

Breaking barriers with translation: contextualization in curriculum design for global education

Quality Education
for All

359

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Received 28 May 2024
Revised 17 March 2025
Accepted 17 March 2025

Abstract

Purpose – This paper aims to highlight how translation can be used to contextualize curriculum materials, ensuring cultural relevance and accessibility for students in low- and middle-income countries. The research problem addressed is the lack of accessible and relevant educational resources for diverse cultural and linguistic backgrounds, hindering effective learning experiences.

Design/methodology/approach – The paper discusses the importance of translation and contextualization in curriculum design for global education, focusing on the case of the STEM Teacher/student Education for Primary Schools project, which was aimed at improving STEM primary school education in Benin, Cameroon and the Democratic Republic of Congo.

Findings – Results show that using translation as a form of contextualization successfully bridges global education with localization, providing culturally responsive science textbooks and enhancing teacher professional development.

Practical implications – The implications include promoting student success, enhancing scientific learning outcomes and fostering critical thinking and creativity among students.

Originality/value – Translation in curriculum design should not be overlooked as a way to expose students in LMICs and other languages to high-quality materials available in higher-income, English-speaking countries. For policymakers and curriculum developers, translation provides the route through which a country's STEM curriculum can be contextualized to provide culturally relevant and meaningful educational resources for all students.

Keywords Curriculum design, Accessibility, STEM education, Equity, Translation, Contextualization

Paper type Case study

Introduction

"Breaking Barriers with Translation: Contextualization in Curriculum Design for Global Education" explores the crucial role of translation in creating inclusive and effective educational curricula for a global audience, using the STEM Teacher/student Education for Primary Schools (STEPS) Project as a case study. In an increasingly interconnected world,



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Quality Education for All
Vol. 2 No. 1, 2025
pp. 359-372
Emerald Publishing Limited
2976-9310
DOI 10.1108/QEA-05-2024-0046

diverse cultural and linguistic backgrounds among students pose unique challenges for educators. Educators can bridge linguistic and cultural gaps by integrating translation and contextualization into curriculum design, ensuring that educational materials are accessible and relevant to students from various backgrounds. Often, high-quality materials are more readily available in higher-income countries, and translation is one way to reduce the barriers for students and educators in low- and middle-income countries, making those materials more accessible.

Global education is an approach to education that aims to promote intercultural competence and prepare students for a globally connected society (Byram and Starkley, 2002). One important aspect of global education is contextualization in curriculum design, which involves using authentic materials, activities, interests, issues, and needs from learners' lives to develop classroom instruction (Utech, 2008). This approach teaches skills while using authentic contexts in which students must use those skills (Utech, 2008). However, designing curriculum that effectively meets the needs of diverse learners in various cultural and linguistic contexts poses a significant challenge. Traditional curriculum models often fail to address the cultural nuances and contextual relevance necessary for meaningful learning experiences.

Contextualization in curriculum design is significant for global education because it helps to break down barriers that prevent students from achieving the highest goals of education (Ford and Zubizaretta, 2018). By using authentic materials and real-world contexts, teachers can help students see the relevance of what they are learning and engage them in the learning process. This approach also helps promote cultural awareness and understanding, which is essential for global citizenship (UNESCO, 2015). Overall, contextualization in curriculum design is important for promoting global education and preparing students for success in an increasingly interconnected world.

Given that English is not the first language of many learners, language barriers can hinder access to educational resources, thus limiting the real benefits of global education. To address these challenges, curriculum designers and educators may need to rely on translated educational materials that are contextualized for specific cultures, that is, that consider the cultural context of the specific learners.

By not harnessing the full benefits of translation and contextualization, curriculum developers and educators face the possibility of reduced motivation for learning and a sense of disengagement in the classroom because the curriculum lacks relevance and meaning for the students. Students find it more difficult to apply what they are learning in real-world situations, thus failing to meet their learning needs, and impacting their academic achievement (Kalchik and Oertle, 2010; Llego, 2022).

Translation and contextualization, therefore, play a crucial role in breaking barriers and ensuring inclusive global education. By providing access to curriculum content in learners' native languages, we can facilitate their engagement, comprehension, and participation in the learning process. As noted above, contextualization goes beyond mere translation into another language, taking into account cultural nuances, local examples, and real-life experiences relevant to the learners' context. This enables students to connect with the content more deeply, making it more accessible and meaningful to their own experiences. Moreover, incorporating translation and contextualization into curriculum design allows for the preservation and promotion of diverse cultural perspectives. It supports the development of intercultural competence and enhances the understanding of different worldviews and ways of life.

What is STEM Teacher/student Education for Primary Schools?

STEPS was a project funded by the Global Partnership for Education Knowledge and Innovation Exchange, a joint endeavor with the International Development Research Centre,

Canada, dedicated to addressing the challenges in improving STEM primary school education in the Democratic Republic of Congo (DRC), Benin, and Cameroon. STEPS aimed to identify and study effective methods that could be scaled to benefit primary school children in these countries and improve educational outcomes, especially in science and math.

The Cameroon Baptist Convention Education Department and NextGenU.org led the project. The consortium, which was supervised by NextGenU.org, comprised nongovernmental organizations from the DRC (Emmanuel Community and HEAR Congo), Benin (Trois Soeurs Education Fund), the USA (Scientific Animations Without Borders), and Japan (Edge of Education).

The project was implemented in 18 primary schools (8 in Cameroon, 5 in Benin, and 5 in the DRC), with teacher professional development (TPD) being offered to more than 150 teachers. The project was tailored to the national contexts of each target country and specifically addressed the need for low- and higher-tech solutions, cost-effectiveness, gender sensitivity, and bilingual content.

The World Bank (2023) explains that a global learning crisis impacts countries' ability to achieve Sustainable Development Goal 4 (SDG4): Quality education for all by 2030. "Too many education systems are not delivering even basic skills for all children, let alone preparing them for the demanding world they will live in as adults" (Saavedra Chanduvi *et al.*, 2020, p. 6). Therefore, the STEPS Project was preparing teachers and students in Benin, Cameroon, and the DRC for the future by delivering relevant pedagogical and content knowledge in STEM.

While the initial aim was to curate and share open-access, high-quality curriculum materials with the schools, the project team quickly discovered the paucity of existing resources that could be considered appropriate for the three countries. Firstly, the majority of the materials were created for North American or European school systems, which would require extensive contextualization if they were to be used in Benin, Cameroon, or the DRC. Additionally, no one Science curriculum could work in all three contexts. With only about 20% similarity between the countries' curriculum standards and the class levels where certain topics were taught, it was imperative that the team create separate materials for each country based on their specific needs.

Structure of the article

Using the STEPS project as a case study, this paper will comprehensively demonstrate how translation can be viewed as a form of contextualization in curriculum design. Readers will be introduced to the conceptual framework that underpins this analysis, highlighting translation's role as a pivotal tool in breaking communication barriers. It will then delve into the understanding of translation as a form of contextualization, asserting the significance of contextualization in curriculum design. By exploring science curriculum design approaches such as inquiry-based teaching and learning and culturally relevant and responsive teaching, the paper will provide a foundation for understanding the STEPS pedagogy selected.

The team's curriculum design process will be the subject of an analysis, which will also look at the difficulties the team encountered and the elements that made the process effective. The article then ends with tangible implications and practical recommendations for curriculum developers, educators, and policymakers, highlighting the contribution to the field of curriculum development and global education and providing thoughts on the significance of breaking barriers with translation to foster inclusivity.

Conceptual framework

This section will present the theories and perspectives that underpin this article. Various definitions and perspectives of translation will be explored, and an explanation of contextualization in

curriculum design will be presented. The section will tie these two subsections together by delving into translation as a form of contextualization.

Understanding translation

Translation has a role in overcoming language and cultural obstacles. By enabling communication and comprehension between people who speak different languages, translation helps to build connections on a global scale (Xue, 2020). From a sociocultural viewpoint, translation serves as a tool to encourage exchange and understanding. It allows ideas, knowledge, and literary works to be shared across cultures, promoting diversity while dismantling stereotypes and misconceptions. From a cognitive perspective, translation is seen as a process involving the transfer of meaning and information from one language to another. This process requires both expertise and cognitive abilities like problem-solving, critical thinking, and creativity. In addition, translation plays a role in addressing language barriers in education, helping students overcome language obstacles by granting them access to information and enabling their engagement in educational activities. Moreover, translation acts as a bridge for communication between regions and countries. By fostering understanding and empathy, it aids in closing the gap that language barriers create. Translation acts as a tool for dismantling obstacles that exist among people speaking different languages and belonging to distinct cultural backgrounds.

It is important to analyze different definitions of translation. According to Newmark (1987), the foundation of it all is in translating a text's meaning or essence from one language and culture into another, which calls for the translator to be able to comprehend the original author's intentions before reflecting these in the final version of the work. Since intent is crucial, it makes sense that a translator would choose different approaches to accomplish their objectives. Conversely, Venuti's definition views translation as the act of substituting "a sequence of signifiers" from the source language (SL) with those of the target language (TL), contingent upon the translator's meaning (Venuti, 1995, p. 17). In contrast to Newmark, who emphasizes the author of the source text (ST), Venuti emphasizes the translator's involvement throughout the process.

Another viewpoint is held by Jakobson (1971), who believes that translation involves the simultaneous processes of recoding and transposing. This depends on the translator's comprehension of the communication process as a whole and the nature of the message being conveyed. Nord (1997) considers Jakobson's point of view and asserts that translation is the process of producing a functional target text while maintaining a relationship with a ST that is specified according to the intended or demanded function of the target text. It also facilitates communication, which would not have been possible in the absence of translation due to linguistic and cultural barriers.

Many translation specialists still believe that it is challenging to identify specific theories that underpin translation. Nida (1991) believes that all translators use some kind of implicit theory or perspective when they begin a translation. He identifies four perspectives: philological, linguistic, communicative, and sociosemiotic. The philological perspective dates back to the seventeenth and eighteenth centuries when translation focused on accuracy of form and faithfulness to the ST. The linguistic perspective focuses on the linguistic structure of the languages being translated and accounts for parallels and discrepancies between the general structures of the target and SLs. The communicative perspective goes further and highlights the pragmatic and social uses of languages rather than only their structures, focusing on "dynamic equivalence" (Nida, 1991, p. 25) in an attempt to retain context. The final perspective, the sociosemiotic perspective, focuses on the signs that people in a particular society use to communicate. This means that translators should be aware of the

role of nonverbal communication in certain cultures and how to manage descriptions of these modes of communication when they appear in a text.

In the same way that an understanding of what translation is has evolved, the reasons for translating text from one language to another have changed over the years from merely knowledge enrichment to a significant means of cross-cultural communication in this globalized world. As translation occurs in an increasing number of language combinations, minority cultures and languages are now more accessible to readers. This growing accessibility not only preserves linguistic diversity but also fosters greater empathy and understanding among people from different backgrounds, enriching the global tapestry.

Contextualization in curriculum design

Contextualization in curriculum design involves establishing a connection between the curriculum and the learners' particular environment, circumstance, or application area to make it relevant, meaningful, and valuable to them. It entails incorporating practical aspects, firsthand experiences, and students' abilities into the teaching and learning process (Llego, 2022) so that students understand how their learning in the classroom can be applied in real-life situations. It is a student-centered approach (Yasin *et al.*, 2023) that asserts that education cannot be separated from the larger context in which it occurs and that the content, methods, and goals of education should be customized to meet the needs and interests of learners within their specific cultural and societal contexts (Gorodetsky *et al.*, 2003).

Incorporating contextualization into curriculum design impacts global learning in numerous ways. Contextualization helps make the teaching of the material more relevant and meaningful for students (Bolt and Swartz, 1997), creating a link between their studies and real-life situations, current affairs, and global issues (Gorodetsky *et al.*, 2003; Risan *et al.*, 2021). This approach helps students understand the interconnectedness of subjects and promotes a deeper appreciation and understanding of diverse cultures, perspectives, and ways of life (Bolt and Swartz, 1997).

Contextualization helps students develop critical thinking and problem-solving skills by getting them to think about and apply what they have learned in real-life situations. This is a crucial aspect of learning that ties into the constructivism theory put forth by academics like Dewey (Dewey, 1922, 1929; Vanderstretten, 2002; Lotulung *et al.*, 2018). This approach fosters a deeper understanding of complex global problems and inspires students to develop innovative solutions that are both culturally appropriate and globally inclusive.

Contextualization is linked to culturally relevant or culturally responsive teaching. Mensah (2021, p. 10) describes culturally relevant teaching as a way to “empower students intellectually, socially, emotionally, and politically by using cultural referents to impart knowledge, skills, and attitudes”. According to Gay (2018, p. 36), culturally responsive teaching is defined as “using the cultural knowledge, prior experiences, frames of reference, and performance styles of ethnically diverse students to make learning encounters more relevant to and effective for them”. An educator who seeks to ensure that the material presented to students is contextualized and, hence, culturally relevant or responsive, sees the importance of such pedagogy in students' academic and social development.

Contextualization is crucial in global education, especially when students have varied backgrounds. It allows learners to understand global challenges and develop empathy for other cultures. Students learn about the interconnectedness and interdependence of the world, fostering a collective sense of responsibility. Sustainable Development Goal 4 focuses on providing inclusive and equitable education for all, with contextualization playing a key role in achieving this target (UNESCO, 2015; World Bank, 2023). A contextualized

curriculum guarantees that all learners can relate to the curriculum, promoting inclusivity and minimizing prejudices based on social, cultural, or geographical backgrounds.

Translation as a form of contextualization

Can translation be viewed as a form of contextualization? The simple answer is yes. The translation process extends beyond converting words from one language to another to the interpretation of the meaning and context of the ST and the re-contextualization of that meaning both linguistically and culturally for the target audience (Angelone, 2024).

A good translator must consider both the situational and linguistic context of both the source and TLs (Postan, 2020). This requires the translator to understand cultural nuances, idiomatic expressions, and the socioeconomic environment associated with the two languages. Therefore, the translator's cultural understanding is crucial if we are to produce accurate and culturally responsive translations because words do not appear in isolation (Smith, 2023). The translator must see language as both a product and a carrier of culture. According to Smith (2023), some words are culture-specific, meaning they have specific significance to a particular culture and may be difficult to translate into other languages without losing their original meaning. Additionally, how people express themselves allows values and culture to be passed from one generation to the next. Translation that captures all these nuances, therefore, presents contextualized material to the target audience.

One cannot ignore the power of translation as a tool to provide contextualized curricula to a global audience. While it may seem like a contradiction in our globalized environment, translation can, in fact, ensure that content that is available in one region is localized for other regions, taking into account all of the local cultural aspects and social norms that pertain to the persons who will use the content. The following section will show how this was accomplished in the STEPS Project.

Translation and contextualization: the case of STEM Teacher/student Education for Primary Schools

A case study approach was adopted to analyze the implementation of the STEPS project across the three countries. This approach allows for an in-depth exploration of the project's challenges, successes, and broader implications within diverse educational contexts.

The data was collected using a combination of methods. Teachers and students were observed during science lessons to assess the effectiveness of the translated and contextualized curriculum materials, and focus groups and surveys were conducted with teachers who had used the materials. Discussions with translators and curriculum designers also provided insight into the translation process and its impact. A final document analysis of the translated materials was also conducted, to compare the new materials with original versions to assess the level of localization and contextualization.

Project description

The goal of the STEPS project was to provide scalable solutions to improve learning outcomes for primary school students in STEM, particularly Mathematics and Science. This section will examine the process that was used to create the Science curriculum materials that would be used in the three countries: the English subsystem of Cameroon, Benin, and the DRC. The discussion will show how translation was used to contextualize the Science curriculum for the French-speaking countries of Benin and the DRC. The challenges faced by the various teams will be highlighted in an effort to articulate the difficulties encountered during this work, and examples of successful contextualization will be given.

Curriculum design process

[Meyers and Nulty \(2009\)](#) identify five principles of curriculum design that help educators optimize the quality of student learning outcomes. They believe that the curriculum materials must provide learners with resources and experiences that are authentic and practical, logical and connected, encourage active participation in the learning process, are aligned with the learning objectives, and provide some sort of motivation and incentive for learning. These principles underlie the decisions made by the STEPS project to incorporate Inquiry learning into the Science curriculum design.

The majority of requests for change in science education highlight the importance of involving students in inquiry-based learning to foster the active construction of knowledge, as well as encouraging collaborative learning to enhance communication and the establishment of common understanding ([Lehman et al., 2006](#)). Based on this premise, the STEPS project focused on introducing teachers to inquiry-based teaching and learning strategies and designing new Companion Teacher Guides and student Workbooks that would expose learners to inquiry in the classroom.

The process began with a crosswalk of each country's curriculum standards to give the team an understanding of how each Science curriculum was structured in terms of what topics were taught and when they were taught. The crosswalk also gave insight into the similarities and differences among topic priorities in the countries. Our findings revealed that there was little similarity, which meant that the team had to design specific materials for each country. Following months of research and evaluations of global open-access curricula, the team agreed to use the Core Science curriculum (USA) and Siyavula (South Africa) as the base upon which the local curricula would be built. However, before finalizing designs, the team needed to focus first on the pedagogy that would be the basis for classroom teaching and learning.

Feedback from teachers indicated that classroom practices were predominantly teacher-led instruction, and so by selecting inquiry-based teaching/learning, STEPS was able to introduce a universal pedagogical approach. This allowed teachers to expose students to authentic, practical learning that encouraged critical thinking and the construction of knowledge by students ([Constantinou et al., 2018](#)). Inquiry-based approaches, as opposed to teacher-led approaches, are touted for their benefits in ensuring that “the individual learner constructs their own understandings (of reality) from their experiences and interactions during the learning process” ([Areepattamannil et al., 2020](#), p. 676).

Several strategies can be used in an inquiry-based approach. The STEPS project identified two key strategies that would form the basis of the curriculum. They included Essential Questions (EQs) and KWLs. EQs are topical questions that guide the lesson. They help teachers promote conceptual thinking among their students, allowing them to “connect what they learn back to the real world, where they can put their new understandings to work” ([Wilhelm, 2012](#), p. 25). When used at the beginning of a lesson, an EQ guides every part of the lesson, from the introduction to the lesson summary, the activities, and the evaluation. According to [Wilhelm \(2012\)](#), the way the question is phrased will guide the teacher in designing the types of activities that will be used in the classroom to enable students to answer it. Consequently, the questions need to be interesting, inspire critical thinking and discovery, and allow students to see how what they are learning is linked to the world around them.

Another key strategy employed by the STEPS project was the use of Know, Want to Know, and Learned (KWL). [Blachowicz and Ogle \(2008\)](#) explain that the KWL strategy allows teachers to help students actively engage with the material by having them contemplate what they already know (K), what they want to learn (W), and what they have

learned in the lesson (L). This strategy utilizes students' prior knowledge to fully engage them during the lesson, encouraging inquiry and active participation.

Teacher Companion Guides to Inquiry Science, consisting of units and lessons, were designed for each country based on their science curriculum for each class level. Each unit presented a full description and a list of lessons, while every lesson began with one or two objectives and an EQ. The guided lesson plans detailed all that the teacher would need to do prior to teaching the lesson, including the preparation of materials for activities, additional information called "Know the Science", designed to increase the teacher's knowledge of the topic, and a Pupil's Reading where one was available.

The inquiry process began with the teacher first introducing the EQ to the students. Students were asked to share what they *know* about the topic and what they *would like to know*, the first two steps in the KWL. This discussion prepared students to listen carefully, participate fully in practical activities, and search for new information in the readings to which they were exposed. Every lesson ended with a summary that required students to respond to the EQs, thus also responding in part to the L in the KWL strategy. Every lesson presented students with an assessment, either orally or in writing, through which teachers could assess what students learned during the lesson. Unit assessments were also included, and these summative assessments used different formats for evaluating new knowledge and skills in realistic ways.

In a lesson that introduced six-year-old Cameroonian students to HIV/AIDS, the EQ that was posed at the beginning of the lesson was: "Is HIV and AIDS like the flu?" The lesson allowed the teacher to present factual information on HIV and AIDS and how they are spread and to compare them to other diseases like the flu. Students also spent time reflecting on myths or stories they may have heard in their communities or homes about how HIV/AIDS was transmitted, allowing them to explore local oral traditions. They also had an opportunity to address stigma based on the perpetuation of incorrect information about HIV/AIDS. The entire lesson enabled students to link what they know with what they have learned during the lesson and to connect that new knowledge to potential experiences in the community, a key aspect of inquiry in the classroom. Students thus collaborated to construct an understanding of HIV/AIDS, and by debunking some myths, they were better able to contribute to keeping themselves and others in their communities safe.

It must be noted that because the curriculum design team was predominantly English-speaking, each Teacher Companion Guide was first written in English. The team designed each unit and lesson for Benin and the DRC based on each country's curriculum standards, and then these were all translated into French. An entire translation team was hired and trained to undertake this task, which resulted in two French Teacher Companion Guides, one for each country.

Translation of texts. The translation of educational texts does not only focus on accuracy but must also consider the local cultural contexts. Examples must reflect local culture and traditions so that the materials are relevant to the student's experiences. To ensure that the finished texts were culturally appropriate, the STEPS translation team utilized a process of double review.

Sections of text were fed to ChatGPT 4 for initial translation. The resulting French text was then copied and pasted into the French version of the Companion Guide, maintaining the original format. Translators reviewed the French content for accuracy and quickly noticed that a more in-depth review was necessary to address context—cultural words, foods, traditions, and so on. Once identified, the translators made the necessary changes. For instance, the English lesson on using our senses contained a story about a little girl who attends a carnival with her aunt, where she describes what she sees, hears, feels, and smells.

For Benin, this lesson was contextualized, so that rather than a carnival, the focus of the story was the Gelede Festival, a popular festival in Benin that most, if not all, of the children would know about. This little bit of cultural relevance while translating made the lesson more appropriate for the students, as it allowed them to see themselves in the stories they were reading. The translators ensured that all the examples mentioned in the story of foods, costumes, and music that the little girl could experience using her senses were applicable to children from Benin.

Another example is a lesson on how the body uses the food we eat, based on a story about a boy who goes hiking in the forest and gets very hungry, although he had a good breakfast and a snack. The translated version of the story ensured that the breakfast foods and snack items mentioned in the story were typical foods eaten in Benin. Even the hiking was done in Pendjari National Park and not just in a generic park, as was used in the English version. The park is mentioned in yet another story about types of animals in the environment, with the national and common animals found in Benin highlighted. The translation team did similar contextualization while reviewing the DRC texts.

It is important to note that team members from both countries also conducted a final review after this initial contextualization, where they verified and/or suggested additional examples. Even the names of characters were changed, ensuring that typical Beninese and Congolese names were used in the texts. Adding this form of cultural context made the texts more culturally relevant to the teachers and students who would use the materials, as they could see themselves in the readings and feel more connected to the lessons.

Challenges and successes

The findings highlight key aspects of translation as a contextualization tool in curriculum design. While the translation process successfully adapted STEM content to local languages and cultures, several challenges emerged, among them, the maintenance of pedagogical integrity, ensuring cultural relevance and student engagement, and the assessment of learning outcomes.

Ensuring that translated and contextualized texts retained the inquiry strategies that served as the texts' foundation was perhaps the biggest challenge the curriculum design team faced. Maintaining pedagogical integrity after translation required additional training for the translation team. For instance, translators spent hours in workshop-type meetings making decisions about how to standardize the wording for KWL and what was the best term to represent "Essential Question". This was not just about equivalence but also about ensuring that teachers carefully understood what the terms meant in the pedagogical context (Angelone, 2024). Once these were agreed upon, each translator made the necessary changes to the translations, ensuring consistency.

The team had assumed that the translation of the texts would be a smooth, straightforward process, with time saved by using the AI tool, ChatGPT4. Because it was essential to ensure that the texts were appropriately contextualized during translation, two rounds of review were needed. This may have prolonged the process, but it ensured that quality was not compromised. The final review, by not just native speakers but persons from the two countries, ensured that no aspect of contextualization was overlooked, allowing the STEPS team to publish culturally responsive and relevant Science texts in French that teachers in Benin and the DRC could feel comfortable using in their classrooms.

This process of utilizing translation as a form of contextualization proved to be a tremendous success for the project. The team managed to bridge global education with localization by utilizing curriculum materials and resources initially designed for students in the USA and other higher-income countries and contextualizing them for students in Benin

and the DRC through translation. Contextualized examples, such as replacing Western festival references, places and foods with local events, locales and dishes significantly improved both teacher and student engagement with the materials. Consequently, material that would not ordinarily be available to that population has been made available, fulfilling a key need that the teachers in Benin and the DRC expressed—that of quality Science textbooks that helped them with teaching lessons. More importantly, these innovative Teacher Companion Guides to Inquiry Science also assisted teachers with gaining more scientific knowledge.

Preliminary results suggest that teachers saw increased engagement during science lessons with students demonstrating improved comprehension of concepts taught. In fact, Heads of Schools reported increased overall engagement among all students, and not just during science lessons. This speaks to the power of engaging materials in any classroom, and the impact that translated materials can have in low-resource contexts. However, a longitudinal study is recommended to validate these initial findings, for a true assessment of the learning outcomes produced by translated, contextualized curriculum materials.

Implications and recommendations

The use of translation as a form of contextualization in curriculum design promotes student success by ensuring that high-quality learning materials are accessible in multiple languages to populations who would otherwise not be able to use them due to limited access or resources. This guarantees equal access to education, regardless of location and language, positioning the STEPS project as a model for improving equitable access to quality education according to Sustainable Development Goal 4. The process may be complex, but it is vital and essential in ensuring that students the world over have access to both content and activities to enhance scientific thinking and inquiry. Governments in LMICs and low-resources areas, as well as international education bodies, should therefore consider allocating dedicated resources to translation and contextualization in curriculum planning.

The main goal of the STEPS project was to improve learning outcomes in STEM by providing TPD and curriculum materials. Translation allowed the project to achieve its goal for Science in the form of complete Teacher Companion Guides to Inquiry Science in French for students in Benin and the DRC, along with TPD in inquiry-based learning strategies that could be integrated in local cultural settings.

The translation process not only ensured the accuracy of the content but also included the cultural context. Culturally specific references were conveyed that linked students to cultural activities, foods, festivals, places, and so on in their countries in the science lessons, allowing them to feel part of the learning. Children could see themselves in some of the stories used to teach scientific content, making the content more relatable and relevant.

A solid foundation in Science in early childhood (primary school) has significant benefits. It exposes children to scientific learning as they acquire new knowledge, explain scientific concepts, and draw conclusions based on what they already know and what they learn in the classroom (Vieira and Tenreiro-Vieira, 2016). The National Research Council (1996, p. 22) defines scientific learning as “the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity”. This type of learning is transferable to all subjects and enhances critical thinking skills, which are needed for active participation in any society. As societies become more reliant on technology and science, it is imperative that children are prepared to think critically to participate in decision-making and problem-solving surrounding scientific issues (International Council for Science, 2011).

Learning science also aids in the development of other skills, such as curiosity and creativity (Street Science, 2022). Early exposure to inquiry in the classroom through experiments and practical activities will undoubtedly spur innovation and creativity among young students, who are naturally curious and questioning. By tapping into this curiosity early, it is hoped that these children will grow to be creative thinkers and innovators.

The findings suggest several implications for policymakers, educators, and curriculum designers. They demonstrate how translation supports learning by aligning materials with students' lived experiences and highlights the role of contextualization in fostering deeper engagement and critical thinking. This is consistent with the theories of Vygotsky and Dewey, who emphasize the importance of social and experiential learning.

Vygotsky's sociocultural theory posits that learning is deeply embedded in social interactions and cultural contexts (Vygotsky, 1978; Liu and Matthews, 2005). Translation as a form of contextualization allows students to engage with curriculum content in a manner that resonates with their everyday experiences, reinforcing knowledge acquisition through meaningful, interactive learning environments presented by STEPS.

Similarly, Dewey's constructivist approach argues that education should be rooted in real-world applications, encouraging critical thinking and problem-solving skills (Dewey, 1922, 1929; Williams, 2017). By embedding local contexts within translated materials, the curriculum fosters inquiry-based learning strategies, enabling the students to make meaningful connections between classroom knowledge and their lived realities. This approach strengthens engagement, motivation to learn, and overall learning outcomes, making education more relevant and impactful for diverse student populations.

No country should now complain about a lack of resources or textbooks for primary school science classrooms, regardless of the language of instruction. STEPS has proven that quality textbooks can be designed to meet specific language and curriculum needs and utilize best practices in the teaching and learning of science. STEPS has also shown that leveraging technology for efficient and accurate translation and combining that with human expertise can enhance both the speed and cultural accuracy of curriculum adaptation. As STEPS moves toward sustainability and global reach, collaborating with countries that wish to reform their STEM curriculum, particularly Science, will be the goal. Children everywhere deserve to benefit from the best materials and teaching strategies to ensure they meet their potential and succeed in a globalized society.

Policymakers, particularly those in low- and middle-income countries, are presented with opportunities to upgrade their STEM curriculum through translation. Why should a country have to accept textbooks that are not contextualized? Why should French-speaking children in Benin, for instance, not have the opportunity to learn about the animals that live in their immediate environment or the foods available in their country that can form part of a balanced diet? When foreign textbooks provide examples with which students are not familiar, it decreases the relevance of what they are learning, as it makes it difficult to link the material to real-life situations.

As discussed previously, further studies are recommended for exploration into the impact of contextualized curricula on student learning outcomes over multiple academic years. It is important to learn how contextualized curriculum materials enhance students' knowledge, attitudes and skills and whether the benefits of contextualized materials are sustained over time. It would also be useful to ascertain how they impact other aspects of student performance, including critical thinking, problem solving abilities and overall academic achievement.

Assessing scalability is another recommended area for future research. While it is important to evaluate the effectiveness of the contextualized materials across various

educational settings, including different cultural, socioeconomic, and institutional contexts, one must pay attention to the factors which influence scalability. Resource availability is a crucial aspect of scalability as implementation will require training of local educators and curriculum designers. Educator preparedness also cannot be overlooked, since teachers' readiness and willingness to adopt new teaching methodologies and materials can significantly impact implementation. Scaling will therefore require not only professional development for teachers but also support systems at their schools and Ministries of Education.

An additional area of focus can also be the exploration of teachers' perspectives on adopting and adapting contextualized curriculum materials in their daily practice. An evaluation of the experiences of those who actually work with the new materials would shed light on necessary support systems required to make the adoption more seamless, as well as specific professional development needs.

Conclusion

This article examined the pivotal role of translation in overcoming obstacles and promoting enhanced global education. The study looked at different theories about translation as a way of contextualizing. It focused on how important it is when designing a curriculum, especially when it comes to using inquiry-based teaching/learning and culturally responsive teaching in Science education.

The case study of STEPS highlighted the crucial role of translation as a contextualization method in curriculum design and implementation. Despite encountering challenges in translating the curriculum, the positive characteristics that contributed to its success surpassed these challenges, thereby strongly endorsing this strategy in global education.

The article provides significant insights for curriculum designers, educators, and policymakers regarding the practical implications of including translation as a method in curriculum design. The ideas offered can serve as a guide for future study and implementation in this field, particularly with the creation of curriculum designs that are appropriate for the unique environment and culturally sensitive.

This inquiry makes a significant contribution to the fields of curriculum creation and global education by highlighting the crucial role of translation as a cultural bridge and facilitator of learning in various contexts and educational settings. This highlights the importance of adapting the curriculum to specific contexts to enhance its relevance and efficacy for learners worldwide.

This article also emphasizes the importance of overcoming obstacles through the process of translation. As cultures become more interconnected on a global scale, the importance of having a common understanding and a universally accepted body of knowledge becomes increasingly crucial. Hence, it is imperative for international education participants to persist in investigating and executing translation and contextualization techniques in curriculum development to guarantee the practicality of education. Translation not only converts languages but also serves as a powerful instrument for contextualizing curricula, facilitating transformative learning, and promoting global knowledge sharing.

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