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TECHNICAL GUIDANCE

Deploying an e-learning environment in Zanzibar: Digital content curation

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Authors Caspar Groeneveld
Dr Elia Kibga
Tom Kaye

#EdTechHub @GlobalEdTechHub edtechhub.org

Contents

Terms and abbreviations

Abbreviations	
CC	Creative Commons
KICD	Kenya Institute of Curriculum Development
NGO	Non-Governmental Organisation
SME	Subject-Matter Expert

Terms	
Content base	A body of available digital content
Content item	A digital object containing learning content, such as a video, an audio file, a text or a simulation
Content source	An existing repository of digital content from which content may be taken, such as Khan Academy
Curriculum	The structure of the body of knowledge a learner is supposed to progress through and acquire through their academic career
Learning point	Essential information that a skill — and with it, a content item — needs to contain
Learning objective	Statements that define high-level expected goals of a curriculum
Learning outcome	Clear statements on what a learner is expected to know or be able to do
Pace	The speed and complexity of a learning video; a content item with a lot of information in a short period of time has a high pace
Skill	In the context of digital content curation and creation, skill refers to concepts that can be translated into a content item
Taxonomy or skills taxonomy	In the context of digital content curation and creation, a skills taxonomy is the hierarchical organisation of subject, topic, learning outcome, skills and learning points with their matching content items; usually maintained in a spreadsheet or database
Topic	A logical unit of several skills; often, chapter titles are taken as topic names

Introduction

In April 2020, the Zanzibar Ministry of Education and Vocational Training (MoEVT) and the World Bank approached the EdTech Hub (the Hub) to explore the feasibility of implementing a Virtual Learning Environment (VLE). The MoEVT, the World Bank and the Hub agreed that the Hub would work with the MoEVT to develop:

1. A practical and actionable report analysing key factors to be considered in deploying an e-learning platform in Zanzibar.
2. A report documenting the process of sourcing appropriate digital content, aligning this content with the curriculum and populating the e-learning system accordingly.
3. An implementation plan to guide the deployment of the e-learning system.

This document addresses part two of the request and is an elaboration of the digital content selection, curation and adaptation process suggested in the first report. However, this document is a stand-alone piece that does not require familiarity with any of the other deliverables.

Purpose and scope

Following school closures mandated by the Government of Zanzibar in response to the COVID-19 pandemic, Zanzibar's children are currently relying on alternative forms of distance education. This situation has created an immediate need for the MoEVT to develop a digital content base that can reach Zanzibar's students at home. This document outlines a practical, user-friendly process that the MoEVT can follow to build a robust digital content base in line with the needs of students.

This document has kept four principles in mind for this digital content curation process:

1. Content dissemination should start immediately.
2. Content should be curated for use in both the short term and the longer term. Use in the short term will focus on providing educational continuity to students as they return to school in Zanzibar. Content will support learning in schools, but will also ensure Zanzibar students will have support in the case of any future shutdowns related to COVID-19. In the longer term, content might be used in schools, to provide learning opportunities for out-of-school children, and for resilience in case of a future crisis.
3. Curation speed is therefore relevant. It is preferable to curate basic, foundational content now and supplement and/or replace this later with other content.
4. Curated digital content must be relevant for Zanzibar. The complexity or pace of the content should be appropriate for local students; content should be at the right level for local students; and content should keep local customs and culture in mind.

This document identifies and explains the steps for curating digital content. However, please note that while in some respects it can serve as a manual, it is not comprehensive.

Finally, two underlying observations to bear in mind are: First, content curation, like content creation, requires expertise and capacity. The process outlined in this document is robust, but it will take some time to develop internal processes and capacity. It may be worthwhile

to engage with an external expert to build this capacity and these processes. Second, this document discusses digital content *curation*, ***not*** *the creation* of digital content. While content creation builds on a similar framework, it falls outside the scope of this document.

Structure

This document outlines steps for a curation process of digital content, discusses roles and responsibilities, then provides a very rough example budget and timeline, and ends with a list of potential content sources.

Several steps are suggested for the curation process itself. The actual work process can differ and in some cases, steps can be combined or added. However, all steps are relevant for an effective curation process. The steps are shown in Figure 1.

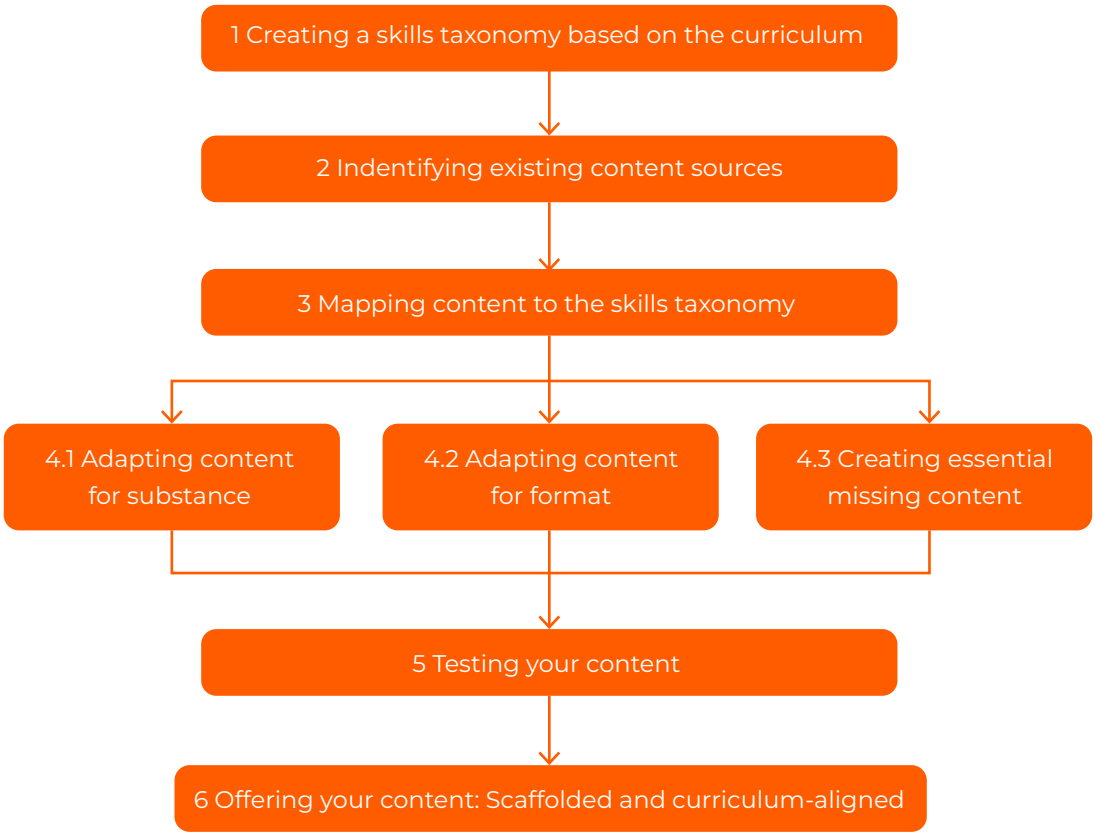

Figure 1
Steps involved in the content curation process

Before we consider these steps, we offer the following thoughts on education improvement in Zanzibar. We appreciate that the construction of the school curriculum lies under the ministry's authority and that taking this curriculum as the starting point and aligning resources to it is the logical order. However, Zanzibar required rapid access to digital content. There are many openly licensed text/workbooks that could be deployed very quickly. It may be worth considering whether any such existing resources could be disseminated immediately to support learning now, even if they are not fully aligned with the approved curriculum. In this case, the focus of section 2 would be on identifying such work-/textbooks and deploying them immediately. Over time, those resources would then be adapted and aligned through the processes outlined in Sections 1 through 6.

1 Creating a skills taxonomy based on the curriculum

Any digital content curation or creation process begins with identifying which content is exactly needed and where. This identification process relies on an analysis of the curriculum for the learning objectives and the actual textbooks for specific learning outcomes.

A curriculum is used to identify learning objectives and to structure the content in a coherent way that aligns with the needs of students and teachers. Often, the learning objectives in the curriculum are high-level and lack specificity. They guide the construction of textbooks. These textbooks, in turn, can be used to identify the actual learning outcomes that learners are expected to acquire. So, the curriculum provides a background framework, but the textbooks are used most intensively for the identification of the learning outcomes for which we need content.

In the process of content curation or content creation, the specific learning outcomes or concepts that can be translated into one content item are called *skills*. A skill can contain one or several learning points: essential information that the content items need to contain. A content item that covers a skill can be a video, an audio fragment, a text or a simulation, while assessment questions are often added and tagged to that skill to assess understanding of that skill. A lesson in class typically encompasses one skill, but sometimes more than one skill is dealt with in one lesson. However, a skill rarely covers more than one lesson. If a skill cannot be taught in one lesson, we recommend splitting it up and creating skills with fewer learning points. In a schematic, the relationship between curriculum, textbooks and skills is illustrated as in Figure 2.

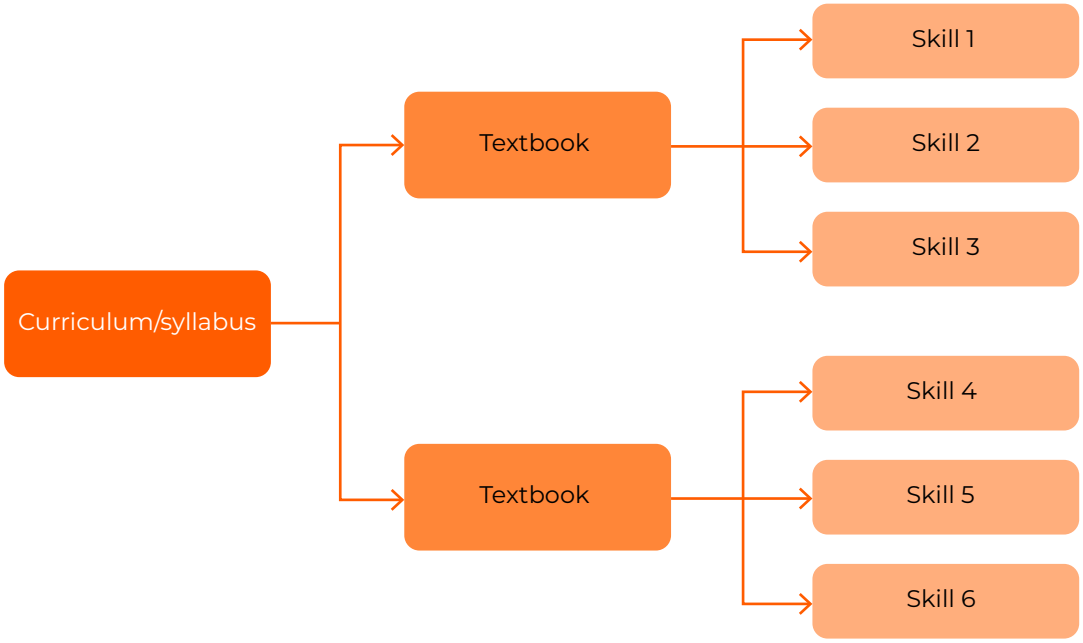

Figure 2
Schematic representation of skills identification

When we apply this approach to a subject, for example, Biology, Form 2, the schematic becomes the one in Figure 3 where skills and their learning points have been identified.

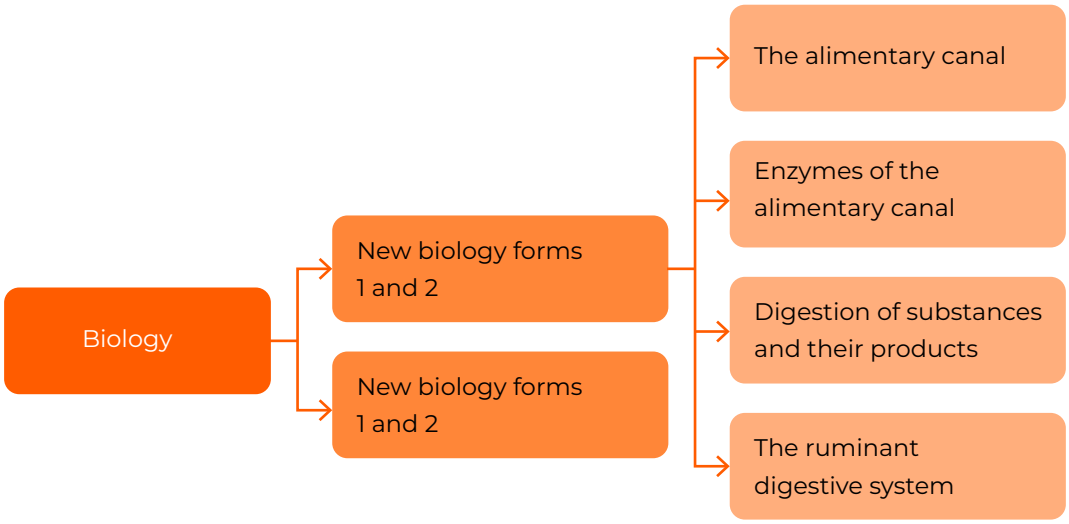

Figure 3
Skills identification of Biology, Form 2, Chapter 14: The Human Digestive System

Once we have identified our skills and learning points, we can add all of the information above to a database or spreadsheet. A database or spreadsheet allows us to insert extra fields, as well as sort, categorise and count the content that we have. Curating content for multiple skills in multiple grades and for multiple subjects requires multiple subject-matter experts and content developers, and involves managing hundreds of content items in different stages of development. A well-designed and well-maintained spreadsheet or database will allow all stakeholders to understand how the process is progressing.

Table 1 shows how a database or spreadsheet can be used to track, monitor and report on the content curation process. In Table 1, we have 102 skills for Biology in Forms 1 and 2. For example, by 30 April, 20% of these skills were successfully curated. Thirteen of the curated skills have video content, three have a simulation, and four have textual content. Besides, 200 assessment questions have been curated and 100 assessment questions have been newly created, all in multiple-choice format. This is an average of 15 assessment questions per skill. The average duration of the curated videos is 4 minutes and 12 seconds. There are 82 skills left, and at this pace, we can be confident that most content will be available on 1 September.

Subject: Biology Forms 1 and 2 — Progress report (30 April)	
Total skills	**102**
Curated as at 30 April	**20 (20%)**
Video content	13
Average video length	4'12"
Simulation	3
Textual content	4
Assessment questions (15 per skill) as at 30 April	**300**
Curated assessment questions (MCQ)	200
Newly created assessment questions (MCQ)	100

Table 1
Reporting and tracking purposes of a database or spreadsheet

This organisation from subject, curriculum, topic, skill and learning points constitutes the skills taxonomy. These learning points are essential since they inform the fit of any curated content. Section 3, Mapping content to the skills taxonomy, discusses this mapping exercise.

Table 2 shows an example of a skills taxonomy in a spreadsheet. In practice, the table can have more fields than this example, depending on the structure and relationship of the curriculum, the textbooks and local needs. For example, fields for 'Subtopic' or 'Learning outcome' can be added. The example shows that in some cases, such as the skill 'The digestive system and digestion process', the content curator can decide to keep it as one skill or split the skill into smaller skills. Typically, one lesson comprises one skill or multiple smaller skills. An added advantage of having smaller skills is that when an update or modification is needed, they can be processed faster and more easily.

Subject	Curriculum/ learning objective	Topic	Skill	Skill code	Learning points
Biology	Explain the process of digestion in human beings	The Human Digestive System	The digestive system and digestion process: the alimentary canal	BI-2-14-02	Learn the function of mouth, stomach, duodenum, ileum and large intestine.
			The digestive system and digestion process: enzymes of the alimentary canal	BI-2-14-03	Understand and contrast the enzymes that parts of the alimentary canal secrete (salivary amylase; pepsin; rennin, trypsin, pancreatic amylase; pancreatic lipase; maltase; sucrase; lactase, peptidase).
			The digestive system and digestion process: digestion of substances and their products	BI-2-14-04	Understand which parts of the alimentary canal digest which substances. Describe the products of digestion.
			The ruminant digestive system	BI-2-14-05	Understand the differences between human and ruminant digestive systems. Describe the parts of the ruminant digestive systems.
			Diseases and disorders of the digestive system	BI-2-14-06	Explain and give examples of causes, symptoms and treatment of diseases (dental caries; heartburn; stomach ulcers; constipation; flatulence).

Table 2
Example of a skills taxonomy for three Biology skills

The skills taxonomy will form a foundation for the selection of content bases and for mapping of content. It will establish a basis both for content curation and content creation.

We note that some virtual learning environments, such as Kolibri (Groeneveld et al., 2020), have the facilities for content alignment built-in.

2 Identifying existing content sources

There are many digital content sources available on the internet that can potentially provide content. Ideally, content is sourced from regions with similar curricula, language and learning levels; Tables 12, 13 and 14 provide a list of potential content sources. However, three questions, also displayed in Figure 4, are relevant when considering whether these content sources can be used to contribute to Zanzibar's content base:

1. Are we allowed to use the content?
2. Is the content applicable?
3. Is the content appropriate for the context?

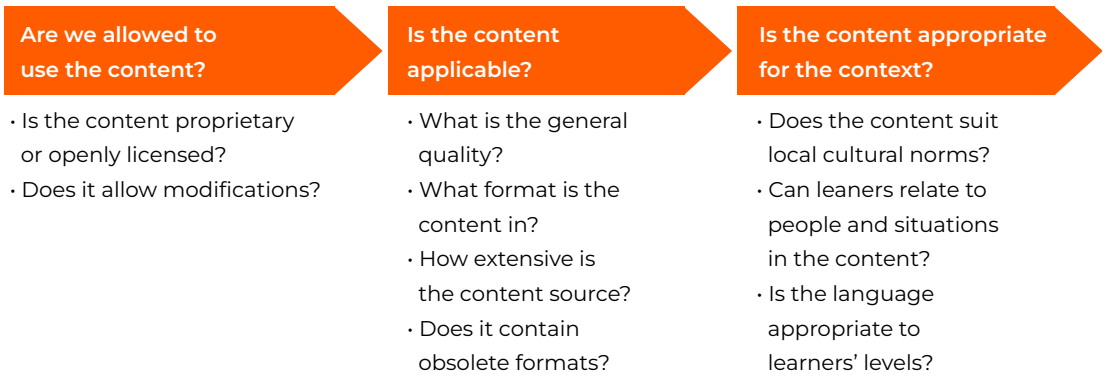

Figure 4
Three questions for considering a content source

2.1 Are we allowed to use the content?

Roughly speaking, there are two types of content: proprietary and openly licensed content.

2.1.1 Proprietary content

Proprietary content is content that is owned by the content creator. This content cannot be disseminated by others without permission. Often, a cost is involved to use the content. Proprietary content is often offered by private entities, but some charities or NGOs also keep their content proprietary. This ensures that they can keep control over the quality of the content.

Content that is offered for free to students, but is proprietary, cannot be reused by other providers, such as governments, without permission. Often, this content can be accessed only through a specific platform or through the provider's own VLE. In practice, negotiation on terms of usage can take time and is not always fruitful. Proprietary content can cost money, but the flip side is that the content creator might be willing to modify the content in exchange for a fee. Finally, even if proprietary content can be used from a content provider, the content provider may wish to keep control over the modification process. These costs can be prohibitively high. Box 1 provides an example of the costs involved in engaging with a content provider to make amendments to proprietary content.

The MoEVT has provided a list of content and VLEs currently used in Zanzibar. One of these providers is a charity that makes its content available for free, allows it to be disseminated by non-commercial parties for free, but does not allow others to make modifications. This particular NGO wants to keep control of the QA process and translate the content under their own supervision. This NGO reported the following translation costs for one video — in this case from English to Spanish:

– Translation of the video script: $75.

– Recording the new voice-over of the script: $200.

– Synchronising the new voice-over with the video and adjusting the video to match the new language: $500.

The total cost of translating one video comes to $775. Translating all of their videos into a new language, in their case 500, would amount to roughly $387,500, assuming there is no discount based on volume.

Box 1
Example of translation costs from a foreign NGO with proprietary content

2.1.2 Openly licensed content

Open content designates content that is available under an open licence. Open licences grant the user certain rights. For example, the Creative Commons licence — one very common type of open licences — allows users to further distribute the content in the original format. For proprietary content, such as a regular TV programme, this is not the case.

There are several variations of the Creative Commons licence, which grant users additional freedoms, but also impose some additional requirements. A common requirement is the need to attribute the originator. For example, the Creative Commons Attribution licence ('CC BY') gives you permission to adapt the content as you like, as long as:

1. You mention who made the content (typically by giving the name of the work, the URL to the work, and the licence of the work).
2. You make clear that changes made were yours, and not by the original content creator (typically by stating that you developed the new document, but have based it on the original document).

For example, you can edit a CC-BY-licensed textbook as you like. However, you have to make some clear changes to the cover, that indicate that this is now your textbook. However, apart from those two requirements, you can do what you like: Adapt, translate, and even sell. Other commonly used licenses (and their restrictions) are shown in the table below.

Some of the most common Creative Commons licences are shown in Table 3, alongside the licence badge that helps you recognise such content.

Licence/badge	Explanation of licence
CC BY 	This licence requires attribution. Content can be reused, but a reference to the content creator must be included, either in the content item or in the frame. Often, content repositories indicate how to make the attribution.
CC BY-SA 	SA stands for 'Share-Alike'. The licence requires attribution (as CC BY), but add the condition that you must retain the same licence; that is to say, you have to give users of your content the same rights (CC BY-SA) under which you received the content in the first place (for example, also CC BY-SA).
CC BY-NC 	NC stands for 'Non-Commercial'. The licence requires attribution (as CC BY), but add the condition that you cannot use the content for making profit.
CC BY-ND 	ND stands for 'No Derivatives'. The licence requires attribution (as CC BY), but you cannot make adaptations. For example, you can still include an image in another document, but you have to include it without making modifications.

Table 3
Creative Commons licences

An introduction to open content in education, tailored to the African context is available (Haßler, 2016).

2.2 Is the content applicable?

Many content sources with wonderful content are available. However, not all content sources will fit the Zanzibar context. Content repositories may have content that does not match the curriculum, the level of instruction, has a different level of language or a different variety of that language, or has a pace that is too fast or too slow.

Good content may not fit if it covers different learning points to the curriculum or textbooks. Too many learning points in the content may confuse teachers and students and will need to be removed. This may have implications for introductory or summary fragments in the content as well. Too few learning points will require the creation of new content. In such cases, the number of modifications needed can nullify the advantages of curating content.

Content may also be heavy on data requirements. For example, certain simulations may require a lot of bandwidth or disk space, or require a graphics engine. Or content can be in obsolete formats that will have to be replaced soon. These types of content provide challenges in low-resource environments with low connectivity, or where the population does not have the economic flexibility to purchase the required amounts of internet data.

2.3 Is the content appropriate for the context?

Finally, even if content is excellent, it may simply not be appropriate for the local situation. Learning happens best when learners can build on existing knowledge. When a situation is presented that is unfamiliar for them or not mindful of local norms — for example, a video warning against the risks of smoking that shows a pregnant woman smoking is not acceptable in all countries — learners will not be able to relate to the content and maybe less successful learners.

Considerations on the appropriateness of content have been listed in Table 4.

Consideration	Description
Content properties	
General quality	Content should be carefully created, factually correct and use correct grammar. It should include an introduction, clear structure and a summary.
Format of content	The content source can contain textual content, video content, audio content or interactive content.
Length or duration	A typical text should be the right length. The duration of a video should be long enough to calmly explain all learning points. The length or duration needed should take into account how the content is used: at home, in class or both.
Format of video	The format of the videos should be suitable for needs. A recorded lecture comes closest to classroom teaching. While it is easiest to produce, it is less engaging than an animated video. A talking head on top of an animation is difficult to modify when the language or pace requires change.
Extent of content source	The source should have several content items that can be used. The more content items we can use from one source, the fewer sources we need for curating items, which in turn means less variety in content styles. In general, a more consistent style of content is easier to use for students and teachers. Content items taken from many different sources can give a disjointed and inconsistent feel to the content.
Locally appropriate	The content should be available in clear and straightforward language. For primary levels, content items should be in the local language. Content items should have an appropriate pace and cover all relevant learning points: not consistently more or fewer.
Students can relate	The protagonists in the videos and the worlds presented in stories should be relatable.
Culturally appropriate	The content should take the local situation and cultural and religious norms or taboos into account. For example, payments are made in local or familiar currencies; there are no bare arms or legs if that goes against modesty norms; pork or beef is not eaten if that goes against dietary norms.
Technical properties	
General quality	Audio should be clear and crisp. Colours in videos should be clear and have appropriate contrast. On-screen text must also be legible on cheap smartphones or when projected in a dimly lit room.
Obsolete formats	The content objects are in a format that is relevant for current technology. For example, objects in Flash format are obsolete. Instead of PDF text formats, HTML5 can be preferable since it is responsive on smartphones.

Table 4
Considerations for selecting a content source

A list of potential content sources, including information on their licensing, has been added in Tables 12, 13 and 14 at the end of this document.

3 Mapping content to the skills taxonomy

Once several content sources which contain relevant, appropriate content that can be reused have been identified, content can be mapped to the skills taxonomy.

The skills taxonomy that we built in the first step can now be used to map content items to the predefined skills. Sometimes, several content items will cover one skill. This mapping process is used to identify whether there is adequate content available to cover all skills. If adequate content is not available then the mapping is used to identify gaps. Additionally, the mapping process helps identify where modifications or new content are needed, which will be further discussed in Sections 4a, 4b and 4c.

A skill taxonomy with content mapping is shown in Table 5. In this mapping, it shows the candidate content, the comments and suggested changes, and the final content item. This final content item is saved in the local repository and uploaded to an online content repository — where students and teachers can access them — or to a VLE.

In this particular example, we see that we have not found one content item that covers all learning points in this skill. We can now choose to split the skill into multiple skills or accept that we need multiple content items for one skill. This is a choice the subject-matter expert (SME) makes.

Skill	Skill code	Learning points	Candidate content	Comments	Changes	Final content item
The digestive system and digestion process	BI-2-14-02	Explain the function of mouth, stomach, duodenum, ileum and large intestine. Explain the enzymes that parts of the alimentary canal secrete (salivary amylase; pepsin; rennin, trypsin, pancreatic amylase; pancreatic lipase; maltase; sucrase; lactase, peptidase). Explain which parts of the alimentary canal digest which substances. Explain the products of digestion.	Khan Academy: gastrointestinal tract; FuseSchool: Digestion - What is it?; Ted-Ed: How your digestive system works	Will need different videos to cover all learning points. Suggested to change skill into multiple skills. Fuseschool is too fast and doesn't cover the different parts of the canal; Ted-Ed is nicely animated, but speech goes fast and the video is long. Ted-Ed has a good length and pace and does not need modifications.	Use Khan Academy video. Cut 0:30-0:40 and 4:20-5:40	– Bi-2-14-02-digestive_system_and_digestion_process.mp4 – Bi-2-14-02-digestive_system_and_digestion_process_assessment.html

Table 5
Skills taxonomy with content mapping

In this example, we have mapped a secondary grade skill. The principle works the same for primary grade skills. Primary grade skills are easier in terms of subject, but scaffolding and fitting the skills is more important as younger children do not yet have the capacity to fill in gaps or solve inconsistencies in content. While the subject content of earlier grade content is easier, the fit of earlier grade content is more important than that of later grade content. Usually, content items require some sort of modification; these can be on the actual content or substance, or the technical format of the content. The next two sections discuss these modifications.

4 Adapting and creating content

4.1 Adapting content for substance

A content curation process means that content can be sourced and disseminated quickly. However, changes are often needed to make the content appropriate for the audience. The content should, as discussed in Section 2 and shown in Table 6, fit the curriculum and learning points, have the right level and be culturally appropriate. Often, sourced content needs changes to work well in a new context. We have split the types of changes into substantive changes — changes in the content itself — and changes in format — technical changes to the digital content items. This distinction is somewhat artificial, but since the different types of change need different processes and actors, we felt that the distinction is helpful.

	Recurring checklist for every content item	
	Check the fit with learning points. Identify content to be removed, added or modified.	✔
	Check the fit with local norms. Identify content to be removed, added or modified.	✔
	Check the level of the content item. Check for changes in language, pace and difficulty.	✔

Table 6
Recurring tasks for the curation of content

Not all content adjustments carry the same effort. Table 7 shows different tasks and the effort involved. The more modifications they need, the less useful curating a specific content item is. Still, in principle, curating existing content is less labour intensive than creating content from scratch.

	Task	Description	Effort
	Adjust for pace	Technically, it is simple to slow down or speed up a video somewhat without noticeably affecting the quality, if change is not more than ±10–20%.	Moderate
	Add subtitles in English or local language	Subtitling videos can be a relatively fast process. However, it requires students to be proficient readers. If students are not proficient readers, they will either miss the video or miss the subtitles. Bear in mind that subtitles should always be added manually; online video services offer automatic subtitle features, but they fail when terminology is complex and students are most reliant on the subtitles.	Moderate
	Dub audio in English or local language	Dubbing audio in a simpler or slower version of English or in the local language is labour intensive. It requires a translated script, a review of the script, a technically good recording, technical effort on syncing the new audio with the video, and finally another review.	High
	Cut redundant content	Cutting a fragment of a video is fast and easy. However, removing fragments can threaten consistency, or invalidate a summary at the end of a video.	Moderate
	Add additional content	If new content needs to be added, the fastest way to do this is to use a simple text file. At a later stage, an entirely new content item can be created from scratch, or an extensively modified version of the existing, curated content item can be produced. If a text file is produced, this is best done in a responsive format such as HTML (see next section).	High

Table 7
Effort required for modifying substance of content items

4.2 Adapting content for format

Content may require changes in format to fit local infrastructure, local dissemination channels, or to work with current technologies.

With few students expected to access content through wide-screen computers in Zanzibar, content should have a responsive design, so that it adapts to the screen size of any device. Content created in HTML5, the most recent standard, typically is responsive. Table 8 provides an overview of technical adjustments to content.

	Task	Description	Effort
	Recreate content in current formats, for example, PDF in HTML5	Recreating a textual PDF in HTML5 requires moderate effort. If there are images or charts in the PDF, the effort is greater.	Moderate–high
	Ignore obsolete formats if they cannot be adjusted	If obsolete formats cannot be easily adjusted, they are best not selected as content items. Adjusting obsolete content can require as much effort as creating content from scratch. For example, Flash content cannot be edited and requires creating content in a contemporary format.	Low
	High-resolution videos can be rendered as low-resolution videos	This requires moderate effort. Online services such as YouTube do this automatically when videos are streamed online. However, to allow local downloads, low-resolution video options need to be available.	Low
	Recreating content to fit different mediums; for example quizzes through web and SMS	The effort of repurposing text is moderate but depends greatly on the quality of templates and standards for the different formats of the same content item. Technical support in setting these standards and the workflow is required.	Moderate

Table 8
Effort for modifying format of content items

After adjusting content items on substance and format, there may be skills in the skills taxonomy for which no content has been found. The next section discusses an approach to missing content.

4.3 Creating essential missing content

The purpose of this report is to describe the process of content curation with the intention of producing an appropriate, usable, curriculum-aligned content base quickly. Both in terms of speed and cost, curated content is preferable to creating customised content. However, there may be skills for which no content can be curated. For example, skills may be taught differently than in other parts of the world or may belong to subjects specific to the local region, such as the history of Zanzibar.

We recommend focusing on speed and quality with a quick user-testing cycle, which is described in Section 5. This entails accepting that there can be gaps in the skills and content mapping, where no content of sufficient quality can be curated. There may be some cases, however, where a skill is deemed absolutely necessary and content needs to be created. In that case, content can be created in a multimedia format, which is costly and can take time, or in textual format, which is faster to do but misses the power of visualisation that may be needed to convey certain points. The choice you make depends on the content financer and developer. However, when multimedia content is created,

the content should be of a quality that ensures usability and validity for a good number of years. This includes considerations on delivery modes. Video content can be broadcast through television, shared through WhatsApp or placed in a VLE. If content needs to be made available urgently, textual content can be created quickly, and more vivid content can be planned for the future. A practical option is to partner with private content providers to create customised content; especially in the short term, private companies will work faster and at a lower cost to provide good quality multimedia content than the Ministry can.

Figure 5 illustrates the process for selecting which content needs to be created. This process is compatible with the skills taxonomy. After the curation process, many skills will remain empty for which no content can be curated, or no content can be curated quickly enough to fit requirements. An inventory of missing skills can be used to identify essential skills that are missing but require digital content. Finally, the list of essential, but missing skills, can inform the planning of timelines needed for content creation and help develop a budget.

Figure 5
Process for selecting essential, missing skills for creation

5 Testing your content

Whether content is curated or created, user testing is a necessity. User testing will tell us if the content is understood by the majority of all types of learners, whether the language is clear, whether the content is enjoyable, if there is a clear link between the text and pictures or video, and most importantly, whether students can learn by using the content (for example, if the content is valid).

It is imperative to start testing content early in the curation process, to allow timely changes to the curation approach when needed. Figure 6 offers an example of a testing cycle.

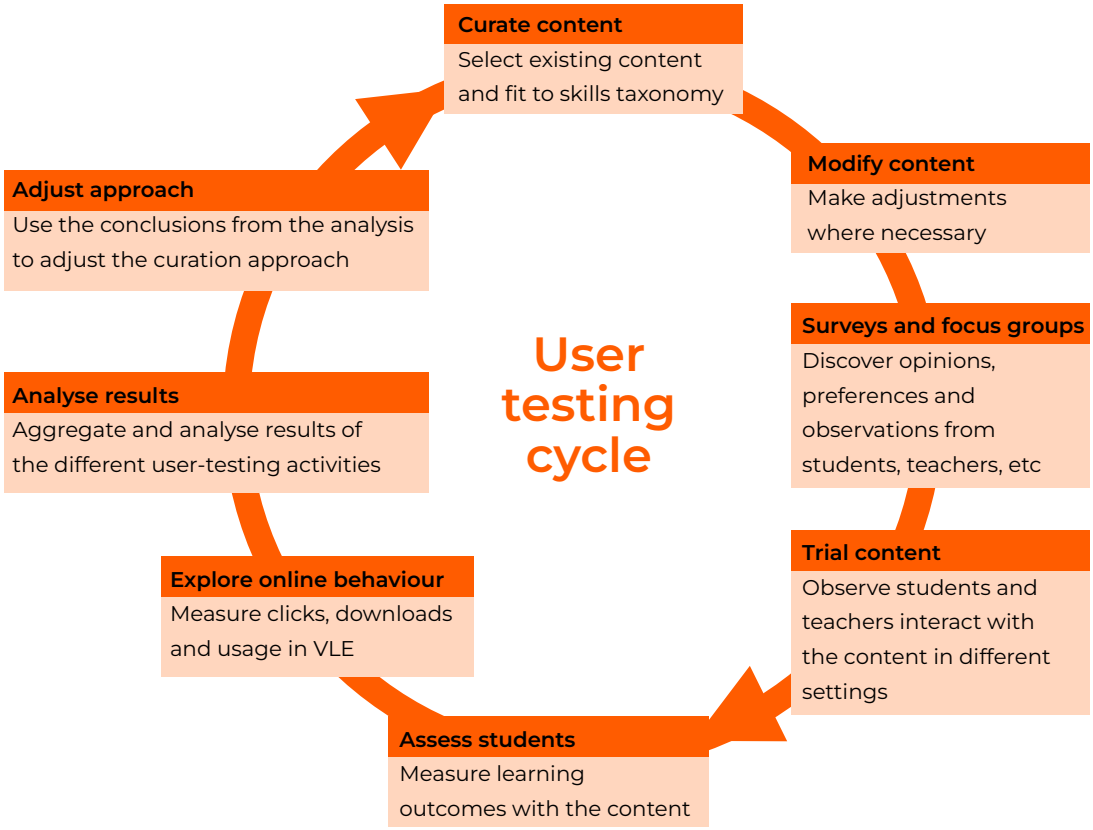

Figure 6
User testing cycle to inform the content curation process

5.1 How to test

There are different types of questions we can ask to test the quality of our content: we can discuss the content in focus groups, survey our users, track online behaviour and we can test learners. All of these methods have their value, but they serve different purposes. Focus groups allow you to scratch the surface and pick up observations that are not anticipated. Surveys provide structured responses, which allows them to be compared and analysed quantitatively. They are great for understanding preferences. However, evidence shows that learners are not good judges of their own learning process, and a survey is not a good method to find out whether content is *effective*. To find out whether students are learning well with the content, you need to assess them. Ideally, students should be compared with a control group provided with a textbook or a traditional lesson. Finally, if content has been uploaded to a VLE, usage data are usually available. These can tell us if students

actually interacted with the content, if they download it, or how often or how fast they went through it.

Table 9, below, shows uses of different methodologies in user testing to assess the quality of our content. These methodologies are complementary and not exclusive. To get a full understanding of the quality and impact of the content, a mix of all the different methodologies is needed.

	Focus groups	Survey	Test	Usage data
What it does	Provides answers to questions you did not ask Can yield unanticipated results	Is structured Provides aesthetic preferences Provides information on legibility, pace, etc.	Shows if students understand the material Most useful if compared with a control group using the book	Shows which content students actually use Shows whether assessment scores correlate with content usage
What it does not do	Does not show effectiveness of content or if content will actually be used	Does not show effectiveness of content or if content will actually be used	Does not show if content is enjoyable or controversial	Does not provide evidence of causal relationships between content and learning outcomes

Table 9
User-testing methodologies

5.2 Who should be involved in user testing

Content should be useful to all students and should be tested with all types of students. This means that user testing among students should be carried out with students in urban and semi-urban regions and from different socioeconomic backgrounds. In other words, there should be a representative sample of students. Also, students with visual or hearing impairments should be included in user testing to understand if the curation approach needs to be adjusted to meet their needs, for example through subtitling or dubbing content. Since students with visual or hearing impairments are more likely to be out of school, having online content is especially important for this group.

Besides students, teachers are an important stakeholder for content. In their case, user testing can include a sample lesson taught with content. Conducting a lesson with the content will more quickly identify advantages or issues with the content than a feedback form. The closer a test is to actual practice, the more useful and valid the results are. As with students, teachers must be taken from different schools and different backgrounds and should represent the total population of teachers well.

School inspectors have a role in assessing teaching with the content. A word of caution is merited: both training and patience will be required before any changes to teaching behaviours take place and better returns are yielded. A first class taught with any new methodology will be less effective, since the teacher will not as yet be proficient. For a fair assessment of teaching content, school inspectors need proper evaluation tools that allow for assessment of different aspects of a lesson.

5.3 Testing standards and protocols

Testing standards and protocols are a natural part of testing cycles. Standards and protocols allow us to compare testing results in different cycles, but also allow us to compare results from different focus group leaders. For example, a focus group usually has a semi-structured approach, where the facilitator asks prescribed open questions and then has subjects elaborate on them. Notes are kept and saved centrally.

5.4 Analysing results

Focus groups, surveys and tests provide different results that need to be analysed to inform next steps. Different methodologies lead to different types of conclusion. Survey data cannot be used to assess the effectiveness of implementation. Self-reports on usage are highly unreliable and should be dismissed in favour of observations or usage data. Results from user testing can be generalised only when the sample size is both sufficiently big and representative to allow for conclusions. Remarkable, single observations in focus groups typically do not lead to conclusions, but they can be used in follow-up focus groups or to modify existing surveys.

Any results deserve scrutiny. For example, when an assessment does not show that students have learnt anything, the reason may be that the content was of low quality, or that the content did not fit the skill well but was otherwise good: it was not valid content. Another example might be when students did not understand the audio in the content. The reason for this may be that the content item has bad sound quality, or that the loudspeakers used in the test classroom were of substandard quality.

For an adjustment of the implementation approach, this scrutiny is key. If a content item has low audio quality, the content item may need to be replaced or dubbed; if loudspeakers in the classroom are of substandard quality, the hardware needs to be updated. If students do not use the content at home, the reason may be that content is not attractive, that they do not know how to log in, that they do not have sufficient bandwidth (for example). Each of these findings requires a different adjustment in the intervention to make the next iteration more likely to be a success.

6 Offering your content: scaffolded and curriculum-aligned

Since the implementation of a VLE and the offering of content falls outside the scope of this document, this section has been placed last. Content can be made available through different platforms and technologies and depends on the technologies available to students, teachers and schools. This can be the Ministry's own website — zlms.moez.go.tz — but can also be a generically accessible platform that students already use, such as YouTube for video content. Content can also be made available as downloadable packages that can be saved to USB flash drives or distributed on USB flash drives or CD ROMs by the Ministry. User testing will show how students and teachers are most likely to access content. In Kenya, for example, one of the most popular ways of sharing educational content was through WhatsApp (McBurnie & Haßler, 2020).

Content is most effective when it is curriculum-aligned and scaffolded. In other words, when students and teachers can access the content in a relevant and logically ordered manner. Scaffolding and offering content in a structured manner is easiest on a designated learning platform. However, generic platforms such as YouTube also provide options to structure content offerings, for example through playlists. While it cannot be structured and offered completely according to the curriculum, in the case of the Biology example above, a playlist called Zanzibar Biology Form 2 could, for example, be created, with the five skills on digestion following each other in a logical order. For example, Wizara ya elimu Zanzibar created such a playlist for Form 3 Chemistry.

Institutional providers, including governments and school chains, often prefer to have their own learning platform. This helps to ensure the quality and consistency of content and to protect students through logins. These advantages come at a risk: sometimes, students cannot find the platforms, or, when they can, find login procedures challenging or payment requirements expensive. Further, students who have access to the internet often already have a habit of visiting existing platforms, such as Facebook or YouTube. Therefore, in addition to adding and structuring content on your own platform, placing content in existing platforms that students have a habit of visiting should be considered. Existing sites have the added benefit of offering excellent disaggregated usage and user statistics and serve the ultimate purpose of content being easy to find and use.

Ecuador, a country in South America, created a learning platform for its own students: educa.ec. Despite the government's efforts to route students to the government's learning platform, only 8% of students indicated that they used the official platform, while 48% used YouTube to access educational content.

In Kenya, the Kenya Institute of Curriculum Development developed a platform to offer content. However, only 10% of digital learners accessed this website, although 27% of digital learners were able to access materials sent to them through WhatsApp.

Box 2

If you build it, they won't come (Asanov et al., 2020; Uwezo, 2020)

7 Roles and responsibilities

The content curation process described in this document outlines steps that can be taken to curate, adapt and disseminate content quickly. When considering how roles will be allocated, it is important to keep two guiding principles in mind:

1. Responsibility for approval of content items always lies with an education or curriculum body, not with a technology body.
2. While many parties are involved, one body should have final responsibility for the content-curation process.

Regardless of who has overall responsibility, the various actors require capacity development and on-the-ground guidance as the process is designed and executed. External expertise seems an absolute necessity in building and shaping the team, defining procedures and starting the process. However, the purpose of any external expert must be to transfer their expertise and ensure the MoEVT builds all necessary capacity.

With many players involved, an example of an organisational chart can be found in Figure 7. This is very much an example and an actual organogram will depend on the organisation of the ministry in question.

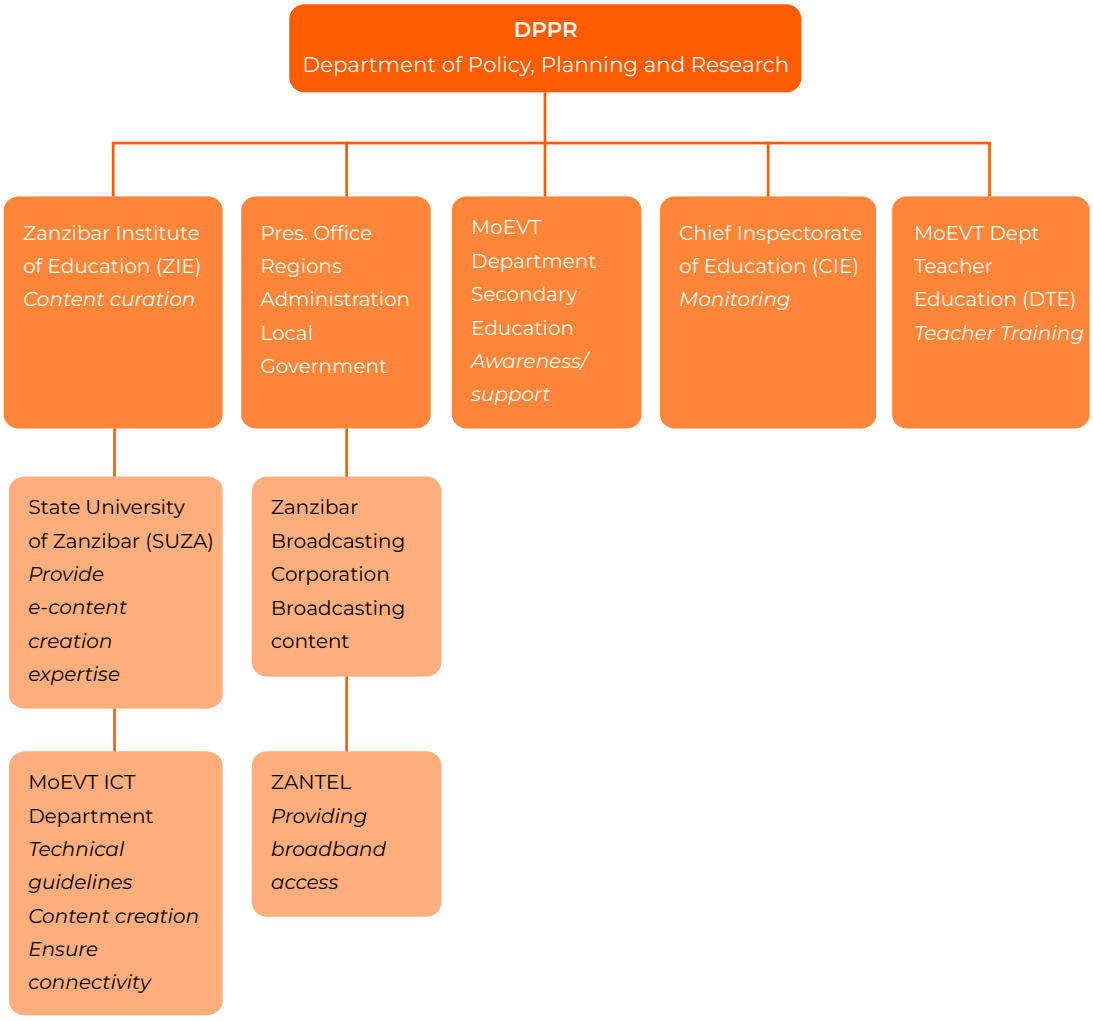

Figure 7
Example of organisational chart for content curation

As can be seen above, some bodies are responsible for implementation, not for curation. Without effective dissemination of content — be it through an online content repository or a VLE — the curated content will not find its students. However, there should be one clear coordinating body, and the responsibility for content development must lie with an educational body.

Within the curation process, clear roles are necessary. It is good practice to always require at least four eyes on every content item before it goes out. An example of a work process is illustrated in Figure 8. As shown, subject-matter experts (SMEs) identify changes; a content developer processes these changes; and the SMEs then approve these changes. The approval role can also be played by an instructional designer.

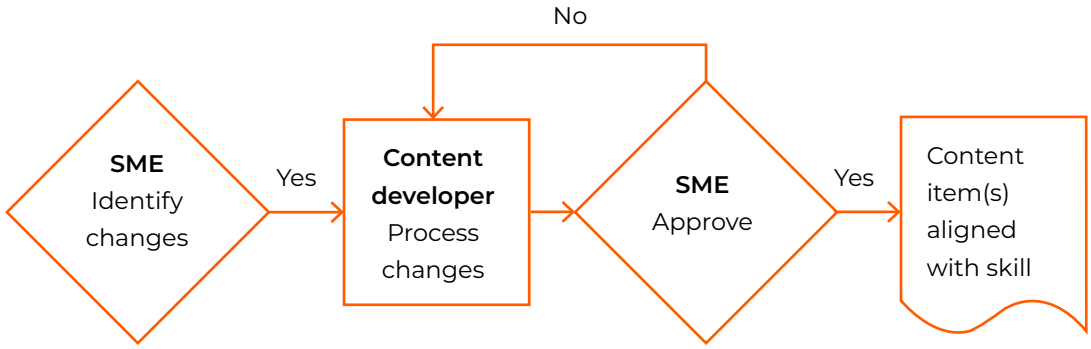

Figure 8
Curation process

8 Final recommendations, budget and timelines

This document describes one possible approach to content curation. While it is not prescriptive, suggestions in this document are based on experience. We would like to conclude by giving some recommendations for the process and some guidance on a very rough budget and timelines.

8.1 Recommendations for beginning the curation process

1. **Start small.** Begin the curation process for one term, for one grade, and one subject. Build a foundation with a skills taxonomy first and expand towards curation once this is in place. This approach will allow you to identify issues and challenges, and to finetune the curation process, workflow and roles and responsibilities. Once the process is successful, it can be duplicated for another grade, then more grades and more subjects, and so on.
2. **Have a short cycle.** Similarly, a short cycle will give you immediate information on the quality of the curated content, its effectiveness and the user response. A first user-testing session can be organised immediately when the first ten content items have been curated. Also, user-testing protocols and design can be developed while content curation starts.
3. **Organise content clearly.** Develop a clear, unambiguous content organisation and naming system. A content curation process will quickly have thousands of content items, some in different stages of development. If there is a lack of clarity on naming or organisation conventions, content items will get lost or it will prove difficult to identify the most recent version.
4. **Bring in an expert.** Content curation requires specific expertise and capacity, and developing that capacity takes time. Be prepared to bring in an expert who can help develop a process that works locally and transfer expertise to the local team.
5. **Test content with representative users.** As discussed above, this is worth emphasising. If learners participating in testing do not represent all learners in the region, there is a risk of curating content that does not meet the requirements of learners in challenging environments or with disabilities.
6. **Curate, don't create.** We have raised this point several times: creation is a much more labour-intensive activity than curation. If curation is an option, opt for curation. There is a benefit to speed, cost and quality.
7. **Use checklists and standards.** Content should include learning points, have redundant learning points removed, be culturally appropriate, have the right pace, level, language, for example. Checklists remind SMEs what to look for, and which checks are essential. They are especially useful early on in the process but are often relied on by experienced curators and creators as well. Including a scoring mechanism based on pre-defined parameters can make this process clearer and easier to follow.

8.2 Timelines and budget

The skills taxonomy and curation process involves many stakeholders and greatly depends on how the process is structured locally and how tasks are assigned. Further, decisions must be made on the suitability of content, the number of skills, and on human resource costing.

As examples, we have created one rough budget for capacity building through training and external expertise, and one rough budget for content creation. Table 10 provides an example of a capacity-building exercise. Daily costs illustrated do not have to be spent consecutively.

Activity	Person	Time allocation	Days	Cost per day	Cost
Training, setting standards	External consultant	20 days	20	$500	$10,000
Internal training	Team of 15	3 days per person	45	$150	$6,750
Total cost					**$16,750**

Table 10
Rough budget for capacity building and external expertise

In extending this budget example to include skill curation, we have used the subject of Biology for Forms 1 and 2. The budget cannot easily be generalised to apply to other subjects. Biology content is generic, taught in English and can be more easily sourced than content for primary levels, which would have to be in the local language. On the other hand, Biology is more sensitive to local norms than, for example, Mathematics.

After a quick review of the textbook, we have estimated that there are 102 distinct skills for which we need content. Since it is a generic science subject, we assume that we can find content for 80% of the skills. These may require modifications. Of the 20 skills that are remaining, we have assumed that five are essential. Please note that the number and complexity of skills can vary considerably depending on the grade and the subject. This budget is an example, and a full budget will depend on the taxonomy and the changes. All personnel are assumed to be government employees.

Activity	Personnel	Effort per skill	Days	Cost per day	Cost
Creating skills taxonomy (per subject/grade)	Subject-Matter Expert		2	$175	$350
Identifying content sources	Subject-Matter Expert		5	$175	$875
Selecting — skill	Subject-Matter Expert	1 hour	10	$175	$1,750
Identifying changes to skill	Subject-Matter Expert	2 hours	20	$175	$3,500
Making audio changes to skill	Language expert	4 hours	40	$150	$6,000
Subtitling skills	Language expert	2 hours	20	$150	$3,000
Video changes to skill	Developer	12 hours	120	$150	$18,000
Reviewing changed skill	Subject-Matter Expert	0.5 hours	5	$175	$875
Creating essential, missing skills (textual skill)	Developer	16 hours (textual skill)	10	$150	$1,500
Reviewing created skills	Subject-Matter Expert	4 hours	2.5	$175	$438
Maintaining repository (upload or adding to package)	Technologist	.25 hours	3	$125	$375
Total cost					**$36,663**

Table 11
Rough budget for skill curation for 2 grades of Biology, around 100 skills

Based on the activities planned in the budget, we can create a timeline. The timeline does not have a final delivery date. In practice, there will be a team of curators working as SMEs, content developers and technologists, with content being curated and made available on a rolling basis. Realistically, the first curated content items can be made available four weeks after the start of this process. Depending on the size of the team, curation of content for one grade of one subject can take anywhere between three months and a year. Figure 9 provides a sample timeline.

Figure 9
Timeline of content curation, with the first curated items available in week 5

9 Potential content sources

We have provided a list of potential content sources for use in Zanzibar in Tables 12, 13 and 14. Most sources have a Creative Commons licence, but some are proprietary or do not allow derivatives. A list of free or open digital learning resources is available here.

Source	Comments
Open Up Resources	**Target grades:** K–12 **Subjects:** Math and English **Format(s):** Text and ready for print **Licences:** CC BY
Siyavula	**Target grades:** Grade 4–12 **Subjects:** Math and Science **Format(s):** Textbooks **Licences:** Various CC licences
CK-12	**Target grades:** K–12 **Subjects:** All **Format(s):** Multiple formats **Licences:** Various CC licences

Table 12
Essential content sources — global

Source	Comments
Khan Academy Swahili	**Target grades:** Secondary **Subjects:** Maths and science **Format(s):** Videos **Licences:** CC NC SA BY
Ubongo kids	**Target grades:** Pre-K–Primary **Subjects:** English, Swahili, maths, science **Format(s):** Videos (in Swahili) **Licences:** Proprietary
HaloStudy	**Target grades:** Secondary (Forms 1–4) **Subjects:** Maths and sciences **Format(s):** Video and quizzes **Licences:** Proprietary (made by University of Dar es Salaam's Center for Virtual Learning
ShuleDirect	**Target grades:** Secondary (Forms 1–4); curriculum aligned with Tanzania **Subjects:** English, maths, science, history, geography **Format(s):** Text, videos, quizzes **Licences:** Proprietary

Table 13
Swahili content

Source	Comments
Curriki	**Target grades:** All **Subjects:** All **Format(s):** All **Licences:** Various CC licences depending on content item
Khan Academy	**Target grades:** K–12 **Subjects:** Maths and science **Format(s):** Videos and online practice problems **Licences:** CC NC SA BY
Ted-ed	**Target grades:** Not curriculum-aligned; mostly secondary **Subjects:** Sciences and social sciences **Format(s):** Video **Licences:** CC ND
PhET	**Target grades:** K–12 **Subjects:** Maths and science **Format(s):** HTML5 simulations **Licences:** CC BY
Profuturo	**Target grades:** Secondary **Subjects:** All **Format(s):** Full lessons including videos, available offline **Licences:** Proprietary
FuseSchool	**Target grades:** Secondary **Subjects:** Maths and science **Format(s):** Videos **Licences:** CC BY NC
SplashLearn	**Target grades:** Pre-K to grade 5 **Subjects:** Maths **Format(s):** HTML5 **Licences:** Proprietary
E-Learning for kids	**Target grades:** Primary **Subjects:** Maths and science **Format(s):** videos **Licences:** CC NC ND BY
OER Commons	Not a repository, but a search engine for OER

Table 14

Additional content sources

10 References

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