Culturally based mathematics tasks: a framework for designing tasks from traditional Kven artefacts and knowledge

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This article discusses mathematical and cultural task design to support minority and endangered languages and cultures. More precisely, we propose a theoretical framework to design mathematical tasks for language immersion in mathematics for Kven students. Drawing on previous studies, we suggest that traditional tools have the potential to support the learning of mathematics, language, and culture. One challenge for endangered languages and cultures is that the younger generations may have lost connections with their traditional language and culture. We argue that the older generations can mediate authentic aspects of Kven culture to students, which then become historical-cultural authentic (HiCuA) aspects.

This article discusses mathematical and cultural task design using historical-cultural authentic (HiCuA) activities as means to support minority and endangered languages and cultures in the context of Kven people. The intention is to provide a framework that can support minority students' identities and learning of language and culture in addition to mathematics even when the students are not familiar with their own heritage culture and language. We use language immersion in mathematics for Kven students to illustrate how historical-cultural activities can be used to support revitalisation processes for endangered languages and cultures. Before discussing the framework, we set the scene and the sociolinguistic context by describing 1) the historical background of the Kven people, 2) the current situation of the Kven language and culture, and 3) Kven language's position in the Norwegian education system.

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Kven students and the Norwegian context

The Kven people are autochthonous to the area comprising the coastal and inland regions of northern Norway, northern Sweden, and northern Finland: from the Gulf of Bothnia and north, northeast, and northwest to the coast of Norway. The Kvens have traditionally also lived in the costal part of the Kola Peninsula in Russia. The Kven people have inhabited this geographically wide area together with indigenous Sami people. The Kven people in Norway consider themselves as closely related with Kvens, also called Lantalaiset, in Sweden and with the people in Sweden who call themselves Tornionlaaksolaiset, although separated by borders and with independent developments over the last centuries. This article mainly focuses on Kven students and the Kven language in a Norwegian context. In the northern part of Norway the heritage of a great number of the children is Kven, Sami, or both in addition to Norwegian and other nationalities/backgrounds. The exact number of Kvens in Norway is unknown, but a large health survey in the 1980s estimated the population in some areas, such as approximately 20–25 % in North Troms and Finnmark, giving an approximation of 50.000–60.000 Kvens as reported by Lane (2011) and Schall (2017).

The heritage language of the Kven people is the Kven language. It has three main dialects, and is closely related to Meänkieli and northern Finnish dialects. In Norway, Kven language, together with Finnish language, is offered as a second language to students with Kven backgrounds in the most northern counties, Troms and Finnmark. The Norwegian political definition of the Kven language is that it is a *minority* or *regional language* protected under the European Charter for Regional or Minority Languages. Kven language is an *indigenous language* in the sense that it "is native to a particular area" (Meaney, Trinick & Farihall, 2012, p. 19). The Kven language is an autochthonous language with long historical connections and roots in the regions of Troms and Finnmark in northern Norway (Niemi, 2010). According to the *European language maintenance barometer*, Kven is a seriously endangered language (Toivanen et al., 2013). As a consequence of harsh assimilation policies in Norway in the past, a considerable language shift has occurred in Kven communities. The number of speakers who have Kven as their mother tongue decreased dramatically after the Second World War because of a lack of intergenerational transmission in family contexts (Lane, 2011; Räisänen & Kunnas, 2012). Kven language is traditionally the mother tongue for most of the Kven people; however, those who speak it fluently nowadays are mostly born in the 1950s or earlier (Lane, 2011). In most modern Kven families, the language has been lost, and the know-ledge of Kven traditions is diminishing. However, language and cultural revitalisation and awareness started in Kven communities, mainly in the 1980s (Huss, 1999), and the Kven people were finally recognised as a national minority in Norway in 1998 (Lane, 2011). The Kven language was recognised as a national minority language in 2005, and it has been protected under the European charter of regional and minority languages since then. This increased awareness in the Kven communities has led to, for instance, an increasing number of grandparents speaking Kven to their grandchildren (Bruland, 2018).

In the 1990s the Kven language was introduced as a subject in school called *Finnish as a second language*, first as a pilot in some schools and later, in 1997, it was included in the national curriculum (Niiranen, 2011). Because of ”effective” assimilation policy practices, the generations of Kvens born after the 1960s had the natural intergenerational transmission of the Kven language and culture disrupted. Therefore, the school subject of *Kven as a second language*[1] has been an important political strategy, where one of the main goals is to revitalise and sustain the use of the Kven language and culture (Niiranen, 2011). Despite the compromised situation of the Kven language and culture, there has been almost no attention given to the Kven language as a school subject (Nygaard & Bro, 2015). Over the last decade, the number of students who choose to learn Kven as a second language has decreased and the number of dropouts from the subject has increased. Often students go to Kven language classes when their peers have lessons in subjects like mathematics, and, as a consequence, parents worry, for example, about their children's mathematical learning processes. This has been identified as one of three main reasons for the increasing number of dropouts (Nygaard & Bro, 2015). The other two contributing factors are inadequate information about language rights and educational programmes in the Kven language and the lack of opportunities to practice the language in the local communities. Moreover, one sees that multilingualism in minority populations is either ignored or handled in a non-productive way (Laakso, 2013). There is an immediate need to improve the teaching of Kven as a second language in schools in a way that does not limit Kven learners' opportunities to learn other subjects, such as mathematics.

In addition to the ambition to functional bilingualism among Kven children, it is of great importance to maintain and strengthen all students' performance in mathematics. Students' achievement in mathematics is one of the main factors influencing their access to university and higher education (Falch, Nyhus & Strøm, 2014), hence ensuring strong achievement in mathematics is a guiding principle. The framework described in this article builds on the assumption that mathematics as a school subject could be used as a potential medium to strengthen and revitalise endangered languages. Through this article, we aim to discuss mathematics as one of the realisable and reliable bridges between students and Kven language and culture. We draw on research reporting language immersion or CLIL (Content and Language Integrated Learning) as beneficial for students' simultaneous mathematical and language learning (Culligan, 2010; Jäppinen, 2005; Marsh, Hau & Kong, 2000). According to Jäppinen (2005), the students in CLIL environments in Finland performed as well as or better than the control group taught through their first language in regard to their mathematical thinking. These findings have inspired us to embark on a design-based research study where we design mathematics tasks based on traditional Kven artefacts and knowledge. The next step is to implement the tasks, and monitor students' mathematical thinking and language learning processes when working on the tasks; however, this is not in the scope of this article.

Language immersion in mathematics for the Kven language

Where a second or foreign language is used as the medium of instruction, different programmes have been used to improve the teaching. Language immersion is one such type of programme and it is usually applied for local or regional minority languages (Baker, 2001; Hinton, 2002; Meaney et al., 2012). The framework for bilingual learning called Content and Language Integrated Learning (CLIL) (Jäppinen, 2005; Lasagabaster & Sierra, 2010) is another programme. For our framework, we have the need to clarify which type of learning environment would be the best for endangered minority or regional languages, in particular for the Kven language.

Language immersion is an effective method for language revitalisation because it promotes the use of minority languages and language maintenance through expanding the contexts of language use in minority communities (Grenoble & Whaley, 2006; Harrison, 1998; Hinton, 2002, 2011; Olthuis, Kivelä & Skutnabb-Kangas, 2013). Immersion and CLIL for second languages have already been implemented and well proven with good results in several countries, including Canada, Australia, New Zealand, and Finland (Culligan, 2010; de Courcy & Burston, 2000; Jäppinen, 2005; Meaney et al., 2012). Notably, language immersion and CLIL are considered to be closely related methodologies, and the terms are to some extent used in an overlapping and interchangeable manner (Lasagabaster & Sierra, 2010). Lasagabaster and Sierra discuss similarities and differences between immersion programmes and CLIL, with respect to the following four aspects: 1) teacher training, 2) the sociolinguistic context, 3) the methodological aspect, and 4) that the linguistic objectives include different goals and programme differences for these two teaching and learning approaches. They close the discussion by suggesting "that there is a compelling need to distinguish between these two types of programme" (Lasagabaster & Sierra, 2010, p. 373).

Language immersion models vary in different countries and languages, but they often have a common goal, namely to increase the level of bilingualism among the students participating, and to strengthen students identity and connection to the target minority language community through language learning. In both total and partial immersion models, the language immersion and learning environments in other subjects, for example mathematics, rely on the local traditional culture and simultaneously on its intergenerational transmission. In total immersion programmes, all subjects are taught through the target language. In partial immersion and bilingual programmes, instruction tend to be organised so some of the subjects are taught in the students' first language and other subjects are taught in the students' second language. In these programmes, teaching second language is then integrated into the instruction of other subjects. In the context of minority language immersion, the language used in instruction is a local minority or heritage language, and immersion programmes has the goal of helping students to attain bilingual proficiency (Baker, 2001; Fortune & Tedick, 2008; Grenoble & Whaley, 2006; Hinton, 2002). CLIL-oriented education has bilingual proficiency as a goal, too, and the language of instruction is also the second language that the students are learning alongside the content. However, the language can be any second language usually without any local or identity connections for students, for example English in Norway or Finland (Lasagabaster & Sierra, 2010).

With the importance of minority culture, promoting a heritage language and involving the local community in the context of Kven language, we suggest that either a total (preferably) or a partial immersion model can best support the revitalisation of Kven language and culture. Designed for the Kven immersion mathematics classroom, our proposed framework is based on well-designed language immersion models developed for language revitalisation in Maori and Sami communities with strong emphasis on minority culture and traditions (Meaney et al., 2012; Nutti, 2013). One challenge, as we see it, in revitalising Kven language and culture, will be to make mathematics tasks based on traditional historical and cultural knowledge authentic for the students. To meet this challenge, we suggest that the immersion model is rooted in the local language community. Given the situation for the Kven language, this means that elderly Kven people will have an important role in the process of designing tasks. For this reason, we aim to provide a link between the older generations' knowledge and the learning environment in today's schools. In the following sections, we discuss aspects of authenticity in historical- and culture-based tasks.

Historical-cultural authentic tasks and learning activities

The sociocultural/linguistic framework proposed in this article serves two purposes. First, the framework aims to provide guidelines on how to design mathematics tasks that will support learning of the Kven language and culture and support the students' Kven identity. Especially important from this perspective is to design mathematics tasks based on themes/objects that carry important cultural values in the Kven community. Secondly, the tasks should in relevant ways connect mathematics teaching and learning and Kven language learning to ensure meaningful learning and thinking processes in mathematics. Consequently, the framework aims to use traditional artefacts and knowledge as authentic and realistic sources for designing mathematics tasks that are closely related to everyday life and in particular to Kven language and culture. In this article, we will exemplify the proposed framework by discussing a piece of traditional Kven fishing equipment.

By building on traditional artefacts and knowledge, we aim to develop immersion learning environments rooted in authentic contexts. Our understanding of authenticity is inspired by Vos (2015), who suggests that authenticity "is a *social construct*: it is an agreement reached through a social process" (p. 108). Following this suggestion, students' environments outside the classroom are considered crucial for identifying whether a task can be considered authentic or not. The situation with Kven language makes authenticity challenging. As mentioned in the introduction, most of today's students have lost or have little connection to the Kven language and traditions because of the cultural assimilation and language shift when the grandparents of the students were young (and even earlier in some areas). In these situations, traditional artefacts and knowledge may not be authentic for students. We, therefore, extend Vos' (2015) definition by suggesting that adults and elderly Kven people – Elders – can mediate students' access to traditional artefacts and knowledge as authentic sources. This is because the Elders still have the traditional knowledge and language, passed down through the generations. Elders can bring their knowledge and experiences, and hence provide a link between the students and the Kven culture. We refer to tasks that become authentic for students through elderly peoples' mediation as *historical-cultural authentic*, in short *HiCuA*.

We believe that HiCuA tasks and learning activities have the potential to provide students with opportunities to engage in meaningful learning activities about mathematics and cultural knowledge. Moreover, through HiCuA tasks and learning activities the traditional themes/objects are reconstructed as authentic resources for the students. The HiCuA framework includes a process that identifies objects such as traditional artefacts or other types of traditional knowledge that provide a source for mathematical reasoning. These objects should be familiar to the students' family and/or local community so that Elders may provide information and stories about the objects from their childhood, about their ancestors, and from the common heritage of the minority community. This means that in many cases the family members have (had) direct contact and experiences with the specific traditional knowledge. Lunney Borden (2013) explained that "coming together to learn together" (p. 9) became a fruitful approach to share knowing and build new knowing about students' learning of mathematics through an Indigenous language. Although Lunney Borden (2013) referred to groups of adults, we believe bringing students, the Elders, and teachers together and working in a historical-cultural-based manner has the potential to revitalise the Kven language and culture on one hand and to support mathematical thinking and learning processes on the other.

The HiCuA framework

In the discussion that follows we will present the proposed HiCuA framework briefly, before we use a traditional Kven fish trap (in Kven: *ryysä*) to exemplify our framework for designing HiCuA tasks for students in grades 1–4. The framework follows three phases: (1) identifying traditional artefacts or knowledge, (2) designing mathematics tasks, and (3) implementation (see figure 1).

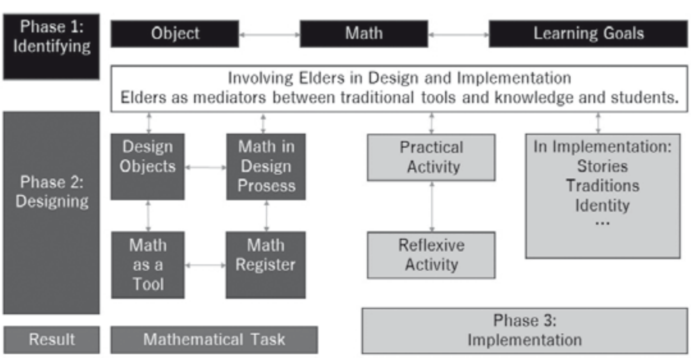

Figure 1. *The HiCuA framework*

The black boxes in figure 1 belong to phase 1: identifying. This is the preparation phase of the HiCuA process. Here the teacher, preferably together with Elders, identifies an object, such as a traditional artefact and/or knowledge, to base the task or lesson on. Simultaneously, the chosen object is analysed with respect to the mathematical knowledge and learning goals involved in designing, using and/or working with this object. The learning goals from the curriculum are then chosen with respect to mathematical and language aspects relevant to the chosen object.

Phase 2 is marked in dark grey and describes four aspects of the task design process. In this phase, the teacher designs the task in collaboration with Elders. We are aware that students' work with learning activities intended for mathematics does not always encourage students to use and learn mathematics. This has been reported, for example, in a study on students' collaborative learning activities, where Bungum, Esjeholm, and Lysne (2016) observed that students' use of mathematics was limited, although the activities were intended to provide opportunities to use mathematics. To meet this challenge, we suggest that the teacher take on the important role of developing instructions that aim to connect the boxes in phase 1 with the boxes in phase 2. More precisely, the teacher must in phase 3 plan how to best support students' learning of mathematics and language according to the intended learning goals.

The light grey boxes represent the implementation of the designed task, phase 3. In this phase, students, teachers, and, if possible, also Elders work together with the chosen object based on the learning goals and, for example, stories, traditions, and identity. This phase will typically consist of both practical and reflexive activities, and the teacher has an important role in encouraging students to engage in mathematical meaning-making processes when working on the culture-based theme/object. See more on this under the section describing phase 3.

In the following sections, we exemplify how the proposed model can be used to develop a learning activity inspired by a traditional fish trap for students in grades 1–4.

Phase 1. Identifying

Nutti (2013) has reported on tensions between teachers' understanding of students' mathematical learning opportunities when working on culture-based mathematics activities and when working on activities based on the national mathematics curriculum. The findings reported by Nutti (2013) suggest that teachers are concerned whether culture-based mathe-matics activities offer Indigenous students equal opportunities to learn mathematics compared to students following the standard national curriculum. In the framework proposed in the present article, we suggest that this challenge can be met by making a clear connection between the national curriculum and the cultural-based knowledge. This is of course not an easy task, but drawing on work that has reported on the potential that culture-based knowledge has to provide a solid basis for learning mathe-matics (Fyhn et al., 2015; Nutti, 2013; Vos, Devesse & Pinto, 2007), we believe in most cases it is feasible. Moreover, we believe teachers, with their expertise on students' learning processes, are in a strong position to develop mathematical tasks intended to promote opportunities to engage in both mathematics and culture-based knowledge.

The richness of both the mathematics and the cultural activities is important. Bishop (1988) proposed six universal activities that can be used to explore mathematics as cultural knowledge: counting, locating, measuring, designing, playing, and explaining. Although these activities have the potential to illuminate all aspects of mathematics, Nutti (2013) argues that focusing on these six activities alone contains a risk of too much emphasis on counting and measuring. Nutti moreover argues that that if the aim is to provide the students with knowledge adapted to modern society, then the concept of culture-based mathematics "does not necessarily imply a choice between mathematics based on either national mathematics or Indigenous culture, but teaching that unites national school mathematics teaching with Indigenous culture-based knowledge" (Nutti, 2013, p. 70). To support teachers in including a wider collection of mathematical aspects when designing culture-based tasks, we use the national curriculum as a starting point, as we consider the national curriculum in mathematics and the culture-based knowledge as complementing and strengthening students' opportunities to learn both mathematics and the Kven language and culture. Moreover, for the framework to be realistic and useful in a Norwegian setting, the national curriculum is an important aspect that must be included as the teachers are obliged to follow these national guidelines.

An example that illustrates the richness for both mathematics and cultural knowledge, and in addition provides the historical connection, is the traditional construction of boats where there are techniques for conditioning the wood to bend nicely along the shape of the boat. The wood is left in the sea at a certain depth for a certain amount of time. This gives a function in two variables (time and depth) describing the "softness" of the wood, where physical properties such as pressure come into consideration. Another example is the traditional method for locating the good fish banks, which is to position the boat such that two landmarks or points in the landscape align in one direction and two other line up in another direction. Hence, the boat is at the crossing point of two lines, each given by two distinct points in two or three dimensions (however, this may be projected as two dimensions on a map). The fish trap, which we will use to exemplify the HiCuA framework, is another example, mainly for the lower grades. All these examples have in common that even though they contain mathematical richness; traditionally this richness was usually not expressed explicitly in mathematical terms.

The fish trap is a type of traditional fishing equipment used by the Kven people in some areas in northern Norway. Figure 2 shows a model of a traditional fish trap (the drawing is based on discussions with local informants). These traps were homemade and widely used in wintertime to catch arctic char and other types of fish.

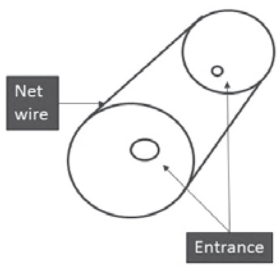

Figure 2. *A traditional fish trap from a Kven area in northern Norway*

Figure 3 shows a more modern fish trap, that is commonly used and which normally is not homemade, and an illustration of the use of these traps. This traditional artefact/knowledge provides a source for working with a variety of mathematical topics while giving the students an opportunity to learn this traditional method of fishing. In the task, the students will build the trap before they try it out. Depending on the grade, the

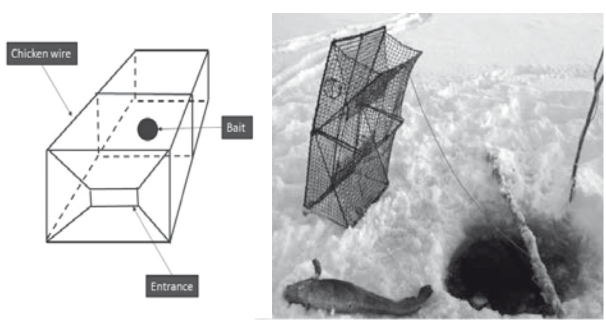

Figure 3. *A modern fish trap from a Kven area in northern Norway*[2]

students' learning goals are identified together with the mathematical contents of the HiCuA object (figure 1). In the case of the Kven fish trap, the mathematical concepts may, for example, include length, volume, size/circumference, area, surface, counting, statistics of the fish size/type of fish/seasonal availability/time of day, etc. The two types of fish traps have different geometrical properties, cylindrical and cuboid, which gives options and variety in regard to mathematical exploration and reasoning and gives opportunities to explore the different objects both with comparing and exploring different aspects of the geometrical properties together with cultural and historical considerations.

Table 1 presents competence aims from the national curriculum for the common core subjects of *mathematics* and the national curriculum for Kven language, called *Finnish as a second language* that can provide a basis for students' work on the fish trap activity described in the present article. In the table we have provided some specific examples and suggestions for this task in italics.

Table 1. *Competence aims for the common core subjects of mathematics and Finnish as a second language, with suggestions for the fish trap activity*

Mathematics	Finnish as a second language
Numbers: make estimates of and find numbers by means of counting in one's head, using counting aids and written notes, making estimates by calculating with simple numbers, and assessing answers. *Counting fish, counting when doing measurements, doing estimates for sizes, etc.*	Language learning: identify situations where knowing the Finnish or Kven language might be useful. *Vocabulary in Kven language as naming animals, topography, types of fish, equipment and actions (such as drilling holes in the ice), and mathematical register for example connected to length, size, circumference, thickness, density, etc.*
Geometry: draw, build, experiment with, and describe geometric figures and models in practical connections, including technology and design. *For example, building a trap involves geometry and design. Drilling holes and finding a good placement of the trap on the lake involves practical estimates in geometry.*	Communication: understand simple instructions given in Finnish or the Kven language. *This is connected to for example getting the fishing equipment ready, drilling holes, measuring distances, making a fire, gathering for food, etc.*
Measurement: use non-standardised measurement units and explain the purpose of standardised measurement units, and convert between common measurement units. *Measurement units may be steps, and other ways of doing measurements with the body, and using ropes to measure. A traditional type of measurement is to wrap a rope from the hand and around the elbow and count number of rounds. Standardised measurements may also be used.*	Communication: understand and use figures in practical situations. *This is for example using measurement units in different settings (distances, length), counting and making statistics.*
Statistics: collect, sort, note, and illustrate data using tally marks, tables, and bar graphs, with and without the use of digital tools, and converse about the process and what the illustrations tell us about the data. *Number of fish, types of fish, probabilities for catching a fish, making hypotheses drawing on experience and local knowledge for example about the site/lake.*	Culture, community, and literature: compare some aspects of ways of living, traditions, and customs in the Kven, Finnish, Sami, and Norwegian cultures. *Discussions in this natural setting and with nature as provider of subjects: A reindeer on site is an opportunity to talk about this animal in nature and reindeer herding. The different types of fishing methods is deeply rooted in the cultures in the area with most traditions in common. Etc.*

Phase 2. Designing

If not already in phase 1, the Elders are involved in phase 2: the design of the task and/or lessons (see figure 4). In our example, there are a number of ways to build the trap, and in designing and adapting the task to a local context, and the teacher should involve Elders from the local community to ensure that this is done according to the traditions in that specific area. Wagner and Lunney Borden (2015) present examples from conversations with Mi'kmaw teachers and Elders. These examples demonstrate tensions between common sense and school mathematics. Drawing on the findings reported by Wagner and Lunney Borden (2015), we suggest that conversations between teachers and Elders have the potential to strengthen both the cultural and the mathematical aspects of the planned HiCuA lessons.

Figure 4 shows the four elements that form the design process. To support students' opportunities to learn mathematics and language in this phase, it is crucial that the learning goals (competency aims) are connected to these four elements. For instance, the teacher has to carefully plan how students can be offered opportunities to discuss non-standardised measurement units – if that is one of the learning goals or if these are identified as a part of the traditional knowledge. When designing a fish trap, geometrical figures and mea-surements are examples of mathematical aspects that can be used. Estimates and calculations can be used as tools. From the language point of view, it is crucial that students have opportunities to and are encouraged to communicate in the Kven language. Hence, another part of the design is ensuring that students gain the required mathematical register in the target language, in our case in the Kven language.

Each language has been developed to sufficiently express concepts of the associated culture and meet the needs of the society in which the language is used. Moreover, ”each language will have its own distinct

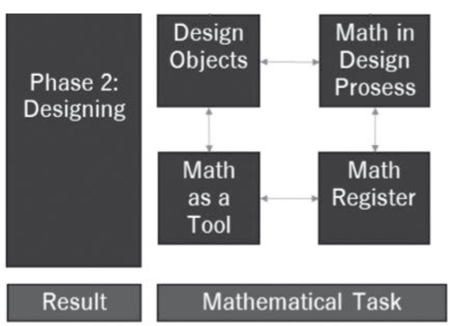

Figure 4. *Design process*

mathematics register, encompassing ways in which mathematical meaning is expressed in that language" (Ni Riordan & Mccluskey, 2015, p. 1456). However, for expressing (Western) mathematics, the grammatical and conceptual structures of the Indigenous language may not suffice. The language may lack words for specific mathematical terms, as reported by Harris (1980) for Aboriginal languages in Australia on particular concepts connected to measurement. In Indigenous languages there is often an absence of logical connectors such as "if ... then" or "because". Another example in Maori language is that numerical prefixes depend on the relationship a person has with the object (Meaney et al., 2012). For the Maori language, the following word-creation techniques have been used to (re) construct a mathematical register: derivation by affiliation, gerunding, calquing, compounding, circumlocution, resurrection of old words, and metaphors (Meaney et al., 2012). This process involved negotiations with the users of the language and the minority community to achieve consensus in accordance with perceptions, beliefs, different types of knowledge, etc. (Meaney et al., 2012). For the Kven language, the process of (re)constructing a mathematical register is in its very early phase and there is a current need for knowing more about the mathematical terms already existing in the spoken language before the written language can be reconstructed with respect to mathematical terms. The written Kven language may be missing a significant number of the mathematics terms and concepts needed to teach the subject. According to Meaney et al. (2012), translations to provide a mathematical register is generally not acceptable when a language is in decline, the majority language in schooling have been a means of assimilation and when a group considers their language as endangered, then there is normally a greater concern about "authenticity". Meaney et al. (2012) further notice that the development of a mathematical register may cause changes in the language and the culture, and challenges are that new words may cause a concern among the speakers of the language, e.g. there may be a gap between the original and mathematical meaning. When designing the task for the mathematical concepts identified in phase 1, if whole or parts of the mathematical register are missing, they must be reconstructed. Preferably this will be done in cooperation with experts on the Kven language, and the Elders and users of the language are consulted.

Phase 3. Implementation

In the third phase, it is time to implement the developed task within learning activities. In this particular example, the students design a fish trap and discuss aspects of the design process according to the chosen competence aims in mathematics and in the language as a subject. Important aspects here will be students and teacher(s) talking about the mathematical concepts in the Kven language, for instance discussing geometric figures and methods for constructing the fish trap. This includes discussions, preferably with Elders, on how people used to do the construction, decide the size of the trap, and estimate the required materials and how they communicated while working together on such projects. In figure 5, practical and reflexive activity are in different boxes but in the implementation phase, these forms of activities will operate together. Practical activities and reflexive activities are intertwined and contribute to different strengths in the learning processes. We use the term *practical activity* about what students are doing, such as the process of designing a fish trap, whereas we use the term *reflexive activity* about students' communication when working with a particular activity. This communication can be student-student communication, teacher-student communication, and communication involving Elders.

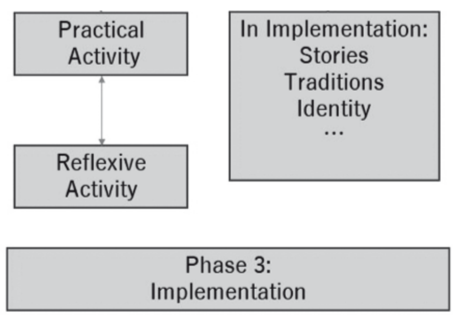

Figure 5. *The implementation phase*

The third phase has an important role in strengthening students' Kven identity. In our example with the fish trap, we suggest that the implementation phase end with using the fish trap in authentic situations – that the students, the Elders, and the teacher use the fish trap to fish in the traditional way. Here the Elders will have an important role in telling stories about the traditional use of the fish trap and showing how to use it. This part of the implementation phase is about fishing the traditional way but also about how to prepare and consume the fish, including how to clean it, make traditional dishes, etc. These types of practical activities are a great opportunity to use and learn the Kven language in an authentic setting and for the students to learn about their own culture.

The project with the fish trap is an example of a source of traditional knowledge linked to nature and natural science. For example, in the spring the perch come close to the lakeside to spawn. The use of the fish trap in the spring has traditionally been to place the fish trap in the water close to the lakeside and cover it with branches to keep it below the surface – probably to imitate a suitable place to leave the eggs to grow into fry. This part of the implementation may also involve discussing the ethics of keeping the fish alive in the trap and respect for other living beings in nature with questions like ”Why do we harvest?” and ”What is the best way to do it?” For instance, ecological considerations may come up in the discussions, with traditional knowledge as a guide. Moreover, it gives valuable paths for further work and exploration of the mathematical concepts in relation to the specific object and culture-based knowledge as well as explorations within other school subjects such as biology and ecology.

Concluding remarks

In this article we have discussed the history of the Kven language and culture loss and possibilities for its revitalisation. The situation of the Kven language and culture is that there is a need for strengthening students' knowledge about Kven traditions and to support their process of achieving functional competence in Kven language. Immersion programmes have been demonstrated to be one of the best ways to revitalise languages and cultures in situations where they are in decline. We suggest that total or partial immersion programmes have potential to strengthen the situations of endangered languages and cultures, such as the Kven language and culture. Moreover, we have proposed a framework that teachers can use to develop and design mathematical learning activities based upon traditional resources. This framework is inspired by work done by, among others, Fyhn et al. (2015) and Vos et al. (2007). These studies indicate that traditional artefacts and knowledge can support learning environments where students are offered opportunities to learn mathematics and develop their cultural identity. Based upon the findings from previous studies, we believe the proposed framework has potential to support teachers in developing learning activities aiming to offer students opportunities to engage in both mathematics and language learning. Most of the studies that have inspired our work focus on students' learning from authentic resources. As we have argued, for endangered languages and cultures the authentic aspect of traditional tools and activities can be a challenge. To meet this challenge, we suggest that the older generations (e.g. the students' grandparents) can mediate authentic aspects of the culture to the students.

It should be noted that although our study focuses on the Kven language and culture, this is not to say that the proposed framework is limited to Kven contexts. We believe the framework can be used by teachers in designing learning activities that support mathematics and language learning in general. The techniques used for the construction of boats, the alignment-technique for locating fish banks, and the fish trap itself have analogies in other cultures and for other nations. This means that the culture-based tasks are not excluding students of origins other than Kven origin but are rather a source for intercultural discussions and supporting intercultural education and resonate with considerations by, for example, Nutti (2013).

The proposed framework is currently purely theoretical and there is a need for implementing the framework in educational settings and developing it further in close cooperation with teachers. It is, after all, teachers who are the experts on how to implement and support students' opportunities to learn. We, therefore, argue that the framework cannot fully be a useful tool for teachers before it has been developed further and adjusted to local contexts together with experienced teachers. Our next step will therefore be to collaborate with teachers and examine the framework according to the following aspects: 1) how do teachers experience the use of this framework in designing learning activities intended to support students' learning of both mathematics and minority languages, 2) what aspects of mathematics and language learning can be observed in the activities developed by the proposed framework, and 3) what do teachers identify, in retrospect, as factors supporting students' use of mathematics and language in the developed learning activities.

This article and the framework are inspired by discussions with Imelda Perley, who is an Elder-in-Residence and Instructor at the Mi'kmaq-Wolastoqey Centre at the University at New Brunswick in Canada. The Wolastoq language is in a linguistic situation similar to that of the Kven language, with ”very little significant usage in communities or institutions” (Taylor, Plaice & Perley, 2010, p. 95). Imelda Perley's work with Wolastoq Elders on language, knowledge, and culture over many years has led to an increased focus on involving Elders in the research process and cultivating respect through their role as participants, colleagues, and carriers of knowledge (Taylor et al., 2010). From learning about the work with Wolastoqewiyik culture, it became clear to us that mathematics is not only a tool that supports students' learning of mathematics and that immersion programmes is not only about learning a language. Mathematics in an immersion setting also has the potential to cultivate students' understanding about their traditional culture and to identify with their cultural heritage. We would like to close our article with words from Imelda Perley: *Grandmothers and Grandfathers, Thank you for our language that you have saved for us. It is now our turn to save it for the ones who are not born yet.*

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Notes

1 The Kven language is taught under the part of the national curriculum called *Finnish as a second language* in which students can choose between the Kven and Finnish languages. Unless we are referring to the national curriculum, we will refer to the subject as *Kven as second language*.

2 Photo from Gjeddari (2015).

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