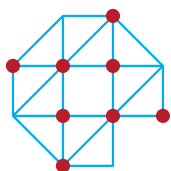
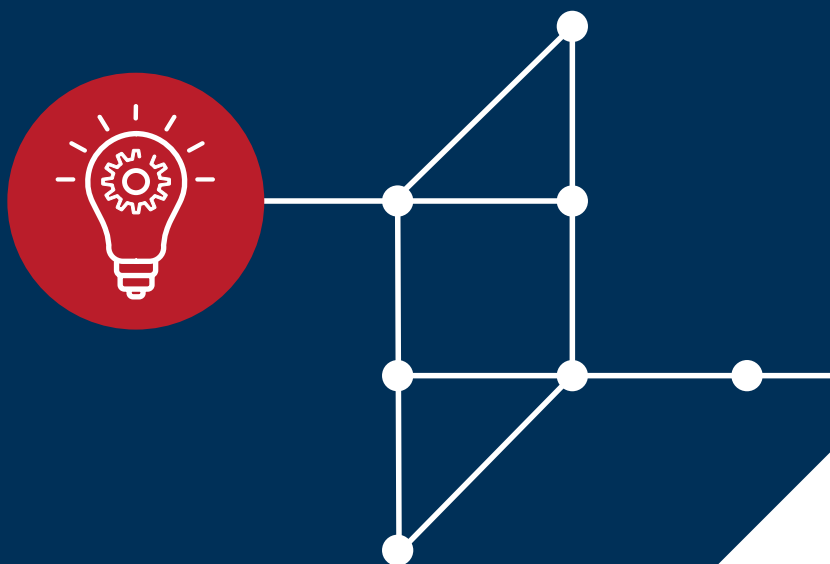


# Under the bonnet: A review of EdTech testbeds in Europe

Examples of cooperation  
between EdTech developers  
and the education community



**Acceleration plan**  
Educational innovation  
with ICT





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Examples of cooperation between EdTech developers  
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**Acceleration Plan Educational Innovation with IT**  
Working group EdTech for educational innovation  
[www.versnellingsplan.nl](http://www.versnellingsplan.nl)



**Acceleration plan**  
Educational innovation  
with ICT

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**Objective**  
This report describes a variety of testbed initiatives in Europe. As each initiative has a different aim, understanding these initiatives can help readers of this report to implement an effective testbed model in a particular setting.

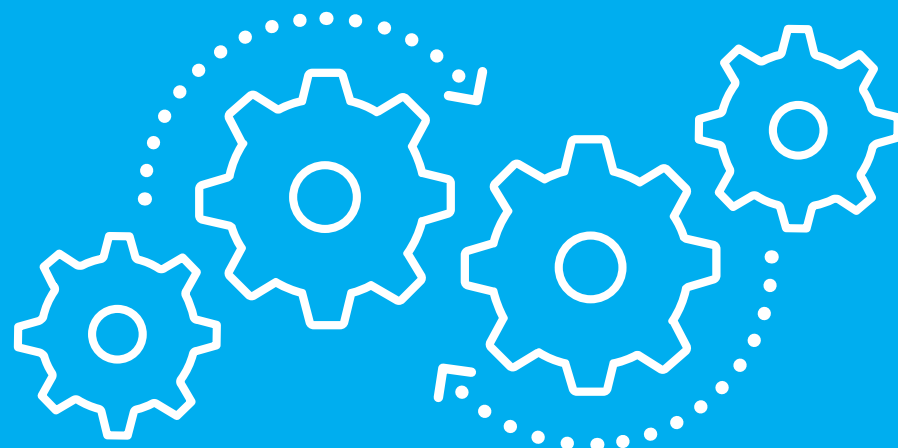


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The symbols corresponding to the four testbed models are:  
1) [link](#), 2) [link](#), 3) [link](#), 4) [link](#).

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## 1. Introduction

The field of education is constantly evolving. Students require dynamic, relevant content, while lecturers aim to optimise their teaching, making use of a variety of resources. Meanwhile, the government adjusts the focus of education in response to developments in society. In all of these developments, technology is sometimes regarded as the holy grail: it can solve society's problems by achieving the necessary level of efficacy and/or improving education. How can the technology sector best respond to this? How can it improve products and motivate the education sector to make proper use of them, and in doing so maximise the value of technology for the sector?

Over the past few decades, technology in education has become a major accelerator of innovation in the sector. In this report, we consider the development of this education technology, better known as EdTech. This covers the whole process, from idea to prototype to finished product. A common definition of EdTech is given below:<sup>1</sup>

*“EdTech refers to all technology, both hardware and software, that is made to improve the education given by lecturers and to improve the educational outcomes of students.”*

This includes technology that is used throughout the education sector, from primary to higher education. Before EdTech can be successfully applied in education, a lot of research and building, testing and evaluation needs to take place. Testing and evaluation requires close cooperation between the educational institution and the EdTech company concerned, but in practice this can be hard to realise.

Regarding such cooperation, educational institutions indicate that it is: *“often unclear which person or organisational unit is the main point of contact for educational innovation with EdTech initiatives”*<sup>2</sup>. Furthermore, even if they do know who to contact, they often report a lack of clarity about the process they should follow. This can present a barrier to experimenting with EdTech.

Other reasons for the currently limited adoption and scaling of EdTech in education include a lack of budget, resources and/or facilities and a lack of a clear EdTech vision and strategy. In the EdTech [Findings Report](#) of the Acceleration Plan EdTech Zone (now the working

<sup>1</sup> [www.versnellingsplan.nl/en/Kennisbank/startup-in-residence-edtech](http://www.versnellingsplan.nl/en/Kennisbank/startup-in-residence-edtech)

<sup>2</sup> [EdTech Findings Report](#)

group EdTech for educational innovation), participants noted that: *“the lack of a clear framework for evaluating the success or added value of an experiment or pilot with EdTech further complicates the decision-making process with regard to scaling up”*. This despite the fact that the impact of the technology determines whether or not it can be successfully implemented in education practice.

Looking beyond the Netherlands to the rest of Europe, various initiatives have been set up for organising collaboration between educational institutions and EdTech suppliers. These initiatives vary widely, from coming up with ideas for EdTech to implementing it in practice, and include pilot projects and experiments. What do these initiatives entail? And, what can we learn from them? In this report, we analyse a number of initiatives that focus specifically on EdTech testing and evaluation. We base this analysis on the question: ‘How do these initiatives contribute to a stronger EdTech ecosystem?’

N.B.: The EdTech testing and evaluation process is similar to the Build-Measure-Learn (BML)<sup>III</sup> cycle, which is often applied in product development projects.

## 1.1 What is a testbed?

Anyone searching for EdTech creation, development and evaluation initiatives will soon come across the term ‘testbed’. A testbed is a platform for the rigorous, transparent and replicable testing of new or other technologies. The platform may be physical or virtual.

An EdTech testbed is defined as: *“an environment to test and experiment with EdTech in a real-world setting”<sup>IV</sup>*. These testbeds are organised because:

- The education market is known to be difficult to penetrate, partly due to complex legislation and regulations, but also due to a high aversion to risk in the sector. A programme that makes it easier to try out new technologies with no obligations can help in this.
- A variety of evidence is required for different purposes and stakeholders before a new technology can be implemented. However, EdTech suppliers, in collaboration with researchers and educational institutions, do not produce sufficient evidence of what works in practice.
- The resources of educational institutions are limited (e.g. time, money, digital skills). These must therefore be used efficiently.
- Educational institutions are relatively slow to adopt new technologies, partly due to the high costs involved and partly due to the high risk of failure for institutions that experiment with EdTech products and services. They may therefore be wary of pilot projects.

<sup>III</sup> More information: [www.cleverism.com/how-build-measure-learn-cycle-really-works](http://www.cleverism.com/how-build-measure-learn-cycle-really-works)

<sup>IV</sup> From: [EdTech testbeds: models for improving evidence](#) (2019, Batty et al.).

The aim, therefore, is to use testbeds to increase the chance of successful implementation of EdTech in education and therefore make better use of its potential.

## 1.2 Testbed models

Various types of testbeds can be used to develop EdTech solutions. NestaV identifies four such models:



- 1) **Co-design:** EdTech suppliers, researchers, lecturers and students work together to identify educational needs and opportunities, and to develop a combination of technology and pedagogy to address these.



- 2) **Test and learn:** EdTech suppliers work with educational institutions to rapidly test their products in a real-world setting so that they can improve them.



- 3) **Evidence hub:** Educators and educational institutions work with EdTech developers and researchers to generate evidence about impact and disseminate evidence-based advice to guide adoption and scaling of the technology/application.



- 4) **EdTech network:** A network of educational institutions, researchers and suppliers that share their experience and insights. This may also involve a training and professional development network.

We apply the same distinction between these four models in this report. Based on our analysis, we can conclude that there is often overlap between two or more models in an initiative, or that the distinction is difficult to make based on the available information. This report focuses on testing and evaluating EdTech, which more or less corresponds to the second model, ‘Test and learn’. This EdTech testbed model is less about obtaining academic evidence of a technology’s impact, and more about generating reliable and relevant knowledge through analysis, observation or experience that can be applied to education practice.

To a certain extent, this may also involve the generation of evidence on the impact of a product or service, so that there is some overlap with the third model, ‘Evidence hub’. After all, the EdTech developers, educational institutions and investors ultimately need to know

whether the product will result in positive change. This makes testing and gathering feedback an essential element for all those involved, as is generating evidence based on the testing and evaluation results.

### 1.3 Which initiatives were analysed?

What do the European testbeds test? Based on desk research, findability and contact with the testbed organisers, the following five initiatives were analysed with respect to their test and evaluation process:

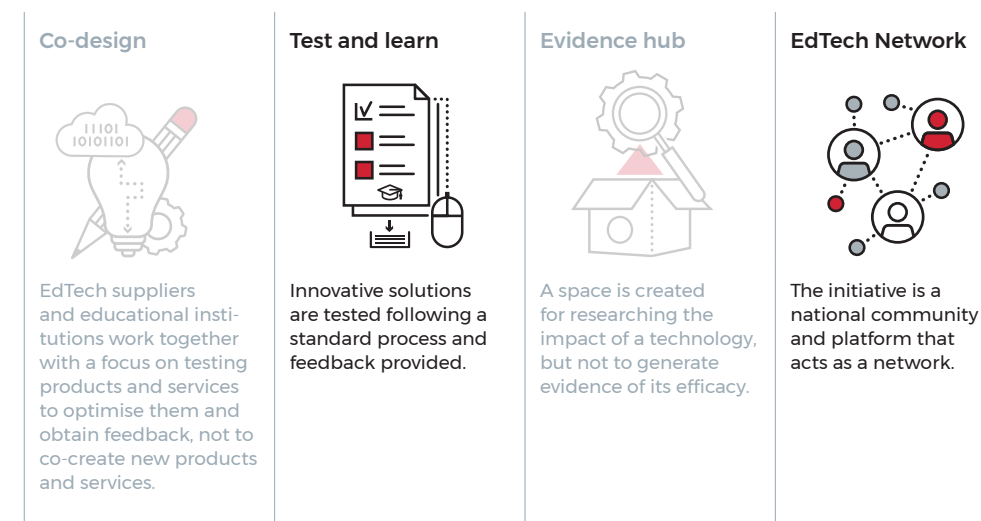
- [Swedish EdTest](#) (Sweden)
- [EDULAB](#) (Estonia)
- [European Schoolnet](#) (EU, Brussels)
- [EDUCATE 2.0](#) (UK)
- [Testbed Helsinki](#) (Finland)

We describe the testbeds in Sections 2 to 6, based on the Nesta testbed categories.

We analysed the model, design and results of each testbed, and interviews were conducted to obtain more information.

In the conclusion (Section 7), we describe the opportunities and challenges for the education sector as identified in this analysis, where relevant to the needs of educational institutions. We end the report with a brief discussion.

## 2. Swedish EdTest



This Swedish initiative is a national community that focuses on strengthening educators' digital skills and improving the products and services that they use. The community is formed by representatives from particular regions and/or professional or research fields. The goal of the community is to bridge the gap between customers and suppliers so that better digital tools can be developed, therefore addressing users' real needs. At the same time, the community also works to strengthen the ability of educators to choose and evaluate digital learning resources, through interaction between EdTech suppliers and the education field.

Hanna Elving, head project manager for Swedish Edtest, emphasises that they find it essential for educators to be aware of the role they play in the development of education technology, which is why testing focuses on its use in the classroom. They test technologies by letting educators use them, so that they can make more informed demands of the digital learning resources that they need and use. The community also ensures that EdTech companies have a better understanding of life in the classroom and how they can improve their products.

Educators and programme directors can sign up to join the community on the Edtest [website](#). Note that participants must be a member of the Swedish Institute for Educational Research. Suppliers may also participate in the testbeds. They are expected to provide a clear focus for a test and to use the feedback that they receive to improve the product.

## 2.1 Testbed design

Swedish Edtest is responsible for the programme administration and facilitates contact between the educational institutions and the EdTech companies. It also provides standard agreements such as pilot/testing agreements and support relating to complex issues such as GDPR. It does not provide agreements for any future purchase of the products, as the focus is on improving the digital skills of educators and gathering feedback for the suppliers.

The Swedish Edtest approach is as follows:

1	An institution decides that it is interested in testing a particular product or service.	2	A meeting is organised, facilitated by Swedish Edtest, in which the EdTech supplier and institution decide whether they want to start a test; if so, they sign an <a href="#">agreement</a> .
3	Agreements are made concerning the number of participants, the time frame, and so on. Swedish Edtest provides standard support cards for use in the test.	4	The educator writes an evaluation of the product, which is included in the test report. The supplier uses this report to improve the product or service.
5	All educators and suppliers who have completed the evaluation process receive a certificate demonstrating participation in the Edtest. This may be used by suppliers for marketing and communication purposes.		

Swedish Edtest has developed support cards and use cases, which are used as a template for the testbed. Swedish Edtest addresses the following four areas:

- [Subject content](#)
- [Skills and abilities](#)
- [Use of own teaching materials](#)
- [Assessment and documenting progress](#)

Each area has a corresponding support card that can be used during testing, containing questions specific to the theme. When the test is completed, the results are discussed in follow-up and evaluation meetings and used to generate a detailed test report.

The meetings – the kick-off, check-ins and evaluation – take on average three hours, and the complete test programme takes about six weeks, says Elving. Testing takes place during lessons, in the real classroom setting, therefore not online, and participation is free of charge. Any further collaboration is the decision of the institution and the educators, together with the supplier.

## 2.2 Programme results

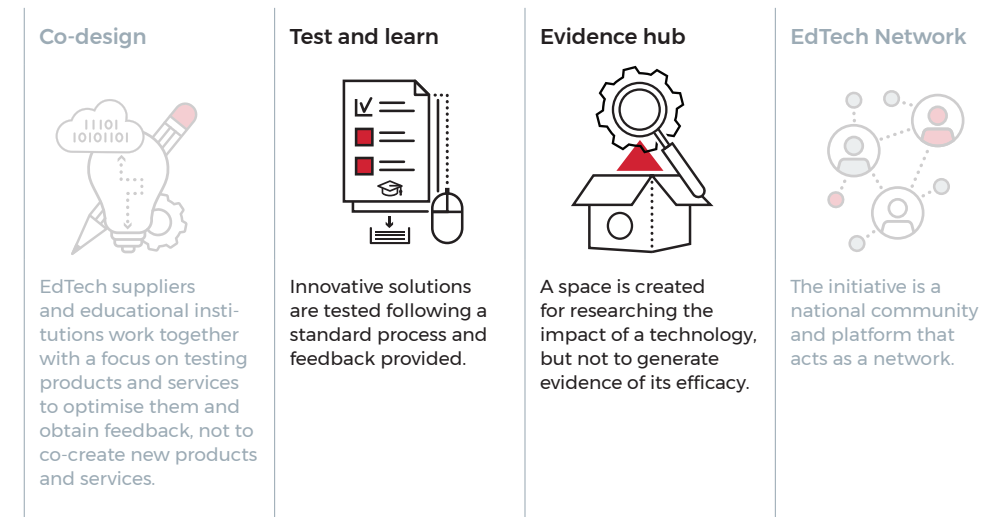
Most test programmes are initiated by EdTech companies who publish their product or service on the Swedish Edtest platform. An educator or institution then goes to the platform to register to participate in the test. Swedish Edtest found that less use was made of the platform if it was left up to the education sector to initiate a test. During the first two years of the programme, over 200 educators and more than 50 EdTech companies participated in tests.

Hanna Elving confirms that it has been difficult for Swedish Edtest to identify challenges in the field. The decision was therefore made to overhaul the programme and focus more on identifying needs and challenges in the classroom. To achieve this, Edtest decided to enter into a [partnership with EDUCATE](#) in the autumn of 2022. The partnership will focus on the development of a Scandinavian hub for evidence-based EdTech.

According to Elving, research into the use and efficacy of digital solutions is failing to keep up with ongoing technological developments, so that research papers and other reports quickly become out of date. As a result, educators do not always have the most recent information on the quality and impact of EdTech in educational institutions. This lack of high-quality research also makes it difficult for educators to determine what exactly constitutes good, effective EdTech. In addition, they have little information about the product development process in EdTech companies, says Hanna Elving. The evaluations show that educators do improve their digital skills through participation in a Swedish Edtest testbed,

and that they are more able to critically examine and select digital learning resources. The testbed therefore contributes to the professional development of educators.

### 3. EDULAB



**EDULAB** is an EdTech research, training and development initiative led by **CEITER**, a research centre at Tallinn University in Estonia. CEITER aims to support educational innovation through evidence-based, sustainable and scalable changes in teaching and learning processes. The focus in Estonia, as in the Netherlands, is on a lifelong learning strategy. This strategy requires taking a different approach to the education system and the role that technology plays in it. EDULAB aims to provide a testbed for education and EdTech research, to ensure the scaling of innovation.

EDULAB has also experienced some challenges regarding the use of new technologies and their impact on the learning process. The initiative involves researchers from multiple university departments, including Educational Science, Digital Technologies and Psychology, to improve the co-creation process with EdTech suppliers. As mentioned above, an important aim of the initiative is the scaling of EdTech solutions. EDULAB achieves this by providing an integrated programme that is centred on evidence-based research. The education technology is tested in a number of steps, drawing on 'living labs' methods and taking an 'innovation incubator' approach. The testbed starts with a controlled setting before scaling to test with a wider target group. The research is led by educators, who participate at all stages in the research process. The EDULAB programme

is designed to test innovative teaching and learning methods – in particular in STEM – and to assess how they affect student learning.

The living labs approach is a well-known innovation method, but what is it exactly? While there is no general definition of a living lab, the literature does provide the following:

*“a research methodology for sensing, prototyping, validating and refining complex solutions in multiple and evolving real-life contexts.”<sup>v</sup>*

Other than a traditional laboratory, a living lab works with real-life contexts and takes a user-based approach. The physical and/or organisational boundaries of a living lab are governed by its purpose, scope and context, which are defined by the users in advance. The real-life setting is needed to develop innovative solutions that can withstand the complexity of real life and daily practice. After all, the success of an innovation depends not only on its technical brilliance; often, the organisational and/or societal aspects ultimately determine its success.

In the EDULAB programme, these living labs take the form of communities, which consist of educators, researchers and other stakeholders who interact to promote innovation and share knowledge. These communities provide a common context where:

- innovative teaching and learning methods can be developed, tested and ultimately disseminated throughout the educational system in Estonia;
- educators are trained to use this innovative technology;
- research into the innovation can take place to build a strong evidence base.

### 3.1 Testbed design

The EDULAB philosophy is to refine or improve EdTech, not to make a judgement about whether the product or service does or does not work. EDULAB applies a four-stage model. In the first stage, researchers initiate a research study through a co-creation process with educators. Researchers then test the new EdTech technology in a controlled environment by experimenting with it in order to gather evidence. In the third stage, educators join a six- to 12-month training programme that focuses on implementing the technology in, for example, lesson plans, teaching materials and tests. They then test the technology in their

own group or class, and write a report to share the programme results. The last phase focuses on maintaining contact with the testbed participants. In this way, researchers follow a learning process by taking part in an online community in which educators communicate about the new EdTech.

EDULAB focuses primarily on the evidence-based implementation of innovative technology. Each of its labs is integrated in the research programme, and the researchers are closely involved in the whole testing process. The goal is to scale research to test with an increasingly wider group, and therefore to gather evidence of and insight into the learning processes and the impact on students. To do this, the researchers use a set of tools, such as feedback tools for students. Observation tools are also used, such as questionnaires and data from specific technologies (sensors, etc.). Together, these tools form a toolbox that simplifies their use for students.

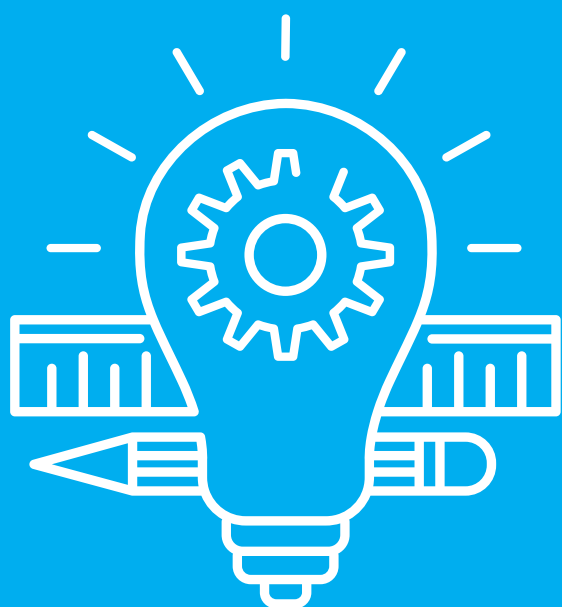
### 3.2 Programme results

According to the EDULAB website, engaging educators has been relatively easy, with the most recent training programme fully subscribed. The most recent publications are from 2020 and the website states that more than 100 schools, 300 educators and 3,000 pupils/students have taken part in an EDULAB co-creation project. However, the long distances make involving educators from regions beyond Tallinn more difficult. The conclusion is also drawn that educators and researchers each have their own priorities and expectations, and that it is a challenge to align these.

The projects (or cases) that are tested or demonstrated in the EDULAB programme concern specific technologies (robots, sensors) that are implemented in the teaching and learning process. Although the results have not been published on the EDULAB website, the information provided indicates that they also focus on novel teaching and learning methods and their impact in the classroom. The EDULAB programme aims to transform the testbed into a general model for teacher training, educational research and educational innovation in Estonia. This testbed therefore also focuses on evidence-informed innovation, professional development and refining innovation.

<sup>v</sup> Eriksson et al. (2005), [link](#)





## 4. European Schoolnet: Future Classroom Lab

### Co-design



EdTech suppliers and educational institutions work together with a focus on testing products and services to optimise them and obtain feedback, not to co-create new products and services.

### Test and learn



Innovative solutions are tested following a standard process and feedback provided.

### Evidence hub



A space is created for researching the impact of a technology, but not to generate evidence of its efficacy.

### EdTech Network



The initiative is a national community and platform that acts as a network.

European Schoolnet is a non-profit organisation that supports innovation in education and consists of a network of 34 national education ministries across Europe. The organisation is based in Brussels. It carries out multi-stakeholder projects and focuses on improving the integration of technology in education, with a focus on ICT and digitisation. European Schoolnet applies a broader concept of education than the physical classroom alone; rather, it refers to anywhere that learning takes place, including the home or other places outside the educational institution. Its activities focus on:

- identifying and testing innovations;
- investigating new education models of technology-enhanced learning;
- sharing evidence of their efficacy;
- supporting inter-school collaboration.

Through European Schoolnet, EdTech suppliers can make direct contact with the European network of educational institutions, once they have registered with European Schoolnet. A validation pilot can then be carried out at the interested institution.

It is possible to discern a testbed in the wide range of activities that the organisation carries out. This is the 'Future Classroom Lab' in Brussels. This is a physical meeting space for innovations in education, including existing and novel EdTech.

The lab also provides a validation service, to help EdTech suppliers and researchers organise small or large pilot projects in educational institutions, in a way that meets the needs of educators. It also provides support for educators in these pilots. The lab makes it possible for organisations or individuals to select the most suitable validation method, each of which follows a different methodology. The lab consists of six different zones, each with its own specific goal. The six zones are: create, interact, present, investigate, exchange and develop. For example, a zone may focus more on the design, implementation or efficacy of EdTech in an education setting, and provide the necessary facilities.



**Figure 1** Future Classroom Lab ([link](#))

This is what European Schoolnet says about the Future Classroom Lab:

*"The Future Classroom Lab (FCL), created by European Schoolnet, is an inspirational learning environment, offering a platform where teachers, school leaders, teacher educators, policymakers and other stakeholders can explore innovative pedagogical practices, educational equipment, and technologies."*<sup>vi</sup>

<sup>vi</sup> See: [fcl.eun.org/about](http://fcl.eun.org/about).

The ability to rapidly and flexibly collect data and evidence is considered to be an important benefit of the lab. While educators were interested in the free software and opportunities for professional development, they also warned of the constraints on their time, given their already considerable workloads. EdTech suppliers wanted to conduct faster testing and find ways to increase the willingness of educational institutions to take part in pilots, which is why the lab was set up.

#### 4.1 Testbed design

As well as providing a physical meeting place in the form of the lab, European Schoolnet also provides detailed manuals in the investigate zone. These are called the toolkit, and are designed to allow researchers and testers to determine the goal of the pilot. The toolkit helps in the pilot planning and design, but also in determining the appropriate methodology and exact implementation of tests in institutions.

We can consider this European Schoolnet toolkit as a testbed model that focuses on testing and evaluating. The testbed was designed to identify the needs of EdTech suppliers and educators. To do this, guidance on validation methodologies, validation scenarios and tools and templates were developed for potential testers and EdTech suppliers. According to European Schoolnet, this helps to design appropriate validation methodologies for the development and optimisation of products and services that consider the needs of participating institutions and suppliers.

The toolkit consists of five sets of tools. Each set guides the user through the steps for creating a 'scenario'. These scenarios are descriptions of learning and teaching that provide a clear vision for technology-enhanced innovation and pedagogical practices. The toolkit helps to adapt a scenario for application in the classroom in a structured manner and to test and analyse it. One set focuses on specifically testing and evaluating a tool, resource or learning activity in a classroom pilot. The primary objective of such a pilot is to generate feedback based on the aspects described below (note that templates have been developed to support the [evaluation process](#)):

- The expected benefits of the new technology compared with the actual benefits experienced during its implementation;
- The efficacy of the innovation and its impact on learning;
- Good ideas, tools and resources that can be shared with other educators;
- Improvements to teaching methods and learning opportunities for students and the impact on the motivation of educators.

A [validation manual](#) was also published in 2014, explaining what the European Schoolnet evaluation model is and the methods used. These methods are designed to be used in

particular education settings and are accompanied by example scenarios. The manual can be used to select a suitable testing and evaluation methodology for a particular setting.

## 4.2 Programme results

Between 2012 and 2019<sup>vii</sup>, almost 200 educational institutions were involved the European Schoolnet Future Classroom Lab initiative. Some were inspired by the lab, while others used elements of it to set up their own lab. Meanwhile, similar labs have been established in other European countries<sup>viii</sup>.

The outcomes of the creation of a physical learning lab were presented, in 2019 and therefore cover more than just the testing and evaluating element. The report mentions the following benefits:

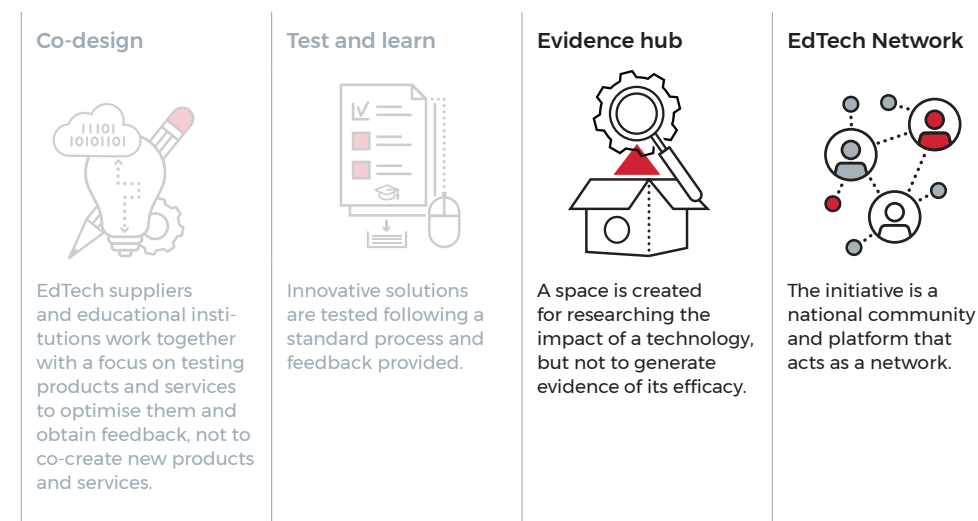
- Educators who have tried different technologies in the learning lab go on to design lessons and start their own projects making more use of technology;
- Educators learn to work with different apps, which they implement in various ways in the classroom;
- Students are more motivated and engaged;
- Students take a more active role in the learning process;
- More collaborative learning between educators;
- More opportunities for the educational institution to get involved in other projects initiated by EdTech suppliers;
- Publicity about the learning lab encourages more commercial companies to become involved as partners.

Because the 'classroom pilot' tool set is not a specific element of the Future Classroom Lab, it is not possible to provide concrete results for this. Furthermore, the toolkit is available to the general public and can be implemented as required by the user, and the results are not recorded.

<sup>vii</sup> At the time of writing (September 2022), more recent figures were not available on the website.

<sup>viii</sup> Albania, Austria, Belgium, Czech Republic, Croatia, Cyprus, Denmark, Germany, Estonia, Finland, France, Greece, Ireland, Italy, Malta, Moldova, The Netherlands, Poland, Norway, Portugal, Slovakia, Switzerland, Spain, Turkey, Ukraine

## 5. EDUCATE 2.0 Programme



The EDUCATE 2.0 programme is a British initiative <sup>ix</sup> that aims to improve the EdTech sector by providing training and mentoring programmes to support and enhance the use of evidence-informed EdTech. Its mission is "to accelerate research to develop evidence-informed ways of combining human and artificial intelligence to benefit human learning". Rose Luckin, founder of the programme, explained in a paper that the main reason for creating EDUCATE was the disconnect between the people building technology and its users. EDUCATE is a research-focused accelerator that is based on the 'Golden Triangle', which bridges the gap between three parties: EdTech designers and developers, researchers in education and EdTech, and users.

The EDUCATE website provides figures from market research conducted in 2018, which reports that:

- 57% of EdTech purchases in educational institutions take place as a result of experiences and recommendations of educators;
- 37% of experienced managers indicated that EdTech as it currently stands meets their needs to some extent;

<sup>ix</sup> A collaboration between ERDF, F6S, BESA and EDUCATE Ventures Research Ltd.

- 52% of educational institutions rely on educators to assess the efficacy of EdTech products.

This research therefore shows that EdTech is mainly implemented based on the experiences of people working in the education sector, rather than on an evidence-informed basis. EDUCATE's goal is to advance the efficacy of EdTech by making research evidence, practical applications and outcomes available to educators, researchers and technology developers. The idea of EDUCATE is that access to and the application of research is fundamental in ensuring that people can take full advantage of the opportunities that EdTech can provide to improve learning. One of its main tasks is therefore to bring together participating EdTech startups and academic researchers, who then carry out research that is relevant to the startup. The idea behind this is that small organisations do not have the expertise or the resources required for such research. The programme therefore focuses primarily on matchmaking between startups and researchers in the field of EdTech.

### 5.1 Testbed design

As described above, EDUCATE focuses primarily on supporting academic research into the efficacy of EdTech in the education setting. It also has two other focus areas, as described below. The programme therefore consists of the following elements:

- Academic researchers provide knowledge of educational technology and connect EdTech companies with the education sector;
- EDUCATE provides EdTech designers and developers with a [training and mentoring programme](#) to promote the use of cutting-edge research methodologies and best practices;
- Both lecturers and students are involved in the auditing of educational institutions, by providing their need/input for research into the impacts of innovative technology.

The programme focuses less on testing innovations, and more on supporting educational researchers and smaller EdTech companies. It therefore brings together their expertise, by providing an extensive training and research programme specifically for EdTech research. This programme focuses not just on 'what works', but also on the 'how', 'when' and 'why', reducing the risk that solutions are developed that do not address the real 'problem'. This extensive, problem-based analysis phase also highlights the collaboration between the various stakeholders, as they start by analysing a solution. EDUCATE has also developed an [evaluation tool](#) that stakeholders involved in EdTech development, such as EdTech suppliers, students, parents and lecturers, can use to support evidence-informed technology.

A guide has also been produced to help educational institutions choose the right EdTech for them. In-depth guidance is provided in the '[Buying the right EdTech-guide](#)' which

describes the following four steps:

- 1) identify what you need and what you want to achieve;
- 2) identify which resources you have available and which resources you need for successful implementation;
- 3) test the product before you buy it;
- 4) make a decision based on the test results.

EDUCATE does not regard product testing as a partnership with an EdTech company, but focuses more on a trial period in which educational institutions use the technology. EDUCATE suggests taking a number of steps before starting a pilot.



**Figure 2** Steps to take before conducting an EdTech trial – EDUCATE

The second step refers to looking for evidence of efficacy. Here too, therefore, the testing emphasises 'evidence-informed' research. However, the focus is on evidence that can be obtained from the EdTech supplier, which EDUCATE recommends institutions explicitly request. This testbed is therefore more suited to EdTech products that have already reached a certain stage of development, as it focuses less on improving and refining the technology and more on using it.

### 5.2 Programme results

Since 2017, 252 startups have completed the EDUCATE programme. This has resulted in a number of challenges and outcomes, which have been published in an overview. The most notable of these are:

- Most lecturers do not have the required skills, instruments and knowledge to apply an evidence-informed approach;
- Despite the considerable academic interest and policy focus, as well as the resources directed to bringing evidence into EdTech practice, it is still a challenge to demonstrate robust evidence on the impacts of technology in education at scale;
- The lack of investment and interest on the part of EdTech companies in adopting an evidence-informed evaluation and testing process for their products is a challenge in partnerships;

- There is an immediate need for replicable systematic reviews in EdTech and a collective body of evidence on a particular topic. Systematic reviews have become fundamental to evidence-based research and represent a key methodology for locating, appraising, synthesising and reporting available evidence, which ideally should come from such studies. This aspect is addressed in the EDUCATE training programme. Participants are trained to assess the type of evidence that can be generated in different phases, therefore creating an evidence-based mindset;
- There is a danger of taking a top-down approach in which academics or policymakers tell practitioners what to do and what not to do, whereby practitioners are expected to 'simply' follow the rules. According to EDUCATE, evidence-informed EdTech is all about asking the right questions and identifying the best decision and solution in a particular setting.

Following on from the positive results and enthusiasm with which EDUCATE has been received in the sector, Rose Luckin has announced that their mission is now to develop a [global](#) programme. Several programme partners are already named on the website.

## 6. Testbed Helsinki

### Co-design



EdTech suppliers and educational institutions work together with a focus on testing products and services to optimise them and obtain feedback, not to co-create new products and services.

### Test and learn



Innovative solutions are tested following a standard process and feedback provided.

### Evidence hub



A space is created for researching the impact of a technology, but not to generate evidence of its efficacy.

### EdTech Network



The initiative is a national community and platform that acts as a network.

[Testbed Helsinki](#) assists innovative EdTech companies by providing the possibility to “incorporate the teachers’ vast potential into companies’ product development processes”. This Finnish testbed was developed by the Helsinki city council and focuses, in addition to EdTech, on the circular economy, health and well-being, and smart mobility. The testbed is part of the ‘[Helsinki City Strategy 2021-2025](#)’, through which Helsinki aims to become an enticing region for testing out new solutions in an urban environment. This focuses on both promoting business opportunities for companies and creating well-being for all Helsinki residents.

The testbeds are physical or virtual development and testing platforms and are accessible to all city partners. These partners are companies, city staff, end users, universities and research institutes. The city makes resources such as buildings or data available to organise these testbeds, which can be used as product development environments. Such buildings include schools and healthcare centres. Both national and international organisations, large or small, may register to participate in a testbed.

The website describes the following benefits for companies that participate in testbed activities:

- it accelerates the process of developing novel solutions;
- it provides companies with access to real-life environments;
- it provides companies with a facilitated experimentation process;
- it strengthens companies' customer understanding (developed solutions receive immediate feedback);
- it offers companies valuable references.

Helsinki's goal is to encourage companies to innovate and generate knowledge for the education sector. It also aims to make it as easy as possible for companies to test innovation, including companies that have not previously operated in the area of education. To do this, it has set up three 'co-creating solutions', each of which have a different target group:

- Testbed Helsinki: for innovation competitions and co-creation at various stages of product development;
- Premium showcase space: for testing and presenting novel EdTech solutions;
- HubLessons: for short-term testing and co-creation workshops in the '[Helsinki Education Hub](#)'

The aim of these testbeds is to make it easier for companies and other organisations to initiate testing activities, improve products and develop novel, innovative solutions. This is mainly done through a single platform that organises such activities. This, in turn, will strengthen the city's own innovation capabilities and increase cooperation possibilities with companies.

## 6.1 Testbed design

Regarding EdTech, Testbed Helsinki focuses on organising innovation challenges and rapid tests in the field of education. Here too, the considerable divide between companies and education institutions is seen as a significant challenge in the education sector, and the information flow and resulting dialogue that a partnership can provide could help to bridge this divide.

Testbed Helsinki also provides a [model](#) to simplify testing activities. Companies may also submit a testing proposal by filling in the contact form or contact Testbed Helsinki to take part in testing activities. There are therefore various opportunities for both [companies](#) and educational institutions to take part in tests. A product or service must meet several criteria before it may be tested. These are:

- the operator applying for the test has a genuine need for development of the solution (product or service);
- the tested product or service solves a real challenge or offers significant improvements compared to existing solutions;
- the tested solution has business potential and scalability possibilities;
- the City of Helsinki requires information or has another need related to the tested solution and/or the organization needs (extra) resources to enable the implementation of the test.

Companies and other partners are expected to provide a clear description of the goals of the test and how it serves the company's product development or business development goals. If the proposal is successful and the solution ends up being tested, the partner must commit to the successful implementation of the test by allocating sufficient human resources and time. Testbed Helsinki brings the parties together and arranges resources such as a location for the test, or assigns a City service unit. It may also involve educators, city staff and/or customer groups in the test. In the case of an open call, the City of Helsinki may contribute to the costs associated with the tests.

The general duration of a test is three to six months. Prior to a test, an agreement is signed that describes the solution. The intellectual property rights for the product or service remain with the main operator applying for the test, unless otherwise agreed. On completion of the tests, all companies receive a reference, which can be used as part of the company's marketing activities.

## 6.2 Sidestep: Helsinki Education Hub

Building on the testbed, an Education Hub was established in September 2021, with the idea to unite education innovators under a single EdTech roof. The hub is home to EdTech startups, investors, pedagogical experts, researchers, companies and public organisations. It is a physical meeting place for creating successful and innovative EdTech startups and solutions. The goal of the hub is to enhance education by improving the innovation and product development process and the productivity of EdTech startups. This is also achieved by bring people together from throughout the education ecosystem.

An '[incubator programme](#)' for EdTech innovation has also been set up in the hub. In this programme, EdTech developers receive help from experienced business and education professionals to grow their idea into a valuable, scalable and international business concept. This is achieved, for example, through workshops, mentoring assignments and lectures. Because the programme is part of the hub, participants also receive network support for the further development of their solution. The 20-week programme covers various themes,

such as defining the problem, financial management, validation and sales & marketing. It has many similarities with the Dutch 'Startup in Residence: EdTech' programme; an initiative of the [Acceleration plan](#) working group EdTech.

### 6.3 Programme results

Various solutions for learning environments have already been tested in the testbed. For example, one pilot focused on the use of food waste data, whereby the City of Helsinki challenged companies to develop solutions that utilise food waste data from schools. The goal was to develop novel solutions, for example to help optimise production volumes or reduce food waste or the carbon footprint. However, despite this being called EdTech, is it really EdTech in accordance with the definition?<sup>x</sup>

A pilot was also conducted using IoT (Internet of Things) solutions in school buildings, in which companies were challenged to develop and test such solutions in a primary school. Another pilot focused on a learning environment that uses augmented reality (AR) in a scale model of the City of Helsinki. While the testbed does not provide any concrete results on its website, it does refer to open source datasets in general, as the same testbed is used to address multiple themes. This open source data is available to all, free of charge, and can be used by residents, students and companies in their research and development activities. As a result, solutions can be developed that apply, in this case, specifically to the city of Helsinki.

<sup>x</sup> EdTech refers to all technology, both hardware and software, that is made to improve the education given by lecturers and to improve the educational outcomes of students.  
[www.versnellingsplan.nl/en/Kennisbank/startup-in-residence-edtech](http://www.versnellingsplan.nl/en/Kennisbank/startup-in-residence-edtech)

## 7. Conclusion

The clear common denominator in the testbed initiatives analysed in this report is the way in which they aim to create a hub or network in which participants can work together to develop innovative solutions. For example, Testbed Helsinki has set up various platforms to be used by regional stakeholders, EDUCATE focuses on bringing together researchers and EdTech suppliers, EDULAB and European Schoolnet have developed a physical or virtual collaborative environment, and Edtest has created a central platform to match EdTech demand and supply.

### 7.1 Hub

As identified in the testbeds, both EdTech suppliers and educational institutions have a need for co-creation, making the platform function of a testbed a logical step. This was confirmed in an NAS (Network of National Advisory Services) workshop on the EdTech sector in Europe<sup>xi</sup>. A mediator, or a space, is required in which the EdTech sector can meet practitioners, to work together to develop novel solutions, but also to optimise and improve existing services and products. Based on the Nesta categories, we describe the different testbed models below and when they are best applied:

<sup>xi</sup> Workshop held on 15 June 2022.



1 Co-design	2 Test and learn
<p>According to the description provided by Nesta, various parties work together in this testbed model to identify educational needs and opportunities and to develop a product or service to address these. In all the testbeds analysed in this report, identifying the various needs is considered fundamental to the potential success of an EdTech solution. When developing technology, this should even be the first step. Either the EdTech supplier, the educational institution or the research institution can initiate this first step, depending on the goal of the EdTech solution. For example, an educational institution that requires a specific innovative product that does not yet exist may initiate this first step.</p> <p><b>Phase:</b> initiation, startup or research phase  <b>Use to:</b> create or develop new solutions or functionalities  <b>Example:</b> <a href="#">Testbed Helsinki</a></p>	<p>The test and learn model focuses on the one hand on the rapid testing of a product or service so that it can be optimised, and on the other hand on obtaining feedback from the technology users. It therefore concerns prototypes, versions or existing solutions. This is a continuation of the co-design model, specifically intended to obtain feedback for incorporation into the next round of testing. It can therefore be used to iteratively improve products or services. While both EdTech suppliers and educational institutions can initiate and organise this model, it is usually the EdTech supplier who does so. After all, it is essential for the EdTech sector to involve users in the development process. If initiated by an educational institution, this could take the form of a trial of an existing product or service for a certain period followed by formal feedback, giving the institution the opportunity to try out the product before making a commitment.</p> <p><b>Phase:</b> product or service optimisation, product trial  <b>Use to:</b> obtain feedback from potential users or test an existing solution in an education setting  <b>Example:</b> <a href="#">Swedish EDtest</a></p>

3 Evidence hub	4 EdTech network
<p>The evidence hub model focuses on gathering evidence. This testbed is therefore less about testing solutions and more about assessing the benefits of a technology. It also takes a more academic approach, with the research carried out in a controlled setting. The EdTech suppliers are therefore primarily responsible for initiating this, rather than the educational and research institutions, although a platform or programme can contribute by bringing together the necessary parties. There is less of a prominent role for the end users, as they are more involved in applying the technology. This model focuses on gathering evidence on the efficacy of a solution. While research into the efficacy of novel solutions will of course always benefit EdTech development, this step is optional in the EdTech development process.</p> <p><b>Phase:</b> development of a product or service, providing a reliable basis for funding decisions  <b>Use to:</b> gather evidence of efficacy, provide a basis for policy decisions in educational institutions, sales and marketing purposes  <b>Example:</b> <a href="#">Testbed Helsinki</a></p>	<p>This testbed model is a digital or physical platform that brings together various parties. We regard this not as a testbed as such, but as a space to create interaction between parties, who may have a specific question, product or service. This can take the form of a website, or meetings in which solutions are offered, educational institutions present a challenge, or new information about EdTech is shared. Once the interaction has been initiated, one of the other testing models will be applied, focusing on – depending on the required outcome – development, testing or research. The benefit of this kind of platform is the bringing together of information, potential end users and suppliers in one place, which increases findability. Such platforms are initiated by an independent or public organisation.</p> <p><b>Phase:</b> initiate collaboration, market research, information-gathering  <b>Use to:</b> cluster information and stakeholders, attract partners, find solutions  <b>Example:</b> <a href="#">EdTech Impact</a></p>

Table 1 Testbed models – applications



In educational institutions, testbeds should be given a different function or provided in a different form, such as the hubs and labs. Testing is also an important aspect of such initiatives, and the standardisation and centralisation that they involve can improve their efficacy. After all, a high level of commitment is required to test novel, innovative solutions, but time and capacity are scarce resources. Time and capacity however form the basis to some extent of all of the testbed models. If these are lacking, this will have a considerable impact on the chance of achieving a successful outcome. Opportunities to optimise these resources must therefore be considered in the testbeds.

## 7.2 Provision of information

One way of ensuring successful and efficient testbeds is to create a managed database containing anonymised information; in fact, Testbed Helsinki names this as an important success factor. Such a database also benefits the product development process, for example in the case of innovative solutions that utilise learning analytics. While it is not always relevant in every project, it will certainly increase efficiency and reduce pressure on the already scarce time of educational institutions. Such a database could be put together by a public sector body in cooperation with educational institutions. University TLCs (Teaching & Learning Centres) could also play a role in this. These are central teams that support educational development, teaching staff development, knowledge sharing and innovation. They also advise and facilitate regarding the purchase of educational applications.

Willingness to take part in the testbeds also needs to be increased, and can be achieved by changing the EdTech mindset and vision. A concrete final product, incentive or outcome for the participants can help with this. In the cases of both Swedish Edtest and Testbed Helsinki, certification is one such outcome. However, certification in the EdTech sector has its drawbacks, as it can lead to unfair competition. Such certification must therefore be carefully considered before it is implemented: what exactly will be certified, who will provide certification and who will receive it. The SURF [Educational Applications Project](#), for example, could support such decision-making processes.

## 7.3 Need-based innovation

When testing and evaluating novel solutions, it is essential to ask the right research questions. This may seem obvious, but Hanna Elving, head project manager for Swedish Edtest, believes there is still too much of a focus on existing technologies and evaluation using randomised controlled trials (RCTs). *“There is a lot of focus on the technology instead of the impact that innovation can have. For example, the focus is often on methods and tools such as serious games, VR, iPads, wearables or 3D printers. However, these studies do not have the required impact. We need to focus more on the real problems in the classroom, such as ineffective teaching practices, lack of intellectual curiosity and*

*creativity, miscommunication, lack of motivation and the time that educators have to spend on tasks.”*

For example, a university may attempt to increase attendance at lectures by thinking up novel ways of attracting students to the lecture theatre. However, what they really need to think about is why the students want to follow the lecture online. We therefore need to develop solutions based on the need. We also need to realise that such solutions may not necessarily result in more students attending lectures. This is why creating, building and improving EdTech must always start with the questions: what is the problem and how did it arise, before looking to develop a solution.

Thomas Reeves, Professor Emeritus of Learning, Design and Technology at the University of Georgia, says more or less the same in an [article](#) in which he notes that the potential impact on learning lies not in the new technologies themselves, but on the new pedagogical practices that can be developed thanks to these new technologies. Imagine that an RCT is carried out on a virtual reality (VR) application. This application can be used in a virtual classroom to take part in a traditional lecture that is identical to a lecture in a physical lecture theatre. The outcome will probably be that the VR has no significant impact on students’ learning. However, the potential of VR should not be dismissed based on this outcome.

Similarly, a university may respond to a low lecture turnout by thinking up novel ways of attracting students to the lecture theatre. However, what they really need to think about is why the students want to follow the lecture online. Solutions therefore need to be found based on that need. Furthermore, such solutions may not necessarily result in more students attending lectures; there may be a better alternative. This is why creating, building and improving EdTech must always start with the need in the education setting.

## 7.4 Innovation and procurement

Universities use the services of e-learning specialists, instructional designers, media designers and other support staff to help develop blended and online courses. Although they do this in an attempt to meet the need for innovation in the institution, it cannot be the only answer. Rather, such developments need to be accompanied by a reorganisation of the EdTech procurement processes. After all, internal teams are no substitute for the solutions developed by EdTech companies, who can develop solutions to common educational technology problems while spreading the development costs across a large number of clients making use of economies of scale. Internal e-learning and innovation staff should therefore ask themselves whether certain problems are not better solved by these EdTech companies. Their own focus should be on aligning the available tools with the specific

needs of their teaching staff. Internal teams should therefore support educators in selecting the right tool for their need and ensuring that optimum use is made of the opportunities they provide.

Universities should be aware of this when setting up teams of specialists to work on digital innovation in their institutions, as it can prevent an overhaul of the tools they use being required a few years down the line. By taking a critical approach to procurement processes, EdTech testbeds provide an innovative mechanism for developing solutions that meet the needs of the institutions, making use of the EdTech market.

### 7.5 What next?

As we have seen, there are various points to consider when it comes to organising testbeds. In general, each participant has its own role and needs, and each testbed model serves a different purpose.

For example, the working group EdTech for educational innovation started a pilot project in 2022 for the Startup in Residence (SiR) programme that focuses on co-creation between universities and startups. This programme is concerned with pilots that focus on collaborative product development and less on testing and evaluating. Such a pilot project takes the form of a challenge, which EdTech may have a solution to. Note that this programme addresses only a limited number of the challenges that face the sector.

In the meetings that were held preceding the formulation of the challenges, lecturers were found to think primarily in terms of existing solutions and optimisation, or to be unaware of developments in the EdTech sector. It is therefore essential to form a national community of educational institutions, researchers and EdTech suppliers. Such a community also provides matching opportunities for testing and evaluating EdTech. It can also help to organise a hub for sharing knowledge and research results. This makes it easier for people to initiate pilots and tests to improve education, to carry out and disseminate research, and to adapt products to meet practitioners' needs.

This national community, or platform, could be included as an initiative in the Digitaliseringsimpuls Onderwijs programme (now Npuls). One of the objectives of this programme is to build a knowledge infrastructure, including a hub, to make it easier to find information and as part of which each educational institution sets up its own TLC. A grant will also be made available for research into educational innovation. An EdTech platform could form part of this.

## 8. Discussie

Developing a testbed model that focuses on testing and evaluating EdTech can make it easier to connect stakeholders in the EdTech ecosystem. Insufficient use is currently made of the potential of this in the Netherlands, partly because collaboration between such stakeholders is not organised centrally. The result is stand-alone initiatives, in some cases initiated by individuals and institutions with little understanding of the applications they use. Lecturers seem to be regarded as passive users of such technology while – given their didactic skills – they are well positioned to take a pivotal role in EdTech development. The development of hubs or labs as described in this report can help to identify the needs of lecturers, and the role of lecturers should be strengthened in testbeds, to prevent them experiencing a lack of ownership when using the technology.

It is worth mentioning that the stage of development of the product or service is an important factor here. As the four Nesta testbed models show, each model serves a different purpose (see Table 1, Section 7.1). It is therefore important to consider the developmental stage of the EdTech solution and the needs of the target group. Such a critical approach will increase the chance that the education institution/research institution/EdTech supplier partnership achieves a successful outcome.

It also seems to be difficult to carry out true need-based innovation, and new EdTech products often turn out to be a clone or optimisation of an existing solution. The EdTech sector therefore seems to struggle to provide evidence of the benefits and positive impacts of their technologies. As far as EdTech development is concerned, it is essential to take a need-based approach, before starting the actual product development process. Educators have an important role to play in this, as described above, but a multidisciplinary team is also required to identify the core of the problem. Policymakers, students and researchers should also be involved, to make sure that their perspectives are taken into account in the development process, ideally in every step, from development to evaluation. An independent project leader is needed to structure and manage this process.

As far as testing and evaluation are concerned, there are advantages to organising this centrally in the institution. For example, a TLC would be a highly suitable place, as it is a central unit that forms a coordinated link between education, innovation and other university services such as IT and procurement. The TLC should put in place a flexible procedure to facilitate such testing processes. The next step is to link the focus areas and projects of each TLC at the national level, to enable the exchange of experiences and a more coordinated approach. The role of these centres in Npuls provides an opportunity to place

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EdTech development on the national and European agendas. There is plenty of room for improvement in EdTech development, and many opportunities to work on such improvement in more public-private partnerships. In this way, we can work together to build a future-proof EdTech ecosystem.

*The Acceleration Plan for Educational Innovation with IT is a four-year programme of SURF, the Netherlands Association of Universities of Applied Sciences and the Association of Universities in The Netherlands. The aim of the programme is to bring together initiatives, knowledge, and experiences and to quickly and concretely get started with opportunities for higher education. This is done in eight different “zones”. In the acceleration zone EdTech, six institutions are working in two tracks to facilitate EdTech in higher education in the Netherlands.*



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