Media and Communication
2025 • Volume 13 • Article 9051
https://doi.org/10.17645/mac.9051

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Open Access Journal

Reflecting With Teachers on Research-Based Tools: The ySKILLS Education Toolkit

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Submitted: 26 July 2024 **Accepted:** 13 September 2024 **Published:** in press

Issue: This article is part of the issue "Evaluating and Enhancing Media Literacy and Digital Skills" edited by Leen d'Haenens (KU Leuven) and Willem Joris (Vrije Universiteit Brussel), fully open access at https://doi.org/10.17645/mac.i466

Abstract

This article focuses on the links between academic research and educational practices, examining how practitioners use, contextualize, and co-construct research findings on digital skills. To explore these issues, firstly we present an education toolkit developed within a European research project and aligned with normative and substantive guidelines for science communication. Aiming to grasp the potentialities and limitations of the toolkit in action, we then explore the perceptions of teachers from two educational settings in Portugal who employed it in their classrooms. Subsequent focus groups evidenced overall positive feedback from teachers, complemented by practical tips to improve the usefulness of the toolkit and adherence to it by teachers and students, thus adding layers of knowledge to the performative dimension of an evidence-based resource and building bridges between the academic and professional worlds.

Keywords

education toolkit; educational tools; digital skills; research-based education; science communication

1. Introduction

Digital skills, broadly understood as the ability to apply knowledge in the digital context to achieve personal and social benefits and mitigate risks associated with its negative aspects (Helsper et al., 2020), are presented as an unavoidable issue in contemporary education. Alongside an understanding of how to use digital devices, research emphasizes the importance of fostering digital literacy—the conceptualization of which goes beyond functional aspects to include critical ones—and the ability "to shape as well as use digital platforms and environments, building on knowledge about why ICTs do what they do and what the consequences of this for individuals and society might be" (Smahel et al., 2023, p. 12).

Continuous change in digital technologies and concerns over their impacts have resulted in a variety of terms and approaches to digital literacies, such as "data and privacy literacy" (Livingstone et al., 2020) and "critical big data literacy" (Sander, 2020), which require the attention of educational systems, schools, and teachers (Ilomäki et al., 2023). These literacies are intertwined with children's rights and citizenship, promoting an approach based on the premise of agency (Pangrazio & Sefton-Green, 2021).

Yet, school curricula and teachers' practices struggle to keep up to date in a constantly evolving field undergoing rapid transformation, thus compromising the adequate education of students. Some critics point to the narrow emphasis on technical and informational skills (Falloon, 2020), which are normally restricted to a separate school subject (Pettersson, 2018). Others identify the challenges teachers face in understanding and getting involved with students' digital lives (Saul, 2016).

Research on pedagogical strategies to promote digital literacies generally agrees on building on active learning paradigms, promoting critical consciousness, and learning by doing or discussing (Jones & Mitchell, 2016; Willeck & Mendelberg, 2022). At the same time, the existing literature has been highlighting the role of researchers in contributing to educational thought on this matter, whether by devising general frameworks or vocabulary (Saul, 2016) or by suggesting new approaches (Pettersson, 2018).

In this regard, what are the links between research and educational practices? How are research findings on digital literacy/skills used, contextualized, and co-constructed by practitioners? Considering the cultural role of research (Biesta, 2007), we aim to understand teachers' perspectives on a research-based tool. Our research questions, which focus on how teachers receive and appropriate this practical tool, are the following:

RQ1: What are the potentialities and limitations of the education toolkit in action?

RQ2: How could the education toolkit be improved?

RQ3: How do teachers see the relationship between research and their pedagogical practice?

Section 2 explores the connections between research and education within the framework of the evidence-based education movement, alongside general criteria for evaluating the quality and effectiveness of science communication. We then move on to presenting the ySKILLS Education Toolkit and analysing teachers' perceptions, after detailing the methodology for data collection.

2. The Context: Linking Research and Education

2.1. From Research to Educational Practices: A Critical Approach

Although not new, the evidence-based education movement has been gaining momentum to the point of being called a hegemonic force (Wescott, 2022). The myriad of expressions used to refer to this movement in teachers' practices—e.g., research-based profession (Hargreaves, 2007) and knowledge mobilization (Levin, 2011)—are based on the assumption of rationality in educational practice, which would use scientifically produced knowledge to make decisions and improve results, and on a linear and unidirectional model, where scientific knowledge would have an operational and instrumental relevance for practice (Lindblad & Pettersson, 2023).

This focus ultimately regulates research, as not all evidence is regarded as scientific proof. Methods based on controlled trials with random samples, robust statistical models, and causal analyses are given priority (Biesta, 2007; Welsh, 2021). It also constrains teachers' practice, minimizing their agency in a context where trust and legitimacy for these professionals are already on trial.

However, there are multiple ways for professionals in the field to participate in the (co-)production and use of knowledge, besides the instrumental one. Welsh (2021) identifies conceptual use (research that shapes a view of problems and solutions), symbolic use (research that validates previous positions, preferences, or decisions), and process use (incorporating research into the work of practitioners). Rather than a linear moment, research use in practice is thus a "labyrinth process" (Welsh, 2021, p. 173).

Consequently, there are also different ways for research to inform practice. Biesta's (2007) distinction between the technical and cultural role of research helps us highlight the need to improve the relationship between research and education, adding a reflective dimension to the discussion about "what works," contributing to critical questioning, understanding problems, or building alternative paths of action. Therefore, creating robustly sound and practical research is only part of the challenge: It is crucial, even an ethical issue (Taylor, 2019), to consider how to effectively translate and disseminate results to educators so they can incorporate research findings into their thinking and practices (Owen et al., 2021).

Regarding the relationship between research and practice in digital skills education, the most well-known initiatives derive from joint efforts to put this theme on the agenda—following its identification as a key competence for lifelong learning by the European Parliament and Council in 2006—and to clarify its meaning. Existing frameworks have expanded their definitions, areas, and levels of proficiency, like in the most recent version of the Digital Competence Framework for Citizens (Vuorikari et al., 2022). There are also specific frameworks for teachers, designed to integrate technology into their practice—e.g., the Technological Pedagogical Content Knowledge (Mishra & Koehler, 2006)—or for self-assessing and reflection on competences and needs—e.g., the Digital Competence of Educators (Redecker & Punie, 2017) and the UNESCO ICT competence framework (Butcher, 2018). These are mostly used in education for self-assessment purposes, to legitimate training proposals, and for curriculum evaluation (Santos et al., 2021), and some authors call for a shared institutional responsibility for their implementation (Falloon, 2020). Policy documents and research papers on school education focusing on critical digital literacies tend to emphasize e-safety and online risk issues, while giving less attention to benefits and opportunities (Ilomäki et al., 2023).

Other international initiatives develop research-based practical guidance and educational resources for teachers. This is the case of the Better Internet for Kids portal and the Common Sense platform, which add to the existing frameworks the availability of training and pedagogical resources. On another level, there has been an investment in intervention programmes to foster digital skills. According to a recent literature review, those programmes are mostly directed at (future) teachers and students (especially university students) and favour formal courses or workshops to the detriment of bottom-up or beneficiary-led initiatives (Martinez et al., 2023). Thus, collaborative research projects and co-construction of materials between academics and practitioners seem to be lacking.

2.2. Creating Educational Tools From Research Results

Transforming research results into educational tools is a challenge that requires thinking about how to communicate/translate scientific results in a manner that is understandable (Bertemes et al., 2024), i.e., how to deal with science communication. The criteria put forward by Lafrenière and Cox (2013) for evaluating the quality and effectiveness of science communication include normative, performative, and substantive aspects. Normative aspects pertain to the quality of the research, for example, in terms of methodological rigour and ethical appropriateness, and to the aim of ensuring that the interpretations made in scientific communication are based on valid conclusions; they deal with determining what content should be included. Performative aspects relate to the communication work and its effect on audiences (e.g., whether the language used is accessible, promotes engagement, and helps the audience understand and appraise the issues, and what feelings it generates). Substantive aspects refer to the textual and visual characteristics of the science communication format. Both substantive and performative aspects relate to how to present content.

As regards the substantive aspects, scientists must use clear and concise language and adapt it to the target groups. They must simplify their communication, but not to the point that it is no longer scientifically correct. To achieve this, Bertemes et al. (2024) suggest four key points: (a) avoiding scientific jargon or explaining it in simpler terms when first using it; (b) being aware that the same word can mean different things to different audiences; (c) considering that different cultures and experiences may influence how people interpret what is said; (d) being aware that the language style is important, therefore using short sentences, simple words, and the active voice.

Since communicating complex information to non-experts requires simplification, contextualization, and framing to achieve specific outcomes, engaging non-academics (e.g., teachers and children) is crucial to reducing message bias (Cormick, 2019). In addition, listening to children is an expression of the mutual learning principle, according to which adults can learn from young people's perspectives and experiences and vice versa (Bødker et al., 2021). It is also in alignment with the children's right to participate and be involved in matters that are important to them and affect their lives (Lansdown, 2005).

Additionally, visual information is important in science communication as it can attract attention, generate excitement, educate, and sometimes even manipulate, all at once. Furthermore, visual information is processed more rapidly and often conveys a more complex pattern than textual information (Bertemes et al., 2024). Therefore, educational tools must have a visual identity that is engaging and attractive for the intended audience. Using interactive formats to share information can ensure that the audience understands and actively engages with and interprets the findings.

These guidelines will help us present the methodology used to design an educational tool developed specifically to communicate scientific resources and results within the framework of the ySKILLS project.

3. The ySKILLS Education Toolkit: A Research-Based Tool

The ySKILLS (Youth Skills) project (2020–2023, funded by the European Union's Horizon 2020 Research & Innovation programme, under grant agreement no. 870612) aimed to enhance digital skills to promote

resilience in young individuals. Based on the premise that children play an active role in their development, the ySKILLS research examined how digital skills influence the opportunities and risks associated with ICT use among 12- to 17-year-olds in Europe (see https://ySKILLS.eu).

Over four years, the ySKILLS project employed various methodologies. One of its first steps was the development of the youth Digital Skills Indicator (yDSI), a measurement tool with 31 items that cover four dimensions of digital skills—each with functional and critical aspects—namely, technological and operational, information navigation and processing, communication and interaction, and content creation and production, the latter three also including digital knowledge items (Helsper et al., 2020). This tool was designed following an extensive academic and grey literature review and several validation practices and differs from existing international frameworks in that it is a measurement tool geared specifically towards young people (Helsper et al., 2020). The yDSI indicator was the basis for a longitudinal survey (2021, 2022, and 2023) in six countries (Estonia, Finland, Germany, Italy, Poland, and Portugal), in which the same group of students answered the same questions about their skills. In 2022, some students undertook performance tests (Van Laar et al., 2022). Furthermore, qualitative studies were conducted on the relevance of non-formal education in learning digital skills, the role of digital skills among adolescent refugees and young people with mental health issues, and misinformation and disinformation (Baptista et al., 2022).

One of the main objectives of the ySKILLS research was to develop insightful strategies for key stakeholder groups such as adolescents, teachers, and families. This objective reflects the importance of leveraging project results to share knowledge, strengthen research, and create tangible societal benefits (European Commission: Executive Agency for Small and Medium-sized Enterprises et al., 2019). Ethical and children's rights reflections influenced the decision to create an education toolkit and how it should be built. Being in charge of the communication, dissemination, and exploitation work package, the Portuguese team was responsible for developing the toolkit, working in close collaboration with the ySKILLS research team.

The toolkit, which is designed for non-academic use and targeted to facilitators who work with 12- to 17-year-olds, aims to promote digital skills by inviting young people to reflect on how those skills are defined and organized and how they can be improved. It can be used in educational settings and in informal environments such as youth associations or within families.

The development of the education toolkit involved careful consideration of normative (what content should be included) and substantive (how the content should be presented) criteria. This included a multi-phase process, starting with ySKILLS researchers reflecting on the content and determining which research tools could be used as educational resources. Table 1 provides an outline of the research instruments and results that informed each activity. The ySKILLS conceptual and methodological framework is present throughout the toolkit, notably in the theoretical integration of antecedents and outcomes of digital skills and online uses (e.g., Digital Map, Features & Impacts of the Internet) and in the definition, multidimensionality, and measure of digital literacy (Smahel et al., 2023), comprising both digital skills and digital knowledge items (e.g., Digital Skills under the Spotlight, Features & Impacts of the Internet, Navigation & Searching for Information, Content Creation, Communication & Interaction). Furthermore, considerable thought was given to how to present the activities in an engaging, appealing, and accessible manner. Interactive formats were prioritized to ensure adolescents could take part as active audiences.

Following this phase, we developed a prototype and sought input from children and teachers, working closely with the Portuguese Directorate General of Education. In webinars, we presented the first draft to young digital leaders (students conducting digital peer-to-peer sessions in their schools) and digital ambassadors (teachers focused on digital education). Both groups provided feedback, especially on technical aspects. This also helped us assess whether the activities were too challenging. It was the first step in evaluating the third criterion for the quality and effectiveness of science communication: performance. Finally, the Portuguese version was translated into English, reviewed by a proofreader, and then translated into the languages of the ySKILLS participating countries by the national teams, thus becoming available for use by anyone in those languages.

The ySKILLS Education Toolkit website has two modules, evaluate and execute, each containing three activities (Figure 1).

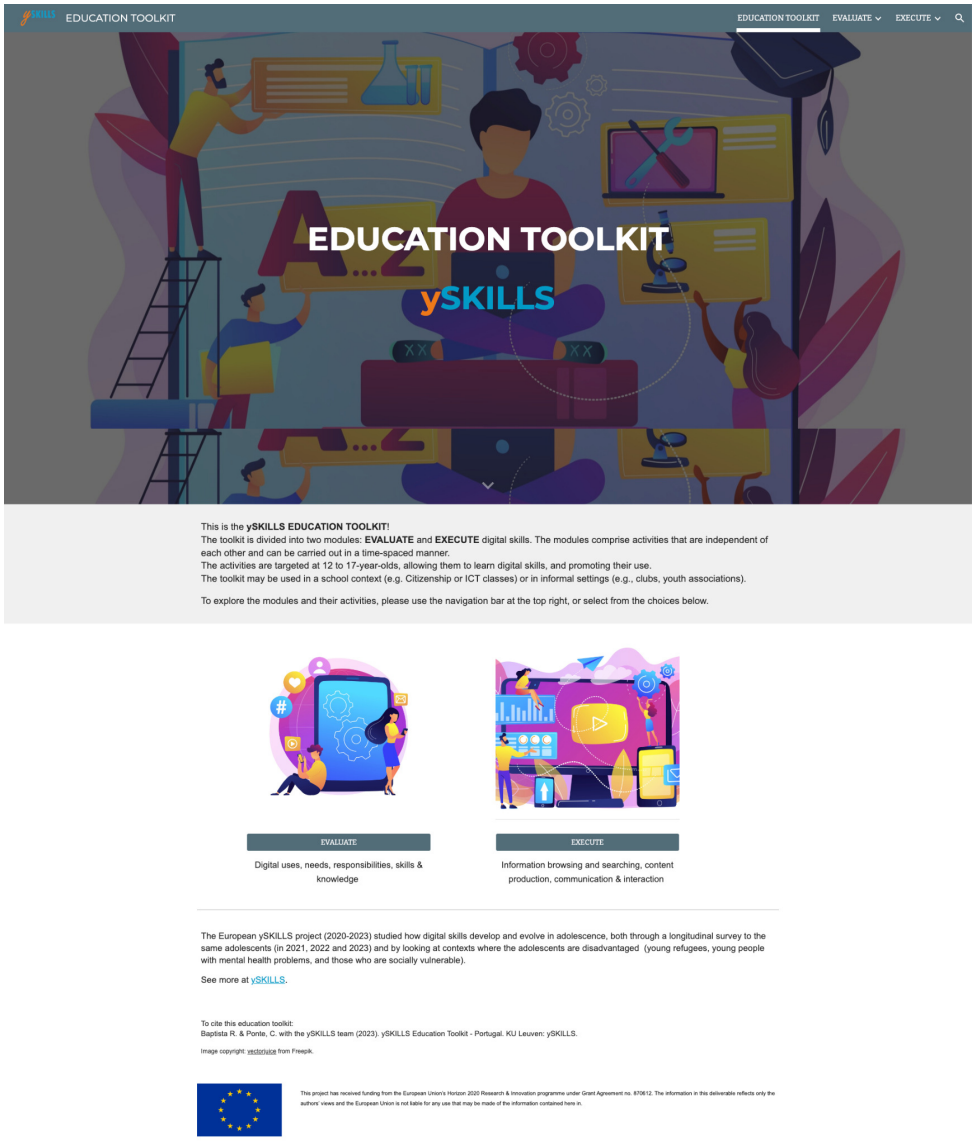

Figure 1. ySKILLS Education Toolkit homepage introducing the toolkit and the two modules. Source: Baptista et al. (2023).

The concept behind these modules was to create an environment where participants first reflect on their understanding of digital skills and then engage in tasks that enhance them (Table 1).

These modules prompt participants to reflect and create content while fostering critical thinking. This aligns with the evolving definition of digital skills, which has expanded from solely technical abilities to social and content creation skills (Van Laar et al., 2022).

Table 1. Description of the toolkit activities (module, name, duration, aims, and origin).

Module	Activity	Duration (minutes)	Aims	Origin
Evaluate	Digital Map	45'	— To reflect on digital uses, needs, expectations, and obstacles related to online uses and activities	Asset mapping of the qualitative study with refugee children and adolescents
Evaluate	Digital skills under the spotlight	90'	— To reflect on adolescents' digital uses — To recognize what digital skills are — To identify four groups of digital skills — To find out which groups are more or less reported by European teenagers — To discuss solutions for increasing the less reported skills	Research tools and results for digital skills items of the ySKILLS longitudinal survey
Evaluate	Features & impacts of the internet	30'	— To recognize some characteristics and impacts of the internet — To reflect on the ways these characteristics influence digital activities	Research tools and results for digital knowledge items of the ySKILLS longitudinal survey
Execute	Navigation & searching for information	45'	— To evaluate whether a website is trustworthy — To identify which information is more objective and reliable — To evaluate different search procedures	Research tools for the performance tests
Execute	*Content creation*	45'	— To identify sites with highly reliable and less reliable information — To evaluate Instagram posts — To design a presentation in digital format and disseminate it	Research tools for the performance tests
Execute	*Communication & interaction*	45'	— To identify problematic messages on a digital platform — To recognize what should not be shared on social media — To understand that communication approaches depend on the receiver	Research tools for the performance tests

Each activity has a session plan for facilitators, such as teachers, to provide a clear outline of the session (Figure 2). It also helps organize the session, manage time, and reduce the facilitator's workload when preparing for the session. The session plan includes objectives, time, materials, briefing, and step-by-step instructions for conducting the session. In some activities, a tips section was added.

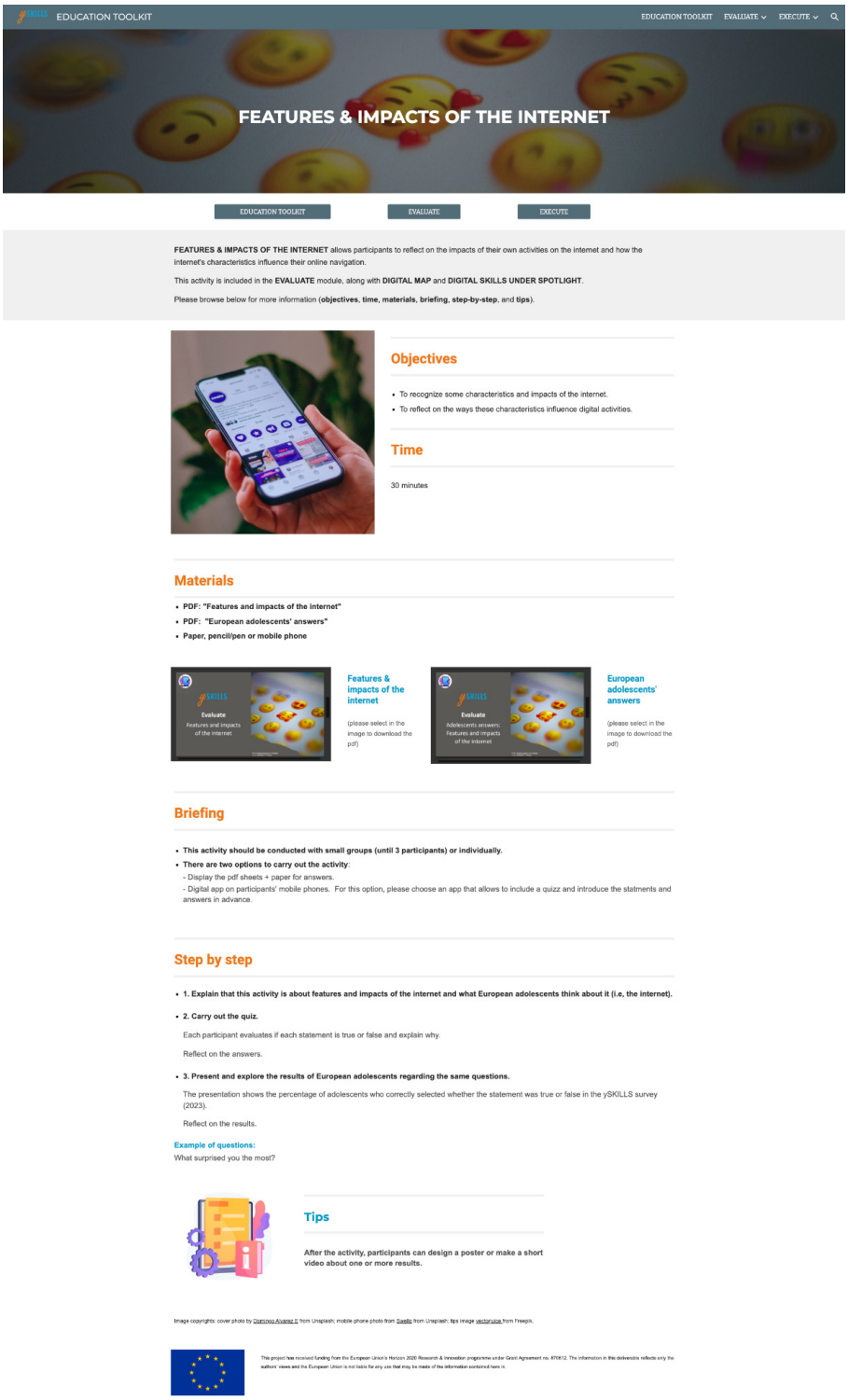

Figure 2. Example of a session plan in the ySKILLS Education Toolkit. Source: Baptista et al. (2023).

In line with our mission to integrate research with educational resources, we have striven to ensure that the content for each activity is engaging and relevant to adolescents. To that effect, we have drawn upon the insights of Bertemes et al. (2024) regarding textual characteristics. Our efforts have focused on avoiding scientific jargon, excessive technicalities, and unnecessary detail. We have incorporated visual aids, such as images and diagrams, to illustrate key concepts effectively. Additionally, we suggest pedagogical approaches rooted in active learning, fostering critical awareness and hands-on or discussion-based learning. These interactive formats ensure that the audience understands and actively engages with and interprets the findings, taking ownership of the information.

However, for digital learning to be fair and accessible to everyone, it is essential to have offline functionalities for the continuity of learning anywhere, anytime, especially in marginalized settings (UNICEF, 2023). Consequently, we have designed all activities to be conducted either online or offline, except the digital map activity, which is offline only. Furthermore, we provide the materials in PDF rather than PowerPoint presentations since the former does not depend on software updates. This ensures that the lack of internet connectivity or access to technology does not hinder activity performance.

To sum up, we have used science communication and pedagogical approaches to create a tool that teachers in various countries can easily use. By the end of the ySKILLS project, the education toolkit was accessible online in five languages. This dissemination has also been expanded beyond the countries that participated in the project, as evidenced by the UNESCO Aruba office's interest in implementing the toolkit in schools in Aruba.

4. Methods

After presenting and distributing the education toolkit, we were interested in discussing the potential and limitations of its use in classrooms with teachers, who are key beneficiaries of the toolkit. This allowed us to further elaborate on how teachers receive and appropriate this research-based tool (performative criteria) and to capture more generally how teachers consider the research-practice link.

Two schools not directly involved in the ySKILLS project were selected using a convenience-based sample method, and both agreed to participate in this discussion. Previous professional contacts facilitated the collaboration, and we ensured geographical variability: both were high schools in urban settings, one located in the metropolitan area of Lisbon (school A) and the other in the countryside (school B). Our main contact in each school—the school principal in one case and someone close to the school board in the other—selected and recruited the participating teachers based on our single criterion of teaching level, to match the appropriate age of the children for whom the activities were designed (lower secondary). The school principals promptly approved the initiative, which showed the strategic relevance of this theme, and all teachers were interested and agreed to participate.

We began by organizing an initial Zoom meeting where we presented the education toolkit and the instructions for the activity: Each participant had to choose at least one of the six activities and explore it independently in their classrooms.

A few weeks later we conducted focus groups in the two school settings. Focus groups are defined as a data collection method through group interaction on a subject introduced and conducted by the researcher as an

interviewer (Morgan, 1996). Due to the approaching end of the school year and a set of personal misfortunes that overlapped with the data collection, the focus group in school A involved only two teachers; the school principal was also present. Table 2 presents the main characteristics of the teachers.

Table 2. Characteristics of the participants.

School	Sex	Age	Years of teaching experience	Teaching area
A	F	47	+/−20	Citizenship education & geography
A	M	28	4	Citizenship education & geography
B	M	49	21	Geography
B	M	42	15	Citizenship education
B	M	46	10	Information & communication technology
B	M	31	3	History
B	F	55	32	Citizenship education
B	F	49	8	Physics & chemistry

The initiative mobilized eight teachers (five male and three female). Most taught subjects directly relevant to the development of their students' digital skills—ICT and citizenship education—and (often simultaneously) subjects within the social sciences—geography (three) and history (two). Three teachers had less than 10 years of experience, while three others had more than 20 years.

The discussion followed a semi-structured script around five dimensions: (a) preparation, (b) implementation of the activity, (c) student feedback, (d) reflection on the education toolkit, (e) discussion on the relationship between research and education. Each focus group session took one hour. The audio was recorded, and the main results were analysed based on the dimensions mentioned above.

5. Education Toolkit in Action: Teachers' Perspectives

At the time of this initiative, three teachers had not worked on digital skills in their classrooms. All but one chose just one activity. Features and Impacts of the Internet (6 teachers), from the evaluation module, was the most chosen. In school A, each teacher chose one activity from the execute module: Communication and Interaction and Navigation and Searching for Information. The latter was also chosen by one teacher in school B. Around 200 students participated, all from the third cycle of basic education (grades seven to nine).

5.1. Preparation

All teachers deemed the first online meeting useful for getting to know each other and gaining a general understanding of the toolkit. They also considered the resources and session plans to be clear.

To ensure they achieved their goals for the final part of the school year, and amidst many other tasks, the choice of activity was mainly driven by ease of implementation. Nevertheless, some tried to involve students or made an extra effort to try more than one activity: "I presented the themes that were on the ySKILLS portal and the matter was negotiated with the students, they were the ones who chose" (F, 55, school B); "I tried to do one from each [module] to try it out. As this was already at the end of the year, in the last week, it was only possible to apply it in two classes" (F, 47, school A).

The majority complemented the activity with an interactive part, as suggested in the session plan (Kahoot or Google forms). These adaptations were meant to captivate students, even if they involved more work:

> I created the form. I put in the questions, with images, made a print screen of all the images, that's it…it took up a little more time…because I also wanted it to be a little more attractive for the students when they were answering the questions. (F, 47, school A)

Some perceived fragilities in the students' digital skills and certain expectations about their reactions were also presented as reasons to justify the choice of activity: "Navigation and Information…so that they realize the big mistakes they make when doing their homework, and this was clear when they immediately clicked the first link that appeared" (F, 49, school B); "I chose Navigation and Information. That's because I think it is the type of thing that is most dangerous for them, and they should pay attention, even in homework and all, verify the sources, check if everything is ok" (M, 28, school A); "they use social networks more and more, and they don't have a perfect understanding of the information that is on the internet" (M, 42, school B).

The general perception was that this type of activity was better suited for a general subject, such as Citizenship Education, rather than a tool whose contents could be changed to serve other subjects. This is why an immediate application was valued: "In geography, there is no time to do this, but these are good activities to do in Citizenship Education" (M, 49, school B). Nevertheless, some teachers identified points of contact with other subjects, like physics and chemistry.

5.2. Implementation

The Navigation and Searching for Information activity was praised for its pedagogical and civic value. Class debates or group discussions shone a light on certain issues: "Confusion naturally arose because they didn't get the same answer" (F, 49, school B); "immediately there were little conversations, they were trying to find out a bit more" (M, 28, school A). Some functional constraints were also identified:

> I noticed that you can't use Google's search tool on a smartphone. And I was confused myself, I was there trying to no avail. Then I switched to the computer and was able to do it. But they [the students] hardly use the computer. They even have difficulties using the computer. (M, 28, school A)

No other logistic constraints were reported, which indicates that those classes were used to employing digital tools for learning. However, a lack of understanding was identified when implementing specific activities, as was the case with two questions in the Communication and Interaction activity that raised doubts due to unclear wording or a confusing image.

In the Features and Impacts of the Internet activity, where students were confronted with questions derived from the yDSI knowledge items, teachers appreciated the explanations provided in the slides, which facilitated the moderation of the discussion.

The materials and time allocated were seen as adequate and sufficient for the target population. The themes covered were considered pertinent, topical, and even related to other subjects in the curriculum (for example, Greta and global warming, telecommunications, etc.), although in school B the interaction between teachers

pointed to the emergent need to discuss the use of artificial intelligence: "[AI use] is increasing considerably in homework related to natural disasters; some will do a search on meteorological and hydrological drought when it is on the manual, for example, they will go to ChatGPT" (M, 49, school B).

Some teachers realized that their students' digital skills did not meet their expectations:

> I thought that they went further, that they knew more. (F, 47, school A)

> What really surprised me was the fact that they realized [through the activity] that not all the information they search for is actually effective. I find it strange that in the eighth year of schooling they think everything that is there [is right]. (F, 49, school B)

By contrast, the teacher of a "very good" class (M, 42, school B) stated that students were quite at ease with the questions. In the discussion, it was suggested that the toolkit could be improved by introducing different levels of complexity.

Despite some fears of distraction or excessive competitiveness to get the answers right, overall the toolkit was welcomed as a tool that motivates students to pay attention and favours an educational use of smartphones: "They were curious…as they answered the questions….Even to see each other's responses afterwards" (F, 47, school A); "they really liked it because they used their smartphones to do activities they enjoy. And then they discussed them. In the following class they asked me if we were going to continue" (M, 28, school A).

5.3. Reflection on the Education Toolkit

Overall, participating teachers expressed their appreciation for the activity and regretted not having had more time to explore further; they also manifested the desire to continue to use the toolkit in the following academic year. The active learning nature of the activities was highlighted:

> I think the usefulness of this toolkit is precisely to get students to reflect on these practices. This is largely based on questions and little activities, but then they can debate among themselves and reflect on these practices. It is not just listening to how it is done, but also reflecting in practice. (F, 47, school A)

> In citizenship classes, I covered [these skills] but it was more theoretical because I did not have activities. Here we have all the practical part, which I think is essential because there is a big difference between speaking, listening, and doing. (M, 28, school A)

The ICT teacher (M, 46, school B), who frequently creates his own applications and gaming solutions, expressed some criticism regarding the Features and Impacts of the Internet activity, which is based on questions and answers, followed by debate. In his opinion, the suggested adaptation to a Kahoot is not enough and not even desirable, because the result is "that competition, for them [the students], is about being faster, and in the end it is not the fastest who gets it right." For this reason, he strongly suggested the necessity of "a set of platforms prepared to be able to really show what is happening," including the future consequences of what is being done online now, using simulations to that effect.

One of the suggestions to improve the education toolkit was to increase the avenues for feedback from the people who use it, for example, by embedding a form in each activity or by providing pre- and post-questionnaires to assess what was learned after implementing the activities.

5.4. Relating Research and Educational Practice

In school B, despite several attempts to reformulate, the majority did not understand the question associated with the relationship between evidence-based knowledge and its exploration for educational practices. Thus, almost everyone dissociated themselves from the question and focused on the practical and functional dimension of its wording: "I am not going to do a search [on how] to take photographs and I am not interested in doing a TikTok with students, as this is part of their skills nowadays" (M, 49, school B).

Most teachers revealed that they have no contact with nor look for research in a transdisciplinary domain such as digital skills. When challenged to imagine how to establish this link, they considered that the possibilities were limited to offers of formal training, regular support, and monitoring or information directly channelled by superiors. Interestingly, the benefits of this relationship based on exchange and shared practices were emphasized primarily by the members of the school management team:

> It is interesting that the team that designs this toolkit and these materials can establish a relationship with those who apply them. (Principal, school A)

> It is good to have access to various perspectives…for ourselves; even though it is not for us to use this in class, it is for us to train as teachers and often adapt our teaching practice afterwards….I am here because even though I haven't read any of this I think this topic is extremely important and this education for digital literacy is essential….How to do this, I don't know either, but how can we facilitate this bridge? Indeed, not everyone has the time, availability, or interest to go look for books. (Contact at school B)

6. Final Remarks

In this article, we have critically examined a research-based tool developed within the ySKILLS project and designed to promote digital literacy and skills among adolescents and to be used, inter alia, by teachers in educational settings. The ySKILLS project's theoretical and conceptual models, tools, and results informed the content of the toolkit and its design, centring it on evaluation and execution activities. This toolkit differs from existing frameworks that aim to guide teachers to enhance students' digital skills in that it encompasses several dimensions designed specifically for young people (yDSI), considers risks as well as opportunities, and provides ready-to-use yet adaptable activities.

To analyse how teachers receive and appropriate the ySKILLS Education Toolkit, we challenged professionals from two schools to try it in their classrooms. The main limitation of this study is its restricted scope, as it involved only eight teachers (who applied the activities with around 200 students) in Portugal. The results would certainly be enriched if the experience were to be replicated in more diverse settings or in other countries. Nevertheless, the discussion with teachers raised some pertinent questions regarding the performative aspects at play and for the purpose of capturing more generally how teachers perceive the research-practice link.

The performative criteria for assessing the quality and effectiveness of science communication (Lafrenière & Cox, 2013) are directly related to how teachers receive and appropriate the education toolkit, as they deal with aspects such as the accessibility of the toolkit, the level of engagement it elicits, and how it supports a better understanding of certain issues. The high degree of applicability of the education toolkit was the most appreciated feature. Indeed, it saves teachers time when they are usually overwhelmed and provides rare pedagogical resources. Moreover, toolkit activities were seen by teachers—and students—as enjoyable, engaging, and useful. Other potentialities relate to a coordinated strategy to focus on this area or its use by teachers across several subjects, although this would entail more work on adaptation.

Amongst the limitations, they identified minor issues with the clarity of certain activities and instructions, particularly regarding devices or browsers. The most critical interviewees directed their comments at the format of the activities, which in their opinion should be more experimental, although it bears noting that they only tried one of the modules. This shows some risks in the design option to make each activity independent, which can lead to some teachers losing sight of the way the entire kit is structured.

While the relevance of the contents was highlighted, they do not include activities directly related to artificial intelligence, and we can imagine how this need for constant updating constitutes another potential limitation; the need for flexible frameworks has already been identified in the literature (Ilomäki et al., 2023). Some of the suggestions for improvement relate to the inclusion of mechanisms for user feedback, to which we can add the evaluation of the toolkit's impact on young people's digital literacy and the introduction of different levels of complexity.

Globally, teachers' perception of the relationship between research and educational practice is more instrumental and linear: they prioritize ready-to-use materials and see themselves as "implementers" following interventions or training. They do not actively seek out research but do value maintaining close relationships with the academic sector. Therefore, we emphasize that evidence-based tools should be designed to be used autonomously while also being contextualized, readapted, and transformed to meet different needs, allowing for different uses. The presence of researchers in the field seems to be a desirable way to strengthen the connection with education, facilitating science communication and promoting a conceptual use of research (Welsh, 2021) through shared discussions and reflective practices (Biesta, 2007).

Acknowledgments

The authors wish to acknowledge the schools and teachers who participated in this study, the digital leaders and ambassadors who contributed their views, and the collaboration of ySKILLS colleagues with whom previous versions of the Education Toolkit were discussed.

Funding

This work is funded by national funds through FCT—Fundação para a Ciência e Tecnologia under the project ref.: UIDB/05021/2020.

Conflict of Interests

The authors declare no conflict of interests.

References

Baptista, R., Mascheroni, G., Vissenberg, J., Georgiou, M., Livingstone, S., d'Haenens, L., & Ponte, C. (2022). *Vulnerabilities and digital skills. Interactive report on the in-depth studies*. ySKILLS.

Baptista, R., & Ponte, C., ySKILLS. (2023). ySKILLS education toolkit: Portugal. ySKILLS.

Bertemes, J., Haan, S., & Hans, D. (2024). *50 essentials on science communication*. De Gruyter. https://doi.org/10.1515/9783110763577

Biesta, G. (2007). Why "what works" won't work: Evidence-based practice and the democratic deficit in educational research. *Educational theory*, *57*(1), 1–22. https://doi.org/10.1111/j.1741-5446.2006.00241.x

Bødker, S., Dindler, C., Iversen, O. S., & Smith, R. C. (2021). Participatory design. *Synthesis Lectures on Human-Centered Informatics*, *14*(5). https://doi.org/10.2200/S01136ED1V01Y202110HCI052

Butcher, N. (2018). *Unesco ICT competence framework for teachers*. UNESCO.

Cormick, C. (2019). *The science of communicating science: The ultimate guide*. CABI. https://doi.org/10.1071/9781486309825

European Commission: Executive Agency for Small and Medium-sized Enterprises, Haardt, J., Weiler, N., Scherer, J., Sweeney, E., Weber, S., Azofra, M., Ala-Mutka, K., Sagias, I., Spichtinger, D., & Cravetto, R. (2019). *Making the most of your H2020 project: Boosting the impact of your project through effective communication, dissemination and exploitation*. Publications Office of the European Union. https://data.europa.eu/doi/10.2826/045684

Falloon, G. (2020). From digital literacy to digital competence: The teacher digital competency (TDC) framework. *Education Technology Research*, *68*, 2449–2472. https://doi.org/10.1007/s11423-020-09767-4

Hargreaves, D. H. (2007). Teaching as a research-based profession: Possibilities and prospects. (Teacher Training Agency Annual Lecture 1996). In M. Hammersley (Ed.), *Educational research and evidence-based practice* (pp. 3–17). Open University Press.

Helsper, E. J., Schneider, L. S., van Deursen, A. J. A. M., & van Laar, E. (2020). *The youth digital skills indicator: Report on the conceptualisation and development of the ySKILLS digital skills measure*. ySKILLS. https://doi.org/10.5281/zenodo.4476540

Ilomäki, L., Lakkala, M., Kallunki, V., Mundy, D., Romero, M., Romeu, T., & Gouseti, A. (2023). Critical digital literacies at school level: A systematic review. *Review of Education*, *11*, Article e3425. https://doi.org/10.1002/rev3.3425

Jones, L. M., & Mitchell, K. J. (2016). Defining and measuring youth digital citizenship. *New Media & Society*, *18*(9), 2063–2079. https://doi.org/10.1177/1461444815577797

Lafrenière, D., & Cox, S. M. (2013). 'If you can call it a poem': Toward a framework for the assessment of art-based works. *Qualitative Research*, *13*(3), 318–336. https://doi.org/10.1177/1468794112446104

Lansdown, G. (2005). *The evolving capacities of the child*. UNICEF. https://digitallibrary.un.org/record/556609

Levin, B. (2011). Mobilising research knowledge in education. *London Review of Education*, *9*(1), 15–26.

Lindblad, S., & Pettersson, D. (2023). 'Who are we writing for?': On research publishing in comparative studies based on international large-scale assessments. *Sisyphus, Journal of Education*, *11*(2), 139–163. https://doi.org/10.25749/sis.28905

Livingstone, S., Stoilova, M., & Nandagiri, R. (2020). *Data and privacy literacy: The role of the school in educating children in a datafied society*. In D. Frau-Meigs, S. Kotilainen, M. Pathak-Shelat, M. Hoechsmann, & S. R. Poyntz (Eds.), *The handbook of media education research* (pp. 219–236). Wiley. https://doi.org/10.1002/9781119166900.ch38

Martinez, D., Helsper, E., Casado, M. A., Martinez, G., Larrañaga, N., Garmendia, M., Olveira, R., Salmela-Aro, K., Spurava, G., Hietajärvi, L., Maksniemi, E., Sormanen, N., Tiihonen, S., & Wilska, T.-A. (2023). *Analysing intervention programmes: Barriers and success factors. A systematic review*. KU Leuven; REMEDIS.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, *108*, 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Morgan, D. L. (1996). Focus groups. *Annual Review of Sociology*, *22*, 129–152. http://doi.org/10.1146/annurev.soc.22.1.129

Owen, K., Watkins, R., & Hughes, J. C. (2021). From evidence-informed to evidence-based: An evidence building framework for education. *Review of Education*, *10*(1), Article e3342. https://doi.org/10.1002/rev3.3342

Pangrazio, L., & Sefton-Green, J. (2021). Digital rights, digital citizenship and digital literacy: What's the difference? *Journal of New Approaches in Educational Research*, *10*, 15–27. https://doi.org/10.7821/naer.2021.1.616

Pettersson, F. (2018). On the issues of digital competence in educational contexts—A review of literature. *Education and Information Technologies*, *23*, 1005–1021. https://doi.org/10.1007/s10639-017-9649-3

Redecker, C., & Punie, Y. (2017). *European framework for the digital competence of educators: DigCompEdu*. Publications Office of the European Union. https://data.europa.eu/doi/10.2760/159770

Sander, I. (2020). What is critical big data literacy and how can it be implemented? *Internet Policy Review*, *9*(2), 1–22. https://doi.org/10.14763/2020.2.1479

Santos, C., Mattar, J., & Pedro, N. (2021). Use of DigComp and DigCompEdu digital competence frameworks in education: Literature review. *Brazilian Journal of Education, Tecnhology and Society*, *14*(2), 311–327. https://doi.org/10.14571/brajets.v14.n2.311-327

Saul, R. (2016). Education and the mediated subject: What today's teachers need most from researchers of youth and media. *Journal of Children and Media*, *10*(2), 156–163. https://doi.org/10.1080/17482798.2015.1127837

Smahel, D., Mascheroni, G., Livingstone, S., Helsper, E., van Deursen, A. J. A. M., Tercova, N., Stoilova, M., Georgiou, M. A., Machackova, H., & Alho, K. (2023). *Theoretical integration of ySKILLS: Towards a new model of digital literacy*. ySKILLS.

Taylor, J. (2019). Reporting research findings to participants is an ethical imperative. *BMJ*, *367*, Article l6324. https://doi.org/10.1136/bmj.l6324

UNICEF. (2023). *Top 10 reasons digital learning succeeds or fails*. https://www.unicef.org/innocenti/top-10-reasons-digital-learning-succeeds-or-fails

Van Laar, E., van Deursen, A. J. A. M., Helsper, E. J., & Schneider, L. S. (2022). *The youth digital skills performance tests: Report on the development of real-life tasks encompassing information navigation and processing, communication and interaction, and content creation and production skills*. ySKILLS. https://doi.org/10.5281/zenodo.7110264

Vuorikari, R., Kluzer, S., & Punie, Y. (2022). *DigComp 2.2: The digital competence framework for citizens—With new examples of knowledge, skills and attitudes*. Publications Office of the European Union. https://doi.org/10.2760/115376

Welsh, R. (2021). Assessing the quality of education research through its relevance to practice: An integrative review of research-practice partnerships.*Review of Research in Education*, *45*, 170–194. https://doi.org/10.3102/0091732X20985082

Wescott, S. (2022). The post-truth tyrannies of an evidence-based hegemony. *Education Policy Analysis Archives*, *30*(95). https://doi.org/10.14507/epaa.30.6178

Willeck, C., & Mendelberg, T. (2022). Education and political participation. *Annual Review of Political Science*, *25*, 89–110. https://doi.org/10.1146/annurev-polisci-051120-014235

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