

Process evaluation in secondary schools

**Informed health choices intervention to teach secondary school adolescents in Uganda to assess claims about treatment effects: A process evaluation protocol**

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# Colophon

*Title* Informed health choices intervention to teach secondary school adolescents in Uganda to assess claims about treatment effects: A process evaluation protocol.

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# Abstract

## Background

We designed the “*Be smart about your health*” digital resources to teach lower secondary school students how to assess the trustworthiness of claims about the effects of treatments. We shall evaluate effects of using these resources in a randomised trial in Uganda. This paper describes the process evaluation that will be conducted alongside this trial. The aim is to identify factors affecting the implementation, fidelity, effects, and scaling up use of the *Be smart about your health* teaching resources in Uganda and potential adverse and beneficial effects of the intervention.

## Methods

Forty teachers from 40 schools in the intervention arm of the trial will complete a lesson evaluation questionnaire after each of the 10 lessons and at the end of the term. We will conduct structured classroom observations at all 40 schools. We will purposively select eight schools where we will conduct focus group discussions with teachers and students. We also will conduct key informant interviews among education officers (that visit the schools to monitor the implementation), teachers, head teachers, learners, and their parents. We will use a framework analysis approach to analyse the data.

## Expected results

We anticipate that the findings from this evaluation will provide insights into factors that may impact the effectiveness of using the *Be smart about your health* resources, factors that can inhibit or facilitate scaling up use of the resources, and potential effects that were not measured quantitatively after the intervention, including transfer of what was learned to other contexts and adverse effects.

# Background

People across the globe must deal with health information coming from multiple sources. This includes claims about the effects of health interventions made by health professionals and researchers, charlatans, herbal medicine sellers, governments and international organizations, journalists, advertisers, family members, friends, students and teachers, and others. Many health claims are questionable – for example, the information that appears on energy drink bottles and in health-related advertisements in print and digital media[1]. When people believe unreliable claims, they may end up using ineffective or harmful interventions, which can result in unnecessary suffering and wasted resources[2-7]. Conversely, when people fail to believe and act on *reliable* claims, this can also result in unnecessary suffering and inefficient use of resources [8-10].

Scientifically literate citizens are essential in a democracy and in making well informed decisions. There is a large population of young people in Uganda [11]. We have an opportunity to equip that population with the skills they will need to assess health claims and make informed personal choices and choices for others. Young people in schools have time for learning and they can bring knowledge back to their family members and community [12].

The Informed Health Choices (IHC) key concepts are essential principles that people need to understand and apply when deciding what health claims to believe and what to do [13]. We used an interactive process with key stakeholders to reach a consensus on nine (of 49) IHC key concepts to include in learning resources for secondary schools [14]. We also conducted context analyses prior to developing the resources to inform the design of the resources and help ensure that they are fit for the contexts in which they will be used [15]. We then developed the IHC secondary school resources (called the *Be smart about your health* resources) using a human centred design approach[16]. This was an iterative process with cycles of idea generation, prototyping solutions, piloting, user testing and making improvements. Students, teachers, and curriculum developers provided feedback and input into the design of the resources.

The resources are web based and we will deliver them digitally to teachers, via smart phones and/or computers. In some schools, which have projectors, the

lessons will be delivered to students using projectors. Digital technologies have been used in several settings across the world to support learning. In Uganda, this has improved tremendously over the last decade with an intentional drive to use information and communication technology (ICT) in learning and not only in administration and entertainment [17]. The new lower secondary school curriculum encourages the use of ICT in learning [18].

Cluster randomised trials in Uganda, Rwanda, and Kenya will be conducted to evaluate the effectiveness of IHC secondary school resources [19-21]. The trial in Uganda will include 40 schools in the intervention arm and 40 in the control arm. The primary outcome is the proportion of students with a predetermined passing score on the *Critical Thinking about Health Test*, which measures understanding of the nine IHC key concepts and the ability to apply them [15].

We plan to conduct a process evaluation alongside the randomised trial to examine implementation of the intervention and possible adverse and beneficial effects that will not be measured in the trial. The aims of the process evaluation are: to document the extent to which the IHC secondary school intervention is delivered as intended; and identify factors that can affect scaling up use of the *Be smart about your health* resources in lower secondary schools of Uganda if the intervention is effective; and potential adverse and beneficial effects of the intervention. The process evaluation will be conducted during and after delivery of the intervention in schools allocated to the intervention.

# Methods

## Objectives

The objectives of this study are to:

1. Document the extent to which the IHC secondary school intervention is delivered as intended
2. Explore intended and unintended potential effects of the intervention
3. Identify factors that could affect effective delivery and scaling up of the intervention

## Design

We will conduct a mixed methods study using both qualitative and quantitative approaches. We will collect qualitative data using observations, interviews, and focus group discussions. We will collect quantitative data using lesson evaluation forms completed by teachers after each lesson. We will use a framework thematic approach to analyse the data [22].

## Frameworks

As a starting point, we have adapted two frameworks developed in a process evaluation conducted to assess a similar intervention developed for primary schools in Uganda – see Table 1 and Additional file 1 [23]. Table 1 includes factors that could affect the implementation, effects, and scaling up of the school resources, while the second table focuses on the potential adverse and beneficial effects of the IHC learning resources (Additional file 1). The framework of potential effects was based on literature review, pilot and user testing of the IHC primary school learning resources; discussions with education researchers, policy makers and teachers; and potential beneficial effects identified by the National Curriculum Development Centre in Uganda.

**Table 1: Framework for factors that could affect the implementation, impact, and scaling up use of the 'Be smart about your health' resources**

Domain	Factors and sources	Explanation
Teachers	Skills and competencies	Teacher's education and experience in relation to the lessons being taught.
	Understanding of the content being taught	Teacher's understanding of the content.
	Sufficient training	The extent to which the teachers received sufficient training in teaching the lessons.
	Self-efficacy	Teacher's confidence in teaching the lessons.
	Fit to the teacher's teaching style and context (e.g., class size)	Teachers' comfort with the instructions or ability to adapt the instructions to their style and context.
	Attitudes	Teachers' attitude towards new material (change), science, critical thinking and independent thinking by learners (or their role as authorities in the classroom).
	Beliefs	Teachers' beliefs about the teaching methods or content (e.g., beliefs about what treatments work or the underlying IHC key concepts).
	Emotions	Teachers' emotions, such as stress or anxiety.
	Motivation	Teachers' motivation to teach the material.
	Positive learning environment	Teachers' ability to create a positive learning environment; for example, encouraging discussion, responding positively to questions, engaging learners.
Learners	Literacy	Learners' ability to understand the material.
	Attendance	Learners' attendance or reasons for poor attendance (e.g., long distances to school or inability to pay school fees).
	Motivation to learn	Learners' motivation to learn the new material.
	Attitudes	Learners' attitudes towards learning, towards authorities, towards science, towards critical thinking.
	Beliefs	Learners' beliefs about the content (e.g., what treatments work or the IHC key concepts).
	Home environment	The extent to which learners' home environments encourage or discourage learning from the lessons.
	Differentiated instruction	The extent to which learners' different learning needs are met.
	Peer influence	Positive or negative attitudes of other learners towards the material.
Teaching materials	Value of the material	The extent to which the materials are valued by the teachers and learners.
	Compatibility with the curriculum	The extent to which the material fits with the rest of the curriculum and how that curriculum is taught.
	Appropriateness of the material	The extent to which the materials are relevant, challenging and engaging.
	Credibility of the material	The extent to which the teachers and learners perceive the material as credible.

Domain	Factors and sources	Explanation
School system and environment	Time constraints	The extent to which there is sufficient time to accommodate introducing the new material.
	Competing priorities	The extent to which other priorities for the school, teachers or learners limit introducing the material (e.g., preparing for exams).
	School organisation and management	The extent to which the schools provide environments that support adoption of new subjects, material and teaching methods.
	School resources, particularly human resources	The extent to which the schools have adequate resources to introduce the new materials (e.g., human resources, learner/teacher ratio, teacher workload, classroom space and classroom resources, such as blackboards and acoustics).
	Attitudes and beliefs of head teacher and other teachers	Attitudes or beliefs of colleagues that influence the teacher's interest in and ability to teach the material.
	Parent and community involvement	Parents' attitudes towards the new material or how things are done at the school.
	Regulation	Regulations (e.g., Ministry of Education policies and regulations) that affect introducing the new material.
	Political environment	Elements of the political environment that affect introducing the new material; for example, authoritarianism or teacher strikes.
	Bureaucracy	Bureaucratic arrangements that delay or limit introduction of the new materials, or facilitate introducing them.
Incentives and disincentives	Incentives or disincentives for teachers or head teachers to introduce the new materials.	

## Sites and population

We will conduct the process evaluation in all schools allocated to the intervention arm of the trial. The participants will include 13-17-year-old learners in form 2 of lower secondary schools and their teachers. In addition to the learners and teachers, we will include education officers (that visit the schools to monitor the implementation), head teachers, and parents.

## The interventions

We provide a detailed description of the intervention using the GREET checklist in Additional file 1. Schools in both the control and intervention groups will continue teaching the national standard curriculum.

## Logic model

Table 2 below describes some assumptions and contextual factors that might influence the implementation of the intervention.

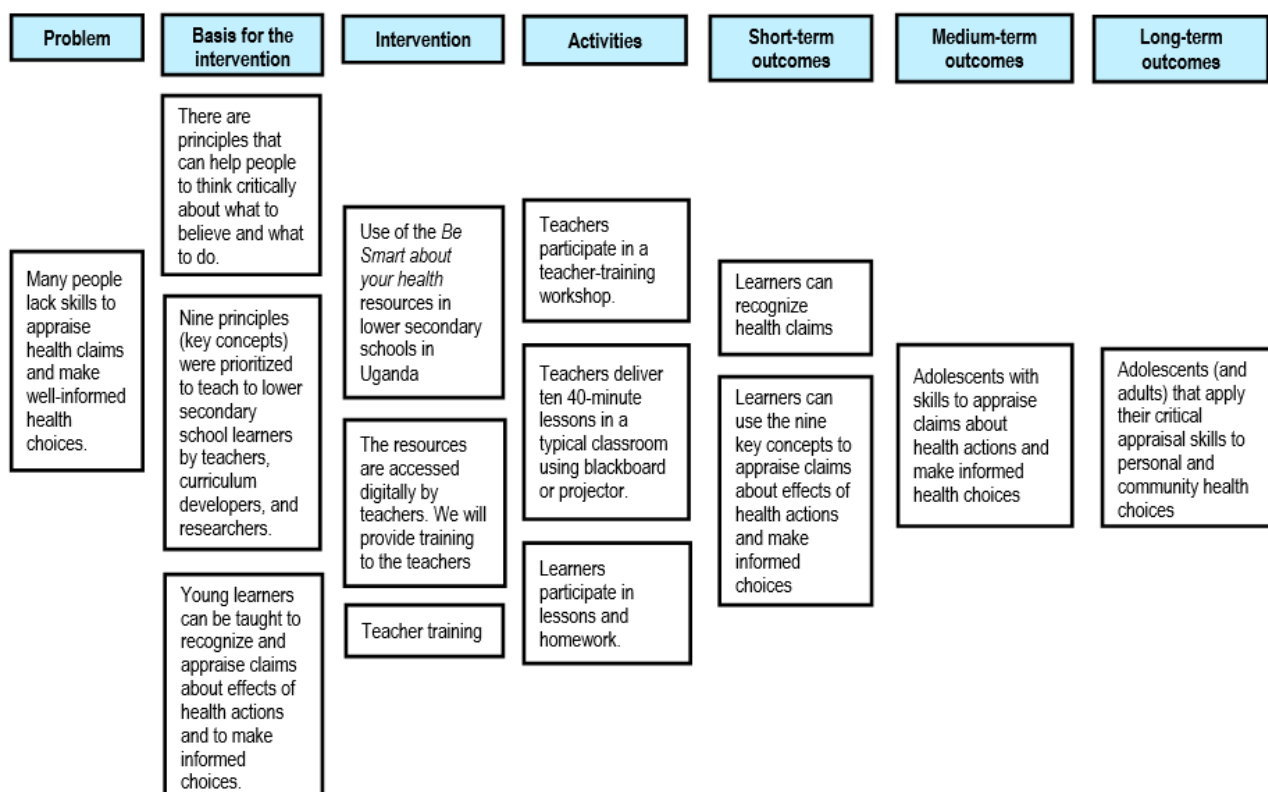


**Table 2: Logic model assumptions and external factors affecting the intervention**

Assumptions	Contextual factors
<ol style="list-style-type: none"> <li>1. The <i>Be smart about your health</i> lessons are useful and fit for the context.</li> <li>2. High confidence among teachers to deliver the lessons as intended, after a teacher training workshop</li> <li>3. Teachers can access the lessons using smart phones for preparation and, in some cases, delivery of lesson.</li> <li>4. Teachers deliver the lessons using the proposed structure and teaching strategies.</li> <li>5. Learners participate actively and see value in learning of the lessons.</li> <li>6. Learners have paper and pens to use during the lessons.</li> <li>7. Schools are willing to dedicate time and resources for the lessons.</li> </ol>	<ol style="list-style-type: none"> <li>1. ICT resources (smartphones, computers, projectors, Internet access) and their use in teaching and learning</li> <li>2. School administration support (allocate class time and teachers, support teachers)</li> <li>3. The lower secondary national curriculum's demand for the teaching of critical thinking, communication, ICT proficiency, and problem-solving skills</li> <li>4. Education officers at the schools, district, and national level support the intervention delivery.</li> <li>5. Learners' friends, teachers in other classes, family, and community members discuss content of the intervention with students.</li> </ol>

The assumptions and contextual factors indicate potential ways in which the intervention might work or not work according to the logic model (Figure 1). The logic model is a diagrammatic representation of the relationships between the intervention and intended outcomes. This model depicts the intended core components of the intervention and how they are expected to produce change.

**Figure 1: Logic model for teaching lower secondary school learners to think critically about claims on effects of health interventions to make informed health choices**



## **Data collection and management**

### ***Teacher's workshop and lesson evaluation***

Teachers in the intervention arm of the trial will complete a training workshop evaluation form (Additional file 3) at the end of the workshop and a lesson evaluation form (Additional file 4) after each lesson they teach. We will use surveyCTO software [24] to program password protected electronic lesson evaluation forms that will be shared with teachers as a link via smartphone to collect information on lesson preparation, the teaching environment, and lesson goal achievement.

### ***Observations***

Trained research assistants or the principal investigator (RS) will observe at least one of the ten lessons in all 40 intervention schools to evaluate how the intervention is implemented. We will use a structured form (Additional file 5) and will enter these data into a spreadsheet. During the observed lessons, we will note how well the teachers adhere to the lesson plan, problems that the teachers or learners have during the lesson, and aspects of the lesson that go particularly well. We will also take photos to illustrate the lesson flow and learners' participation.

### ***Key informant interviews and focus group discussions***

We will conduct key informant interviews and focus group discussions among teachers, learners, principals, parents, policy makers from the Ministry of Education and Sports and the National Curriculum Development Centre, and education officers who have visited the schools and observed the *Be smart about your health* lessons.

The principal investigators (RS) will carry out the interviews and moderate the focus groups. The research assistant will be responsible for observation and note taking. The interviews and focus group discussions will be conducted in English, audio-recorded, and transcribed. The questions in the guides for the interviews and focus groups (Additional file 6) are based on the frameworks in Table 1 and Additional file 1.

## **Sampling**

The intervention will be implemented in 40 schools in Uganda [19]. We will collect feedback on all 10 lessons from all 40 teachers in the intervention arm of the trial using the lesson evaluation form (Additional file 4), and we will observe at least one lesson at each school in the intervention arm.

We will observe more than one lesson in eight purposively selected schools. We will include two schools from each of four strata based on school ownership (government or private) and mode of intervention delivery (blackboard or projector-based delivery). We will select schools that vary in their performance on the end of term *Critical Thinking about Health Test* (Additional file 7). The four strata are: 1) government managed schools that use blackboard to deliver the resources; 2) privately managed schools that use blackboard to deliver the resources; 3) government managed schools that use projector to deliver the resources; and 4) privately managed schools that use projector to deliver the resources.

We will conduct key informant interviews with at least eight teachers, eight learners and four parents from across the sampled schools, and we will also conduct eight focus group discussions with learners, two from each of the strata described above and two with parents from government and private schools. In addition, we will conduct focus group discussions with at least two groups of teachers selected from the 40 schools in the intervention arm. We will analyse data continuously as we collect and conduct additional interviews or focus group discussions if needed to clarify the findings (e.g., if there are discrepant findings or important gaps).

The teachers that will participate in the focus group discussions will be different from those in the interviews although a similar selection criterion of being drawn from four strata (type of ownership, mode of delivery) as described above and performance on the *Critical Thinking about Health Test*. We hope that by conducting both FGDs and KIIs with teachers and parents, we increase the depth of inquiry, methodological strength, and certainty of the findings. The learners will be purposively selected to include low and high performers based on their scores on the *Critical thinking about Health Test*. Parents of learners who have been selected will be approached from schools with a day section (schools in which learners come from home every school day) and these will vary in level of education.

### **Investigator's reflexive notes**

The investigator (RS) will keep reflexive notes throughout the collection of data for the process evaluation. These notes will capture the investigator's expectations (informed by investigator's own biases, preferences, preconceptions, relationships with participants and how that affects their answers to questions), reflections on the delivery of the intervention, methodological processes (e.g., sensitivity of the tools at collecting the intended data) and ensuring transparency when determining what is new in this research and whether it is true and relevant[25]. In addition to these, at least one key informant interview will be conducted with the investigator to further explore and document the investigator's

reflections. These reflections will be used as an integral part of the quality criterion, using them to describe interview settings through to transcribing and in researcher's subjective responses.

## **Analysis**

### ***Qualitative data analysis***

We will conduct a framework thematic analysis, guided by the frameworks in Table 1 and Additional file 1. This approach includes five stages: transcription, familiarisation, coding, charting and interpretation of the data. Two of the investigators (RS and another researcher) will independently read and reread the transcripts. They will then code the data, using the factors included in the two frameworks, adding emerging factors. We will summarise the coded data, review and resolve any disagreements by discussion. Coded data will be entered in Atlas.ti software [26] using pre-generated themes from the two frameworks. The codes will then be harmonized before producing matrices for charting that will contribute to the summary report of results. The findings will be triangulated across data collection methods and participants, along with RS's reflective notes to improve the strength of the evidence.

### ***Quantitative data analysis***

The quantitative data from the teacher workshop training and lesson evaluation forms will be analysed using descriptive statistics. For example, for levels of teachers' preparedness using scales for factors such as the time they used to prepare: (1- very short, 5- too long), preparedness (1- very unprepared, 5- very prepared), delivery (1- very difficult, 4- very easy). In addition to these data, we will compute the percent of lessons delivered using projectors, average duration of the lessons, average number of students per lesson, and common teaching strategies used in the lessons by executing a multiple response tabulation command in STATA software. All the statistical analyses will be performed with STATA version 16. We shall further triangulate findings from the qualitative data analysis.

## **Appraisal of confidence in the qualitative findings**

We will summarise the key qualitative findings and assess our confidence in these findings using a version of the GRADE-CERQual approach [27] modified for primary qualitative studies [28, 29]. GRADE-CERQual is a systematic and transparent method for assessing the confidence in evidence from reviews of qualitative research (qualitative evidence synthesis). It is based on four components: methodological limitations, data adequacy, coherence, and relevance [30]. Although CERQual has been designed for findings emerging from

qualitative evidence syntheses, the components of the approach are suitable for assessing findings from a single study with multiple sources of qualitative data. We have modified the components slightly for use in a single study, as follows:

- Methodological limitations: the extent to which there are concerns about the sampling and collection of the data that contributed evidence to an individual finding
- Coherence of the finding: an assessment of how clear and compelling the fit is between the data and the finding that brings together these data
- Adequacy of the data contributing to a finding: an overall determination of the degree of richness and quantity of data supporting a finding
- Relevance: the extent to which the body of evidence supporting a finding is applicable to the context (perspective or population, phenomenon of interest, setting) specified in the study question

Two authors will apply the modified GRADE-CERQual approach to each study finding and make a judgement about our overall confidence in the finding. We shall judge our confidence as being high, moderate, low, or very low. All findings start as high confidence and will be graded down if there are important concerns regarding any of the components described above [30] .

## **Ethical considerations**

Ethics approval for this study has been obtained from the School of Medicine research ethics committee at the Makerere University College of Health Sciences and from the Uganda National Council for Science and Technology. We obtained informed consent from head teachers on behalf of the school and students and teachers for participation in the trial [19]. These cover the collection of data using the lesson evaluation form and observation of lessons. We will obtain informed consent from adult participants in interviews and focus groups (Additional file 8). We will obtain informed assent from students who participate in interviews and focus groups (Additional file 9) and consent from their parents (Additional file 10).

## **Project management**

The principal investigator (RS) will act as the overall project coordinator with guidance from SL and assisted by AN and DS. RS obtained letters of approval and permission from appropriate line ministries and ethical bodies for the trial [15] and process evaluation.

RS will work with the in-country team to coordinate recruitment and training of research assistants and ensure proper trial documentation.

All investigators and research assistants will have a Human Subject Protection certificate kept on file.

### **Reporting and dissemination of findings**

The findings will be published in a peer reviewed journal. We will share the findings of this evaluation together with the trial results with all the participating schools and district education officers, the networks of teachers and students who have been engaged in the project [31], and our national and international advisory groups. We also will share a summary of the findings with key institutions, including the Uganda National Curriculum Development Centre; the relevant Ugandan Government departments (Ministry of Health; Ministry of Education and Sports; Ministry of Gender, Labour and Social Development), the Ugandan Schools Association, UNICEF-Uganda, WHO-Afro, and any other institution or agency that expresses interest in this study.

# Declarations

## Stakeholder engagement

We have sought and will continue to seek input from stakeholders throughout this project [37], including the student and teacher networks, national advisory panel, national curriculum committee, and education authorities. The results and interpretation of this study will be shared with these stakeholders and participants before publication.

## Funding

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## Competing interests

The authors declare that they have no financial or any other competing interests.

## Availability of data

The final de-identified dataset and analysis code for the trial will be made available on Zenodo.org.

## Protocol amendments

Any protocol modification will be communicated to relevant parties, including the Ethics Review Committee.

## Contributions to the protocol

RS prepared the first draft of this protocol. All the authors provided feedback and approved the final version. RS is the guarantor.

## **Acknowledgements**

We would like to thank the other members of our research team for their contributions to this project. We also are grateful to the teachers, students, curriculum specialists, and members of our national and international advisory groups who have contributed to this project.

## **Additional files**

1. Description of the intervention using the GREET checklist
2. Evaluating “far transfer” of learning, and evaluating and monitoring potential harms
3. Teachers’ workshop evaluation form
4. Lesson evaluation form
5. Lesson observation form
6. Interview and focus group guides
7. *Critical Thinking about Health Test*
8. Informed consent for interviews and focus group discussions (adults)
9. Informed assent for interviews and focus group discussions (minors)
10. Informed consent for interviews and focus group discussions (parents of participating minors)



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