# Pedagogical Quality Report

Mathletics

## About EdTech Impact

EdTech Impact provides an evidence-first marketplace that empowers educators and institutional leaders to make smarter buying decisions.

The platform brings together a diverse, and often siloed, community of EdTech users, EdTech providers, EdTech researchers and EdTech analysts to systematically assess the quality of education technology using a holistic assessment framework, global quality standards, and time-stamped certification programme.

Today, over 2,000 companies leverage the platform's data-driven insights to strengthen their product, showcase an independent and reliable evidence base, and gain access to a vibrant marketplace of over 400,000 in-market buyers.

EdTech Impact strikes a balance between robust research and practical user insights, giving a voice to all stakeholders, and an agile solution to building a sustainable evidence-first EdTech ecosystem within a variety of contexts.


*The EdTech Impact Quality Framework is supported and governed by a consortium of research partners and expert organisations*

# Evaluation Process

**Access**
Our experts in UX and pedagogy are provided with full access of the product and its relevant materials, such as lesson plans or teacher's guide.

**EAF Evaluation Software**
While our experts use the product, they analyse its pedagogical approach and usability with our evaluation software.

**Outcome**
The evaluation report is presented to the client during a video call. If the product meets the standards, it will be granted the Quality Pedagogy certificate.

# Mathletics

Mathletics is an interactive math platform for ages 5-16

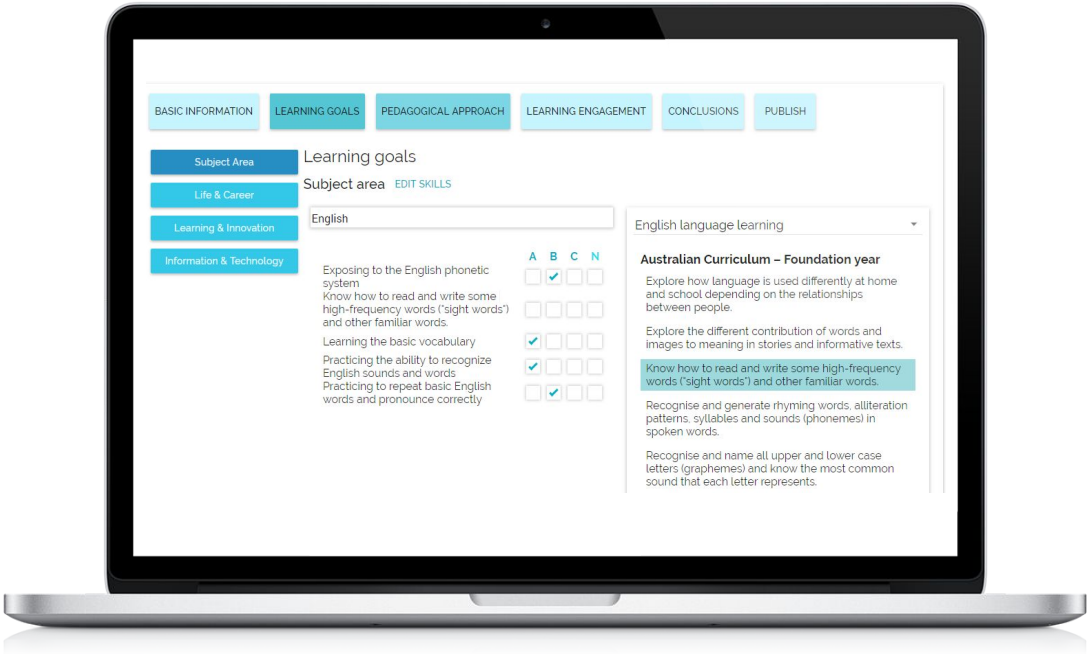
# Learning Goals

# Matching the learning goals

The evaluator maps the product's learning goals against a specific curriculum/curricula.

All supported skills are listed and classified as *didactic (A-level)* or *facilitative (B-level)* goals.

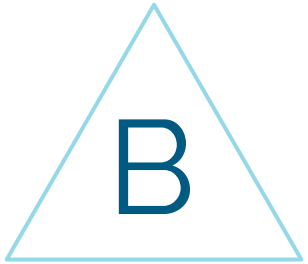
*The EAF Tool has several hundred skills listed from various national curricula on a number of subjects (Languages, STEM, Arts, etc.)*



# Explanations


## Primary Goals

**Content is instructional and didactic:** These skills are constantly learnt in the core usage.




## Secondary Goals

**Content is partly instructional, partly facilitative:** These skills are learnt in the core usage, but are not essentially and constantly stressed.


## Non-Existing

**Content does not exist:** Learning these skills would be a meaningful part of the use of the solution but they are missing.

# Subject Area

Mathematics

# Subject area - Primary skills

**UK National Curriculum - Mathematics - Number - number place and value - Key Stage 2, Year 4**

1. Count in multiples of 6, 7, 9, 25 and 1000. A
2. Find 1000 more or less than a given number. A
3. Count backwards through zero to include negative numbers. A
4. Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones). A
5. Order and compare numbers beyond 1000. A
6. Identify, represent and estimate numbers using different representations. A

# Subject area - Primary skills

**UK National Curriculum - Mathematics - Number - number place and value - Key Stage 2, Year 4**

**7.** Round any number to the nearest 10, 100 or 1000. A

**8.** Solve number and practical problems that involve all of the above and with increasingly large positive numbers. A

**9.** Read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value. A

# Subject area - Primary skills

## UK National Curriculum - Mathematics - Number - addition and subtraction - Key Stage 2, Year 4

1. Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate. A
2. Estimate and use inverse operations to check answers to a calculation. A
3. Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why. A

# Subject area - Primary skills

**UK National Curriculum - Mathematics - Number - multiplication and division -**

**Key Stage 2, Year 4**

1. Recall multiplication and division facts for multiplication tables up to 12 × 12. A
2. Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers. A
3. Recognise and use factor pairs and commutativity in mental calculations. A
4. Multiply two-digit and three-digit numbers by a one-digit number using formal written layout. A
5. Solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one A

# Subject area - Primary skills

## UK National Curriculum - Mathematics - Number - fractions - Key Stage 2, Year 4

1. Recognise and show, using diagrams, families of common equivalent fractions. A
2. Count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten. A
3. Solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number. A
4. Add and subtract fractions with the same denominator. A
5. Recognise and write decimal equivalents of any number of tenths or hundredths. A

# Subject area - Primary skills

## UK National Curriculum - Mathematics - Number - fractions - Key Stage 2, Year 4

6. Recognise and write decimal equivalents to 1/4, 1/2, 3/4. A

7. Find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths. A

8. Round decimals with one decimal place to the nearest whole number. A

9. Compare numbers with the same number of decimal places up to two decimal places. A

10. Solve simple measure and money problems involving fractions and decimals to two decimal places. A

# Subject area - Primary skills

## UK National Curriculum - Mathematics - Measurement- Key Stage 2, Year 4

1. Convert between different units of measure [for example, kilometre to metre; hour to minute]. A
2. Measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres. A
3. Find the area of rectilinear shapes by counting squares. A
4. Estimate, compare and calculate different measures, including money in pounds and pence. A
5. Read, write and convert time between analogue and digital 12- and 24-hour clocks. A
6. Solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days. A

# Subject area - Primary skills

## UK National Curriculum - Mathematics - Geometry - Properties of shapes - Key Stage 2, Year 4

1. Compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes. A
2. Identify acute and obtuse angles and compare and order angles up to two right angles by size. A
3. Identify lines of symmetry in 2-D shapes presented in different orientations. A
4. Complete a simple symmetric figure with respect to a specific line of symmetry. A

# Subject area - Primary skills

## UK National Curriculum - Mathematics - Geometry - Position and direction- Key Stage 2, Year 4

1. Describe positions on a 2-D grid as coordinates in the first quadrant. A
2. Describe movements between positions as translations of a given unit to the left/right and up/down. A
3. Plot specified points and draw sides to complete a given polygon. A

# Subject area - Primary skills

**UK National Curriculum - Mathematics - Statistics and Probability - Key Stage 2, Year 4**

1. Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time 

2. Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphics 

# Life & Career

Wellbeing and Sustainable Development / Cross-Disciplinary Thinking / Cross Cultural Skills and Global Awareness / Work life skills and Entrepreneurship / Social Skills /

# ICT Literacy - Primary Skills

## Wellbeing and Sustainable Development

1. Encouraging the growth of positive self-image ..... A
2. Learning to face failures and disappointments ..... B
3. Practicing to recognize and express feelings ..... B
4. ..... A
5. .....

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# ICT Literacy - Primary Skills

## Wellbeing and Sustainable Development

1. Encouraging the growth of positive self-image ..... A
2. Learning to face failures and disappointments ..... B
3. Practicing to recognize and express feelings ..... B

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# Life & Career skills

## Cross-Disciplinary Thinking

1. Learning to build information on top of previously learned . . . . . A
2. Practicing to notice links between subjects learned . . . . . A
3. Practicing to notice causal connections . . . . . B
4. Learning to combine information to find new innovations . . . . . B
5. Encouraging to build new information and visions . . . . . B

# Life & Career Skills

## Cross Cultural Skills and Global Awareness

1. Learning to face respectfully people and follow the good manners B
2. Encouraging to build new information and visions B
3. Learning to understand people, surroundings and phenomenons around us N

# Life & Career Skills

## Social Skills

**1.** Enabling the growth of positive self-image . . . . . B

# Life & Career Skills

## Work life skills and Entrepreneurship

**1.** Learning to plan and organize work processes B

# Information & Technology

Media and Information Literacy / Multimodal Literacy / ICT Literacy /

# ICT Literacy - Primary Skills

## Multimodal Literacy

1. Understanding and interpreting of matrices and diagrams . . . . . A
2. Practicing logical reasoning to understand and interpret information in different forms . . . . . B

# ICT Literacy - Primary Skills

## Media and Information Literacy

1. Practicing to use information independently and interactively . . . . . A
2. Practicing to find, evaluate and share information . . . . . B

# ICT Literacy - Primary Skills

## ICT Literacy

**1.** Using technology for interaction and collaboration . . . . . A

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# ICT Literacy - Primary Skills

## ICT Literacy

7. Using technology as a part of explorative process . . . . . A
8. Understanding and practicing safe and responsible uses of technology . . . . . A
9. Using technology to express one's emotions and experiences . . . . . B
10. Using technology for interaction and collaboration . . . . . B
11. Using technology for interaction and collaboration (also internationally) . . . . . B

# Learning & Innovation

Creativity and Innovation / Learning to Learn / Critical Thinking & Problem Solving / Cognitive and thinking skills /

# Learning & Innovation

## Cognitive and thinking skills

**1.** Practicing memorizing skills . . . . . A

# Learning & Innovation

## Learning to Learn

1. Practicing persistent working ..... A

2. Practicing to evaluate one's own learning ..... B

# Life & Career Skills

## Critical Thinking & Problem Solving

**1.** Developing problem solving skills . . . . . A

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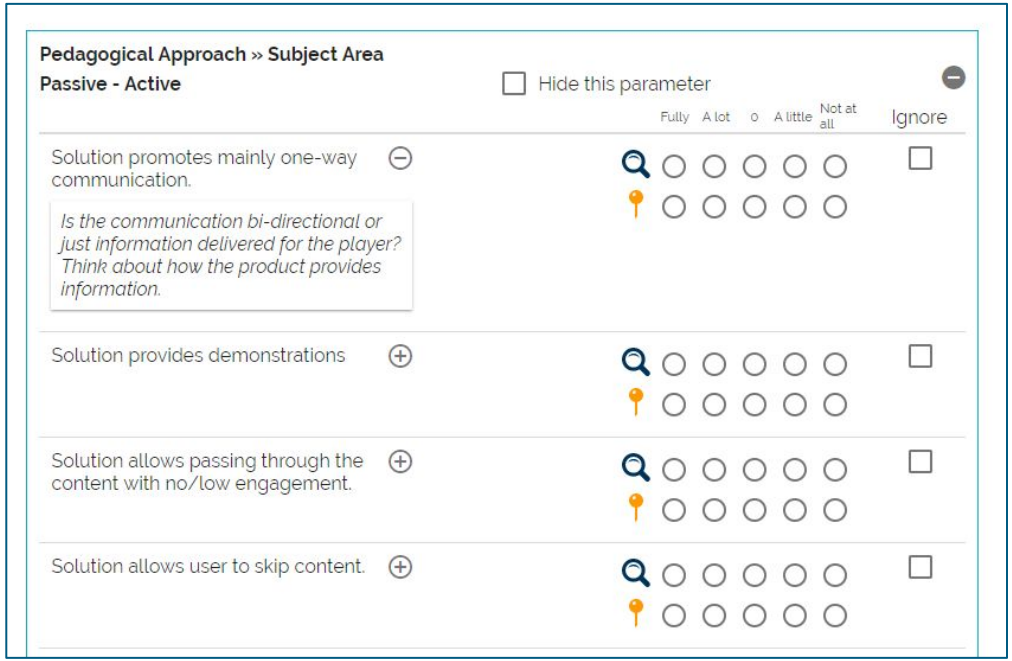
# Pedagogical Approach

# Assessing the pedagogy




The evaluator answers a set of statements to assess the product's pedagogical approach.

The answers to the questions result in a numeric score on each parameter. The parameters are shown as contrary pair sliders.

The assessment is divided into four parameters:

**1. Passive – Active**
**2. Rehearse – Construct**
**3. Linear – Non-linear**
**4. Individual – Collaborative**

*The set of questions and definitions have been developed by researchers at the Helsinki University.*

# Criterion definition

**Passive** / **Active**

Passive: Learner in an observant role

Active: Learning by doing

**Individual** / **Collaborative**

Individual: Learner is learning by themselves

Collaborative: Requires collaboration with other learners

**Linear** / **Non-linear**

Linear: Proceeding linearly through repetitive tasks

Non-linear: Supports free exploration and finding solutions in variable ways.

**Rehearse** / **Construct**

Rehearse: Practicing what was previously learned

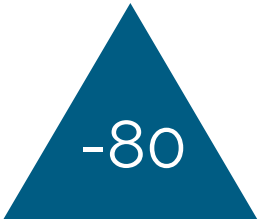
Construct: Learning and constructing new concepts

# How to read the contrary pair analysis


**The magnifier** tells where the product currently positions the learner, in the pedagogical dimension.

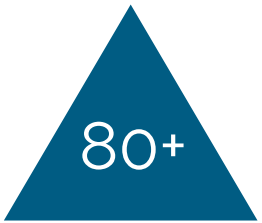
**The pin** shows where the product should position the learner according to the evaluators.

# Rating Scale



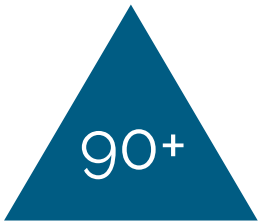

### Fair

**There are crucial issues with the pedagogical approach.** Improvements are necessary in order to achieve high educational quality.




### Good

**The pedagogical approach is valid.** However, many improvements could be made to improve this aspect of the learning experience.




### Excellent

**The pedagogical approach is innovative and meaningful.** Some improvements could be made to improve this aspect of the learning experience.

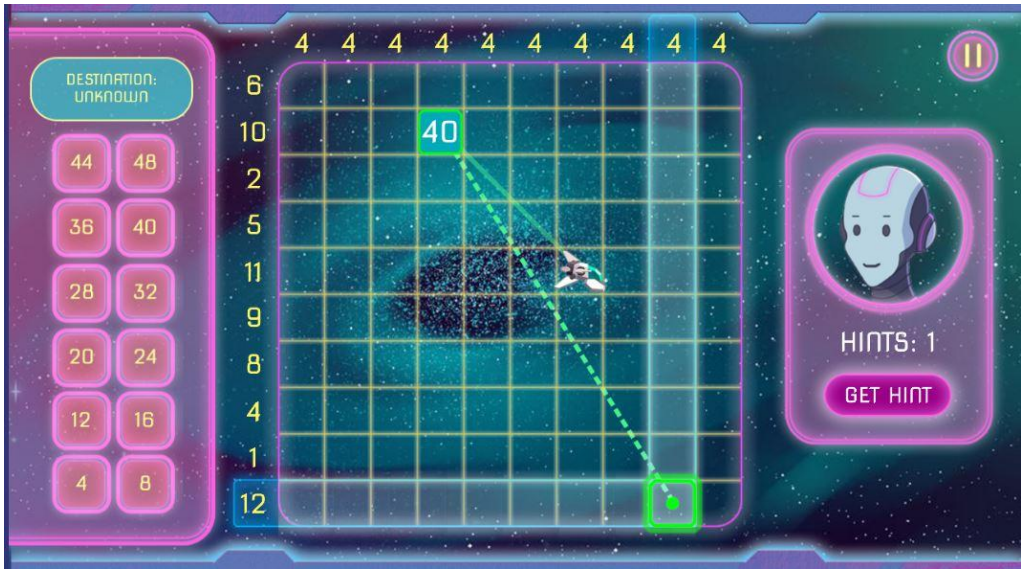

### Outstanding

**The product is exceptionally innovative and provides high educational value.** The content is delivered in an extremely meaningful and engaging way.

# Passive - Active: 90/100 = Excellent


**Strengths:** The solution gives learners the flexibility to choose between different types of exercises that collectively cover the area of skill/topic introduction, practice, application of problem-solving/reasoning, and assessment. Learners can also consult with optional resources to further enhance their understanding, practice skills in in the context of games for something more engaging.

The solution offers a range of features that are highly beneficial for primary school students learning math. By rewarding users after they make progress, the solution reinforces a sense of achievement and motivates students to keep



# Passive - Active: 90/100 = Excellent

Passive — 90 — Active

**Development areas:**

The solution does not appear to offer much feedback or consolidate details of learner performance directly to the learner.
This feels like a missed opportunity to provide data that learners could use to self-identify their individual strengths and weaknesses and make more informed decisions for learning goals and next steps.

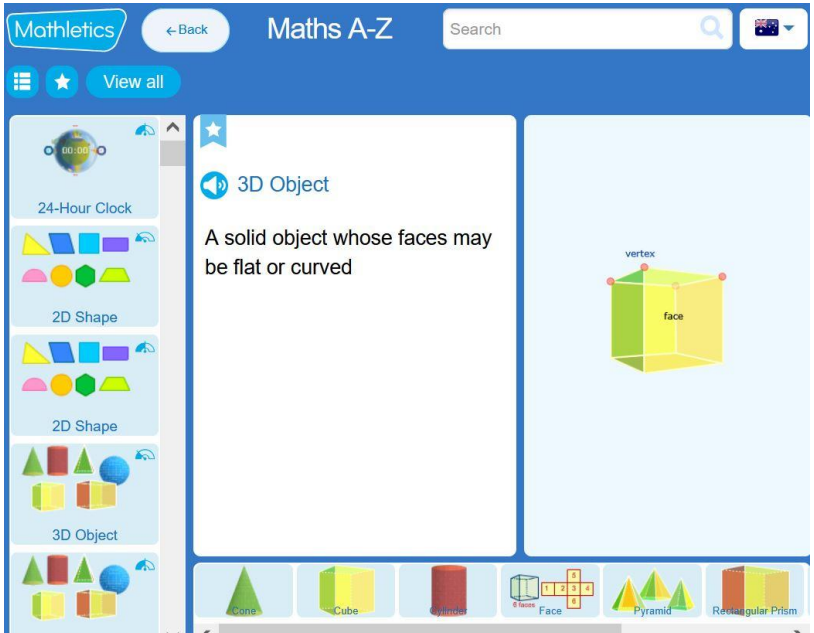
At one point, the instructions asked to "draw a shape," but it was actually about placing points, not drawing. This was a bit confusing. It would be clearer and more helpful for learners if they were asked to draw the shape, as it would aid in learning and remembering the concept better.

# Rehearse - Construct: 88/100 = Good

Rehearse 88 Construct

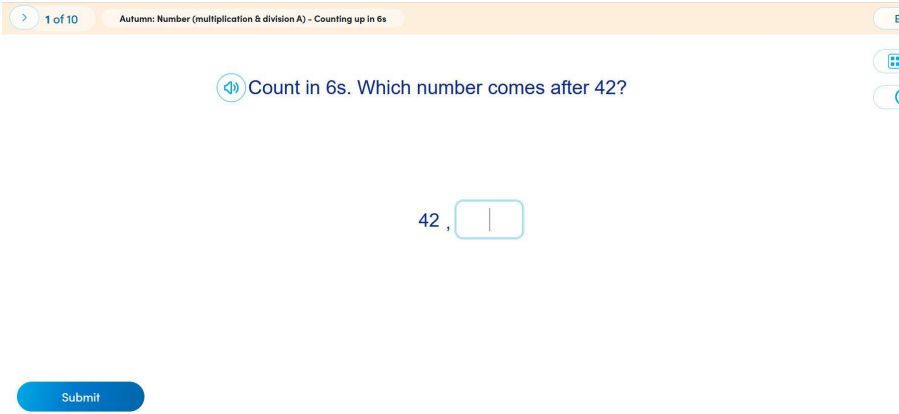
**Strengths:**

The solution helps users define their own learning goals and supports them in reflecting on their progress. It ensures that all users start from the same baseline level, making it fair for everyone. The information provided is tested until the user fully understands it. Success is measured by how well users can apply the knowledge they gain. Additionally, the solution assesses users' prior knowledge, which helps determine their starting point in the learning journey. The solution includes all the key elements of the UK math curriculum, ensuring it covers everything students need to learn.



# Rehearse - Construct: 88/100 = Good

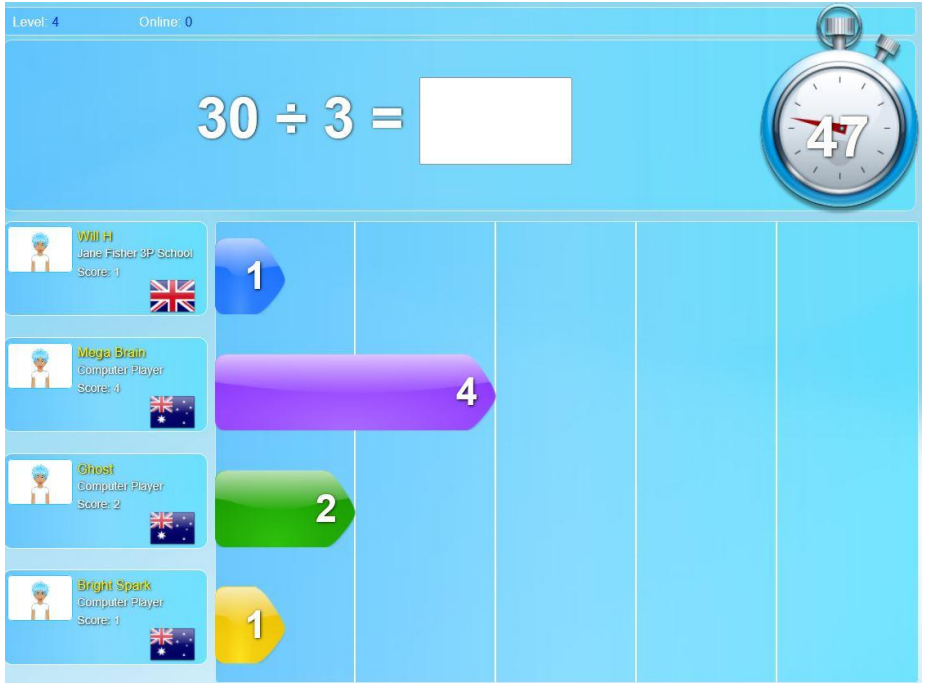

**Development areas:** At times, it would be helpful to have more demonstrations so learners can learn by watching. This is important for understanding. Replicating instructions is also crucial for learning, especially in math, where there are many steps in different operations. By repeating the steps, students can remember them better and perform operations correctly. Sometimes, this repetition is overlooked, but it's essential for mastering the material. There are a lot of multiple-choice exercises, which are simple to create and easy for students to complete. However, they might not help learners understand math deeply. In math, it's important to understand how operations work and why they are done, not just choose the right answer. Instead of only using multiple-choice questions, alternative exercises like solving problems step-by-step, matching



# Linear - Non-linear: 93/100 = Excellent

Linear — 93 — Non-linear

**Strengths: T**he solution adapts to each user's progress, allowing them to move at their own pace. For learning math, this is essential because math builds on itself. A clear path and unlimited practice help students master each step before moving on. This way, they can fully understand each concept, which is key to succeeding in more advanced math. The teacher can compare students using a large amount of data, which can sometimes be overwhelming. However, this allows the teacher to see all the students, track the exercises they've completed, assign new tasks, and monitor their progress.



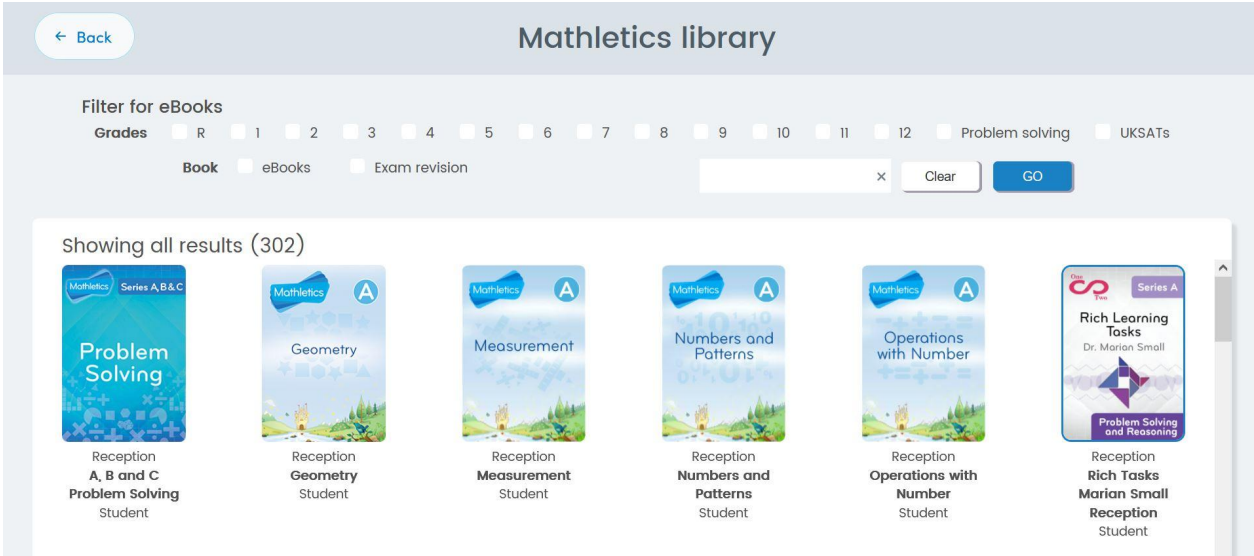
# Linear - Non-linear: 93/100 = Excellent

Linear — 93 — Non-linear

**Development areas:**

The solution could better promote the tools available to assist with learning, such as those in the Resources section. Some of the games, such as ‘Rainforest Maths’ are a bit lacklustre and don’t really offer a different experience from the standard activities.

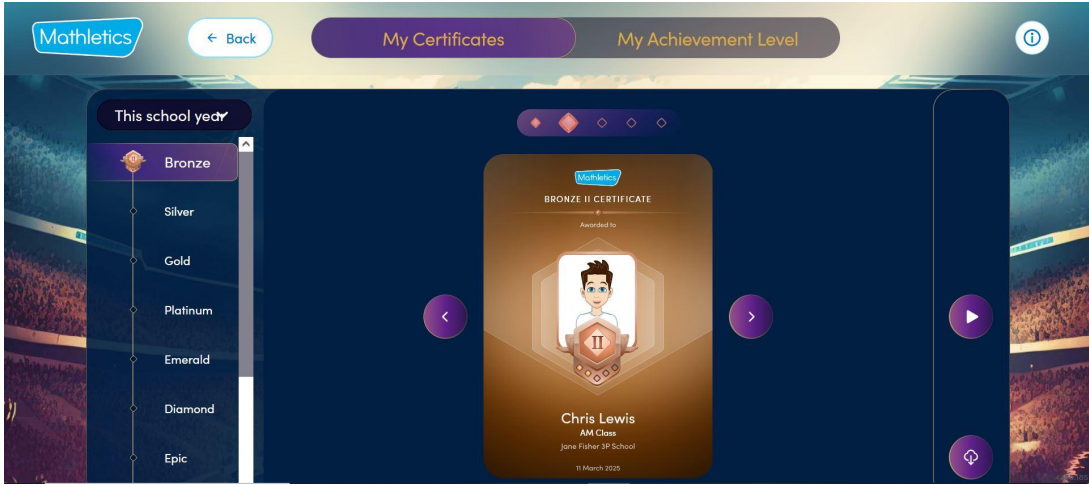
When the learner takes the placement test, it could be fun and helpful for them to see where they stand. Providing a scoreboard or visual tracker would let them see what they already know and what they need to work on to progress.



# Individual - Collaborative: 88/100 = Good

Individual — 88 — Collaborative

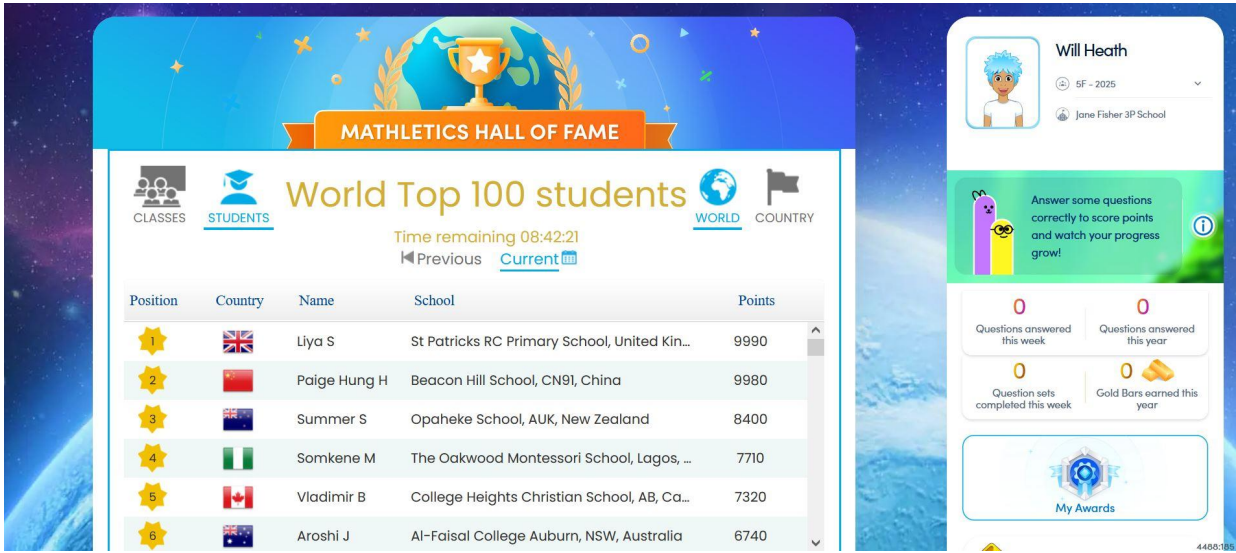
**Strengths:**
The solution lets the learner make their own decisions, which is important for learning math for several reasons, as it encourages independence,. promotes active learning and supports personalized learning.



# Individual - Collaborative: 88/100 = Good

Individual — 88 — Collaborative

**Development areas:**
The Challenges mode allows learners to directly message the teacher for assistance with any exercises in that mode that they have trouble with. Unfortunately, this feature doesn't seem to be available elsewhere in the solution, where it could also prove valuable for enabling the learner to get additional explanations where the provided resources are insufficient, or for the teacher to better understand the learner's specific problem areas.



# Learning Engagement

# The Six Aspects of Learning Engagement

**Autonomy**

*The user feels that their actions in the product are based on their own decisions, free of external pressure.*

**Competence**

*The user can feel capable and effective in their actions rather than incompetent or ineffective.*

**Relatedness**

*The user feels that in the product, there is meaningful contact with people who care about them rather than feeling lonely and neglected. Users can also feel connection with fictional characters and events in the product.*

**Respect**

*The user feels that they are considered as a capable and desired actor rather than one whose opinions and experiences are neglected.*

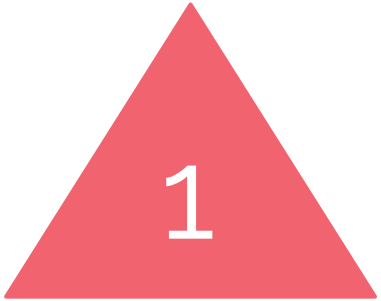
**Stimulation**

*Feeling that the product offers plenty of enjoyment and pleasure rather than a feeling of boredom and understimulation.*

**Safety**

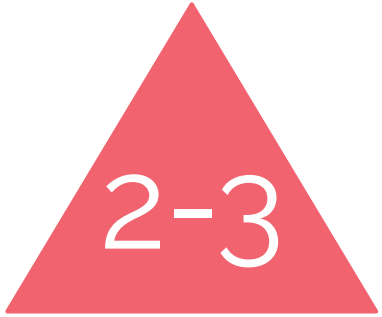
*Feeling that the product is a safe environment for having fun and trying out things rather than feeling uncertain of the consequences or being threatened by other users.*

# The Rating Scale




## Not Supported

**There are issues** with the learning engagement in this area.




## Supported

**The product considers** this aspect of learning engagement. Some improvements could be made in order to improve the support.


## Well supported

**There are several well executed features** which support this aspect of learning engagement.

# Autonomy Score: 3.5/5 = Supported

**The players' actions in the product are based on their own decisions rather than external pressure to choose a certain action.**

| Main strengths | Score |
|---|---|
| 1. It is easy to understand, what is the goal in using the product.. | 4.7 |
| 2. The product sets limitations for using it when and where I want to, and the limitations feel unnecessary or annoying. | 4.3 |

The content in the solution strikes a strong balance of concept explanation, practice, complex problem-solving, and assessment opportunities.

# Autonomy Score: 3.5/5 = Supported

**The players' actions in the product are based on their own decisions rather than external pressure to choose a certain action.**

| Main development areas | Score |
|---|---|
| 1. It is possible to use creativity and express yourself when using the product. | 2.3 |
| 2. It is possible to make choices, and the different choices have clearly different and meaningful outcomes. | 2.7 |

The solution allows learners a great deal of autonomy in determining their learning path, but could provide more feedback and guidance to help them do so.

# Competence Score: 4.5/5 = Well supported

**Feeling that you are very capable and effective in your actions rather than feeling incompetent or ineffective**

| Main strengths | Score |
|---|---|
| 1. The first time experience is encouraging and it is easy to learn to use the product. . . . . | 4.7 |
| 2. Progression on the product depends on succeeding on things relevant for learning. . . . . | 4.7 |
| 3. The product rewards the user in a meaningful way and according to the challenge. . . . . | 4.7 |

Learners can skip content that they find too easy and jump directly to the topics that best match their level. Wording for the exercises is usually clear and easy to understand.

# Competence Score: 4.5/5 = Well supported

**Feeling that you are very capable and effective in your actions rather than feeling incompetent or ineffective**

| Main development areas | Score |
|---|---|
| 1. Experienced and advanced users can find more challenge in the product. | 3.7 |

The user experience is sometimes unintuitive, as the solution features multiple modes of interaction that are not always explained.

# Relatedness Score: 3.6/5 = Supported

**The product supports meaningful contact with people who care about your actions rather than feeling that the contact is one-sided or meaningless. The user can feel connection with fictional characters and events in the product.**

| Main strengths | Score |
|---|---|
| 1. The visuals and characters in the product are suitable for targeted users. | 4.7 |
| 2. The product provides examples or motivation to learn the skill it tries to teach. | 4.7 |

The "Mathletics Live" feature brings an element of community to the experience. Learners can engage in friendly competition with real people and are less likely to feel that they are going through their learning journey alone.

# Relatedness Score: 3.6/5 = Supported

**The product supports meaningful contact with people who care about your actions rather than feeling that the contact is one-sided or meaningless. The user can feel connection with fictional characters and events in the product.**

| Main development areas | Score |
|---|---|
| 1. The product supports social interaction, such as multiplay or sharing of content with other people. | 1.7 |
| 2. The product supports communication with other people and there are good reasons to communicate | 2.0 |

The solution doesn't always feel cohesive, as the different elements all seem to follow a different theme or employ a vastly different interface

# Respect Score: 4.5/5 = Well supported

**Feeling that the product takes the user into account as a capable and desired actor rather than feeling that the user's opinions and experiences are neglected.**

| Main strengths | Score |
|---|---|
| 1. The product is suitable for both inexperienced and experienced users. Players can eg. skip tutorials or choose wanted difficulty levels | 4.7 |

The avatar creation tool is well adapted for learners of all backgrounds, and some of the elements in the solution feature multiple language options.

# Respect Score: 4.5/5 = Well supported

**Feeling that the product takes the user into account as a capable and desired actor rather than feeling that the user's opinions and experiences are neglected.**

| Main development areas | Score |
|---|---|
| 1. The product gives clear feedback on all your actions | 4.0 |

It would be ideal for the solution to provide detailed feedback on wrong answers, so the learner has a better idea of how to improve on the next try.

# Stimulation Score: 4.7/5 = Well supported

**Feeling that you get plenty of enjoyment and pleasure rather than feeling bored and unstimulated by the product.**

| Main strengths | Score |
|---|---|
| 1. The product's challenge level is optimal for the targeted users, or it can be chosen | 5.0 |
| 2. The product's graphics, sounds and other elements support the narrative and user experience in a meaningful way and are pleasant. | 4.7 |

The solution incorporates gamification very well; learners are rewarded for good performance in the exercises with points that can be used in the Meritopia game environment, resulting in an enjoyable loop.

# Stimulation Score: 4.7/5 = Well supported

**Feeling that you get plenty of enjoyment and pleasure rather than feeling bored and unstimulated by the product.**

| Main development areas | Score |
|---|---|
| 1. The product encourages exploring it further. | 4.3 |

Rather than playing games, some learners might prefer activities that highlight the practical, real-life value of the covered maths concepts.

# Safety Score: 3.8/5 = Supported

**Feeling that the product is a safe environment for having fun and trying out things rather than feeling uncertain of the consequences or being threatened by other users**

| Main strengths | Score |
|---|---|
| 1. The user cannot make irreversible errors. Points that lead to restarting the use or re-doing things without a considerable effort should not be possible | 4.7 |
| 2. The product doesn't include content or advertising which would be harmful for the targeted users | 4.7 |

The solution focuses on rewards for achievements and efforts, rather than punishment for errors. The progress made is constantly in view, in the form of charts indicating points scored, number of questions answered, etc. Learners can create a custom avatar instead of presenting their actual identities, ensuring they can participate safely in the competitive mode.

# Safety Score: 3.8/5 = Supported

**Feeling that the product is a safe environment for having fun and trying out things rather than feeling uncertain of the consequences or being threatened by other users**

| Main development areas | Score |
|---|---|
| 1. If the user shares content - their work, their comments or anything else - it is always clear, who has access to the shared content. | 2.5 |

The solution should provide more feedback for wrong answers.

# Results

# High Educational Quality Aspects

1. Mathletics is a comprehensive platform for primary school teachers and learners, offering engaging exercises, progress tracking, and personalized learning to strengthen math skills effectively.
2. The solution is highly engaging and allows for an impressive degree of autonomy, especially considering the rigidity of the subject it covers.

Pedagogical Approach 90 %

Learning Engagement 4.1


According to Pedagogical Quality evaluation, Codiplay represents high educational quality and is proven to promote learning efficiently.

# The EAF Method Background

# Quality Pedagogy

EdTech Impact conducts impact evaluations with the help of the EAF method based on global quality standard for learning solutions.

# Expert Evaluation and Rating

The analysis of how the product supports learning of different skills is done by using a contrary pair criterion. The evaluator uses contrary pairs to diagnose skill-specifically the pedagogical approach which the product represents. The diagnosis is done by using slider between contrary pairs, setting the slider in a position that describes the product's approach. Evaluator uses the same slider to describe the best possible approach and gives a rate (0-100) on how adequate approach the product has.

All diagnoses and ratings are done by two-three expert-evaluators separately. After all skills are diagnosed through the criterion, evaluators discuss and form a concluding diagnose of two separate evaluations.

The rating points out the strengths and development areas, mirroring them with the needs of education field and product development possibilities. After pointing out the development areas, the analysis gathers suggestions on how to improve the product.

# Outcomes

- Defining **what** and **how** the product teaches
- Analysis of features which **engage** the learners
- Pointing out the strengths and development areas
- Giving validation for building the marketing message

# Pedagogical Model and Learner Perception

In the first phase of the analysis evaluators are forming product related statements to define a variation of skill sets that the use of the product supports. The base of the statements is formed upon definitions of 21st century skills, Finnish pedagogics and existing research evidence related to the product. The reason for using the mentioned influencers is that they represent the needs of the education field globally.

In the second phase the same influencers are used to develop the criterion for evaluation how the product supports learning of different detected skills. Finnish new curriculum represents a learner perception based on most advanced understanding of efficient pedagogical approach and therefore it can set the highest quality standards for education tools.

# Pedagogical approach - Passive / Active

Regarding the role of the student, we characterize the learning solution as promoting learning that is situated somewhere on the scale between *passive* and *active*. As key components determining the characteristics of the solution on this scale, we use *accountability, behavioural engagement, and emotional engagement.*

| **Agency** | **Behavioural engagement** | **Emotional engagement** |
|---|---|---|
| *Autonomy* | *Interactivity* | *Activating motivation* |
| *Self-regulation* | *Engagement* | *Sustaining motivation* |
| *Intentionality* | *Scaffolding* | *Feed forward* |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# Pedagogical approach - Rehearse / Construct

Regarding the learning activities, we characterize the learning solution as promoting learning that is situated somewhere on the scale between rehearse and construct. As key components determining the characteristics of the solution on this scale, we use *sparking of interest*, *building of knowledge*, and *reflection of learned*.

| **Interest** | **Knowledge building** | **Reflection** |
|---|---|---|
| *Activating interest* | *Defining goals* | *Reflection* |
| *Mapping prior knowledge* | *Applying existing knowledge (adaptation/ assimilation)* | *Decision-making* |
| *Customisation* | *Knowledge creation* | *Difficulty optimisation* |


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# Pedagogical approach - Individual / Collaborative

Regarding the learning activities, we characterize the learning solution as promoting learning that is situated somewhere on the scale between individual and collaborative. As key components determining the characteristics of the solution on this scale, we use *interaction, responsibility* and *regulation*.

| **Interaction** | **Responsibility** | **Regulation** |
|---|---|---|
| *Interaction* | *Accountability* | *Self / co-regulation* |
| *Fostering collaboration* | *Peer support* | *Personal / shared learning goals* |
| *Content sharing* | *Information sharing* | *Independency / co-dependency* |


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# Pedagogical approach - Linear / Non-linear

Regarding the learning process, we characterize the learning solution as promoting learning that is situated somewhere on the scale between linear and non-linear. As key components determining the characteristics of the solution on this scale, we use *procession* and *predictability*.

| **Process** | **Predictability** |
|---|---|
| *User progression* | *Predictability of outcomes* |
| *UX optimisation* | *UX limitations* |

**Linear**  **Non-linear**

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# Assessing User Happiness

The user experience evaluation is conducted from the perspective of user happiness. The evaluation assesses how fun and engaging a product is to use, and it is suitable for entertainment games, learning games and utility apps.

The evaluation uses a list of heuristics which focus on the activities the users are able to do with the product and how these interactions make the users feel. It considers the general usability of the products but looks behind issues which are not essential for the experience. Therefore, this type of evaluation is also suitable for proof of concept state prototypes and ideas.

The evaluation report serves as a tool for the design and development team. It shows what the features that support the user happiness the best are and how they do it. It will also point out things that hinder the happiness and ways the experience could be improved.

**Sources**: The aspects of user happiness are adapted from Hassenzahl, Marc et all: Designing Moments of Meaning and Pleasure. Experience Design and Happiness. International Journal of Design Vol. 7 No. 3 2013

| **Autonomy** | *The user's actions in the product are based on their own decisions rather than external pressure to choose a certain action.* |
|---|---|
| 1. The user can create their own goals for the use of the product. | 4. The product sets limitations for use; when and where. And the limitations feel unnecessary or annoying. |
| 2. The product motivates the user as well | 5. It is possible to make choices, and the different choices have clearly different and meaningful outcomes. |
| 3. It is easy to understand the goal of using the product. | 6. It is possible to use creativity to express yourself when using the product. |

**Sources**: The heuristics are adapted from the following sources:
Korhonen, Hannu & M. I. Koivisto, Elina. (2006). Playability heuristics for mobile games.
Inostroza, Rodolfo et all (2012). Usability Heuristics for Touchscreen-based Mobile Devices.
Nielsen, Jacob. (1994a). Enhancing the explanatory power of usability heuristics.

| **Competence** | *Feeling that you are very capable and effective in your actions rather than feeling incompetent or ineffective* |
|---|---|
| 1. The product rewards the user in a meaningful way and according to the challenge. | 5. Progression on the product depends on succeeding on things relevant for learning. |
| 2. The product gives you enough information to use it efficiently. | 6. The first time experience is encouraging and it is easy to learn to use the product. |
| 3. Navigation in the product is easy and intuitive. | 7. It is possible to feel successful and proud of oneself when using the product. |
| 4. The challenges and tasks in the product feel optimal for the targeted users. | Experienced and advanced users can find more challenge in the product.. |

**Sources**: The heuristics are adapted from the following sources:
Korhonen, Hannu & M. I. Koivisto, Elina. (2006). Playability heuristics for mobile games.
Inostroza, Rodolfo et all (2012). Usability Heuristics for Touchscreen-based Mobile Devices.
Nielsen, Jacob. (1994a). Enhancing the explanatory power of usability heuristics.

| **Relatedness** | *In the product, there is meaningful contact with people who care about your actions rather than feeling that the contact is one-sided or meaningless. The user can feel connection with fictional characters and events in the product.* |
|---|---|
| 1. The story or fictional world present in the product motivates learning | 4. The product supports social interaction, such as multiplay or sharing of content with other people |
| 2. The product uses language which makes you feel welcome and cared for. | 5. The product provides examples or motivation to learn the skill it tries to teach. |
| 3. The visuals and characters in the product are suitable for targeted users. | 6. The product supports communication with other people and there are a number of good reasons to communicate |

**Sources**: The heuristics are adapted from the following sources:
Korhonen, Hannu & M. I. Koivisto, Elina. (2006). Playability heuristics for mobile games.
Inostroza, Rodolfo et all (2012). Usability Heuristics for Touchscreen-based Mobile Devices.
Nielsen, Jacob. (1994a). Enhancing the explanatory power of usability heuristics.

| **Respect** | *Feeling that you are very capable and effective in your actions rather than feeling incompetent or ineffective* |
|---|---|
| 1. The product gives clear feedback on all your actions | 4. The product is suitable for both inexperienced and experienced users. Players can, for example,. skip tutorials or choose their desired difficulty levels |
| 2. The product doesn't make assumptions on player's age, gender, race, or origin. | 5. The product doesn't have bugs which cause errors or crashing. |
| 3. The product doesn't include discriminative narrative or enforce unnecessary stereotypes. | |

**Sources**: The heuristics are adapted from the following sources:
Korhonen, Hannu & M. I. Koivisto, Elina. (2006). Playability heuristics for mobile games.
Inostroza, Rodolfo et all (2012). Usability Heuristics for Touchscreen-based Mobile Devices.
Nielsen, Jacob. (1994a). Enhancing the explanatory power of usability heuristics.

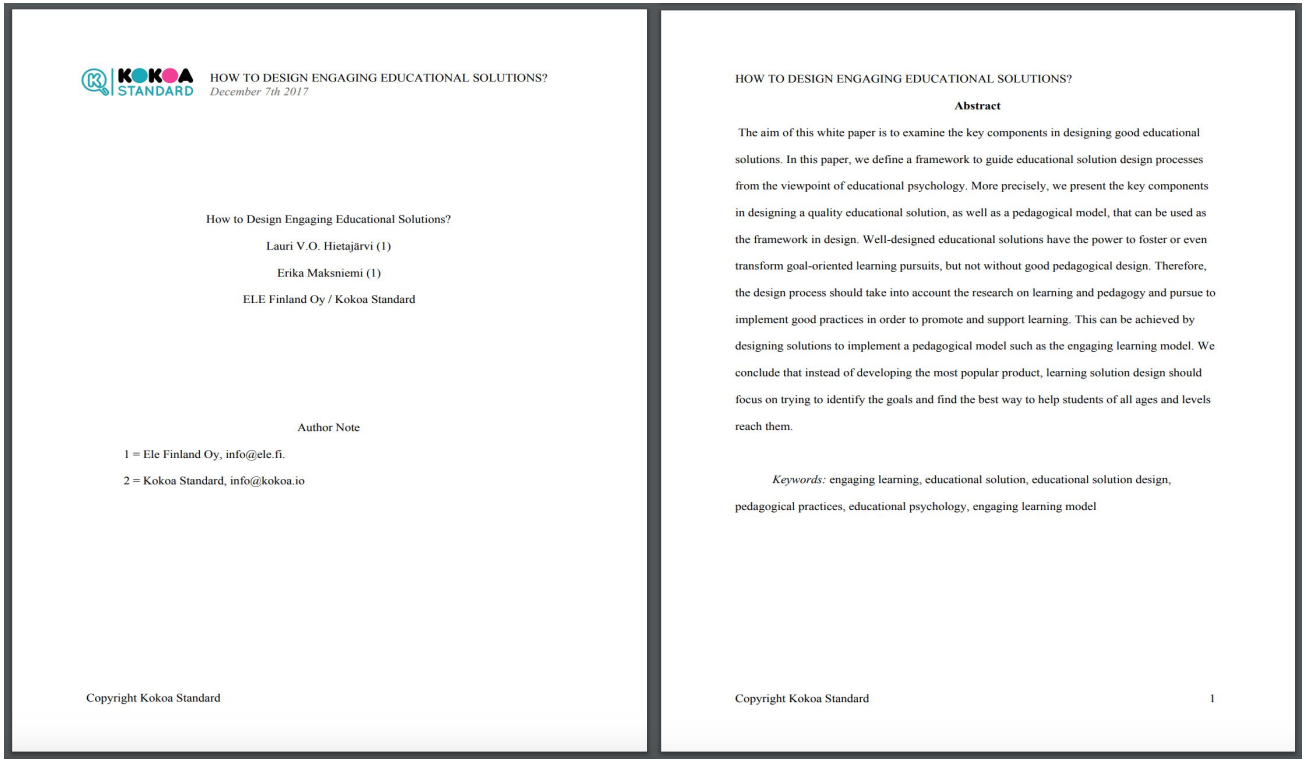
| **Stimulation** | *Feeling that you get plenty of enjoyment and pleasure rather than feeling bored and unstimulated by the product.* |
|---|---|
| 1. The product encourages further exploration | 4. The user doesn't need to unnecessarily repeat things which they have already learned |
| 2. The product's challenge level is optimal for the targeted users, or it can be chosen | 5. The product's graphics, sounds, and other elements support the narrative and user experience in a meaningful way and are pleasant. |

**Sources**: The heuristics are adapted from the following sources:
Korhonen, Hannu & M. I. Koivisto, Elina. (2006). Playability heuristics for mobile games.
Inostroza, Rodolfo et all (2012). Usability Heuristics for Touchscreen-based Mobile Devices.
Nielsen, Jacob. (1994a). Enhancing the explanatory power of usability heuristics.

| **Safety** | *Feeling that the product is a safe environment for having fun and trying out things rather than feeling uncertain of the consequences or being threatened by other users.* |
|---|---|
| 1. Making errors is beneficial. Every time you make an error, you learn something from it. | 4. The user does not lose any hard-won rewards or results if they do something wrong. |
| 2. There is a way to report and possibly block misbehaving users. | 5. If the user shares content - their work, their comments, or anything else - it is always clear who has access to the shared content. |
| 3. The product doesn't include content or advertising which would be harmful to the targeted users. | 6. The user cannot make irreversible errors. Points that lead to restarting the product or re-doing things without a considerable effort should not be possible. |

**Sources**: The heuristics are adapted from the following sources:
Korhonen, Hannu & M. I. Koivisto, Elina. (2006). Playability heuristics for mobile games.
Inostroza, Rodolfo et all (2012). Usability Heuristics for Touchscreen-based Mobile Devices.
Nielsen, Jacob. (1994a). Enhancing the explanatory power of usability heuristics.

The white paper article describes the theoretical background of the evaluation.



KOKOA STANDARD

HOW TO DESIGN ENGAGING EDUCATIONAL SOLUTIONS?

*December 7th 2017*

How to Design Engaging Educational Solutions?

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**Abstract**

The aim of this white paper is to examine the key components in designing good educational solutions. In this paper, we define a framework to guide educational solution design processes from the viewpoint of educational psychology. More precisely, we present the key components in designing a quality educational solution, as well as a pedagogical model, that can be used as the framework in design. Well-designed educational solutions have the power to foster or even transform goal-oriented learning pursuits, but not without good pedagogical design. Therefore, the design process should take into account the research on learning and pedagogy and pursue to implement good practices in order to promote and support learning. This can be achieved by designing solutions to implement a pedagogical model such as the engaging learning model. We conclude that instead of developing the most popular product, learning solution design should focus on trying to identify the goals and find the best way to help students of all ages and levels reach them.

*Keywords:* engaging learning, educational solution, educational solution design, pedagogical practices, educational psychology, engaging learning model


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