Literacy IT Framework
How to sustain literacy apps in your school to support reading fluency of struggling readers

University of Amsterdam

A IS FOR APP

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How to sustain literacy apps in your school to support reading fluency of struggling readers

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The picture on the front page (taken by Katerina Holmes) is available freely at pexels.com

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Introduction

This framework is intended to help professionals working in primary education to implement and sustain the usage of IT-literacy apps in their school. Apps that are considered IT-literacy apps are those that help pupils become better readers, including the ones that focus on reading fluency, one of the important components of reading development[1].

In the A is for App Toolkit you can find a selection of evidence-based apps that help pupils' reading in different phases of their development backed up by a theory section entitled "Three Strategies for Fluent Reading".

In this framework we will guide you as practitioners towards the sustainable usage of IT-literacy apps in your school. It is not about the actual use of the specific apps, but about what you need as a teacher, special needs teacher, coordinator or principal of a school to organize the use of apps in the school in a sustainable way.

This framework can be considered as a checklist of important issues you would need to consider when you start implementing IT-literacy apps in the classroom.

We developed the Literacy IT framework as a starting point, see page 2. The framework is loosely based on an extensive review on the implementation of interventions[2] and adapted specifically to help implementing IT-literacy Apps in primary education.
On the basis of this framework, we discuss the conditions and resources in 8 main topics that we consider important in order to implement IT-literacy apps in a sustainable way:

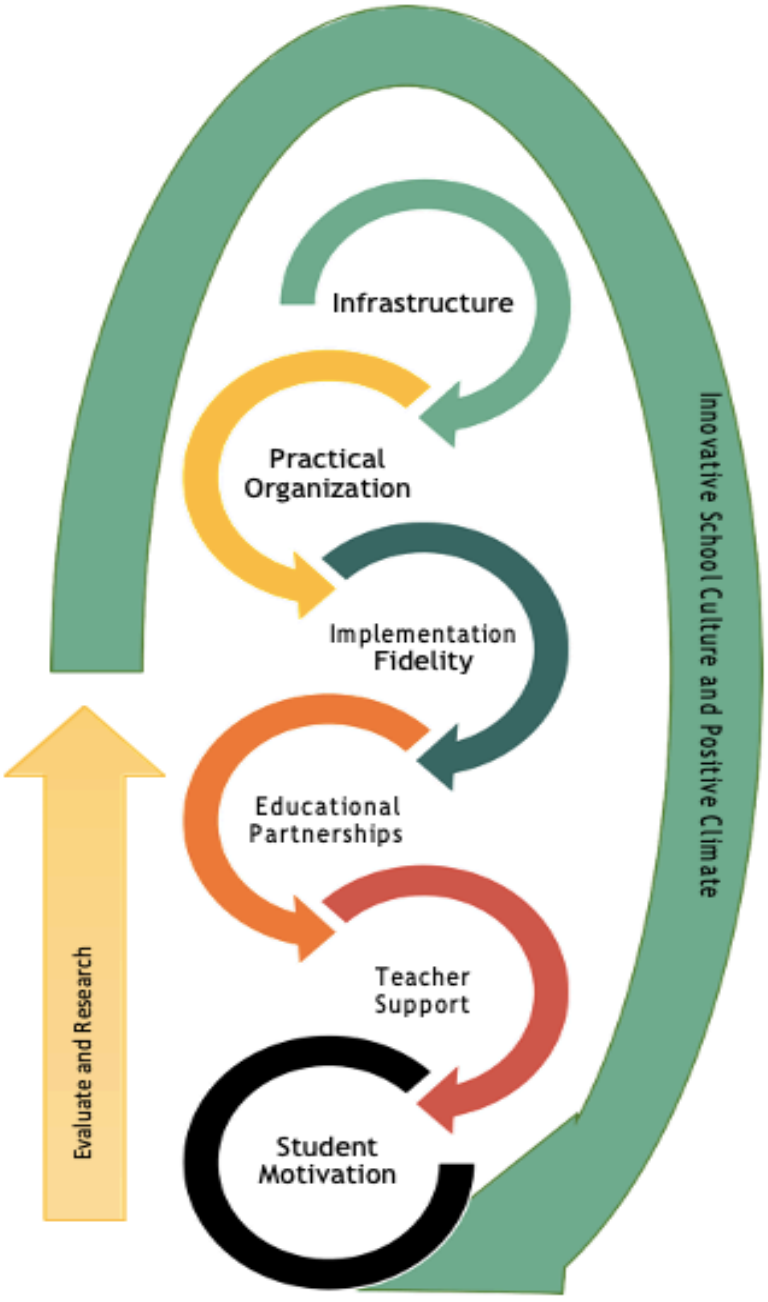
1. Translate the reading policy into a practical organization for the implementation of IT-literacy apps at school
2. Guarantee implementation fidelity: the IT-literacy app is used as intended
3. Foster educational partnerships

1 Rasinsky, 2012
2 Durlak en Dupre, 2008

4. Support teachers in the implementation of apps in the classroom
5. Motivate pupils (at risk for reading difficulties) to use the app regularly
6. Invest in an innovative school culture as well as a positive and safe climate
7. Make sure the (technological) infrastructure is in place
8. Evaluate, monitor and allow research into student outcomes when using the apps

On the basis of these topics, a checklist has been designed (Annex 2) that can be used to establish whether the parameters are in place for successful app implementation.

A is for App Literacy IT Framework[3]



3 Schreurs, 2020

1. Translate the reading policy into a practical organization for the implementation of IT-literacy apps at school

Reading policy, app selection and implementation

One of the main aims in primary education is to acquire (functional) literacy. This means that schools need to define their **mission and vision on literacy instruction**, which, in turn, is in line with the national standards on teaching and literacy. This mission and vision should also focus on prevention of reading difficulties and support of children who show continued reading difficulties. The mission and vision of the schools needs to be translated into **concrete literacy instruction policy**, in which the different components of the curriculum, such as content, dedicated time, learning activities and resources, role of the teacher, and evaluation/assessment are specified[4] and integrated.

The ensuing reading policy should be clear about the goals that need to be obtained and the ways in which these are achieved. Aligning IT-literacy apps with teachers' needs and with the reading curriculum has been found to play an important part in decisions to adopt technology in the classroom[5]. This means that it is clear from the outset which literacy apps relate to the different phases of reading instruction and development, for whom they are relevant, and how they can help to meet certain goals in the reading curriculum.

It also means that it should be clear why literacy apps should be introduced/used (**relevance**), whether the school is **ready** to take on and continue the implementation of the apps and whether there are **resources** to facilitate this implementation[6]. In other words, the questions that need to be addressed are whether there is a need for implementation and whether the school has the time, space, knowledge, skills, budget, equipment, and professionals available for this implementation.

Next to these reading-specific considerations/requirements/assumptions, the connection between reading policy and apps requires an **innovative school culture** in which there is a place for inquiry-based leadership

4 Van den Akker, 2006
5 De Grove et al., 2012
6 Fullan, 1991, 2007

(i.e., expertise)[7], conducive to the process of change and implementation, and ensuring proper guidance[8] (see also Topic 6).

Specific considerations for app implementation at school

If schools want to sustain the use of IT-literacy apps, school leaders and coordinators are advised to integrate the use of IT-based support systems in their school policy[9] and specifically to their literacy/reading policy. A school policy could outline the following information[10]:

- the school's vision regarding reading instruction and the prevention of reading difficulties
- the pedagogical vision on reading instruction
- the availability of knowledge on literacy instruction, reading difficulties, IT and app usage
- the position of apps in the class and school (literacy) curriculum
- the criteria for the selection of apps
- the budget available for apps and related equipment
- the division of roles of school staff in implementing the apps
- the way in which exchange of experiences in using apps in the classroom/at school is facilitated
- the frequency and duration of the use of apps in the classroom
- the way in which outcomes on using the app are evaluated/ monitored
- the way in which teacher and student motivation to use the apps is supported
- the support system
- the communication to stakeholders
- the role of parents and others considered as important by the school team

7 Copland, 2003; Fixsen et al., 2005
8 Fixsen et al., 2005; Hord et al., 2006
9 Tate, 2018
10 Also based on De Grove et al., 2012; Meulenberg, 2020; Oprins et al., 2015; Steenbeek & Oprins, 2015; van den Akker, 2006

With respect to the **positioning of apps in the class and their role in supporting the school's literacy curriculum**, it should be clear from the outset how the apps relate to the school's teaching approach. If, for instance, a response-to-instruction approach is used[11], it can be designatedwhether a specific app should be used in class teaching, small group teaching, additional remedial instruction teaching or individual teaching. This also ensures that all parties are clear on the why and how of the implementation of the app.

With respect to the **division of roles**: To ensure a sustainable implementation of apps in the classroom and in schools, school leaders, special needs teachers or coordinators need to think about a division of roles and responsibilities:

- Who is responsible for the maintenance and budget of the hardware and software?
- Who manages all the licenses and logins of the apps?
- Who does the follow-up on the tracking of the progress of pupils using the apps?
- Who prepares the communication and information for the pupils/parents on the use of the apps?
- Who decides which children are allowed to use the apps (all children, those at-risk, those showing a delay?) Is there a clear selection procedure in place?
- Who provides the technical support for teachers/pupils/parents?
- Who integrates the use of apps in the school's time schedule?
- How is continuity in IT and literacy knowledge maintained/ensured?
- How is continuous evaluation of the reading policy and the reading curriculum ensured?
- How can all participants feel ownership in supporting app use?

Concerning this division of roles, it is essential to have a school champion or coordinator in charge of the use of IT-literacy apps. This could be a

11 Fuchs & Fuchs, 2006

colleague or colleagues dedicated to exploring new apps, motivating colleagues to use apps and functioning as the key contact person(s) for information. Such a coordinator is important for helping teachers to implement IT-literacy apps in the school or in the classrooms.

With respect to the **support system**: Schools need to make sure they have the technical support for teachers, parents and pupils who use apps. Often, the providers of apps also provide technical support. It is important to ensure that before purchasing the licenses to use the apps, the school has the direct contact details of the person who is responsible to help customers with technical and other forms of support. It is necessary to think about emotional support for teachers and parents who use the apps, for example when it is difficult to motivate children to use a particular app or if parents or tutors disagree with the child concerning practicing time. Opportunities need to be created to talk about these or other possible issues.

Concerning the **practical organization of apps in the classroom**, we refer to the extended guidelines of the organization of apps in the classroom, written in the A is for Apps Toolkit page: I know what apps to use, but how do I organize this in my classroom?

Concerning the **integration of apps in the school timetable**: To sustain the use of apps in the classroom it is important to incorporate time into the lesson planning or even into the school's timetable. Some schools opt for organizing a "reading hour" for all pupils of all grades to motivate reading or the use of apps to support reading throughout the school.

2. Guarantee implementation fidelity

Once the literacy apps have been selected, in line with the reading policy and school curriculum, the IT and literacy experts at school can prepare the implementation. It is important that IT-literacy apps are used as intended, as only this type of use guarantees the envisaged outcome. There are 5 important dimensions of implementation fidelity[12]:

1. **Dosage and frequency**: Pupils practice as frequently as the guidelines prescribe (repetition, frequent exercise often is necessary, especially for reading). Evidence-based apps, whose effectiveness have been reported, often prescribe a certain dosage (e.g. 4 times 15 minutes in a week). It is important to stick to that dosage. If an app requires two sessions per week, this should not be compensated by doing one longer session per week. Dosage and frequency are important for effectiveness.

2. **Quality of app usage**: The presence of the tutor or teacher to help with app usage. For some apps a tutor is needed to help children to use the app. According to Francken (2020) clear instruction of the teacher is needed to help pupils understand the main aim and functionalities of the app. Tutoring can also have other functions, like offering individual or small group guidance and instructions on how to use the app, engaging children in pleasant experiences with the app and helping children feel successful by giving positive feedback and support while using the app.

3. **Coverage**: IT-literacy apps are designed with a specific target group in mind. To guarantee effectiveness of the app this target group needs to be respected. Sometimes selection procedures need to be put in place to test pupils' reading outcomes. These selection procedures can be based on existing reading literacy tests, or tests specifically designed to select pupils for the use of the app.

4. **Responsiveness**: The pupils, but also the teacher and other tutors, such as parents, are engaged when practicing in the app. It is

12 Guo et al., 2016, Caroll et al., 2007

important to check the level of responsiveness to guarantee an effect. If, for instance, it turns out that children are not practicing enough with the app, a reward system can be designed. If it turns out that parents are reluctant to allow the use of apps at home, more information on the school reading policy can be provided.

5. **Adaptations**: The school reflects on the adaptions that are required for successful implementation in the classroom or school while ensuring the needed dosage, responsiveness and coverage. For instance, plenary classroom or small group sessions could be introduced in which app use, errors made, or difficult words encountered in the app are discussed and instruction is based on the outcomes on the app. Similarly, adaptations might need to be made to add variability to the games (if some games are considered boring).

App requirements for ensuring implementation fidelity

In order to ensure implementation fidelity, the app should be connected clearly to the literacy learning outcomes, to the literacy curriculum and to the literacy instruction practice at school. Furthermore, a clear manual is required as well as an online/digital FAQ section, a way to interact between teachers and developers, and possibly a platform in which tips and tricks on implementing the app can be exchanged. Furthermore, the app and manual should adhere to guidelines of accessibility.

3. Foster Educational Partnerships

Who are educational partners and why are they important?

Educational partners are parties who connect to support the school goals and/or to support and enhance student learning[13]. Examples are the students' families, the community the school is part of and IT and literacy experts. Other possible partners are those that can aid in generating required funding for equipment, infrastructure and knowledge. Connecting with a diverse group of different partners should help in providing the best education possible for all children, in line with the school's mission and vision. Ideally, these educational partners are collaborating with the school in a participative way.

Partnerships with other professionals could consist of providing, disseminating, or engraining knowledge on language and literacy development linked with the use of app implementation targeting a diverse population. Also, partnerships between schools/teachers and parents can consist of sharing views on the reading curriculum. This would allow for more ways of shaping/creating additional reading practice time and create a working relationship on supporting children with reading difficulties. Successful educational partnerships can benefit the students and can help to 'provide a more level playing field for all families and children'[14]. If implemented successfully, they could also benefit schools, teachers, administrators and the larger community[15].

Fostering educational partnerships with experts outside school for IT literacy apps

As the implementation of IT-literacy apps requires both literacy and IT knowledge, expertise and partnerships can be forged with professionals who have the expertise which the school might not have. Such partnerships can serve to strengthen, support, and even improve the implementation of IT-literacy apps. In order to benefit from these partnerships, good communication ensuring commitment to the same goals by the partners is required.

13 Cox-Petersen, 2010
14 Cox-Petersen, 2010, p.6.
15 Cox-Petersen, 2010

With respect to knowledge on **literacy**, it could be beneficial to team up with experts on literacy development, such as those providing in-service training or those who are experts on family literacy, language difficulties and disorders in relation to reading (such as speech-language therapists or educational psychologists), second language learning and bilingualism in relation to reading. For example, in The Netherlands, an organization with expertise in Developmental Language Disorder (DLD), Koninklijke Auris, has adapted a reading accuracy app for struggling readers specifically for children with DLD. This adapted version can now be used in inclusive education. Creating such educational partnerships can help in supporting students' literacy development. Also, partnerships in which **pedagogical and didactic expertise** is joined and strengthened can aid the amount, shape and quality of literacy instruction. This also means that collaborating with teacher training colleges/tracks could benefit all parties.

With respect to **IT and app knowledge**, good partnership with the developers of the app can be useful to guarantee implementation fidelity (Topic 2) as well as assist in providing specific adaptation for specific student populations. Similarly, partnerships with researchers from universities who are interested in monitoring students and who are investigating the effects of IT-literacy apps can help to shape the implementation and adaptation of app usage. Not only can external partners to the school provide different dimensions that schools might not have considered, app developers and researchers will also benefit from teacher and school experiences in further developing/improving the apps. The partnerships are thus bidirectional with a common goal of improving students' literacy development.

With respect to experiences in implementing literacy apps, educational partnerships with **different teachers/schools** can also be beneficial. All schools and teachers share the same ultimate goals in striving to achieve functional literacy for their students. Through partnerships with other schools and teachers, schools can reflect on their literacy curriculum in relation to specific student populations and teachers can reflect on the implementation of the apps in the classroom setting.

Sharing tips and tricks and fresh perspectives could prove valuable for all partners involved. This can be done in theme meetings and discussion sessions as well as in constructing platforms (for instance: FAQs and asking questions, providing useful examples).

Finally, in the process of deciding on and implementing apps, educational partnerships could be constructed with those who are competent in **processes of change** (see also Topic 1 and 6). These partners can assist in determining the relevance, readiness and relevance of the app implementation[16] as well as guide the change and implementation properly[17].

Fostering educational partnerships with parents for IT literacy apps
Schools sometimes struggle to engage parents in schoolwork. Three key elements play a role in parental involvement[18]:

- The way parents view their role,
- The extent to which parents feel capable of playing an important role in schoolwork,
- The way in which parents are invited by the school to participate in schoolwork.

Therefore, the advice is to give parents[19]:

- Information about the school literacy curriculum and the app that is used
- The opportunity to exchange ideas and concerns about the literacy curriculum
  and the (implementation of) the app; this includes the option of discussing parents' reluctance to use the apps at home
- A role that is closely related to the vision of the school and the vision of the parents

16 Fullan 1991, 2007
17 Fixsen et al., 2005; Hord et al., 2006
18 Hoover-Dempsey & Sandler, 1997
19 Cox-Petersen, 2010

- A role that is fitting their time, space and abilities
- Concrete advice and tools to continue to motivate pupils to read/ practice at home (e.g. a reward system)

- Lots of (informal) feedback about the progress of the student
- Importantly, parents need to feel competent in their role of supporting literacy acquisition through the app. This requires knowledge about how to use the app and interpret the app outcomes. It also requires parents being equipped to support their child. Parents thus need to receive the support to ensure they feel competent in their role.

4. Motivate and support teachers to use IT-literacy apps in the classroom

General pre-requisites for teacher motivation and support in IT-literacy app implementation

A school's **mission and vision** on reading acquisition and the ensuing literacy curriculum should be shaped and supported by the teachers (see also Topic 1 and 6). This is essential to enhance teachers' willingness to make any changes to their literacy instruction, to encourage them to actively consider different options for literacy instruction and to start using apps. Also, the process of implementing an app needs to be managed carefully and concerns should be taken seriously[20].

Furthermore, teachers need to **feel supported in their teaching and app implementation**. This requires a clear division of roles (being able to ask the IT wizard at school questions on the app or device, being able to ask questions to the literacy specialist at school), time to practice with the app and outcomes, options to share experiences with other teachers, time to connect with educational partners (see also Topic 3). They should not have to spend/waste time on constructing the technological infrastructure (Topic 7). Teacher training for the use of apps will also foster implementation fidelity (Topic 2).

Teachers also need to possess **knowledge on literacy development and literacy teaching** to provide successful literacy instruction[21]. Options for in-service training on literacy and didactics should therefore be present and stimulated.

Specific motivators for teacher IT-literacy app implementation

The most important motivators for teachers to use apps are[22]:

Perceived benefits of IT-literacy apps: If teachers notice improvement in the learning process of the pupils in the school, they are more motivated to use the apps in a sustainable way. Make sure that positive stories are

20 Hord et al., 2006
21 Piasta et al., 2020
22 Durlak & Dupre, 2008; Meulenberg, 2020

shared within the team and that pupils' progress is made visible in the school. It should also be clear to the teacher how the app relates to the learning goals, as apps that have no clear relationship to the learning outcomes tend to end up being unused[23].

Dashboard for teachers: A dashboard for teachers, in which they can easily monitor the progress of each pupil, is seen as an important enabler for teachers to use an app. Such information can not only be used to monitor progress but can also be used to provide feedback and shape literacy instruction. It is important to make sure that teachers are able to convert the outcomes presented on the dashboard to actions (e.g. teaching practices, feedback to app developers, feedback to students, parents, care coordinator). Furthermore, if school leaders and care coordinators show clear intentions of tracking and assessing the outcomes, it is more likely than an app will be used[24].

Skill proficiency: Teachers and special-needs teachers need to possess the required skills to support pupils in the use of the IT-literacy app and feel confident in doing so. This requires time to become acquainted with the app and device and the output it generates. It also means that the manuals for the apps should be available at school (IT wizard) and/or that the app developer can be contacted in case questions arise or feedback needs to be provided.

Self-efficacy and team efficacy: If teachers have the feeling that they are competent in the use of apps, they will use them more often in a sustainable way. If individual teachers do not feel competent, team efficacy can help: "we as a team are able to implement apps in the classroom". Teachers who feel less competent can rely on the competence of others. They know that they can ask for help if needed. Teachers thus need to be provided with the required knowledge, skills and support to assist them in using the apps in their literacy teaching. They also need to feel that they can actively contribute to shaping the literacy curriculum[25].

23 Tate, 2018
24 Tate, 2018
25 Bandura, 1997

5. Motivate pupils to use IT-literacy apps in the classroom

Ensure security and privacy

Before turning to pupil motivation specifically, it should be noted that pupil security and privacy while using the app need to be guaranteed. You therefore need to make sure that the security and privacy of the children is guaranteed by the app provider. Read the privacy statement of the app carefully. Should you have concerns about the storage and use of data by other parties, contact the developer. Also, monitor children's behavior, responses and feedback on when they can play with other users who are online. If you think that ill-willing players are in the app/game or that inappropriate communication or behavior is taking place through the app, then make sure required measures are taken.

Select the right app and use it the right way

With respect to app selection, a general issue is that apps should ideally be easy to use and have an enticing look and feel. This will increase or maintain students' motivation. Furthermore, the app should adhere to guidelines of accessibility (see link above).
Regarding the literacy elements targeted, good IT-literacy apps are created with a specific target audience in mind. Some reading apps can be used as an alternative reading method in regular classroom practices, whereas other apps are aimed specifically to be used for additional or remedial teaching. It should be clear to the teacher and/or care coordinator which apps can be used for which students and in which way. If apps are too easy or too difficult motivation may drop. Make sure you have a good procedure in place to select pupils that need the support of an IT-literacy app. For inspiration we recommend the App Analysis Matrix in appendix 1, which we have used in the A is for App project.

Furthermore, the organization and use of the apps both inside and outside the classroom should be considered to motivate children to learn with the app. Tips about classroom organization and how to use IT-literacy apps in the classroom can be found in the A is for App guidelines. Implementation, in turn, is dependent on an alignment with the literacy learning outcomes (Topic 1), motivation of teachers to use the app (Topic 4) and subsequent implementation fidelity (Topic 2).

Tap into students' intrinsic motivation and increasing self-efficacy

If pupils experience feelings of competence, autonomy and relatedness they are more eager to learn[26]. For example, an experience of feeling competent can be enhanced when pupils get feedback that they are doing well in school and that they can learn easily how to use apps or games. Students can feel more autonomy when they can navigate in the app at their own pace. Relatedness can be enhanced when using the app is used in a group. Sometimes a mentor or friendship relationship with a tutor can also enhance students' relatedness. Integrating these aspects in the app will increase intrinsic motivation and therefore increase/ support motivation.

If pupils have the feeling that they are becoming competent and fluent readers with the help of the app, they will enjoy using it more. Being able to successfully perform tasks in the app, verbal support by a tutor/parent or teacher and modeling enhances self-efficacy. However, stress and fatigue may reduce self-efficacy of pupils[27]. Make sure apps are not implemented very late in the day or as an extra task that students need to do (see also Dosage and Frequency in Implementation Fidelity, Topic 2). Schools can focus on these four sources of self-efficacy while implementing IT-Literacy apps in the classroom and in this way stimulate the self-efficacy of beginning teachers.

26 Deci & Ryan, 2002
27 Bandura, 1997

6. Invest in an innovative school culture as well as in a positive and safe climate

App selection and implementation requires an innovative school culture and a positive and safe climate

Both the selection and implementation of IT-literacy apps are dependent on the innovative status of the school culture. Literacy instruction and therefore **app selection** is based on the school's **mission and vision on literacy instruction** and the **concrete literacy instruction policy** (see Topic 1). Successful app usage is dependent on implementation fidelity (Topic 2), the successful ability to foster beneficial educational partnerships (Topic 3), motivation of teachers and students (Topic 4 and 5) and the existence of the right infrastructure (Topic 7).

This all requires a careful process of **app implementation**. For this implementation, it should be clear why literacy apps should be introduced/used (**relevance**), whether the school is **ready** to take on and continue the implementation of the apps and whether there are **resources** to facilitate this implementation[28].

This means that the **process of change and implementation** should be taken seriously[29]. First of all, it should be apparent that the app is not only 'nice to have' but that it is an **integral component of the literacy curriculum**. In order to guide implementation, the **concerns** that arise need to be collected, analyzed and addressed[30]. These concerns can include concerns that relate to information (e.g., 'I would like to know more about the app'), the person (e.g., 'How will using the app in my teaching affect me?'), management (e.g., 'I seem to spend all my time understanding how the app works') , consequences (e.g., 'How is my use of the app affecting my students?'), and collaboration (e.g., 'I am concerned about relating what I am doing with the app with what other instructors are doing'). The different concerns can furthermore surface at different stages of the implementation and therefore require continuous attention.

28 Fullan, 1991, 2007
29 Fixsen et al., 2005; Hord et al., 2006
30 Hord et al., 2006, p. 44-46

Furthermore, for the successful implementation of the app, it is also necessary to monitor how the app is being used followed by acting upon that information. This means that it needs to be established what the **levels of use of the app** by the teacher and school are[31]. Are teachers, for instance, spending most efforts in getting to grips with the app, managing its use in the classroom or are they already integrating the app into their literacy
curriculum (progressing from making it a routine, to refining its use and finally to fully integrating it)? On the basis of assessing the levels of use against time, it becomes clear what is needed to further support app implementation.

Finally, the implementation hinges on **distributed leadership**[32]. Distributed leadership refers to 'collective activity, focused on collective goals, which comprises a quality or energy that is greater than the sum of individual actions'[33]. This means that successful app implementation demands strong consensus on the implementation of the app in the literacy curriculum and classroom and that those leading this process are the ones with expertise (rather than being decided on the basis of hierarchy). This in turn, requires a school culture in which collaboration, professional learning, reciprocal accountability and trust are essential. A collaborative process of app selection and implementation can then take place.

Components of innovative school culture and a positive and safe climate
The environments in which the IT-literacy apps are implemented affects the success of the implementation process. The following factors are considered as important[34]:

Shared vision: The teachers have a shared vision regarding the importance of implementing IT-literacy apps or a vision regarding the prevention of reading difficulties or the reading policy in the school. School teams can discuss their vision together during meetings to enhance a

31 Fixsen et al., 2005; Hord et al., 2006
32 Copland, 2003; Fixsen et al., 2005
33 Copland, 2003, p. 377
34 Durlak & Dupre, 2008

shared goal and ideas on how to deal with reading difficulties (see also Topic 1).

Shared decision making: When choices are made about the implementation of IT-literacy apps teachers are involved in the decision making. The same holds for making adaptions to the implementation process (see also Topic 1).

Positive work climate: Implementation of innovation works best in organizations with high levels of trust amongst colleagues, a sphere of collegiality, a place where disagreement is easily resolved, an organization open to change and innovation.

Networking with external parties: The school has an open collaboration with external local parties to help and bring different perspectives on the implementation process of IT-literacy apps, for example involving speech and language therapists, the developers of the app and language specialists (see also Foster Educational Partnerships, Topic 3).

Professional Learning Community: The school acts as a professional learning community, consisting of a group of dedicated teachers (within the school or a cluster of schools) who meet regularly to develop expertise by sharing and discussing practices in the area of IT-literacy apps. This group informs and inspires the larger school team (see also Topic 1, 3, and 4).

Leadership: The school principal and other leaders who are responsible for the literacy policy in the school support the implementation of IT-literacy apps in every possible way. The implementation of the app in the curriculum is based on a clear process of implementation, addressing the different concerns that might arise during the implementation, evaluating levels of use of the apps and guided by facilitators who subscribe to an organized distributed leadership model.

7. Make sure the (technological) infrastructure is in place at school, and if needed in the children's homes

Laptop or Tablet: To guarantee sustainability of the use of IT-literacy apps, ease of use for both teachers and pupils is a must. In the A is for app guidelines how to use apps in the classroom you can find tips and suggestions on how to use apps in the classroom with a minimal number of laptops or tablets.

As most apps that support reading have the ability to guide, support and evaluate pupils individually, pupils often need to be able to use a device individually while they are practicing. Because most apps have a personal login for each student, several pupils can use the same device at different moments in time. Sharing laptops and tables requests a clear organization of the use of the apps inside or outside the classroom. The choice between a laptop or tablet depends on the design and application of the app itself. Most apps offer a recommendation on the use of the appropriate hardware in their guidelines.

Internet Connection: At present, most apps are "in the cloud". This means one needs to be connected to the internet while using the app. This can affect the overall network of the school. Make sure the network is tested before rolling out a large-scale implementation of the app in the school. A bad/poor connection is often seen as demotivating and very time-consuming. Again, organization is key: for how many pupils can you guarantee a stable online connection simultaneously? How will you organize this in the school?

Additional hardware: The extra hardware needed to use apps depends on the app. Headphones can be used if pupils need to practice individually in the classroom and if sound is essential. For some apps headphones are crucial. Follow the guidelines of the app to make the right choice. Most apps use sound to assist the pupils in their reading. However, if tutors assist the pupils, headphones are not always advisable. Headphones could interfere with the informal learning process between tutor and child. The decision on whether or not to use a headphone could have a big impact on the quality of the learning process. A computer mouse can help pupils to use the app on a laptop. Often a computer mouse can also help tutors to guide pupils through the app.

(Breakout) Rooms: Make sure the room is suitable for the learning activities presented in the chosen app. Some apps for remedial teaching are best used outside the classroom, together with a tutor, or in a small group with other pupils using the app. Information on how to organize a classroom can be found in the A is for app guidelines how to use apps in the classroom.

Teacher guidance: To make sure students use the apps as intended, it is advisable for teachers and/or parents guide students and provide at least an introduction on how to use the app. Especially for children with reading difficulties, reading instructions are sometimes difficult. Even if audio instructions are available, research shows that students sometimes have difficulty with understanding the instructions correctly[35].

35 Francken, 2020

8. Evaluate, monitor and allow research

Evaluate: Conduct an annual evaluation of the mission and vision on literacy instruction and the literacy curriculum (Topic 1). This includes an evaluation of the use of different IT-literacy apps with the entire school team. Evaluation of the app needs to consider at least: app outcomes in relation to general literacy learning outcomes, ease-of-use, return of investment, implementation, usability, perceived need for the app, perceived effect of the app, time-investment, quality of the instruction (Topics 1-7). Also evaluate whether extending or intensifying educational partnerships (Topic 3) is needed for app implementation.

Monitor: The student outcomes should continuously be monitored to adjust levels when needed. Student outcomes over several years should be kept to measure a possible long-term effect of the apps (see also Topic 1, 2, 4 and 5). This means that for literacy outcomes, both the monitoring resources of the app are used (see Topic 2) as well as those regularly used in the classroom and at school. Also make sure to gauge students' motivation in the literacy curriculum and app.

Research: Allow academic partners to investigate the impact of IT-literacy apps in your school to help improve the design, use, and implementation of apps in an evidence-based way. However, also make sure that expectations concerning outcomes, bidirectional feedback and communications with all partners and collaborators are clear and whether the collaboration is one based on educational partners (Topic 3) or whether it is a different collaboration.

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Annex 1. App analysis from a pedagogical and educational-technology

An analysis framework (see Table below) was developed based on the theory described earlier and consists of three main parts. The first part, a general description of the app, contains information about the target group (students with and/or without reading difficulties and the grade of primary education) and the degree of explanation provided within the app, for example about the function of the app, purpose and assignments within the app or how to use the app[36]. The app is also checked as to whether it is used as a standalone program or method-based app.

In the second part, the didactic perspective, it is confirmed which phases of reading development the app focuses on (the phases of decoding, reading fluency and/or reading comprehension) and which methodical principles are used. The skills learned in the decoding reading phase contribute to fluency in reading. Moreover, the principles of both process models are often combined in practice and are therefore not always strictly distinguishable from each other[37].

The third part concerns the educational-technological perspective and can again be divided into three aspects. The first aspect includes the capabilities of the apps, namely interactivity, open-ended input, communication with others, follow-up, adaptivity, feedback, user control, and the possibility of non- linear access[38]. The second aspect that is focused on within the educational-technological perspective is multimedia principles. The previously mentioned principles of Mayer (2014) are general principles for multimedia instruction.

Principles that seem relevant with regard to (multimedia) reading instructions and were therefore included in the framework are: the 'coherence' principle, 'spatial contiguity' principle, 'expectation' principle, 'segmenting' principle, 'pre-training' principle, the 'voice' principle and the 'personalization' principle. The 'personalization' principle (written and spoken words are best formulated in a conversational style) are mainly

36 National Academies of Sciences, Engineering, and Medicine, 2018
37 Van der Leij, 1998
38 National Academies of Sciences, Engineering, and Medicine, 2018

examined with regard to appeals and instructions addressed to the user (for example how much text should be read to be able to play the game). The third aspect concerns the motivational- and game elements present in the app[39].

39 Baumstark & Graf, 2014; Mayer, 2014; Mitgutsch & Alvarado, 2012

Criteria		Check if this applies for the app	
1. General description		App 1	App 2
Target audience	Pupils with reading difficulties		
	Pupils without reading difficulties		
	1st grade of primary education		
	2nd grade of primary education		
	3rd grade of primary education		
Explanation within the app	Function of the app		
	Purpose / assignments within the app		
	Using the app		
	Other aspects of the app		
Stand alone?	Stand-alone app		
	App part of bigger programme/curriculum		
2. Didactic perspective		App 1	App 2
Stages of reading development	Decoding		
	Reading fluency		
	Reading comprehension		
Methodical principles	Learning phonological skills		
	Teaching sound-letter links		
	Teaching sound blending		
	Learning visual synthesis of graphemes		
	Teaching direct word recognition		
	Unlearning unhelpful/guessing strategies for word identification		
	Feedback about accuracy		
	Multi-sensory/modal learning activities Opportunities for overlearning/repeated exposure to words		
	Accelerate / limit the duration of the presentation ('flash reading')		
	Feedback about speed		

3. Educational-technology perspective			
3.1 Features and Functions		App 1	App 2
Interactivity	Does the app offer the possibility to communicate with others?		
Open-ended input	Spoken input		
	Written / typed input		
	Drawings		
	Other open communication		
Communication with others	“Real other” peer - spoken communication		
	“Real other” peer - written / typed communication		
	“Real other” peer - other forms of communication		
	Virtual avatar peer - spoken communication		
	Virtual avatar peer - written / typed communication		
	Virtual avatar peer - other forms of communication		
	“Real other” teacher - spoken communication		
	“Real other” teacher - written / typed communication		
	“Real other” teacher - other forms of communication		
	Virtual avatar teacher- voice communication		
	Virtual avatar teacher - written / typed communication		
	Virtual avatar teacher - other forms of communication		
Succession	User activities		
	Correctness of the user's answer		
	Speed with which the user replies		
	Other elements		
	Visible to the user		
	Visible to others (teachers, parents, professionals)		
Adaptivity	To the activities / behaviour of the user		
	To prior knowledge / level of the user		
	To the correctness of the user's answer		

	To the speed with which the user answers		
	To other characteristics of the user		
Feedback	About the correctness of the answers		
	About why an answer is right or wrong		
	Immediate feedback		
	Delayed feedback		
	Other		
User (or others) control over	Sequence of activities or information		
	Pace of activities or information		
	Subject/content of activities or information		
	Representation of information		
	Other		
Nonlinear access	Due to the adaptivity of the app		
	By the choice of the user (or others)		
3.2 Multimedia principles		**App 1**	**App 2**
Multimedia principles	Coherence		
	Spatial contiguity		
	Expectation		
	Segmenting		
	Pre-training		
	Voice		
	Personalization		
3.3 Game elements or other motivational elements		**App 1**	**App 2**
Motivational / game elements	Reward form		
	Story		
	Certain personalities or characters		
	Possibility to create things yourself within the app		
	Division into different levels that can be achieved		
	Challenges or obstacles to overcome		
	Competition / comparison with others		
	Time pressure		
	Attractive graphic design		
	Other motivational elements or game elements		

Annex 2. Checklist for App implementation

The checklist below is based on the Framework. You can use this to establish whether the school is ready to implement an app.

Nr	Topic	In place? / Notes
1	**Reading policy translated to practical organization for implementation of app at school**	
	Reading policy in place?	
	Clarity about need for apps in curriculum?	
	Readiness of school for implementation; resources available for implementation?	
	Innovative school culture existent?	
	Specific considerations □ Clear school vision on reading instruction and the prevention of reading difficulties? □ Clear pedagogical vision on reading instruction? □ Availability of knowledge on literacy instruction, reading difficulties, IT and app usage? □ Clear criteria for the selection of apps? □ Budget available for apps and related equipment? □ Facilitation of the way in experiences are exchanged in using apps in the classroom/at school? □ Clarity about frequency and duration of the use of apps in the classroom? □ Clarity about the way in which outcomes on using the app are evaluated/monitored? □ Clarity about the way in which teacher and student motivation to use the apps is supported? □ Support system in place? □ Clear plan for communication to stakeholders? □ Clarity about the role of parents and others?	
	Clarity on division of roles? □ Who is responsible for the maintenance and budget of the hardware and software? □ Who manages all the licenses and logins of the apps? □ Who does the follow-up on the tracking of the progress of pupils using the apps? □ Who prepares the communication and information for the pupils/parents on the use of the apps? □ Who decides which children are allowed to use the apps (all children, those at-risk, those showing a delay?) Is there a clear selection procedure in place?	

	□ Who provides the technical support for teachers/pupils/parents? □ Who integrates the use of apps in the school's time schedule? □ How is continuity in IT and literacy knowledge maintained/ensured? □ How is continuous evaluation of the reading policy and the reading curriculum ensured? □ How can all participants feel ownership in supporting app use?	
	Division of roles: □ Who is responsible for the maintenance and budget of the hardware and software? □ Who manages all the licenses and logins of the apps? □ Who does the follow-up on the tracking of the progress of pupils using the apps? □ Who prepares the communication and information for the pupils/parents on the use of the apps? □ Who decides which children are allowed to use the apps? Is there a clear selection procedure in place? □ Who provides the technical support for teachers/pupils/parents? □ Who integrates the use of apps in the school's time schedule? □ How is continuity in IT and literacy knowledge maintained/ensured? □ How is continuous evaluation of the reading policy and the reading curriculum ensured? □ How can all participants feel ownership in supporting app use?	
2	Implementation fidelity □ Sticking to the app as intended? □ Sticking to dosage and frequency? □ Sticking to quality of app usage? □ Sticking to coverage? Are the intended target group using the App? □ Engagement in using the app (pupils, teacher, tutors)? □ Are adaptations needed?	
3	Educational partnerships □ Clarity about presence and need for different and specific educational partnerships irt literacy/apps? (partners for IT+app knowledge, supporting app knowledge and usage, pedagogical and didactic expertise, different schools/teachers, implementing change, funding) □ Clarity about the way partners are invited to contribute/participate? □ Clear approach to communication amongst educational partners? □ Clarity about role of parents? □ Clarity about how to support parents in feeling equipped and competent in their role?	
4	Motivate and support teachers in app use	

	□ Do teachers endorse the school mission and vision on reading acquisition? □ Do teachers play a role in shaping the literacy curriculum? □ Do teachers possess the required knowledge for literacy development and teaching? □ Are teachers involved and supported in implementing the apps in their teaching? □ Are the teachers clearly related to learning outcomes of the pupils and class? □ Do teachers perceive the (potential) benefits of using IT-literacy apps? □ Does the app allow teachers to easily monitor the progress of their class and pupils and shape subsequent instruction? □ Do the school leaders and care coordinators use the app outcomes to track progress? □ Do teachers have the time to learn how to use the app? □ Do teachers have an IT wizard at school to turn to in case of questions and problems? □ Do teachers have a support network for sharing experiences? □ Do teachers feel competent in literacy instruction and in implementing the app?	
5	Motivate pupils to use apps □ Are pupil security and privacy guaranteed by the provider? □ Is pupils' safety guarded during online sessions (behaviour, responses, feedback)? □ Does the child feel motivated to use the app in terms of look and feel? □ Does the child feel motivated to use the app in terms of accessibility? □ Can the child use the app inside and/or outside the classroom? □ Does the app align with the intended learning outcomes of the pupil? □ Does app usage tap into feelings of competence, autonomy and relatedness or is support needed (e.g., a tutor)? □ Is app usage provided at the right time of the day and week?	
6	Innovative school culture □ Is the app implementation process safeguarded (based on topics 1-5, and 7)? □ Is it clear what the relevance of the app is irt the literacy curriculum? □ Is the school ready to implement the app? □ Does the school have the resources to implement, use and monitor the app? □ Is the app an integral component of the literacy curriculum? □ Are the concerns related to the app collected, analysed and addressed continuously? □ What are the levels of use of the app by teachers and school? □ What is needed to further facilitate implementation? □ Is distributed leadership in place for app implementation? □ Is there a shared vision on the importance of implementing the app in the	

	literacy curriculum? ☐ Are the relevant partners involved in choices about the implementation and adaptations? ☐ Is there a positive work climate (trust, colleagiality, openness to change, and supporting innovation)? ☐ Does the school include and facilitate collaboration with external relevant local parties? ☐ Is there a professional learning community at school? ☐ Is the implementation process supported by the principal and other leaders?	
7	Infrastructure ☐ Are the correct devices available? ☐ Is the internet connection sufficient for the entire school? ☐ Does the pupil have internet connection at home (if needed for the app)? ☐ Is the additional required hardware available (e.g. headphones, mouse)? ☐ Is there a room in which the pupil can use the app without being distracted? ☐ Do teachers and parents know how to use the app? ☐ Do pupils know who they can turn to if they have questions about the app?	
8	Evaluation and monitoring ☐ Is the mission and vision of the literacy curriculum evaluated regularly? ☐ Is the usage of methods, including the apps, evaluated regularly? ☐ Are apps evaluated in terms of app outcomes in relation to general literacy learning outcomes, ease-of-use, return of investment, implementation, usability, perceived need for the app, perceived effect of the app, time-investment, quality of the instruction? ☐ Are the educational partnerships involved in successful app implementation evaluated regularly? ☐ Are pupil app outcomes monitored regularly? ☐ Are pupil app outcomes related to literacy goals? ☐ Are instruction levels adjusted on the basis of pupil outcomes? ☐ Is pupil motivation for using the apps monitored regularly? ☐ Is pupil motivation for the literacy curriculum monitored regularly? ☐ Are means available to establish long-term outcomes of app usage and literacy instruction? ☐ Is the impact of the app at school investigated?	