



Implications of Translanguaging for Teaching Computational Thinking in Culturally/linguistically diverse mathematics Classroom

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Abstract

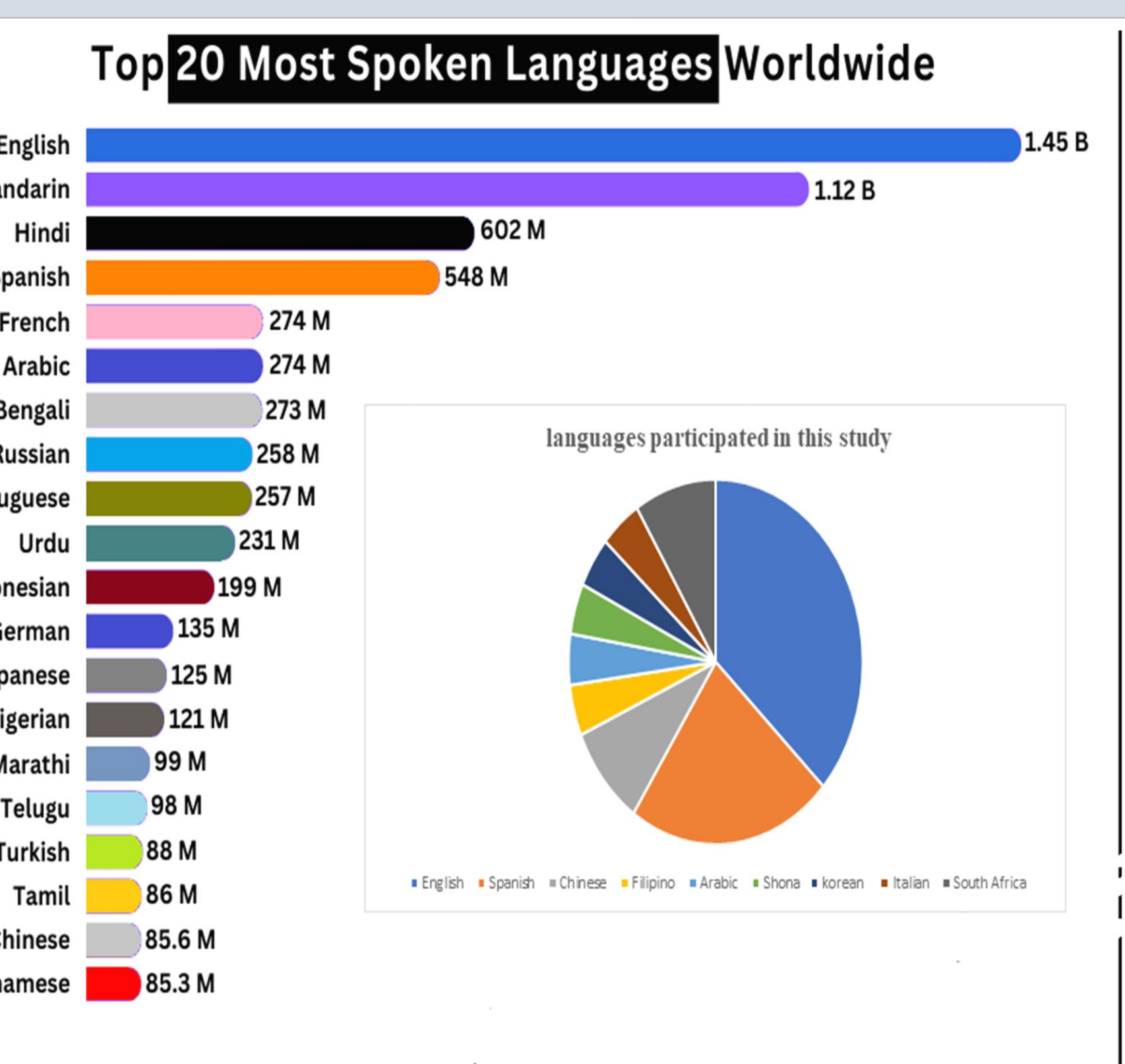
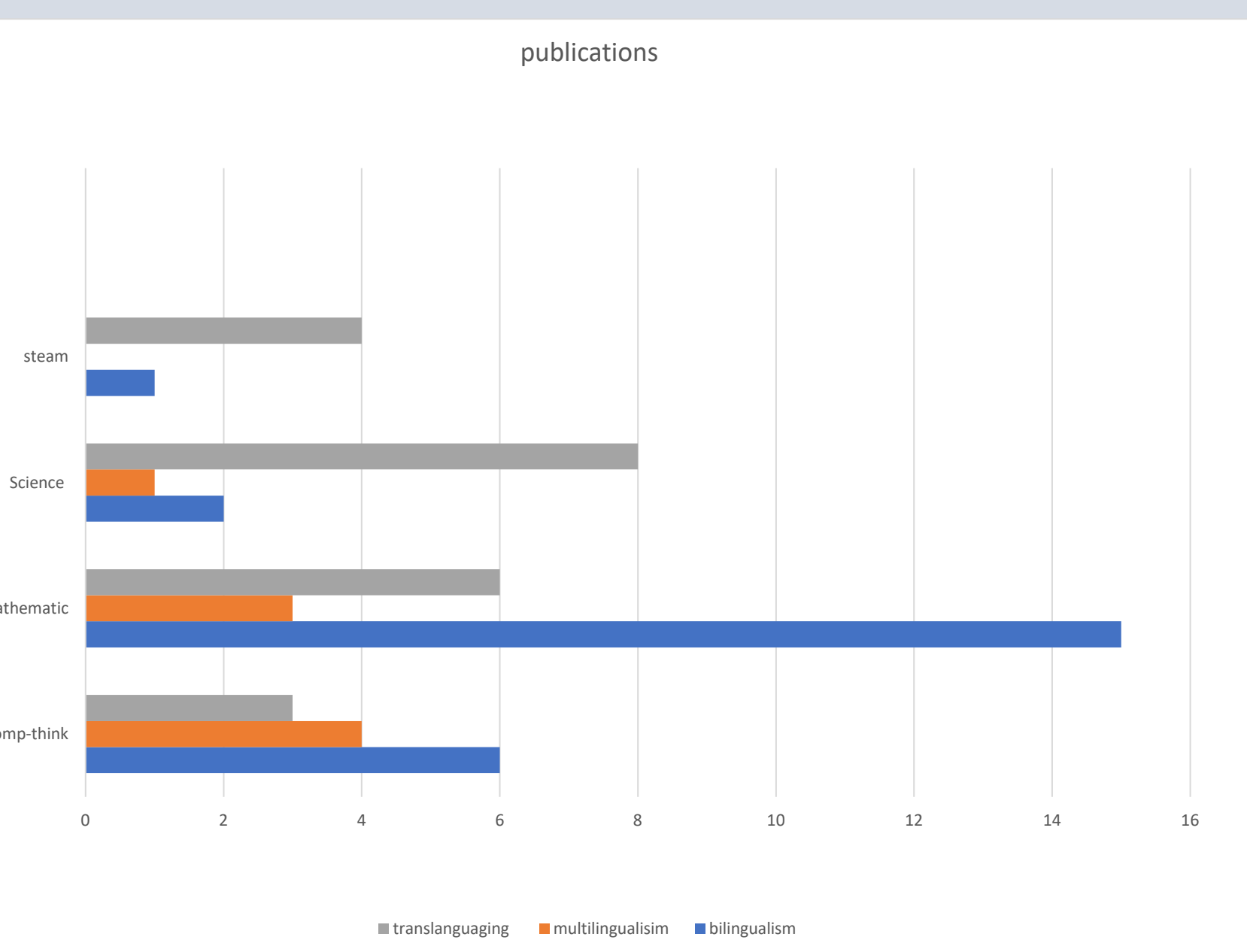
This scoping review study describes an investigation into how translanguaging can assist teachers in presenting computational thinking in mathematics content and technology in diverse multilingual/multicultural mathematics classrooms. In particular, the study looks at how the use of translanguaging may improve the development of digital learning associated with computational thinking in mathematics and other STEM subjects.

The significance of the study

Statement of the problem

Teaching computational thinking to students who are English learners presents its own set of challenges in terms of content, cognitive and linguistic demands. Moreover, groups of students have been stereotyped as having special learning needs because of the challenges they face when trying to learn math in English which is not their first language or mother tongue. It has been noted that this may compound difficulties for language learners who are learning mathematics combined with coding, programming, or computational thinking.

Findings of the study



The countries of the included studies

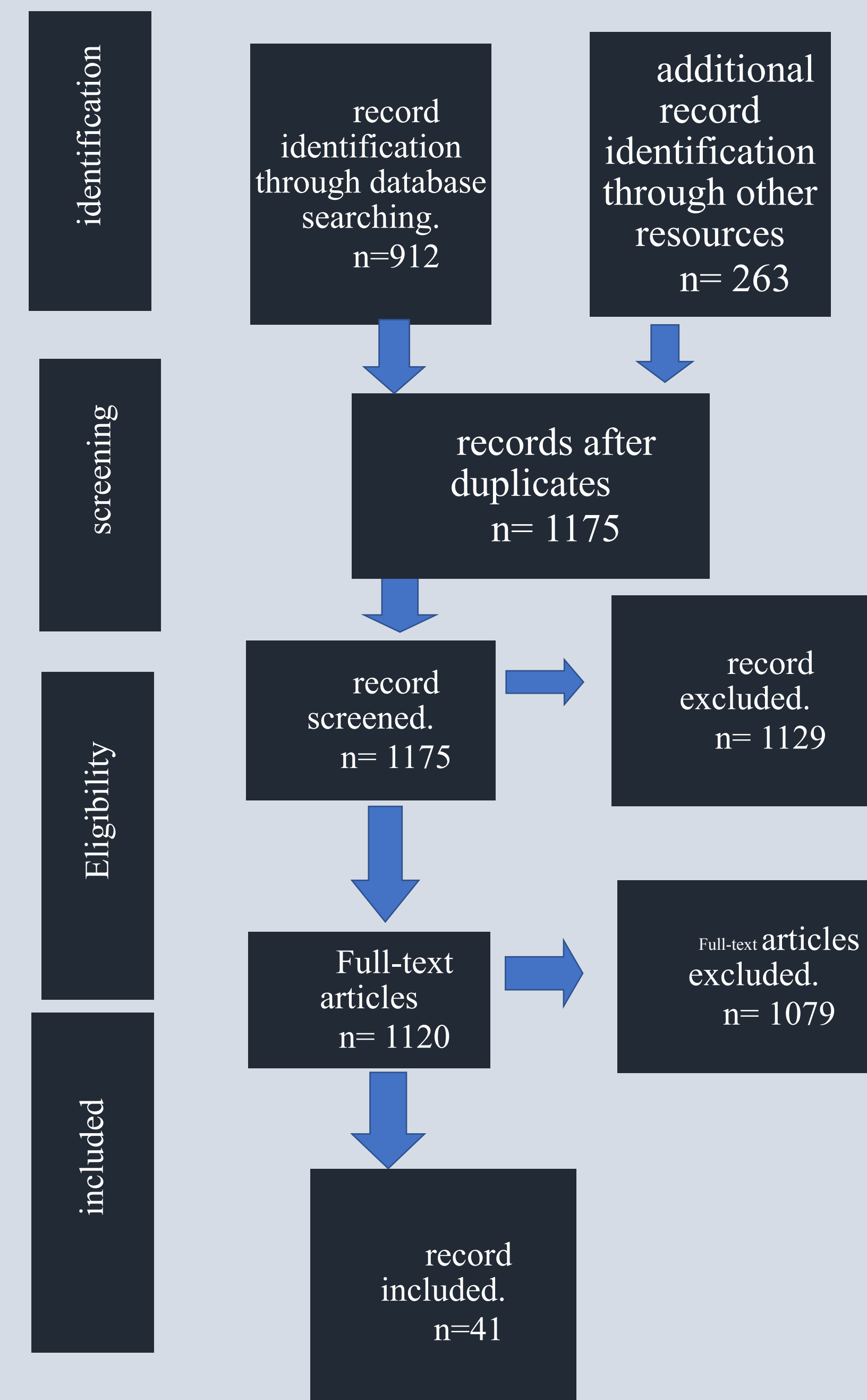
Results

The results showed the impactful benefits of translanguaging for bilingual students when learning computational thinking in a mathematical classroom. Some of these benefits are: translanguaging enables students to establish connections between mathematical concepts and coding vocabulary in their first and second languages. Relatively, this can help students understand the content better and apply what they've learned in new settings. In addition, translanguaging can help learners keep and reinforce their cultural identity by respecting their original language and culture consequently, it gives a sense of belonging and inclusivity in the classroom. can help learners improve their problem-solving skills in mathematics and coding by allowing them to approach problems from diverse language

Conclusion

Due to historical, social, and political pressures, bilinguals in Canada are frequently seen as two monolinguals in one (Roy and Galiev, 2011). English and French are Canada's two official languages, and both are vital to Canadian identity. Both languages are commonly used as two separate systems, with most bilingual people equally skilled in both languages and no overlap between English and French. Canada has three types of immersion programs: French immersion, which was designed primarily for English-speaking students who make up the majority, Heritage Language programs for students with varied native tongues, and Indigenous Language programs for Aboriginal students (Dicks and Genessee, 2017). Therefore, it is vital to discuss the implication of the recent scoping review and explain the gaps among these publications as a goal of this methodology. Hence, it is necessary to legitimize the implementation of students' first languages in the classroom to promote and value their identities, which can also be accomplished through heritage language maintenance programs. Furthermore, this matter can be realized through creative pedagogies, such as bilingual techniques, and educational environments that promote value, and develop children's ethnic and linguistic identities (Beaudrie et al., 2021).

The Total Number of The Studies with the number of the included and the excluded studies



Characteristics of the publications

1. The studies that are between the time frame 2000-2023
 2. The studies that focused on the issue for K-12 students.
 3. All studies that included translanguaging or bilingualism/bilingual students necessarily in these subjects (computational thinking, mathematics, science, and STEM)
- I excluded all the studies that talked about education in general and the ones that focused on learning English as a second language associated with TESOL, studies that did not engage mathematics/ computational thinking, and STEAM in their research

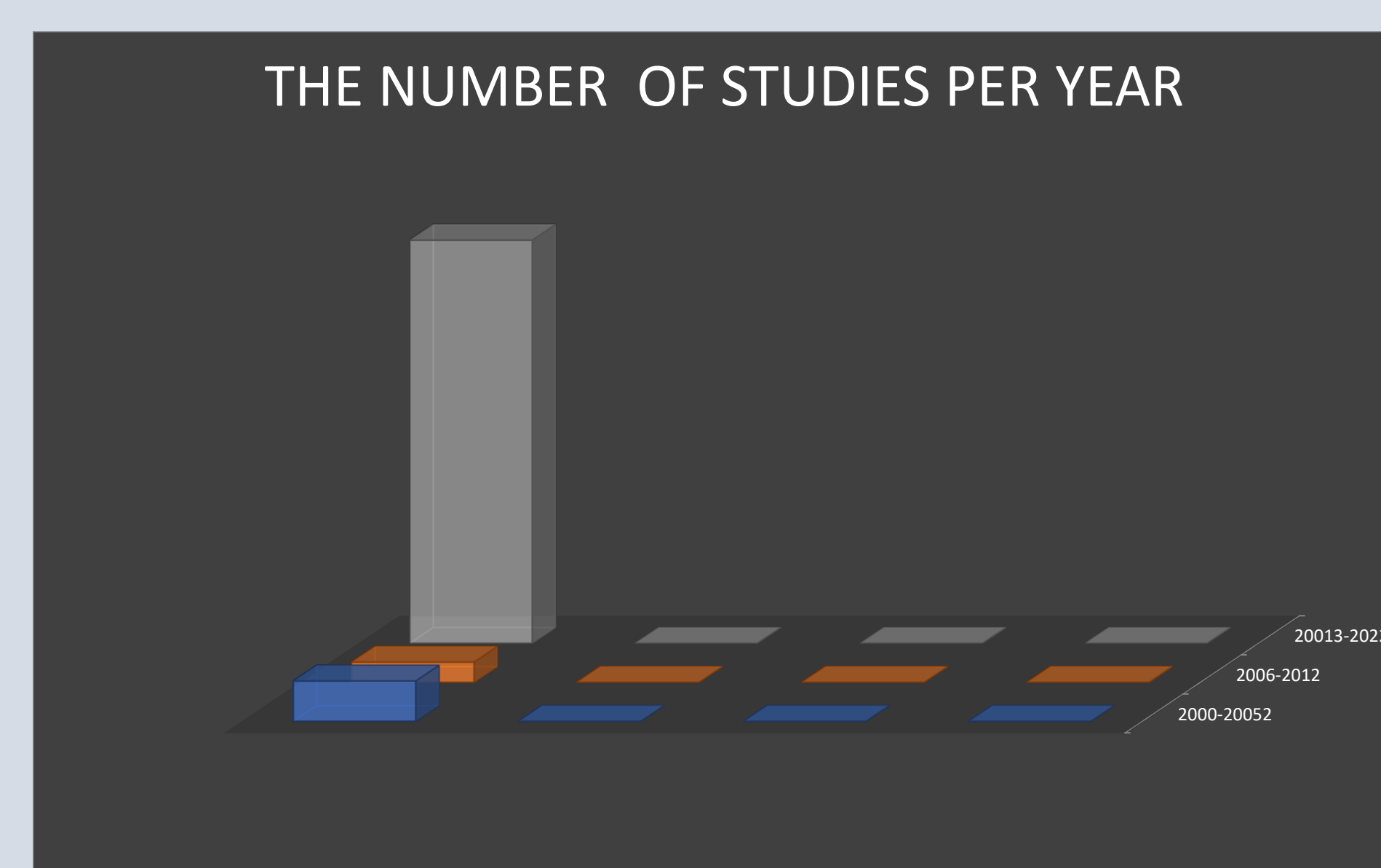
The benefits of the translanguaging and the challenges:

- 1-translanguaging can aid bilingual STEAM students in approaching word problems in new and innovative ways
 - 2- Translanguaging promotes more equitable educational opportunities and validates language and representational diversity within STEM education
 - 3-The translanguaging approach allows bilingual students to showcase their mathematics skills in a way that is respectful of their language practices and beliefs, without compromising their identity or sense of belonging
 - 4-this practice can provide insights into a student's mathematical reasoning, which is especially useful for bilingual students who are working to improve their linguistic and mathematical abilities-
- However:
The effect on monolingual students by addressing monolingual notions that dominate academic institutions, supporting translanguaging in classrooms with multilingual and monolingual students, and incorporating translanguaging principles into instructional designs.

Title of Studies	Total	Included	Excluded
Translanguaging and computational thinking.	266	7	259
Translanguaging and mathematics	210	7	203
Translanguaging STEAM + science	242	8	234
Translanguaging in Mathematics for bilingual students	205	15	190
Translanguaging in computational thinking and coding for bilingual students	43	6	37
Translanguaging in STEAM + science for bilingual students.	209	3	206
Total	1175	46	1129

The databases

- 1- ProQuest
- 2- Springer
- 3-ACM digital library
- 4- Taylor and Frances online
- 5-Linguistic and language behavior abstract
- 6-Dissertation and theses at the University of Western Ontario



- ## The pedagogical approach for translanguaging
- 1design-based pedagogy enables teachers to operationalize high-level theories (such as translanguaging, practice-oriented views of content learning)
 - 2- The effectiveness translanguaging pedagogy including paralinguistic or nonlinguistic semiotic indications such as gesture, art, or emoji. As a pedagogical paradigm-
 - 3-Culturally responsive and translanguaging communication strategies are crucial for students to flourish in English language learning as well as acquire computer literacy
 - 4- Applying "Orchestration" metaphors regarding code and computers
 - 5- Asset-based strategies that encourage teachers to deeply evaluate students' knowledge funds when developing learning experiences and pedagogies