface area using a formula. The last video explained more complex examples to calculate surface area. Both the videos were 4 to 5 minutes in length. This audio-visual was chunked logically having short durations. The practice session with seven multiple-choice questions was presented at the end. The practice questions were based on the content presented in the video. Such a design of learning units is likely to lead to meaningful learning.

Illustrative example: Topic: Arithmetic progression, Grade 10

In the video, the example based on the application of the formula was explained, which was at the ‘Understand’ level. There was a practice question at the same level.

Example in the video- Gaurav took a rented house for 15 years. He was given this house with a monthly rent of 5000 and an annual monthly rent increase of Rs. 500. What will be his monthly rent in the 11th year?

Practice Question- Kedar's height was 70cm when he was one year old. His height increased to 80cm at 2 years, 90 cm at 3 years, and 100 cm when he was 4 years old. If the increase in height happens at the same rate, what will be his height when he is 15 years old?
This entire unit addressed two cognitive levels - ‘Recall’ and ‘Understand.’ The practice questions were also from the same levels.

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 NEP recommendations, learners should be presented with argumentation skills and they should be able to write proofs of theorems. Reviewers found proofs of theorems and corresponding reasoning for these proofs were included in the content videos as per the requirement of the topic. Corresponding assessment questions were found in the practice sessions.

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

There were many different examples related to the surface area of the right circular cylinder that was explained in the video. In this role-play, activity like two friends helping a painter calculate its wages for painting the pole was given. The pole had the shape of a right circular cylinder. Learners identify the shape and decide the surface area that had to be calculated and then explain the cost of painting. In the assessment section there was a question to address the same skill and some practical situation was provided.

Question- Reena's mother wanted to make a cloth bag of cylindrical shape for her water bottle. How much cloth will she need if the radius of the bottle is 6 cm and the height is 15 cm?

Coverage of cognitive level (P10) is rated Valuable. The video content and practice questions showed a range of cognitive levels starting from ‘Recall’ (introductory videos) to ‘Apply’ (application problems) for some of the topics only. In most of the learning units only ‘Recall’ and ‘Understand’ levels were covered.

Feedback Quality (P11) is rated Valuable. The feedback provided in the practice question was an explanation of the solution and sometimes an explanation for all chosen options. But there was no provision for revisiting the relevant content.
**Illustrative example:** Topic: Arithmetic progression, Grade 10

Question: What is the number of terms in the A.P. given below?

\[2, 5, 8, ..., 59\]

(1) 18  
(2) 176  
(3) 20  
(4) 29

Solution:

Correct Option: 3  
2, 5, 8, ..., 59  
\[a = 2, \, d = 5 - 2 = 3, \, \text{last term} = 59\]  
\[a_{n} = a + (n - 1)d\]  
\[59 = 2 + (n - 1) 3\]  
\[59 - 2 = 3n - 3\]  
\[57 = 3n\]  
\[60 = 3n\]  
\[20 = n\]  
i.e., \(n = 20\)

So the correct answer is Option 3

If Option 1 is chosen, then it is incorrect. The student did not change the sign of 3 while transposing it to L.H.S.

If Option 2 is chosen, then also it is incorrect. The student must have taken 59 as ‘n’ and did the calculation for the nth term.

If Option 4 is chosen, then also it is incorrect. The student must have interchanged values of ‘a’ and ‘d’ in the formula.

### 4.2.4. Teacher Support

**Teacher Support (P14)**

**Teacher support (P14) is rated Potential to improve.** Reviewers found that the product did not provide any teacher support.
4.3 Technology and Design

Technology and 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.

4.3.1. User interface design

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, Video button, Next button, Play and pause in the video, practice session, etc. The functionality of all the buttons was consistent throughout the product.

Illustrative example:

- The different icons like ‘share link,’ ‘go back,’ ‘Next,’ ‘Submit responses,’ and ‘See answers’ were easily locatable as well as gave a clear indication of the action to be taken.
- Different types of learning content like the videos and practice quizzes were placed in separate tabs.

Universal Design - Content accessibility (T4) is rated Potential to improve. The product’s design did not provide features that would ensure accessibility to diverse learners. The product did not include a transcript and audio description. Reviewers also found inconsistent use of captions in video units throughout the product.

4.3.2. Technology for meaningful learning

Content type – Technology alignment (T8) is rated Exemplary. The product’s design showed mapping between the content type and visualization. In most of the learning units, the video was used to explain the process of problem-solving. Diagrams were shown to explain definitions (facts) etc.
Illustrative example: Some application of trigonometry, Grade 10

To explain the definition of point of view, line of sight diagrams were shown along with the explanation (Fig. 7).

Fig. 7. Diagram showing Line of sight
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.