Renewal

edtech impact

Pedagogical Quality Report

Strawbees Robotic inventions & School Kit

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

Strawbees School Kit & Robotic Inventions

Strawbees®

Strawbees is a construction kit for executing innovation projects in classroom. Robotic Inventions Kit allows integrating constructions with Micro:Bit

The Main Findings in re-evaluation

1. High quality of product is still present
2. Strawbees offers a meaningful context to learn Science and build innovative experimentations.
3. The lesson plans are well drafted and structured.
4. The activities have maintained excellent quality.
5. Video instructions and curriculum integration have been implemented to a very high standard

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

Evaluation

Education Alliance Finland

The Education Alliance Finland Evaluation Process

All EAF certified products can be found on www.educationalliancefinland.com

Strawbees School Kit & Robotic Inventions

Strawbees is a construction kit for executing innovation projects in classroom. Robotic Inventions Kit allows integrating constructions with Micro:Bit

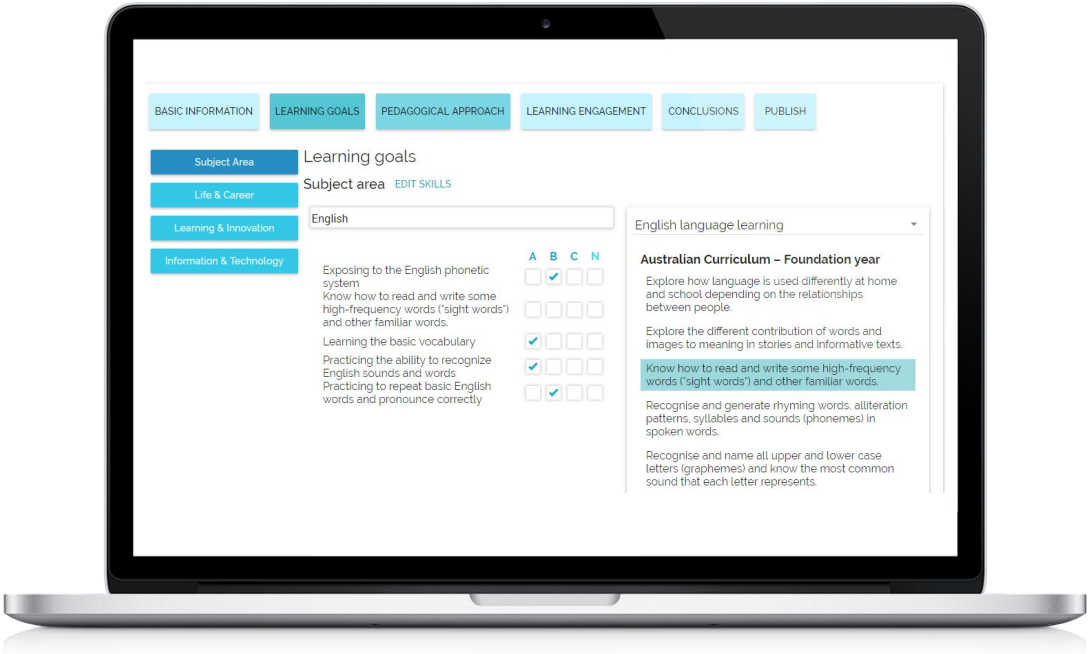
Learning Goals

Matching the learning goals

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

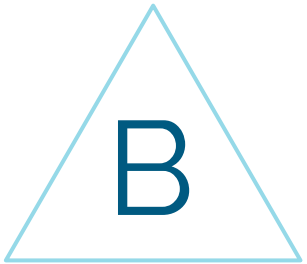
All supported skills are listed and classified as *didactic (A-level)* or *facilitative (B-level)* goals.

The EAF Evaluation Tool has several hundred skills listed from various national curriculums on several subjects (Languages, STEM, Arts etc.)



Primary Goals

Content is instructional and didactic: Learning of these skills is constantly present in the core usage.



Secondary Goals

Content is partly instructional, partly facilitative: Learning of these skills is present in the core usage, but 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 - Strawbees School Kit

STEM

Subject area - Primary skills

Fifth Grade - Next Generation Science Standards

- 3-5.Engineering Design

1. 3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. . . . . A
2. 3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. . . . . A
3. 3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. . . . A

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Subject area - Primary skills

Middle School Engineering Design - Next Generation Science Standards - MS.Engineering Design

1. MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on — A
2. MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. — A
3. MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to — B
4. MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. — B

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Subject area - Primary skills

Fourth Grade - Next Generation Science Standards - 4.Energy

1. 4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object. A

Middle School Physical Science - Next Generation Science Standards - MS.Energy

1. MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. A
2. MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. A
3. MS-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. A

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Subject area - Primary skills

Middle School Physical Science - Next Generation Science Standards - MS.Forces and Interactions

1. MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. A
2. MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. A

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Subject area - Primary skills

Fifth Grade - Next Generation Science Standards - 5.Space Systems: Stars and the Solar System

1. 5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down. A

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Subject Area - Robotic Inventions

Robotics and programming, Science

Subject area - Primary skills

Second Grade - Next Generation Science Standards - K-2.Engineering Design

1. K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs. N
2. K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. N
3. K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. N

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Subject area - Primary skills

Fifth Grade - Next Generation Science Standards

- 3-5.Engineering Design

1. 3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. . . . A
2. 3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. . . . . A
3. 3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. . . . . A

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Subject area - Primary skills

Middle School Engineering Design - Next Generation Science Standards

- MS.Engineering Design

1. MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. A
2. MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on A
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A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Subject area - Primary skills

Fourth Grade - Next Generation Science Standards - 4.Earth's Systems: Processes that Shape the Earth

1. 4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. A

Fifth Grade - Next Generation Science Standards - 5.Earth's Systems

1. 5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. A

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Subject area - Primary skills

Third Grade - Next Generation Science Standards - 3.Weather and Climate

1. 3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. A

Middle School Earth and Space Sciences - Next Generation Science Standards - MS.History of Earth

1. MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. A

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Subject area - Primary skills

High School Earth and Space Sciences - Next Generation Science Standards - HS.Human Sustainability

1. HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. A
2. HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. A

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Life & Career

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

Life & Career skills

Work life skills and Entrepreneurship

1. Encouraging positive attitude towards working life ..... A
2. Practicing time management ..... A
3. Learning to plan and organize work processes ..... A
4. Practicing decision making ..... A
5. Practicing versatile ways of working ..... A
6. Connecting subjects learned at school to skills needed at working life ..... A
7. Realizing the connection between subjects learned in free time and their impact to skills needed at worklife ..... A

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Life & Career skills

Social Skills

1. Practicing to work with others — B
2. Learning to listen other people's opinions — B
3. Learning decision-making, influencing and accountability — A
4. Enabling the growth of positive self-image — A
5. Practicing to argument clearly own opinions and reasonings — B
6. Practicing to give, get and reflect feedback — N

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Life & Career skills

Cross Cultural Skills and Global Awareness

1. Learning to understand people, surroundings and phenomenons around us . . . . . A
2. Encouraging to build new information and visions . . . . . A

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Life & Career skills

Cross-Disciplinary Thinking

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

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Life & Career skills

Wellbeing and Sustainable Development

1. Learning to face failures and disappointments . . . . . A
2. Encouraging the growth of positive self-image . . . . . A
3. Recognizing habits that are good for sustainable living . . . . . B
4. Supporting the growth of environmental awareness . . . . . B

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Learning & Innovation

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

Learning & Innovation

Learning to Learn

1. Practicing persistent working ..... A
2. Practicing to find ways of working that are best for oneself ..... A
3. Practicing to take responsibility of one's own learning ..... A
4. Practicing to evaluate one's own learning ..... B
5. Learning to find the joy of learning and new challenges ..... A
6. Practicing to set one's own learning goals ..... B

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Learning & Innovation

Cognitive and thinking skills

1. Practicing memorizing skills . . . . . A
2. Practicing fine motor skills . . . . . A
3. Practicing categorization and classification . . . . . A
4. Practicing to observe spoken and written language . . . . . A
5. Practising visual recognition . . . . . A
6. Learning to notice causal connections . . . . . A

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Learning & Innovation

Creativity and Innovation

1. Practicing creative thinking . . . . . A
2. Practicing to improvise . . . . . A
3. Encouraging students to be innovative and express new ideas . . . . . A
4. Practicing to use imagination and to be innovative . . . . . A
5. Practicing to use imagination and to be innovative . . . . . A
6. Creating requirements for creative thinking . . . . . A
7. Practicing to use arts as a way to express . . . . . B

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Learning & Innovation

Critical Thinking & Problem Solving

1. Practicing strategic thinking . . . . . A
2. Developing problem solving skills . . . . . A
3. Learning to find solutions in social conflicts . . . . . A
4. Learning to recognise and evaluate arguments and their reasonings . . . . . A
5. Practicing to notice causal connections . . . . . A
6. Practicing to create questions and make justifiable arguments based on observations . . . . . A
7. Practicing to look things from different perspectives . . . . . A
8. Practicing to plan and execute studies, make observations and measurements . . . . . A

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

Information & Technology

Media and Information Literacy / ICT Literacy / Multimodal Literacy /

ICT Literacy - Primary skills

ICT Literacy

1. Using technology resources for problem solving . . . . . A
2. Understanding technological system operations through making . . . . . A
3. Using technology as a part of explorative and creative process . . . . . A
4. Using technological resources for finding and applying information . . . . . A
5. Practicing logical reasoning, algorithms and programming through making . . . . . A
6. Using technology as a part of explorative process . . . . . A
7. Using technology for interaction and collaboration (also internationally) . . . . . B
8. Using technology to express one's emotions and experiences . . . . . B
9. Building common knowledge of technological solutions and their meaning in everyday life . . . . . B

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

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
3. Learning to plan and design own written content and textual representations . . . . . B

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

ICT Literacy - Primary skills

Multimodal Literacy

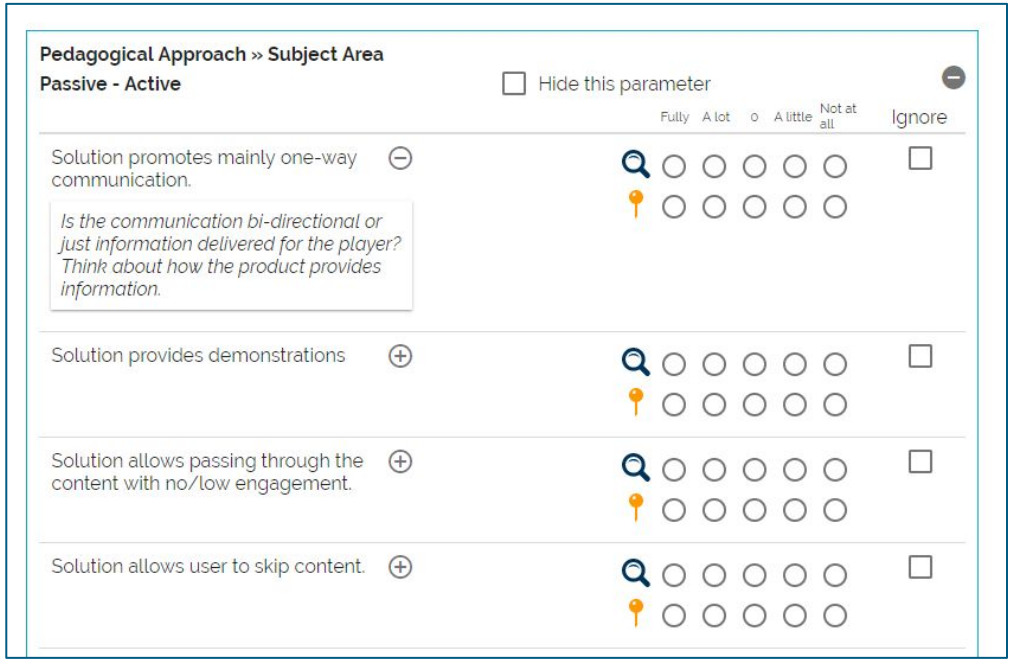
1. Practicing logical reasoning to understand and interpret information in different forms . . . . . A
2. Using technology as a part of explorative and creative process . . . . . A
3. Learning to acquire, modify and produce information in different forms . . . . . A
4. Practising to understand visual concepts and shapes and observe their qualities . . . . . A
5. Learning to understand and interpret diverse types of texts . . . . . A

A = Primary goal: content is didactic

B = Secondary goal: content is facilitative

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 to 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 from the Helsinki University.

Criterion definition

Passive / Active

Passive: Learner in an observant role

Active: Learning by doing

Individual / Collaborative

Individual: Learner is learning by her- or himself

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 earlierly learned

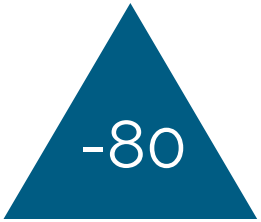
Construct: Learning and constructing new concepts

How to read the contrary pair analysis?

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

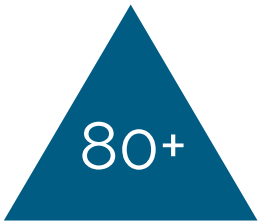
The pin shows where the product should position the learner according to the evaluators.

The Rating Scale



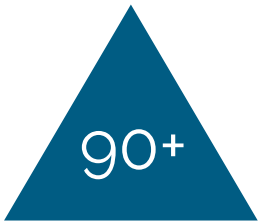
Fair

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 in order to improve this aspect of learning experience.



Excellent

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

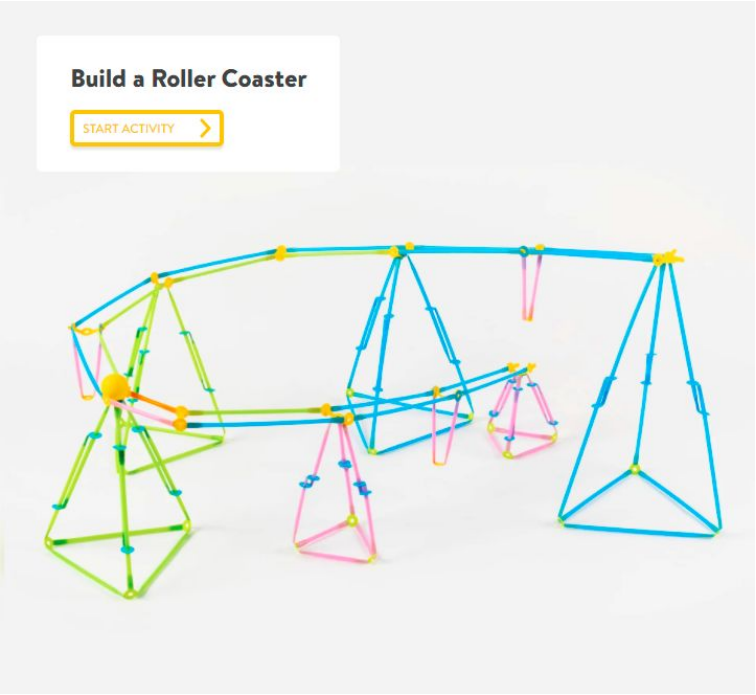
Outstanding

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

Passive - Active: 84/100 = Good

Passive — 84 — Active

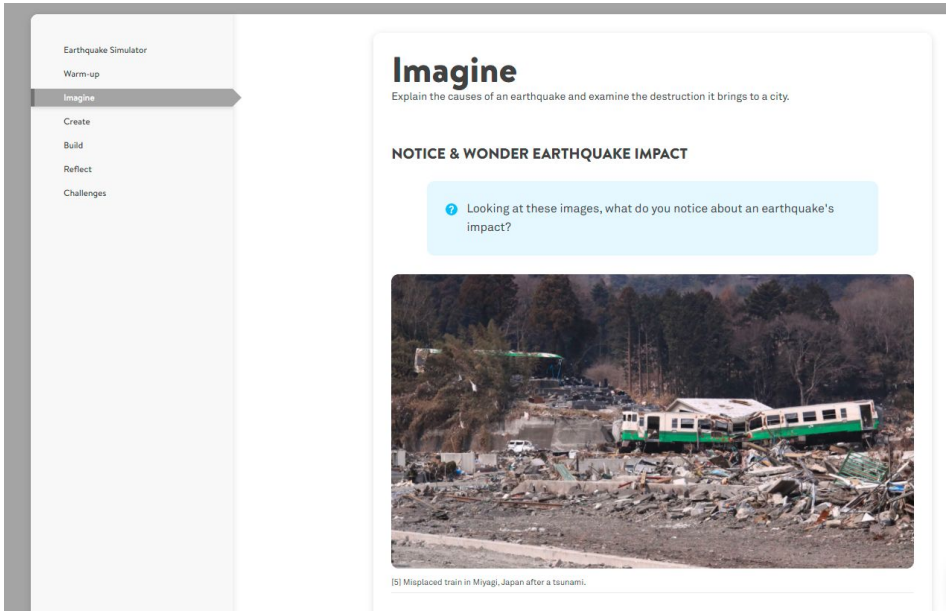
Strengths: In essence, Strawbees promotes learning by doing through projects. This is an active way of learning. The platform offers both theory and easy-to-follow instructions for building. The resources are rich in media and include text, images and videos. Challenges are offered so that the students can take the projects a bit further. The reflection part has good questions to process what has been done.



Passive - Active: 84/100 = Good

Passive — 84 — Active

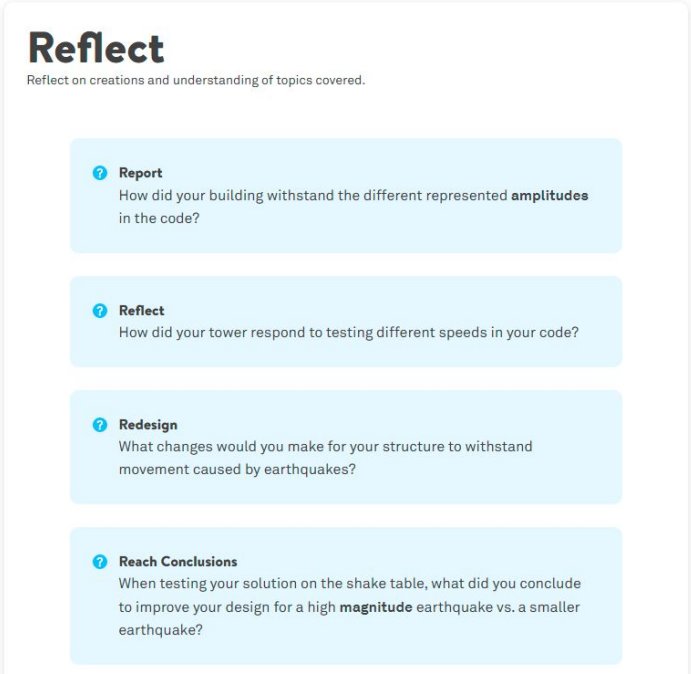
Development areas: Strawbees platform is mostly done for delivering information related to projects, not as much to work as LMS or assessment tool, so the students are not required to fill in information. Therefore it allows passing through the content with no engagement, if the student doesn't feel motivated to read the content. Could there be e.g. multiple-choice questions inside the theory to check the student's understanding? Could the reflect part include text boxes / data tables e.g. so that the student would need to write something? This would make the material more engaging even if the answers would not be saved.



Rehearse - Construct: 83/100 = Good

Rehearse 83 Construct

Strengths: When learning with Strawbees, prior skills or knowledge needs to be used in conjunction with new. The solution offers a great way to deepen previous knowledge in a practical way or to learn a new topic through experimenting. The lessons are structured well. They progress from warm-up to doing and then to further challenges, and the learning goals are visible and easy to understand. Strawbees Innovation cards are a great addition to the product and inspire further learning.



Reflect

Reflect on creations and understanding of topics covered.

Report
How did your building withstand the different represented **amplitudes** in the code?

Reflect
How did your tower respond to testing different speeds in your code?

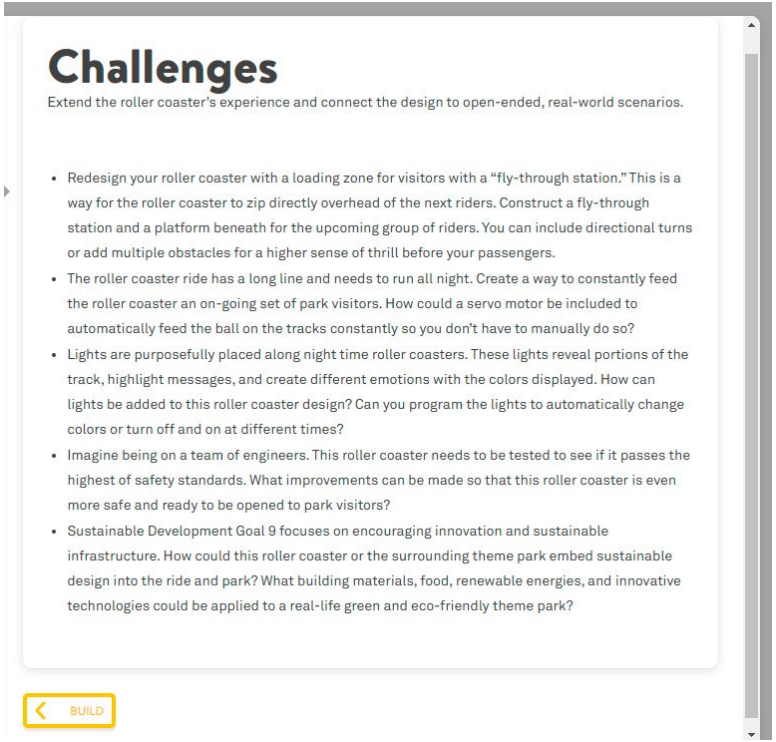
Redesign
What changes would you make for your structure to withstand movement caused by earthquakes?

Reach Conclusions
When testing your solution on the shake table, what did you conclude to improve your design for a high **magnitude** earthquake vs. a smaller earthquake?

Rehearse - Construct: 83/100 = Good

Rehearse 83 Construct

Development areas: The extra challenges are great but they could be emphasized more - now everyone is just doing what the instructions tell the students to do and the more open-ended challenges feel like extra work. Could the instructions be just an intro and then the site would recommend the student to make a question and hypothesis and take the project in a direction that could help solve that question. The MicroBit coding parts were just about copying the code - could it include also assignments to alter or create code? In the future, there could be a more clearer learning path, both in relation to science topics and programming. The earth-quake activity assumed quite a lot of MicroBit knowledge (variables etc), but this was not really communicated in the requirements. Could there be more "starter activities" where a student can learn about the microbit?



Challenges

Extend the roller coaster's experience and connect the design to open-ended, real-world scenarios.

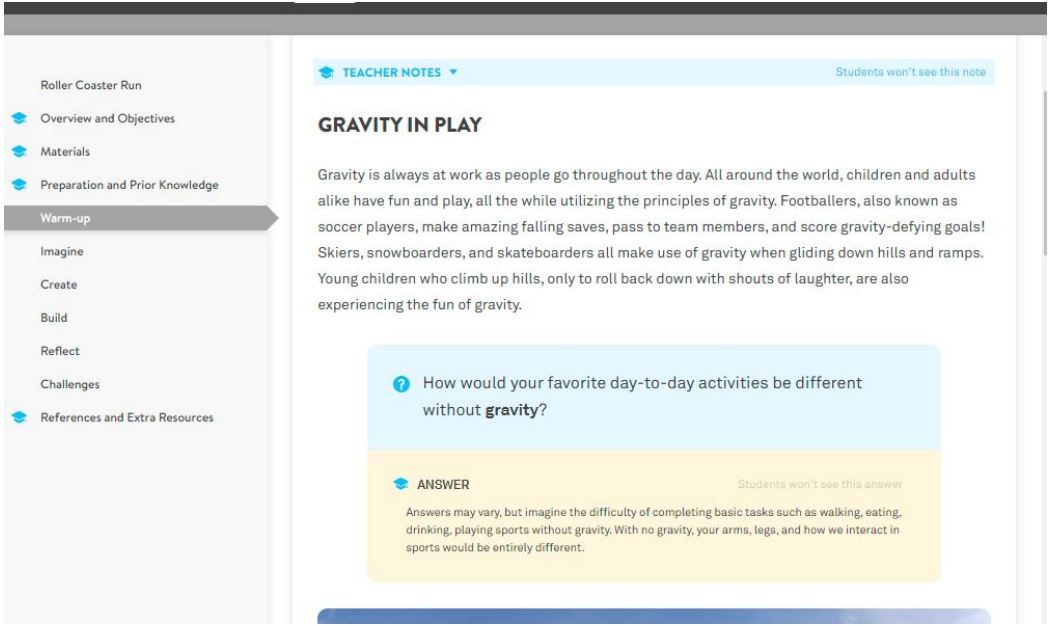
- Redesign your roller coaster with a loading zone for visitors with a "fly-through station." This is a way for the roller coaster to zip directly overhead of the next riders. Construct a fly-through station and a platform beneath for the upcoming group of riders. You can include directional turns or add multiple obstacles for a higher sense of thrill before your passengers.
- The roller coaster ride has a long line and needs to run all night. Create a way to constantly feed the roller coaster an on-going set of park visitors. How could a servo motor be included to automatically feed the ball on the tracks constantly so you don't have to manually do so?
- Lights are purposefully placed along night time roller coasters. These lights reveal portions of the track, highlight messages, and create different emotions with the colors displayed. How can lights be added to this roller coaster design? Can you program the lights to automatically change colors or turn off and on at different times?
- Imagine being on a team of engineers. This roller coaster needs to be tested to see if it passes the highest of safety standards. What improvements can be made so that this roller coaster is even more safe and ready to be opened to park visitors?
- Sustainable Development Goal 9 focuses on encouraging innovation and sustainable infrastructure. How could this roller coaster or the surrounding theme park embed sustainable design into the ride and park? What building materials, food, renewable energies, and innovative technologies could be applied to a real-life green and eco-friendly theme park?

BUILD

Linear - Non-linear: 91/100 = Excellent

Linear — 91 — Non-linear

Strengths: Strawbees School Kit and Robotic Innovations can offer infinite learning outcomes since the building is easy, easy to vary, and there's great potential to create innovative constructions. When the platform includes more content, the teacher can easily select relevant projects for their lessons. The individual projects have clear start and finish, and duration, learning goals, requirements and instructions are communicated well.



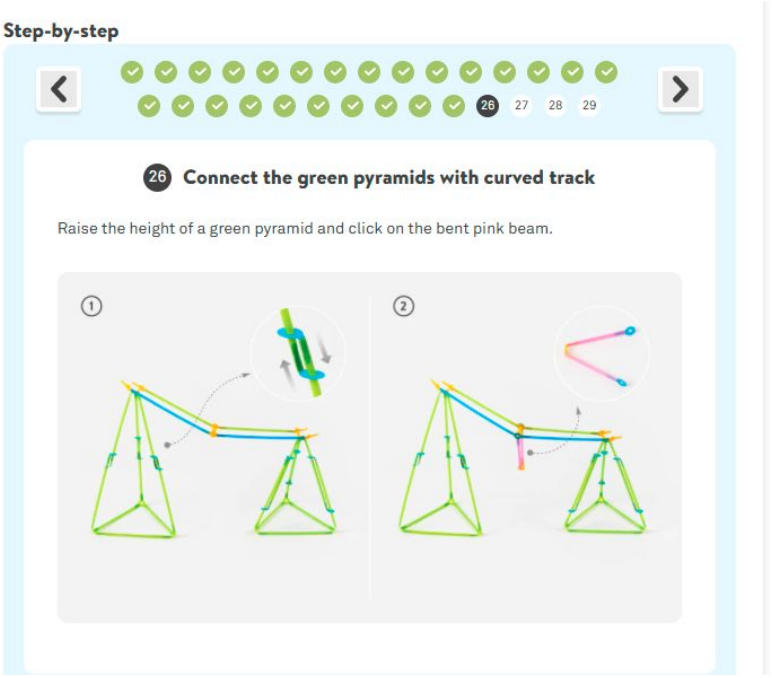
Linear - Non-linear: 91/100 = Excellent

Development areas: The lessons progress in quite a linear manner, and as mentioned in Rehearse-Construct, don't leave much room for open-ended problem setting or solving. The lessons are targeted to a quite broad target group and make one suspect that the younger end of the target group might not be taken into account adequately. The material can be easily adjusted for older/more advanced learners through extra challenges, but the theory part could also include links etc to extra material if the student would want to dig deeper. Right now these are present in teacher material, but not actively promoted to learners.

Individual - Collaborative: 84/100 = Good

Individual 84 Collaborative

Strengths: Because good instructions in student interface, the learners can work autonomously in the project. All in all, Strawbees is a great for working together within a small group but also within a bigger classroom, because the learners can flexibly mix and match parts, and the Strwabees School Kit has a good amount of parts available.



Individual - Collaborative: 84/100 = Good

Development areas: The learners are not guided to help and support each other or encouraged to share their creations. Especially if Challenges are executed, it would be great if the learners would be guided to showcase their solutions and that way help them to learn from each other. Naturally, a teacher can plan the lesson this way. At the moment, Strawbees gives the teacher freedom to execute the projects as group work or individually, and the School Kit and projects work equally well in both cases. However, in countries where teachers might need more support, pedagogical tips for organizing group work or showcasing would be a good addition.

Learning Engagement

The Six Aspects of Learning Engagement

Autonomy

Feeling that the user's actions in the product are based on their own decisions rather than feeling there is external pressure to choose a certain action.

Competence

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

Relatedness

Feeling that in the product there is meaningful contact with people who care about you rather than feeling lonely and uncared for. You can also feel connection with fictional characters and events in the product.

Respect

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.

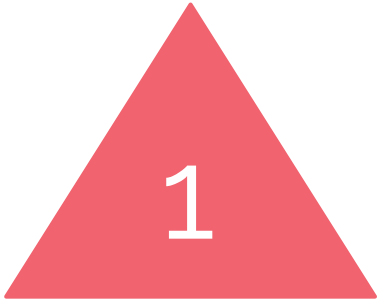
Stimulation

Feeling that the product offers plenty of enjoyment and pleasure rather than feeling bored and understimulated by the product.

Safety

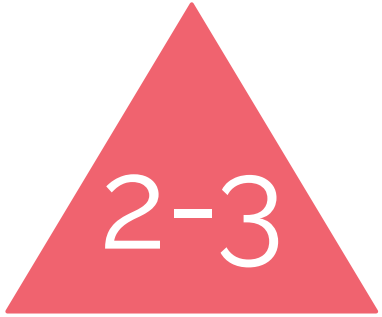
Feeling that the product is a safe environment for having fun and trying out things rather than feeling uncertain of the consequences or threatened by other users.

The Rating Scale



Not Supported

There are issues with the user engagement in this area.



Supported

The product takes into account this aspect of user 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 user engagement.

Autonomy Score: 4.28/5 = Well supported

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

Main strengths	Score
1. The user can create their own goals for the use.	5
2. It is easy to understand, what is the goal in using the product.	4.7
3. The product motivates the use well.	4.7

Strawbees producst are very flexible and enable an endless amount of creativity, especially when combined with Microbit. The challenges make it possible for the students to go as far as they want with the projects.

Autonomy Score: 4.28/5 = Well supported

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

Main development areas	Score
1. It is possible to make choices, and the different choices have clearly different and meaningful outcomes.	3.3

The lessons proceed in linear manner, and Challenges feel like "extra work". The material could encourage the student to pick a challenge a bit more, it could be just the next part of the material after the "intro" that everyone does instead of being extra.

Competence Score: 4.11/5 = Well supported

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

Main strengths	Score
1. It is possible to feel successful and proud of myself when I am using the product.	5
2. Experienced and advanced users can find more challenge in the product.	5

The material is easy to use and the project goals are clearly visible. Building part is essentially a fun process and seeing the concepts come alive and experimenting with them further is very rewarding. Navigation in the teacher platform is easy, even though the evaluated version still had plenty of placeholder material.

Competence Score: 4.11/5 = Well supported

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

Main development areas		Score
1.	Progression on the product depends on succeeding on things relevant for learning.	3.7
2.	The product gives you enough information to use it efficiently.	3.7

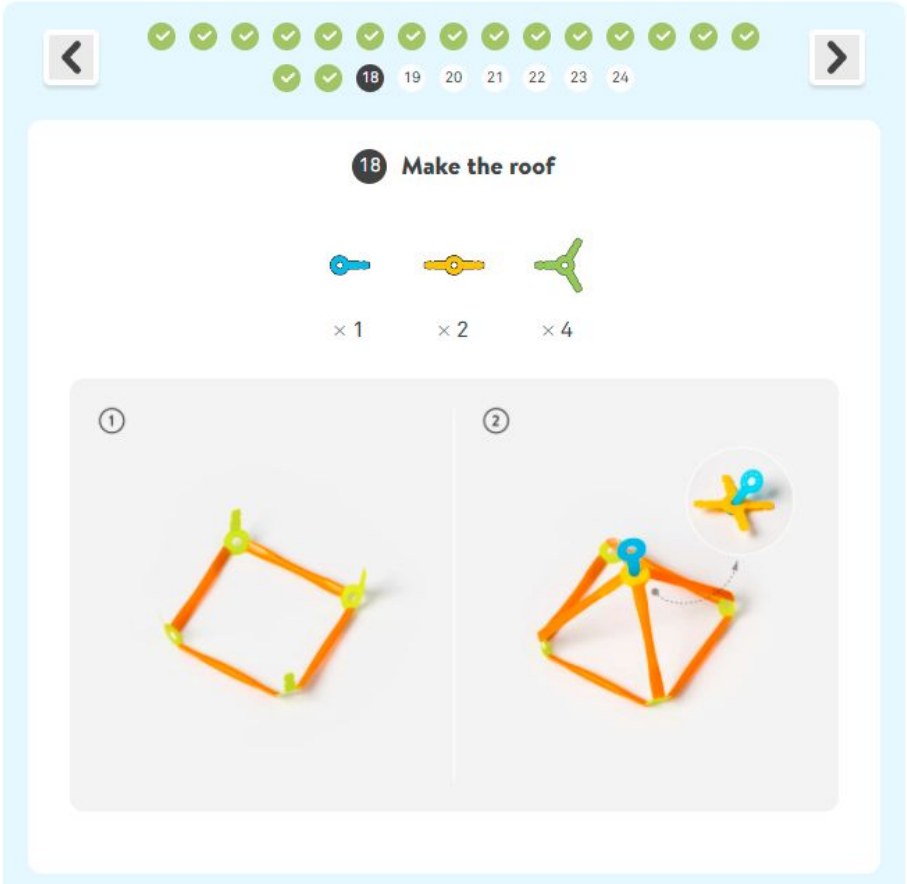
The instructions for building should be checked for inconsistencies.

"Some of the instructions for the building were tricky and I had to go through them multiple times."

Small inconsistency with instructions: Example

The part selection shows 4 green connectors and two yellow connectors, but in the image, the green connectors are not visible at all.

The green connector were needed in the previous step.



Relatedness Score: 3.95/5 = 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 product supports communication with other people and there are good reasons to communicate	3.7
2.	The visuals and characters in the product are suitable for targeted users.	4.7
3.	The product provides examples or motivation to learn the skill it tries to teach.	4.3

The Strawbees products are potentially great for teamwork - within projects or groups and also between groups. The lessons demonstrate science concepts in a great concrete way.

Relatedness Score: 3.95/5 = 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.	2.3

The material itself doesn't encourage sharing your learning outcomes. It is up to the teacher, and can be planned, but the teacher material could offer more tips for that.

Respect Score: 4.2/5 = 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	4.3
2. The product doesn't make assumptions on player's age, gender, race or origin.	5

The material is very inclusive and easy to approach for students. The difficulty level can be adjusted easily - with younger children the building part can be done teacher-led, and older students can execute it themselves and continue building and experimenting. .

Respect Score: 4.2/5 = 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.	3.3
2. The product doesn't have bugs which cause errors or crashing.	3.3

The material is not really interactive, so it doesn't give confirmation for the student that they understood the things they were expected to. Some automatically checked multiple-choice questions could help with this. "Sometimes the pictures didn't load when I was going through the build instructions. "

Stimulation Score: 4.54/5 = Well supported

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

Main strengths	Score
1. The product's challenge level is optimal for the targeted users, or it can be chosen	4.3
2. The product encourages exploring it further.	5

Strawbees encourages experimentation and innovation, and it is easy to build projects according to your interest and capabilities.

Stimulation Score: 4.54/5 = Well supported

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

Main development areas	Score
1. The product's graphics, sounds and other elements support the narrative and user experience in a meaningful way and are pleasant.	4.3

The theory part could include material to explain the concepts visually - e.g. videos or animations. Students could use them individually or the teacher could use them during lesson time. Now, reference material is only in the teacher interface, although it could be presented to students as well. The evaluated lesson material was rather limited, but the platform showed great potentia. "Hopefully there will be a lot of activies in the future from which the teacher or user can choose activities for many purposes."

Safety Score: 4.7/5 = Supported

Feeling that the product is a safe environment for having fun and trying out things rather than feeling uncertain of the consequences or 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	5
2. The product doesn't include content or advertising which would be harmful for the targeted users	5

The materials (the straws and the connectors) are easy to use and won't break easily. The user can go through trial and error multiple times in the projects - you can always tear apart what you have built and make it better. There isn't any online social features and the material can be accessed without login.

Safety Score: 3.86/5 = Supported

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

Main development areas	Score
1. The user does not lose any hard-won rewards or results if they do something wrong.	4.5

The long-term re-usability of the material was not possible to assess. The plastic straws are more brittle than eg. metal or hard plastic, so there is a risk that with more careless builders they will break and they are just thrown away instead of re-used.

Education Alliance Finland

Results

Strawbees School Kit & Robotic Innovations High Educational Quality Aspects

Education Alliance Finland

1. Strawbees supports experimentation and innovation in a great way.
2. The project lesson material are very flexible and easy to adjust to the needs of your students.
3. Combining Strawbees with Microbit extends the learning goals considerable and allows for very interesting projects.
4. The lessons demonstrate science concepts in a tangible way.

Pedagogical Approach 85 %

Learning Engagement 4.16

According to Education Alliance Finland evaluation, Strawbees School Kit & Robotic Innovations represents high educational quality and is proven to promote learning efficiently.

Education Alliance Finland

Background

*Expert Evaluation of **what** the solution teaches and **how** it teaches?*

Education Alliance Finland

Education Alliance Finland conducts impact evaluations 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 diagnose 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 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*

Hietajärvi, Maksniemi (2017) / Engaging learning Ltd. (University of Helsinki)

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.

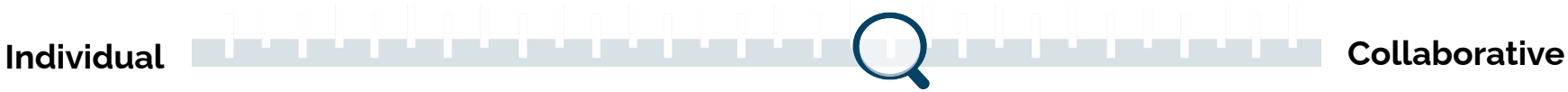
Interest	**Knowledge building**	**Reflection**
Activating interest	*Defining goals*	*Reflection*
Mapping prior knowledge	*Applying existing knowledge (adaptation/ assimilation)*	*Decision-making*
Customisation	*Knowledge creation*	*Difficulty optimisation*

Hietajärvi, Maksniemi (2017) / Engaging learning Ltd. (University of Helsinki)

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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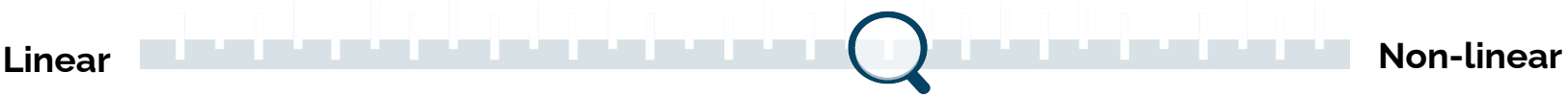
Pedagogical approach - Linear / Non-linear

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*



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Assessing User Happiness

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

The evaluation focuses on things the users are able to do in the product, and how these features make the users feel. It takes into account 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 are the features that support the user happiness the best, 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 player happiness are from Hassenzalh, 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 feeling there is external pressure to choose a certain action.*
1. The user can create their own goals for the use.	4. The product sets limitations for using it when and where I want to, and the limitations feel unnecessary or annoying.
2. The product motivates the use well	5. It is possible to make choices, and the different choices have clearly different and meaningful outcomes.
3. It is easy to understand, what is the goal in using the product.	6. It is possible to use creativity and 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 myself when I am 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 is are 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 eg. skip tutorials or choose wanted 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 understimulated by the product.*
1. The product encourages exploring it further	4. The user doesn't unnecessarily need to 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.

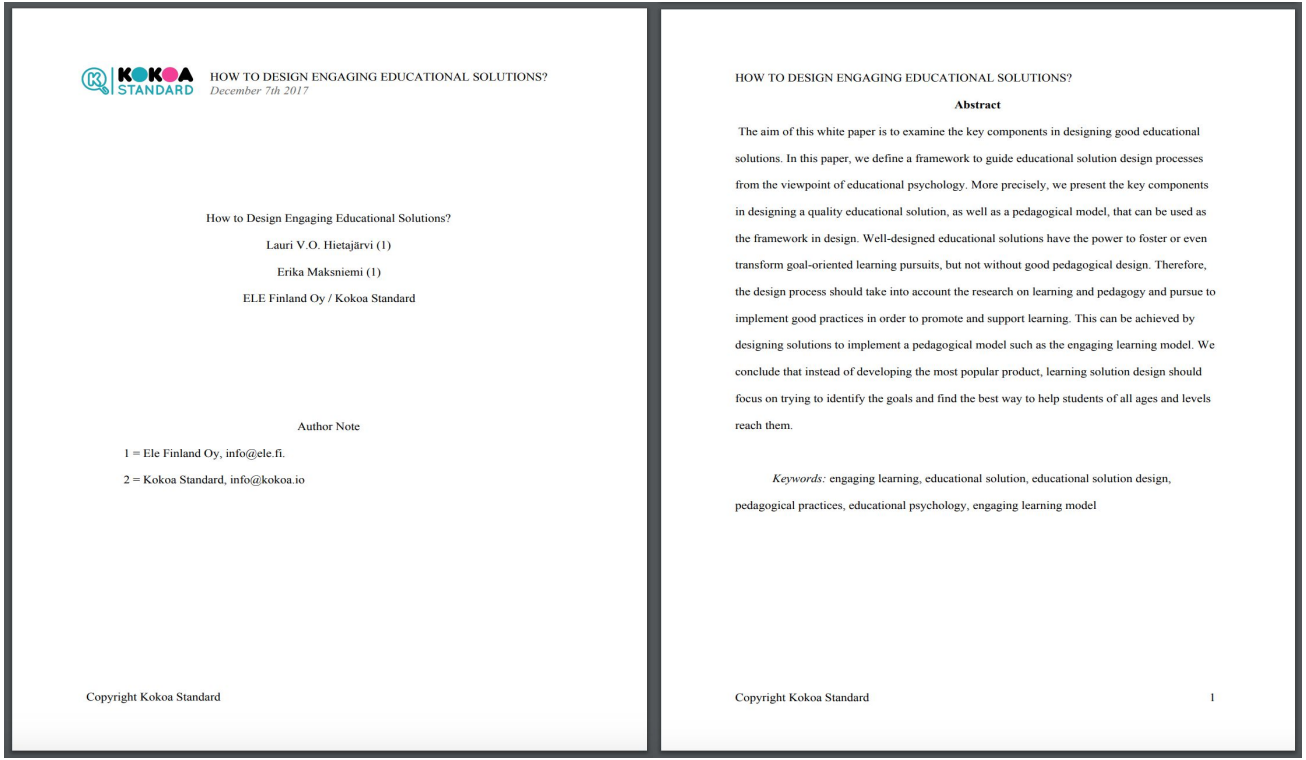
Sources: The heuristics are adapted from the following sources:
Korhonen, Hannu & M. I. Koivisto, Elina. (2006). Playability heuristics for mobile games.
Inostroza, Rodolfo et all (2012). Usability Heuristics for Touchscreen-based Mobile Devices.
Nielsen, Jacob. (1994a). Enhancing the explanatory power 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 threatened by other users.*
1. Making errors is beneficial. Everytime 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. f 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 for the targeted users	6. 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

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.

Theoretical background

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?

Lauri V.O. Hietajärvi (1)

Erika Maksniemi (1)

ELE Finland Oy / Kokoa Standard

Author Note

1 = Ele Finland Oy, info@ele.fi.

2 = Kokoa Standard, info@kokoa.io

HOW TO DESIGN ENGAGING EDUCATIONAL SOLUTIONS?

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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