EdTech Tulna
EVALUATION REPORT

KHAN ACADEMY
MATHEMATICS
GRADES 1-2

Evaluated in February 2021
# Contents

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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

Khan Academy offers instructional videos, practice exercises, and a personalized learning dashboard for learners to study at their own pace in school or at home. The platform also has teacher tools and a coach dashboard that empower teachers to identify the learning requirements of each student, based on which they can tailor remediation for each student. The product contains elements of personalization and adaptivity for learners.
### Potential benefits of this product

- Teachers and learners can be assured of the correctness of the content.
- Learners will likely be able to learn independently as much as possible.
- The video content is very well scaffolded and enables the learner to understand the concept from the basics.
- Practice questions have exemplary feedback quality, scaffolding in terms of hints, and remedial content. These provide learners an effective platform to practice various concepts.
- The course challenge offered at the beginning provides an excellent chance for learners to identify strengths and weaknesses. Learners can effectively plan the topics where they wish to spend more time.
- Learners will likely stay motivated to continue their learning journeys due to the various features of the product.
- The product has a high potential to be used by teachers effectively to identify the learning needs of different students and support them appropriately.
- The intuitive technology and design make it easy for any new learners or institutions to adopt the product.
- The product is excellent at following universal design principles. It addresses the needs of diverse learners and hence makes it inclusive for a variety of learners.

### Potential limitations of this product

- Students in an Indian context, especially from backgrounds where they may not be exposed to English in their day-to-day lives, might find it difficult to relate the accent and tone of the videos and the pace of the videos. This becomes especially difficult for grade 1-2 students.
- The lack of sufficient real-life context and scenarios might deprive learners of the logical connections of mathematics to their everyday life, if they are using this product as their only learning platform.
- The lack of opportunity for experimentation, interactive activities or mathematical tools for problem solving make the product less effective in helping learners make meaning of the content and explore various possibilities on their own. This might lead to a good fluency in procedural mathematical skills while missing out on deeper connections and conceptual understanding.
- Some videos are long. The consistent chalk-talk video format is likely to lead to low engagement. Learners from Grades 1-2 especially need more stories, animations and an effective use of multimedia elements to keep them engaged.
# Khan Academy (Grades 1-2): Summary of Review Ratings by Criteria

## Content Quality: Valuable 🧡

<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 intended learners will likely understand the language with some effort due to the foreign accent and use of some slang.</td>
</tr>
<tr>
<td>C4 Mathematics skill coverage</td>
<td>Skills recommended by the NEP like graphical representation, abstract concepts, understanding shapes &amp; patterns are covered well.</td>
</tr>
<tr>
<td>C5 Curriculum alignment</td>
<td>The content is aligned to NCERT and logically sequenced.</td>
</tr>
<tr>
<td>C6 Inclusivity in representation of learners</td>
<td>There is no attempt to include diverse learners in terms of gender, caste, look, socio-economic class, etc.</td>
</tr>
</tbody>
</table>

## Pedagogical Alignment: Exemplary 🧡

<table>
<thead>
<tr>
<th>P1 Constructivist approach</th>
<th>Multiple ways to think about a concept are presented but many learning units just focus on the procedures to arrive at an answer.</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2 Addressing learning gaps/ alternate conceptions</td>
<td>Potential learning gaps and alternate conceptions are identified and addressed.</td>
</tr>
<tr>
<td>P3 Content in context</td>
<td>Many real world objects have been used but the context is insufficient to make the learner care about the topic.</td>
</tr>
<tr>
<td>P4 Learner scaffolding</td>
<td>Product included sufficient scaffolds like hints to help the learner form the correct mental model of the concept being taught.</td>
</tr>
<tr>
<td>P5 Cognitive engagement</td>
<td>Important elements are highlighted well, and the tone is conversational.</td>
</tr>
<tr>
<td>P6 Motivational Features</td>
<td>The product includes motivational features (Both Intrinsic and Extrinsic) that are well integrated &amp; will encourage learners to explore the content further.</td>
</tr>
</tbody>
</table>
### Executive Summary

**Summary of Review Ratings by Criteria**

#### EdTech Tulna Evaluation Report: Khan Academy, Mathematics Grades 1-2, February 2021

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| **P7 Logical Chunking and Connectedness** | Videos are segmented at the sub-topic level and assessments are clearly mapped to each sub-topic. |
| **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** | The content and assessments are not aligned to the play-based pedagogy as recommended by the NEP. |
| **P10 Cognitive levels covered** | Sufficient questions covering higher order thinking skills are present. |
| **P11 Feedback Quality** | Detailed explanations are present for assessment questions, and there is an opportunity to revisit the related content. |
| **P13 Adaptivity** | The mastery levels of a learner are decided based on a test. The learner is suggested topics that might need more focus. |
| **P14 Teacher support** | There is extensive support for teachers to manage the learning paths of various students. |

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#### Technology and Design: Exemplary

| **T1 Interface design: Enable intuitive use** | The interface is intuitive to use, all elements are clearly visible and actions are mapped to their expected response. |
| **T2 Interface design: Assess consequences of an action** | The interface provides an appropriate response to the learner’s action. |
| **T3 Learner navigation & pace** | The interface provides complete control to learners over their learning path. |
| **T4 Universal Design** | Features of universal design are present to ensure a low entry barrier to diverse learners. |
| **T5 Analytics for learners’ progress** | The dashboard provides easily interpretable progress of the learners to both teachers and learners. |
| **T6 Tools to support problem solving** | No mathematical tools are present except a scribble pad. |
| **T7 Meaningful interactivity** | Appropriate interactivity like text inputs, drag and drop interfaces, radio buttons were used. No superfluous interactivity feature is present. |
| **T8 Content type - Technology alignment** | The images or visualizations used are aligned to the content type. |
4. Detailed Review

4.1 Content Quality 😊

Content Accuracy and Clarity ........................................................................................................ 8
Alignment to National Standards ................................................................................................. 9
Inclusivity in Content Representation ....................................................................................... 10

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

**Content Accuracy (C1)** is rated **Exemplary**: The content is presented to the learners in byte-sized instructional videos for each concept. The video content is accurate, and contains correct facts, explanations and examples. The supporting content used as graphics drawn by the instructor, schematic diagrams that look realistic.

**Illustrative example (Place Value; Grade 1):**
The concept of place value is supported by simple drawings of blocks, representing tens and ones.

```
25 = 2 tens + 5 ones = 
20 + 5

+ tens
ones
```

**Correctness and clarity in assessment (C2) is rated** **Exemplary**. In terms of the assessment questions, it is very clear what is expected from the learner. The solutions and explanations are factually correct, complete and unambiguous. There are no instances of any ambiguity in the content videos or assessment question in our sampled learning units.

**Illustrative example:**
The question is clear and to the point, with the necessary information provided along. It is clear that the learner is expected to enter the answer in the text box.

```
How many carrots are shown below?
Each box has 10 carrots.
```

```
10 10 10 10 10
```

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Language Comprehensibility (C3) is rated Potential to Improve: The Language used in the instructional videos is difficult to understand and follow by grade 1-2 students. The accent is not familiar to the intended learner and the pace at which the instructor talks is difficult to grasp for an Indian student due to the unfamiliar accent. In some instances, it was observed that the instructor used informal foreign slang which the learners might not understand. In rare instances the instructor uses long sentences which are especially clumsy as the instructor does some thinking while teaching. While this might help learners in higher grades, it would be a barrier to comprehension for younger learners. On the other hand, the vocabulary and sentences in the practice section are simple and the accompanying images make it easy to comprehend.

Illustrative example Topic: Numbers from 1 to 100, Grade 1
• "I'm just gonna copy and paste all of this", "If we just wanna feel good - we could throw in a 100". Indian students may not be familiar with slang like 'gonna' and 'wanna'.
• The pace is fast when the instructor says "Over here - they aren't beside here" - but since it is too fast, learners might confuse it as - Over here they are beside each other. It is better to use them over here they are not.
• "The number on the right - we keep going 0,1,2,3,4..." The language sometimes gets clumsy - when the instructor is thinking. That might be confusing for the learners.

4.1.2 Alignment to National Standards

Mathematics Skill coverage (C4) Curriculum alignment (C5)

Mathematics skill coverage (C4) is rated Exemplary: The overall Mathematics mindset and skills required for grade 1-2 (recommended by NEP 2020 and NCF ) like Counting, Pattern Recognition, Estimation and Comparison are covered in the product.

Illustrative example (Counting Numbers to 100, Grade 1):
• The learner is encouraged to notice the patterns while counting that the ones digits repeat after every 10 numbers.
Detailed Review: Content Quality

Curriculum alignment (C5) is rated Exemplary: It is observed that, broadly, all the topics and sub-topics covered were aligned with the content present in NCERT textbooks for Grade 1-2. All content is comprehensively covered, but a minor problem is that the chapter names do not exactly match, which might make it difficult to navigate for a child trying to practice a particular chapter independently. This may be mitigated if appropriate topics and sub-topics are activated by the teacher.

4.1.3 Inclusivity in Content Representation

Inclusivity in the representation of learners (C6) is rated Potential to Improve: No specific attempt or an effort has been made to represent different genders, races, religions, skin color. While there is no apparent bias, attention to the Indian context is lacking overall. There are no Indian names used in any examples, and scenarios use a context from a typical Western country. The accent is also not contextualized to the Indian setting, and that might be a barrier for comprehensibility and hence the learner may not find it relatable.

Illustrative example: Topic - Addition and subtraction with regrouping, Grade 2

Names such as Pauly Pony, Hazel Horse, Mrs. Grange, Mrs. Henry, King Arthur, Gio etc are used in different word problems and some scenarios such as ‘'Snowstorm in Chili Town’ and use of names of animals and objects such as Chipmunk, Acorns etc may not be relatable to learners from different socio-economic backgrounds in India.
4.2 Pedagogical Alignment

Pedagogical Alignment focuses on Adaptivity, learner-centered 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

**Constructivist approach (P1)**

**Addressing learning gaps (P2)**

Constructivist approach in pedagogy design (P1) is rated Valuable: The content and activities allow learners to construct their own understanding of the topic. In many learning units, the learners are presented with multiple ways to think about a concept or problem.

**Illustrative example: Topic: Addition within 20, Grade 1**

Multiple ways to think about addition, which helps the learner to construct the understanding of addition.
- Showing groups of objects and counting on
- Adding on a number line
- Regrouping in 10s and 1s (8+5 = 8+2 +3 = 10 + 3)

**Illustrative example: Topic: Addition and subtraction using a Number line, Grade 2**

The instructor asks the learner to pause and think why the other options in the question are incorrect. Videos in progression help the learner to construct their own understanding, the first video shows how adding using number lines could make it easier to add and the following video makes it very clear on how a number line helps to make adding and subtracting easier.

However, in some cases, the focus and the structure of the instructional videos is on solving a question and arriving at an answer with a step by step procedure without building the complete understanding of the topic.

**Illustrative example: Topic: Comparing 2 digit numbers**

Drag and Drop activity to facilitate counting where in the learner drag the number of objects asked to drag. However, some important aspects of a constructivist approach are missing. The content video directly starts with questions, without giving any idea of why we need to compare numbers, so the user cannot connect to their prior understanding of the concept or the world, nor can they relate to a context.

In the related practice questions, since very similar problems are posed, the mere translation or repetition of the same procedure might get the learner to the correct answer without necessarily understanding.
Addressing learning gaps/alternate conceptions (P2) is rated Exemplary: The content provides opportunities to the learner to identify their learning gaps on their own, followed by their effective addressal. The variety of different examples in the practice section and the way the concept is explained in the instructional video addresses the learning gaps very well.

Illustrative example: Grade 1, Counting small numbers
An attempt has been made to address possible learning gaps. 'Counting in order' addresses the idea that you cannot skip objects while counting. While counting flowers, it is said "You don't skip flowers in the middle". They mention this and say "That's not how you count flowers" and that the first choice may not be right.

Illustrative example: Grade 1, Repeated addition
The number 6 can be obtained in multiple ways - 3 twos or 2 threes.

Illustrative example: Grade 2, Comparing 2 digit numbers
Clears the possible misconception about the = sign. "It's not an instruction to give the answer, but represents the equality of both sides."

Illustrative example: Grade 2, Addition and subtraction using number line
Some incorrect ways of solving a problem are shown in the options, and explained why they are wrong.
4.2.2. Enhancing learner experience

<table>
<thead>
<tr>
<th>Content in context (P3)</th>
<th>Learner scaffolding (P4)</th>
<th>Cognitive Engagement (P5)</th>
<th>Motivational Features (P6)</th>
<th>Logical Chunking and connectedness (P7)</th>
</tr>
</thead>
</table>

**Content in Context (P3) is rated Valuable:** A relevant context has been provided in many topics in the product. The topics have some real world context in terms of the examples commonly used in daily life: Animals such as elephant, cow, pig, horse, bird and squirrel, and objects such as Toys, Sunflower, Car, Crayon boxes etc have been used.

**Illustrative example: Topic: Counting small numbers, Grade 1**
The learner is required to count the number of animals such as squirrels, horses, mice, lady bugs and objects such as flowers by dragging and dropping the appropriate number in the box. These objects are relatable and the fact that in real-life children count objects like that - the concept has been very well contextualized to make it relatable for the learner.

**Illustrative example: Topic: Place Value, Grade 2**
The instructor motivates the topic by some historical storytelling with respect to how counting originated which is quite meaningful and also takes a relatable example of counting numbers since your Last Birthday and allows the learner to appreciate the neatness of the number system and the importance of place value. This helps the learner to help them appreciate the topic and understand why they should learn the topic.

However, in some places, the context may not be sufficient to make learners understand the relevance of the topic.

**Illustrative example: Topic: What is Subtraction, Grade 1**
No real world context is provided on how subtraction is relevant in the real world. Although the topic is explained well using visuals, there is no use of real world objects or scenarios where subtraction might be useful.

**Learner Scaffolding (P4) is rated Exemplary:** The product does provide learners with scaffolds and supports that are likely to be effective in helping the learner form the correct mental model of the concept. The topics are sequenced in a gradual progression from simple to complex to take on higher difficulty. In every topic, the instructor breaks down a complex task into simpler steps and shows multiple examples. The overall progression is also meaningful. Practice exercise questions are logically sequenced with increasing difficulty.

**Illustrative example: Simple to complex**
Addition and Subtraction of 2 numbers, followed by 3 numbers. Starting from adding numbers one number line to more abstract concepts like solving word problems.

The product has provided excellent support to the learners as they solve the practice questions. Right below every exercise, there is a section “Are you stuck? Get help”. Folded hints are provided to allow the learners to come out of a stuck situation. If the learner gets the answer wrong, the system suggests videos to watch as a remedial support to re-learn the topic and come out of the stuck situation. It would be better however if the video were pin-pointed to the problem.
The solutions have been broken down into simpler smaller steps and learners can access the hints step by step, and come up with the correct response by prompting and asking the right question. There are some instances where the reflective prompts are provided to the learner as the instructor asks a question and encourages the learner to pause the video and work through it.

Illustrative example: Topic - Subtraction, Grade 1

Hints are very well presented in a series, which help the learner think, pause and work on the remaining part of the solution by themself. For example, in the question asking the learner to solve \[ 5 - 3 = ? \], the 1st time the learner clicks on the hint it shows 5 objects, the 2nd hint shows a cross on 3 objects, the 3rd hint circles the remaining objects. This 3-step folded hints helps the learner to attempt the question and form a correct model of the concept of subtraction.

Cognitive Engagement (P5) is rated Exemplary: The content presentation style in the instructional videos is conversational, the voice is energetic, personalized and engages the learner, even though the accent is a little unfamiliar and foreign. The important points in the content explanation are highlighted for the learners to enhance their cognitive engagement with the content. The instructor used different color pens to highlight important parts and important test in practice questions are highlighted and enhanced with a graphic support to help visualize.

Illustrative example:

Addition, Grade 2: Numbers to be added are shown with different colors. Corresponding colors are used for the objects. The number line is well represented with the tens bolder than ones, and the jumps are shown with proper arrows from one position to another.
**Counting by Tens, Grade 1:** Packs of 10 balls in different colors are nicely presented to explain the counting by 10s

Motivational Features (P6) is rated Exemplary. The product includes both intrinsic and extrinsic motivational features that are well integrated and have the potential to prompt learners to further explore the content. Extrinsic motivational features include Energy points, Scording Stars, Mastery points, different kinds of Badges and Avatars. Based on a student’s performance and the mastery points gained, different proficiency levels are attained, i.e., Familiar (50/100), Proficient (80/100) and Mastered (100/100). As the learner starts a new topic, they can take course challenges and based on the performance, topic-wise mastery points are added.

**Illustrative example**

Example: A progress indicator, star and a motivational prompt.

Example: Topic level mastery indicator.
Example: Different kinds of badges can be earned by the learners based on the mastery they have achieved or the challenges completed.

### My badges

- **Challenge Patches**
- **Black Hole Badges**
- **Sun Badges**
- **Earth Badges**
- **Moon Badges**
- **Meteorite Badges**

Sun badges are epic. Earning them is a true challenge, and they require impressive dedication.

### Possible Badges

- **Magellan**:
  - Achieve mastery in 500 unique skills
  - 30000 points

- **Sally Ride**:
  - Achieve mastery in 150 unique skills
  - 35000 points

- **Copernicus**:
  - Achieve mastery in 250 unique skills
  - 80000 points

- **Kepler**:
  - Achieve mastery in 500 unique skills
  - 125000 points

- **Hypatia**:
  - Achieve mastery in 250 unique skills
  - 125000 points

- **Newton**:
  - Achieve mastery in 400 unique skills
  - 150000 points

Along with the extrinsic motivational features, the product does an exemplary job at intrinsically motivating the learner.

**Illustrative example:**

- In the instructional videos, the instructor often says things like - "...this is even easier than the other question. Lots of fun!!" This helps to motivate the learner as they watch the video.
- In the practice section, the system provides nudges such as "You got it" "Two more to go!" or "Keep on practicing!" "You got it; keep up the great persistence", "Nice work! Five questions done, keep going".

As soon as the student starts a practice session, the system prompts "Okay, Show us what you can do!" Such challenging statements intrinsically motivates the learner and helps the learner. If the learner gets a question right, such statements appear as they get a star accompanied by an achievement sound on answering correctly.

**Logical chunking and connectedness (P7) is rated Exemplary:** Videos are segmented at the sub-topic level and are available as individual units. The duration of the videos is less than 5 minutes in most of the cases. Assessments are clearly mapped to each sub-topic.

The product has the “Learn” (video content) and “Practice” sections placed side by side. This gives the freedom for the learner to decide to work on the practice questions at any point of time (before, immediately after or at the end of watching all videos).
4.2.3 Assessment of Learning

|------------------------------------------------|------------------------------------------|-------------------------------|------------------------|

**Learning objective – assessment alignment (P8) is rated Exemplary:** The assessment questions are aligned to the learning objective of the topic. The cognitive levels of the content videos and the assessment questions are quite similar. We only see rare instances (only in grade 1) where the content video is at a higher cognitive skill (apply level), while the questions are at a lower level.

**Pedagogy-assessment method alignment (P9) is rated Potential to improve:** Pedagogical strategy used in the product is as recommended for each grade group in NEP, 2020. According to NEP, 2020 - the pedagogical strategy recommended for Pre-Primary School (Grades 1-2) is Play-based teaching. Here, the overall teaching/presentation is not play-based or activity-based. Most questions are in the format of multiple-choice questions and even the videos don't specifically promote play-based learning or encourage the learner to try hands-on activities to get an understanding of the concepts.

**Cognitive levels covered (P10) is rated Exemplary:** The questions are present at various cognitive levels as required, ranging from understanding and identifying, to application and estimation. There is a good coverage of Higher Order Thinking Skills (HOTS) questions in a lot of topics, going much beyond just recalling or identifying. Topics have work problems where learners need to apply the concept, solve problems and make connections between different ideas. Higher level skills such as estimation are covered in some questions. Most HOTS questions are at an application level, but there are some instances of create level questions as well.

**Illustrative example:**

- In the learning unit of Length (Grade 2) the learner is supposed to estimate the length of objects given the length of one object.
- Another example of apply and evaluate level question from Numbers 1 to 100 (Grade 2) where in the student needs to count the number of bags needed for 30 apples, if each can accommodate 10, in the same learning unit some questions require judgment. 'Which is the correct way to count?'

**Feedback Quality (P11) is rated Exemplary:** Most learning units have clear explanations with a proper reasoning for the correct response. Once you get an answer correct - there is an option to "See a step-by-step solution". These solutions are broken down into clear and distinct steps, which likely help the learner understand and even identify specific difficulties or learning gaps. Proper images and signalling in the solutions help further with the understanding. Appropriate remedial content is provided and linked to every question. Apart from the detailed explanation with reasoning and remedial content, there is sometimes also an opportunity to help the child to make deeper connections to the content.
Illustrative example:

- Comparing 2 digit numbers, Grade 2: Explanations are complete, with proper reasoning for every option. The feedback contains the explanation of all the options with proper reasoning. Each option is compared to the reference number one by one. This allows learners to identify any mistake they might have made if they got it wrong.

- Repeated Addition, Grade 1. Two different ways of counting/adding the 6 balls placed in 2X3 pattern is shown in the step by step solution. The Addition could be done row-wise 2+2+2 or column-wise 3+3. Proper images and signaling is used to help learners understand an alternate way to solve the question as well.

<table>
<thead>
<tr>
<th>1 / 5</th>
<th>There are 3 rows with 2 circles in each row.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="" alt="Diagram" /></td>
</tr>
<tr>
<td>2 / 5</td>
<td>3 rows of 2 is equal to $\frac{1}{2} + \frac{2}{2} + \frac{3}{2}$.</td>
</tr>
<tr>
<td>3 / 5</td>
<td>We can also think of the circles in 2 columns with 3 circles in each.</td>
</tr>
<tr>
<td></td>
<td><img src="" alt="Diagram" /></td>
</tr>
<tr>
<td>4 / 5</td>
<td>2 columns of 3 is equal to $\frac{1}{3} + \frac{2}{3}$.</td>
</tr>
<tr>
<td>5 / 5</td>
<td>The number of circles is equal to:</td>
</tr>
<tr>
<td></td>
<td>- $2 + 2 + 2$</td>
</tr>
<tr>
<td></td>
<td>- $3 + 3$</td>
</tr>
</tbody>
</table>
4.2.4. Adaptivity

Adaptivity (P13) is rated Valuable: The product shows evidence of adaptivity to a limited extent. A diagnostic test (unit test) is available on every module however taking the test is not mandated. Even if the diagnostic test is taken only the mastery points at the subtopic level get augmented. The product then nudges the learner to complete topics based on the skill summary dashboard and master points acquired. A true content adaptation based on the diagnostic test doesn't happen.

At a learner performance level, categorizing learners to proficient and familiar happens after completion of practice tests. The learner can level up or down based on the result of the practice test.

4.2.5. Teacher Support

Teacher Support (P14) is rated Exemplary: The product offers ample support for the teacher. It allows teachers to make choices that influence the students’ learning path by creating a course mastery goal. For example, the teacher can set a goal for students to reach 90% mastery in a course by a certain date. Teachers can create their own classroom and add the student roster. Teachers can assign lessons and quizzes to the whole class as well as individual students. Through this the teacher can either encourage in-class practice of the content or treat them as homework’s. The teacher gets to see student responses to each individual question and assess areas of strength and weakness.
4.3 Technology and Design

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

4.3.1 User Interface Design

Interface design: Enable intuitive use (T1) is rated Exemplary: The interface design is very intuitive, the learning units and summary section are neatly segregated. Buttons labels are clear and visible, in progress videos are represented appropriately, all units have uniform structure and consistent controls. The video interface is similar to Youtube and hence familiar for kids.

Button labels are informative and action oriented like “Check”, “Lets Go”, “Start” providing user feedback on what to expect.

Illustrative example:

Intro to fractions

Learn
- Intro to fractions
- Cutting shapes into equal parts

Practice

Up next for you:
Cut shapes into equal parts
Get 5 of 7 questions to level up!

Start

Choose 1 answer:

- Incorrect (selected)
  Yes

- No

Not quite! Try again. Get help, or move on.

Get 5 of 7 questions to level up to Familiar
Interface design: Assess consequences of an action (T2) is rated Exemplary: The overall interface is well designed giving young learners very little opportunities to make an unintended action. The assessment interface restarts at the point it was exited previously.

The learners are also made clear about the consequences of an action.

Illustrative example:

For example, when the learner chooses a hint, it is made clear that the question would not be counted towards their progress. Based on this prompt, the learners can decide if they want to continue using the hint.

Learner Navigation and pace (T3) is rated Exemplary: The product does an outstanding job of providing adequate and full control for a learner in her learning path. The learner can navigate at her own pace (T3), skip assessment questions if required, move backward and forward through the video units and across chapters and units.

Universal Design (T4) is rated Exemplary: Khan Academy India is one of the very few products that rate an exemplary in Universal design (T4). The product follows many WCAG recommendations, including providing subtitles for videos, visual content to supplement audio and helping users navigate and find content easily. The accessibility options available in the user-settings to hide visually dependent content, reduce motion and animations and remove color from videos is a huge positive.

4.3.2 Affordances that Facilitate Learning

<table>
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<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>
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</table>

Analytics for learners’ progress (T5) is rated Exemplary: The learner can view all the activities she has undertaken, her proficiency level and if it has changed, the ratio of correct to total problems in practice assessments, and the time spent on each activity. A separate tab to track assignments is also provided. On the other hand, the teacher can see the exact learning journey of each child (the topics done, questions attempted, the responses) and can also assign particular topics or questions to specific students.
Tools to support Problem-solving (T6) is rated Potential to Improve: No instances of tools to support topic-specific problems solving were observed. There is just a scribble pad that is provided to the learner when they solve questions, throughout. Learners can pick a color, and use it to do any scribble work in the blank space.

Meaningful Interactivity (T7) is rated Exemplary: Basic interactivity to submit the responses like radio buttons, multiple option select and input boxes are available and used appropriately depending on the questions.

Illustrative examples:

- For example, the input boxes to fill in the missing numbers in the skip counting are appropriate
- Dropdown or radio buttons to select among different possibilities in the comparison of 2 numbers. (greater than, less than or equal to.)

Content type – Technology alignment (T8) is rated Exemplary: For the visualizations present in the learning unit, the visualization type suitably maps to the content type.

Illustrative examples:

- Diagram if content type is fact: Proper images of blocks capture the fact about which number is greater. For example, comparing 53 and 35.

- Video if content type is process: The process of addition is very well captured using the explanation videos. For example, 2 separate rectangular boxes are shown with the objects in them, and then combined into one.
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.