Informed Health Choices

Development and evaluation of learning resources

Human-centred design development of Informed Health Choices (IHC) learning resources for secondary school students: Protocol

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Colophon

Title **Human-centred design development of Informed Health Choices (IHC) learning resources for secondary school students: Protocol**

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Date December 2019

Protocol - Human-centred design development of learning resources

Background

Previously, as part of the Informed Health Choices (IHC) project (www.informedhealthchoices.org), we developed learning resources for primary school children in Uganda and their parents/guardians, based on a framework of concepts that people should understand and apply to assess healthcare claims and make informed choices, named the IHC Key Concepts.(1-3) The primary school resources were a set of printed materials: a textbook and a workbook for children, a teachers' guide, a set of cards for one of the lessons, and a classroom poster. For the parents/guardians, we created a podcast.(4, 5)

Randomised trials in Uganda, conducted in 120 schools with over 10,000 children, showed that use of these learning resources, together with an initial teacher training workshop, resulted in a large improvement in the ability of children, teachers, and parents to assess treatment (health intervention) claims.(6, 7) Follow-up data show that the learning was retained by the children for at least one year,(8) while the performance of the parents/guardians who received the intervention declined.

Alongside the trials, we undertook process evaluations to explore barriers and facilitators for scaling up use of the learning resources, potential adverse effects, and potential additional benefits (see *Appendix 1*).(9, 10) Currently, over 20 teams in other countries are translating or adapting IHC resources for their context.

Building on this body of work, we will develop a new set of learning resources for secondary school students in Rwanda, Kenya and Uganda, with the aim of enabling them to apply concepts from the same framework for thinking critically about health claims and making informed healthcare choices (see separate protocol for *Prioritization of Key Concepts*).

Design of these resources will also be informed by our previous work on creating understandable and useful evidence formats,(11-17) and creating a tool to help groups make transparent evidence-informed decisions.(18, 19)

Below are a some of the considerations that will guide resource development:

- *Printing cost is a major barrier, so resources need to be digital.*
  Teachers and policymakers in Uganda expressed an immediate need for the learning-resources that we developed for primary schools.(9) However, the cost of those resources is a major barrier to scaling up their use. The cost of $4 per child is substantial in light of government expenditure per primary school student in Uganda ($29.4) and estimates of the direct costs of primary school education in Uganda.(6) Using digital rather than printed learning resources would eliminate most of this cost. However, creating resources using digital technology brings in new information needs, such as: what characterizes digital resources that have been or can be used successfully by a large number of schools, teachers and students, including in low-resource settings; examples of digital content that teachers and students currently use, like, and find useful; and how we can plan for sustainability of digital resources.

- *Access to technology in many parts of Uganda, Kenya and Rwanda is limited, but secondary schools are likely to have access to computers.*
  There is still limited if any access to computers of any kind in primary schools in low-income countries. On the other hand, access to computers is likely to be increasingly common in

secondary schools, making it potentially feasible to develop resources which could be widely used with small marginal costs. This is partly why we are focusing on secondary school students. However, we need to better understand the Information Communication Technology (ICT) landscape in secondary schools, for instance, what specific technology is available (in schools and outside of school) and examples of how it is used in teaching. We will not seek to conduct comprehensive analyses in each country, but we should identify variations between well-equipped and poorly-equipped schools in the three countries, find out how representative the schools participating in our project are likely to be, and establish a development strategy that, as far as possible, does not exclude schools with few resources or unstable connectivity.

- *Considerations for scaling up should be uncovered early in the project.*
  In Uganda, the process evaluation for the trial of the primary school resources found that teachers, parents, and children supported expanding the IHC project to other schools and other age groups. However, a critical barrier is lack of time in school schedules for teaching new content, so connection to the current curriculum is important. We need to understand how the Key Concepts fit (or do not fit) in the existing curriculum, as well as explore other considerations that could impact scaling up, such as how decisions about what resources are used in schools are made and by who, and where teachers look for and access digital learning resources.

- *We will aim to design resources that are based on effective teaching strategies.*
  There is a body of evidence about the effectiveness of different teaching strategies that we should have an overview of so that it can inform our development choices.

- *The resources should use examples of healthcare claims and choices that are interesting to and relevant for secondary students in Uganda, Kenya and Rwanda.*
  Students are likely to be most engaged if we use examples that they find interesting.

- *Resources need to be translatable and adaptable to other contexts*
  We will design the learning resources to be suitable for teaching in secondary schools in East Africa. The resources will be in English. However, we need to design them in such a way that they can easily be translated and adapted for use in other contexts. This means at the very least planning functionality for language translation in IT development, but we also need to consider how decisions about content, or how we structure and represent content, may impact or facilitate translation/contextualisation. In the process of contextualising the IHC primary school resources for use in Norway, Spain and Ireland, students have expressed interest in examples of treatments, conditions and claims more common in other settings than their own (e.g. malaria), and in a non-European environment (i.e. East Africa). However, in some countries, gatekeepers – such as education and research funding decision makers – have expressed scepticism about the perceived relevance of these resources for use in their context, because they assume the children will not identify with the East-African examples or setting. We need to continue to explore contextualisation needs during development (in collaboration with IHC Network partners), experiment with how to create flexibility for contextualisation where it is possible or necessary, and produce translation/contextualisation guidance when the resources are finalised.

- *We will use a human-centred design approach to develop the resources.*
  A central finding from the process evaluation for the IHC primary school resources was that children and teachers valued the resources, found them interesting, fun and beneficial, and that this was likely due to the human-centred design (HCD) approach that we used to develop the resources (See Appendix 1).(9) This approach is characterized by multiple iterations and close collaboration with users and other stakeholders.(20) We will strive to

closely involve these groups in the development work, particularly teachers and students, within the limitations of their capacity and schedules, as well as ours.

Objectives

Our primary objective is to develop a set of accessible digital learning resources that are experienced as useful, usable, understandable, credible, desirable, and well-suited for use by secondary school students and teachers in Uganda, Kenya and Rwanda.

Secondary questions that we will address are:

- What are conditions in Uganda, Kenya and Rwanda for choosing and using IHC digital learning resources in secondary schools, including demand, fit to curriculum and status of digital resource use in schools ? (see *Context Analysis protocol*)
- What features and functionality characterize digital resources that teachers and students value for teaching and learning? (partly covered in *Context Analysis protocol*)
- What are the technical constraints and considerations for creating digital learning resources that can be readily accessed in a wide variety of secondary schools, including in low-resource settings, in Uganda, Kenya and Rwanda?
- What health claims and choices are secondary school students in Uganda, Kenya and Rwanda interested in? (see *Identification of claims and choices protocol*)
- How can we design resources that are easy to translate and contextualize for use in other settings?
- How can we create digital learning resources that are sustainable?

Methods

Human-centred design

«The design mindset focuses on engaging people early and throughout the process of developing solutions for them. Design seeks to rapidly move from insights to action by translating learnings into concepts that can be tested, adapted, and improved directly with end users.»
www.designforhealth.org(21)

We will use a human-centred design (HCD) approach to develop learning resources.(20) HCD can be defined as an approach to creating products, systems and services that places users and other important stakeholders at the centre of the design, innovation and implementation process. The International Organization for Standardization describes key principles of human-centred design:(22)

- The design is driven and refined by user-centred evaluation.
- The process is iterative.
- The design addresses the whole user experience.
- The design team includes multidisciplinary skills and perspectives.

Although these principles are often referred to in describing HCD, the list has shortcomings. HCD implies a broader approach than focus on just a «user» - for instance a learning resource may provoke important reactions from other people than learners and teachers, such as parents or curriculum developers. Therefore, HCD is often characterised as an approach taking into consideration the concerns of a broader set of stakeholders, not just people who represent users.

HCD has roots in user-centred design approaches in the fields of ergonomics and computer science. Today, these approaches are taught to and practiced by designers in a range of fields such as

product, service and system design, as well as architecture and public planning. In recent years, HCD has gained traction as an approach to innovation in other fields than those traditionally associated with design practice, such as global health.(21, 23, 24)

Hard evidence of the impact of using an HCD approach is scant,(24) though there is increasing consensus on the ethical importance of engaging closely with people who stand to be impacted by research and development.(25) In the process evaluation for the trial of the IHC primary school resources, we sought to identify factors that contributed to the positive effect of IHC learning resources demonstrated in the trial. We concluded that 1) an important factor was that children and teachers *valued* the learning resources, and 2) their experience of value was likely a direct result of the sustained HCD approach over three years, involving many prototypes, extensive feedback from many perspectives, and multiple rounds of observation in classrooms.(9)

How to carry out HCD

There are several different ways of describing an HCD process(26-29), but they have many commonalities: immersion and information gathering; re-defining the challenge underway; and cycles of idea generation, prototyping and feedback, leading to increasingly refined solutions. See *Figure 2*.

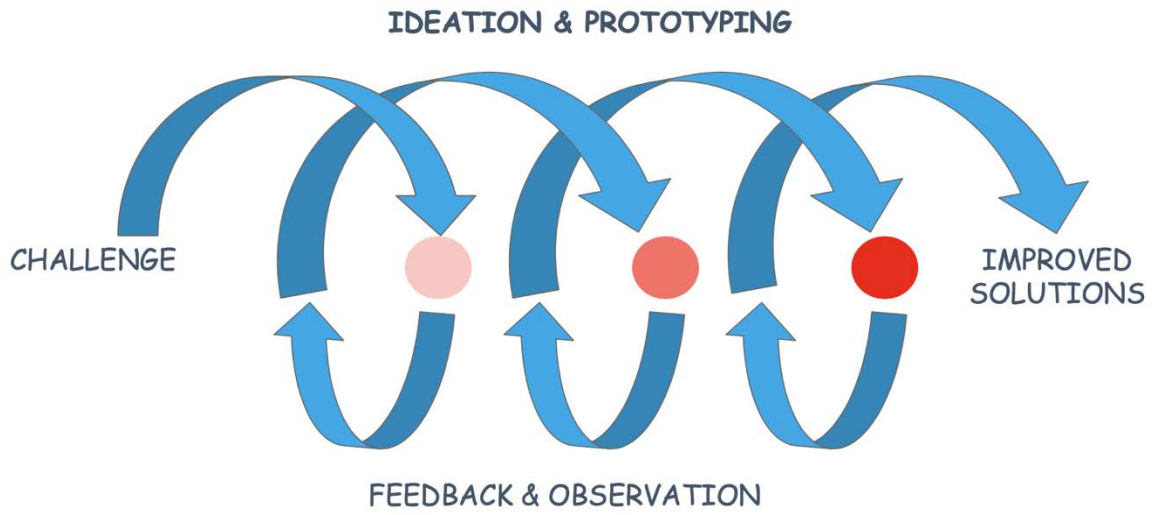


Figure 2. Human-centred design is typically characterized by multiple iterations, and feedback from or engagement with multiple groups of stakeholders

Another way of thinking of a design process, is illustrated by the double diamond model developed by the British Design Council(30) (See *Figure 3*). Although this figure is not labelled specifically as a 'human-centred design' model, the description includes a very similar set of principles: putting people first, collaborating and co-creating when possible, and several iterations. The diamonds illustrate another characteristic of the process: «exploring an issue more widely or deeply (divergent thinking) and then taking focused action (convergent thinking).» The work rarely progresses in such a neat linear fashion, since learning something about the underlying problems will often necessitate a move back to the beginning of redefining the problem. However, these figures illustrate some of the features that are typical of the approach.

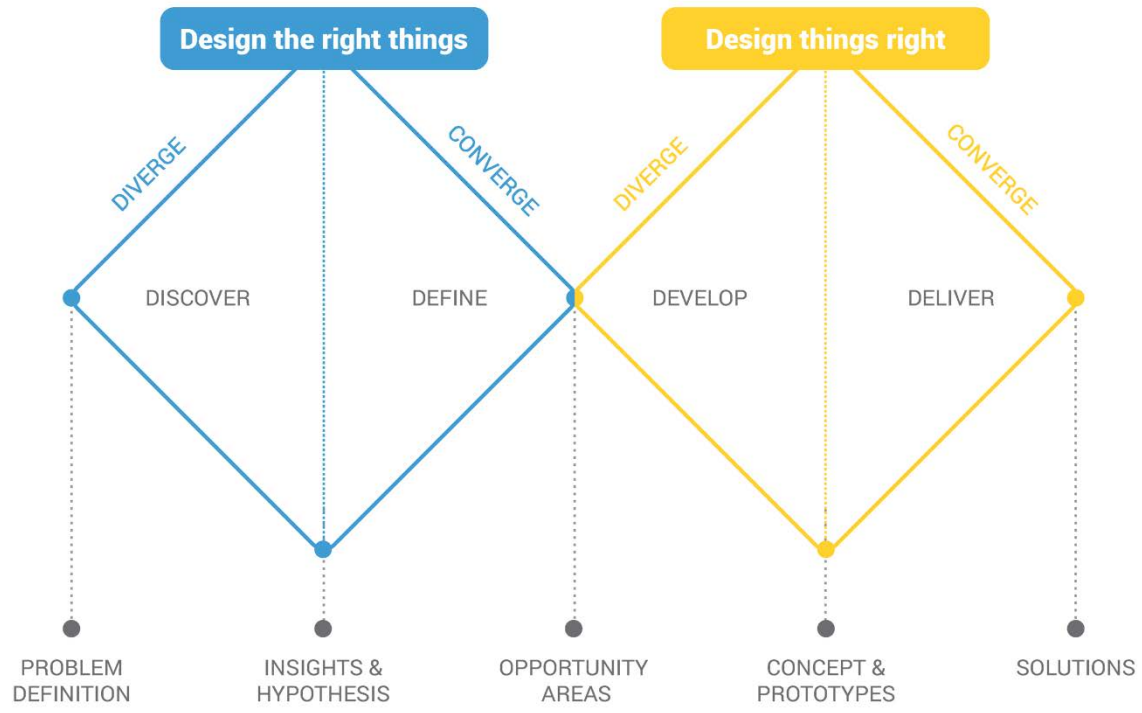


Figure 3. British Design Council developed the Double Diamond model to describe two stages of divergent and convergent thinking in a design process.(30)

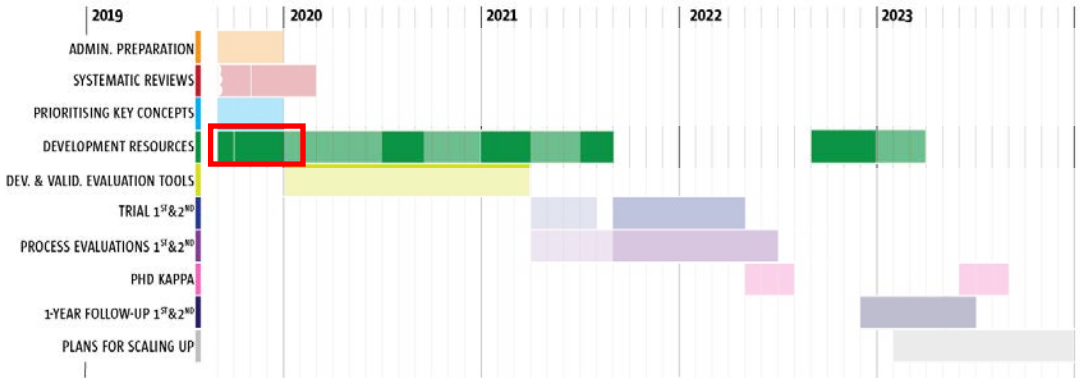
Our work, drawing on these frameworks and on our previous experience developing other resources, will be organised in roughly three phases:

- Gaining insight
- Cycles of idea generation, prototyping and feedback
- Post-trial adjustments and guidance development for translation and contextualisation

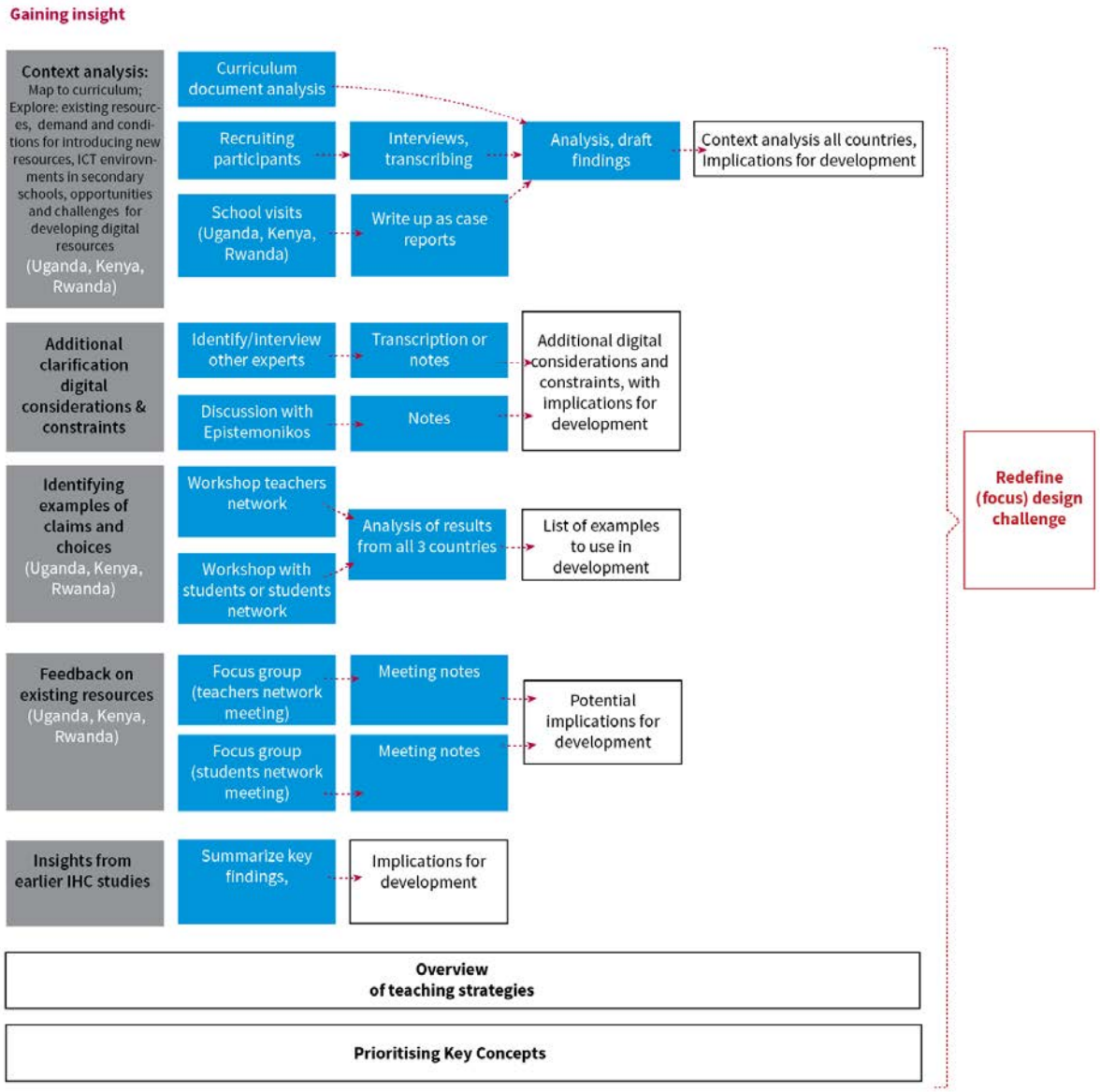
1) Gaining insight

The work in this phase is described as individual activities below, some with separate protocols.

Schedule Phase 1: from the project start to January 2020.



Flow chart Phase 1:



Context analyses (see *Context analysis protocol*)
Separate context analyses will be carried out in Uganda, Kenya and Rwanda. The objectives are to:

- Explore what demand there is for learning resources for teaching critical thinking about health in secondary schools in each country
- Map where teaching critical thinking about health best fits in the curriculum
- Identify and examine relevant resources already in use
- Explore conditions for introducing new learning resources
- Describe what ICT (e.g. devices, platforms, browser software, Internet connection) is likely to be accessible in [Kenyan/Rwandan/Ugandan] secondary schools for teaching and learning purposes, and what, if any, national plans there are for improvements
- Identify opportunities and challenges for developing digital learning resources

Methods include individual interviews, document analysis and school visits. Key informants may include national curriculum developers, people responsible for national IT strategy in secondary schools, science teachers of science and teachers of other relevant subjects, and people responsible for ICT in schools, as well as relevant stakeholders identified by our advisory boards, networks, and participants. For school visits, we will choose a varied selection of schools (from technically well-equipped to poorly-equipped). We will use a checklist of items to explore, and take field notes based on observation of classes using technology, and talking to teachers and head teachers (or people responsible for IT) at the school, and photos where permitted. See article from EduTech blog at the World Bank: Learning from a visit to a school using technology: Some questions to consider

Additional clarification of digital constraints and considerations
In order to develop resources that can be broadly accessible, also for those schools that are less well-equipped, we need to decide what the technical constraints will be for developing resources: what type of devices can we expect schools to have, what platforms, what browsers, etc. We also need to gain an understanding of how digital technology is used by teachers and students today, in the context of teaching and learning. These questions are for the most part covered in the context analyses. We will supplement findings from the context analysis with interviews of relevant experts in EduTech and in discussion with technical developer in this project (Epistemonikos).

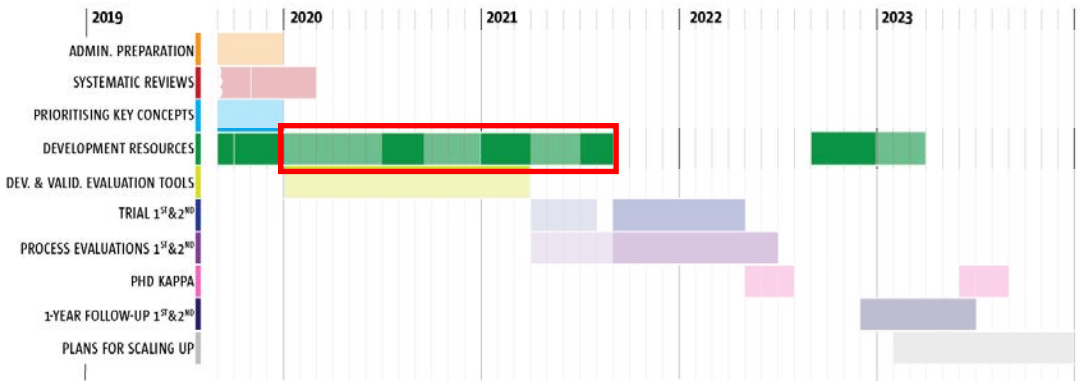
Identifying examples of claims and choices
We need to identify appropriate examples of conditions (primarily illnesses and injuries), treatments (health interventions) and claims about the effects of treatments that can be used in the learning resources. We will collect examples via workshops that we run in meetings with the student and teacher networks in Kenya, Rwanda and Uganda. An example being appropriate means that an example is relevant and interesting to secondary school students and their teachers, in the three countries, at the same time as it will not cause conflict. We need to be careful to ask workshop participants to suggest examples in such a way that they do not reveal personal information regarding their health or the health of other individuals. (See protocol for *Identifying examples of claims and choices*).

Feedback on existing resources: The Health Choices Book and Thatsaclaim.org
We will present previously developed resources to the student and teacher networks (or subgroups of these) in each country, and conduct structured group discussions. The aim is to explore how students and teachers experience those resources. This activity should be done early as it is a way of presenting the IHC Key Concepts, and giving them a better understanding of the project aim.

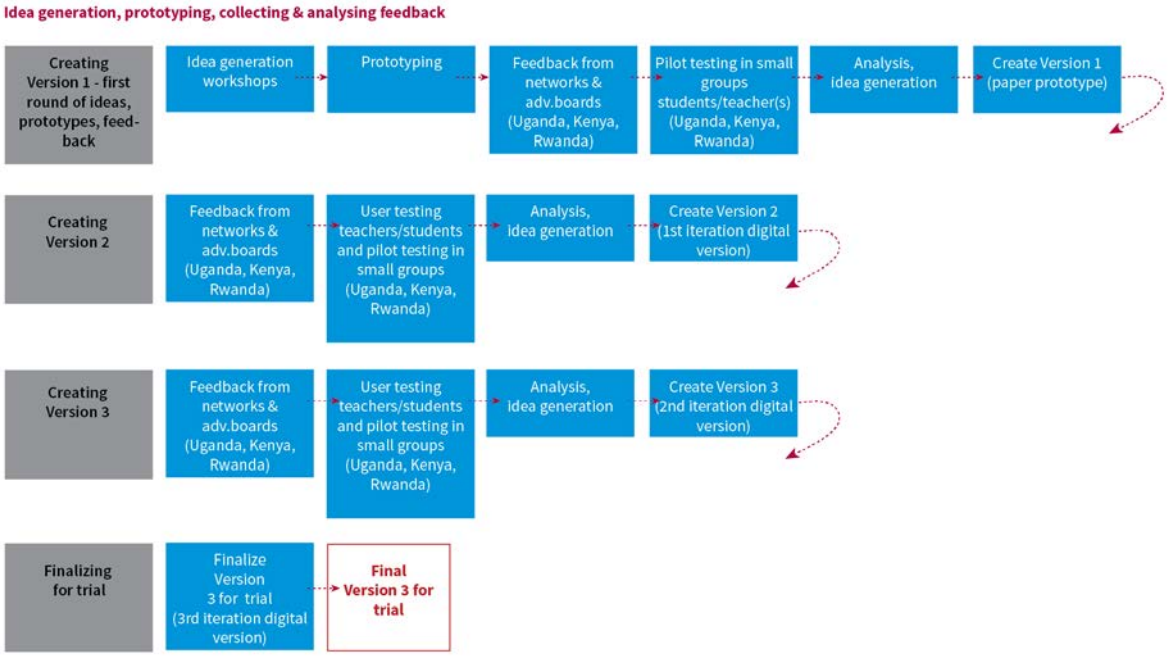
Redefining design challenge
Based on the gathered information in this phase, we will summarize the implications for development and focus the design challenge.

2) Idea generation, prototyping, collecting & analysing feedback

Schedule Phase 2: January 2020 to September 2021.



Flow chart Phase 2:



We will develop resources iteratively, through cycles of

- Idea generation
- Prototyping
- Collecting feedback through user testing, piloting with observation, and focus groups or less structured meetings.
- analysing the problems, then starting again with idea generation to resolve those issues.

In this project we have planned for three iterations. Version 1 of the resources will be a paper-based or low-tech digital (e.g. PowerPoint) prototype. Version 2 will be the first digital solution, programmed by the IT partner, and Version 3 will be an improved iteration of this solution.

Participants

For more in-depth description of participants and how we will recruit them, as well as consent and assent forms, see *Stakeholder engagement protocol*.

Idea generation: We will invite teachers and students from the teachersand student networks to participate in idea generation workshops. If they lack a sufficient understanding of the specific concepts to be able to generate ideas about how to teach those concepts, we can facilitate brainstorming around more generic topics, such as 'how might digital learning resources be designed to be useful for them for teaching in their school'.

Feedback collection: We will collect feedback on ideas and prototypes from the teacher and student networks in each country. We will also collect feedback from the advisory boards in each country, the international advisory board, and the IHC Network of partners around the world who are translating resources.

User testing and prototyping: We will pilot prototypes with small groups of students from participating schools or from the student network, with either a teacher or a member of the project team taking the part of the teacher. Likewise, we will pilot resources with teachers, either together with students at participating schools or from the student network, or with the other members of the teacher network to role-play as students.

When we have digital prototypes, we will conduct individual user tests with teacher and students (or pairs of students).

Analysis: We will invite teachers and students in the teacher and student networks, or ssubgroups of these, to comment on our analysis of the main issues found in the feedback, and to generate ideas about how problems might be resolved. This input would be gathered in form of group discussions.

Idea generation

We will use "creative thinking" methods(24) in idea generation and prototyping to generate a broad set of ideas for how we might design the resources. Brainstorming is one kind of creative thinking method that follows a set of steps: formulate an explicit challenge; generate many solution ideas; discard duplicates and group similar ideas; discuss how ideas might be combined to form better solutions; discuss/vote for those that hold the most promise using pre-determined criteria (e.g. 'most exciting', 'most feasible'); choose which ideas will be the basis for prototyping.(31)

Prototyping

A prototype is an early sketch or model of an idea or a concept. A prototype serves several purposes. It makes the idea more detailed and precise, and provides a common understanding of the concept for the team developing it. It also helps them identify areas that need more thought. In addition, a prototype makes the idea tangible so that users can interact with it and provide feedback. Early prototypes will be low-tech, using paper or simple software. Version 2 of the prototype will be a first draft of a programmed learning resource, and Version 3 will be a near final learning resource.

User testing

We will conduct individual user tests of the resources with teachers and the students to explore how they experience the prototypes. We will collect and analyse qualitative data with the aim of informing resource revision.(15)

Data collection – user testing

Using a semi-structured interview guide, we will facilitate participant's interaction with the prototype, posing a series of tasks and employing a think-aloud approach, as well as asking questions

to explore their user experience. Think-aloud technique is a form of observation that includes not just watching what the test person does, but encouraging them to articulate their thoughts – what they are looking at, thinking, doing, and feeling - while they are performing a task and capturing that speech through audio (and sometimes video) recording.(32, 33) The interview guide will be designed to explore different facets of "user experience", including usefulness, understandability, usability, credibility, desirability, and suitability, based on a revised version of Morville's honeycomb framework(15) (see Table 1). Follow-up questions will cover overall impressions and suggestions for improvement. With the participant's permission, we will audio-record the interviews and transcribe them. If we are testing digital prototypes on a computer screen, we will use screen-capture technology in addition to audio recording.

Table 1. Six facets from the revised version of Morville's honeycomb framework of user experience[16]

Facet	Description
Usefulness	Does this product have practical value for the user?
Usability	How easy and satisfying is this product to use?
Understandability	Does the user recognize what the product is, and do they understand the content? (own subjective experience of understanding)
Credibility	Is it trustworthy?
Desirability	Is it something the user wants - has a positive emotional response to?
Suitability	Does the user feel the product is for "someone like me" or is it alienating/foreign-feeling? (e.g. age, gender, culture–appropriate)

Data analysis – user testing

We will review all of the notes and transcriptions from both user testing and piloting (see below). We will look primarily for barriers and facilitators related to correct understanding, ease of use and favourable reception. We will trace findings back to specific features or characteristics of the resources that appeared to cause problems or facilitate use, and code the findings in three ways:

1) *User problems, praise or suggestions*, in three degrees of importance (rating importance means that the researcher must make a judgment about the potential impact of not addressing the issue) (see Table 2);
2) *Location, feature or functionality where the finding occurs*, such as 'home page', or 'offline use' or 'navigating from menu'. This is so that we can group findings that address the same pages or features or functionality, so they are not resolved in isolation from each other.
3) *According to the six facets of user experience* (See Table 1). (This final set of codes is helpful when writing up the results).

Table 2. Coding of the importance of observations and feedback for the next iteration of the resources

Categories		***Description***	***Explanation***
Problems	***Very important negative finding ("Showstopper")***	A problem that we should address	We need to make judgements about how important/serious we think problems are, *in terms of the resources being experienced positively and being effective*. These should be informed by our understanding of the participant's perspective, based on what they say and do, combined with our knowledge of the content and intent of the
	Important negative finding	A problem that we should probably address	
	Negative finding	A problem that we can easily address	

			resources. For example, a participant may praise part of the content but have completely misunderstood it. Therefore, we would not code this as 'praise'; in terms of the analysis; it would be a 'problem' (negative finding).
Praise	***Important positive finding***	Praise that should perhaps lead to action	Similar to making judgements about the importance of 'problems', we need to make judgements about the importance of 'praise', in terms of the resources being experienced positively and being effective; should the praise lead to changes to the resources? For example, should we do more of something? If yes, your reasoning should be explained in a comment.
	Positive finding	Praise that should probably not lead to action	
Suggestions	***Important constructive finding***	A suggestion that should maybe lead to action	Should a 'suggestion' lead to changes to the resources? Yes or no, your reasoning should be explained in a comment cell. This category is reserved for explicit suggestions from participants. If a suggestion is implicit, it should be explained in a comment.
	Constructive finding	A suggestion that probably does not need any action	

We will first analyse findings within each country and then combine findings from all three countries. We will discuss the combined findings until a consensus is reached about which issues are the most important, and what the underlying problems likely are. Based on this, we will begin the cycle again, with idea generation, to seek solutions to these problems and create a new version of the prototype.

Pilot testing with observation

We will conduct pilot tests of the resources with teachers and small groups of students from participating schools or from the student and teacher networks, to observe how they use the prototypes. If it is not practical for a teacher to participate in pilot testing, a researcher will assume the role of the teacher, so we can observe the interactions of teachers, students, and the technology. Piloting will take place at schools or other locations deteremined to be practical for the participants.

We may also gather additional insight from the perspective of the teacher by asking one teacher to pilot resources at a teacher network meeting, while the other teachers role-play as students.

Data collection – pilot testing

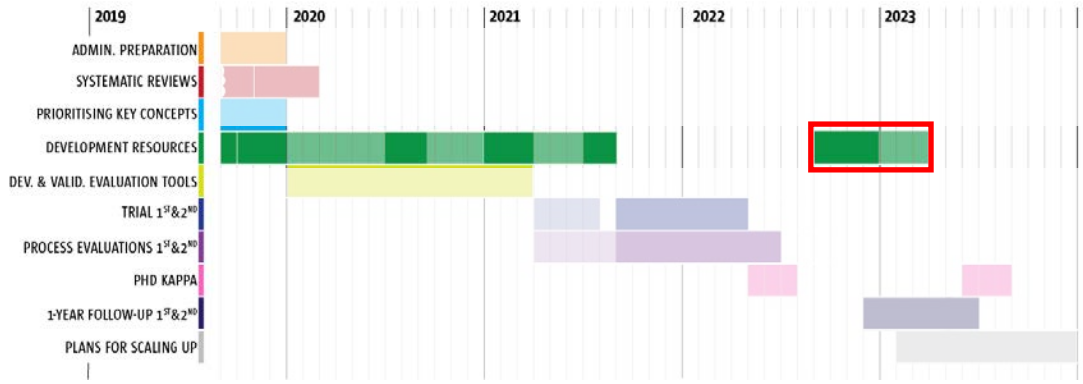
One or more researchers will observe the pilot session and take notes (non-participatory observation). Following each pilot session, we will conduct semi-structured focus group discussion and/or interview(s) to explore the students' and teacher's experience. These will have a similar design as the user testing data collection described above, but include a retroactive dimension – prompting students and teachers to remember what they have just experienced in the lesson. These interviews may be done separately, if we feel that the students are more likely to freely express their

opinions openly without the teacher present. We will audio-record the data collection and transcribe the recordings.

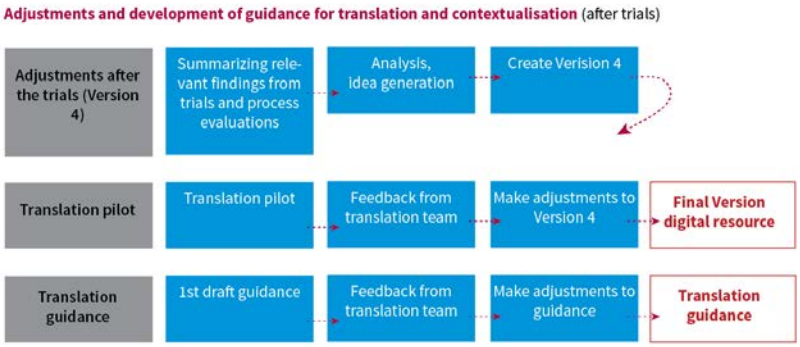
Data analysis – pilot testing
Same as for user testing.

3) After the trial: Resource adjustments and development of guidance for contextualisation

Schedule for Phase 3: September 2022 – March 2023



Flow chart for Phase 3:



We will make final adjustments to the learning resources after the trial and process evaluation are complete. We will pilot the translation functionality with teams from the IHC Network, and collect their feedback about where there are problems. We will then make adjustments to the secondary school resources, creating a final version.

Following this, we will draft guidance for teams who want to translate or contextualise the resources. We will collect feedback from teams in the IHC Network who will be using this guidance, and make adjustments based on their feedback. The output will be a guidance document for translation and contextualisation.

Choice of method, risks, and risk management

Uncertainty about end result

An inherent risk of a design process is that the solution is not described in the beginning - it evolves as the work progresses. Not knowing what the solution will be means there is a risk that nothing of value is actually developed.

However, in any innovation process, nothing new will evolve if all the decisions about what to make are fixed at the beginning. Successful design projects depend on the team tolerating the somewhat uncomfortable feeling of not knowing what they are going to make, especially early in the work. Success also depends on the team trying out many ideas, also ones that will fail, but doing this early enough that there is time to learn from that failure, generate new ideas and try these out. A risk is that the team decides on a direction too quickly, without having explored it sufficiently with end users.

We will mitigate these risks by establishing clear descriptions for how the work will be carried out, and by whom. We also will involve end users early enough so that we can identify ideas that don't work early enough to be able to change direction.

Not having sufficient time for user and stakeholder collaboration

Bringing stakeholders and users actively into the HCD process can take many different forms. At one end of the continuum is asking users for their reactions to prototypes we develop; on the other end is more action research oriented approach where stakeholders influence the aims of the project, or participatory/co-creation approaches where stakeholders generate ideas and create prototypes together with the research team.(34) Due to the complexity of the content and the limitations of time, this project will be is more closely aligned with the former. Although there are potential advantages of involving users in generating ideas and creating prototypes, this method can be very time-consuming for all involved.(24) Additionally, co-creation may not be feasible if the product/service/system is complex. In our earlier work, we have found that it is not always helpful to engage users in the very early idea generation stages until they have some grasp of IHC Key Concepts. Participants have limited time, and it is hard to know what type of engagement provides the best return on investment. In order to inform future projects, we will carry out a stakeholder engagement evaluation. (see *Stakeholder engagement protocol*).

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Appendix 1.

Logic model built showing the main findings (barriers and facilitators) from the IHC primary school process evaluation.