How Sámi teachers’ development of a teaching unit influences their self-determination

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Five teachers from a Sámi lower secondary school participated in two workshops on culturally-responsive mathematics teaching. During the first workshop, the teachers chose to focus on developing a unit about lávvu, the Sámi tent, to be taught between workshops. Their experiences are analysed with respect to Self-Determination Theory, which claims that all humans have a basic need for autonomy, competence and relatedness to others. The data are the teachers’ written notes from the beginning and the end of each workshop day. The analysis reveals subtypes of the three basic needs, which arose when the teachers moved towards self-determination. The need for autonomy appeared as a need for inspiration and for courage. Competence included learning from theory and from experience. Relatedness to others was linked to: Indigenous peoples; other teachers at their school; and teachers at other Sámi schools.

Keywords: Sámi, teacher, self-determination, Indigenous, culturally-responsive teaching.

Introduction

In this paper, we explore teachers’ perspectives on culturally-responsive mathematics as it is imagined and utilized in the design and implementation of a teaching unit on the Sámi tent, lávvu. This artefact, its design and its building, carries important connections to the Sámi people’s intangible cultural heritage, by embodying cultural traditions and ceremonies as well as rules for behaviour. To many Scandinavians, however, the lávvu is merely a tent; a cone like building made with some poles that are covered by cloth. In modern Sámi societies, traditional knowledge of lávvu is not necessarily widespread as people use modern, factory-made lávvus with metal poles. Traditional knowledge about lávvu is more well-known among those who belong to reindeer herding families than by others. In addition, the younger Sámi generation is a non-homogenous group of people with different interests. The teachers at Guovdageainnu nuoraiskuvla, Kautokeino lower secondary school, realised that reahpen, the north Sámi word for the smoke hole in the lávvu’s top, was considered a strange word by many grade ten students. In order to increase students’ cultural and mathematical knowledge, the In addition teachers developed a culturally-responsive teaching unit about lávvu. The teaching unit was carried out in the period between two workshops about culturally-responsive mathematics teaching. At the first workshop, the teachers

¹ The Sámi are an Indigenous people of the Arctic. They live in the northern parts of Norway, Sweden and Finland and on the Kola Peninsula in Russia.
planned the teaching and at the second workshop, they presented the outcomes. We analyse five teachers’ expectations and experiences with the two workshops. Our research question is, how does teachers’ self-determination appear in their workshop notes?

Smith (2006) highlights the importance of self-determination for Indigenous people, by describing it as the aim of a non-linear developmental process that departs from survival and recovery. Self-determination can be considered important in understanding Indigenous mathematics teachers’ motivations for developing and implementing culturally-responsive teaching. Previous research about teachers’ reflections about Sámfization of school mathematics identify several important issues. Jannok Nutti (2013) noted teachers’ ability, drive and possibility, while Fyhn et al. (2016a) describe relations between teachers’ autonomy and their development. Fyhn et al. (2015) point at the importance of including teachers from other subjects, when the context for the teaching is related to their area.

According to Kirmayer et al. (2009), self-determination also relates to resilience, as general discussions of identity tend to underemphasize the role of social action or collective agency in the production of well-being. Nystad, Spein and Ingstad (2014) investigated a Sámi society in Northern Norway and identified community resilience factors including Sámi language competence, use of recreational and natural resources, and traditional ecological knowledge, such as reindeer husbandry related activities. These cultural factors appear to strengthen adolescents’ ethnic identity and pride.

Self-determination theory has provided empirical support for the proposition that all human beings have fundamental psychological needs to be competent, autonomous and related to others (Deci & Ryan, 2012). Autonomy refers to the perceived origin or source of one’s own behaviour; it concerns acting from interest and integrated values. Relatedness is the psychological sense of being with others in a secure community. Autonomy is emphasized in traditional Sámi child rearing (Hoëm, 1976; Balto, 2005) and for Balto (2005) autonomy is a Sámi value. Relatedness to others is connected to holistically sharing and developing knowledge and so it is considered an Indigenous value. Motivational strategies of rewards and threats undermine autonomy and lead to non-optimal outcomes, such as decreased intrinsic motivation, less creativity, and poorer problem solving (Deci & Ryan, 2000). The theoretical framework is constituted by the three categories competent, autonomous and related to others. Following Glaser (2001), we identified subcategories connected to each category by comparing incidents and we named them using the teachers’ words.

**Culturally-responsive teaching**

Gay (2013) described culturally-responsive teaching 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” (p. 49-50). Gay suggests that as part of culturally-responsive teaching, teachers conduct their own analyses of textbooks, the Internet and other sources. They should investigate how different knowledge sources affect teaching and learning and reconstruct or replace existing presentations of issues and situations in the various resources with cultural knowledge and insights. This approach can be seen as having connections to Smith’s (2006/1999) description of self-determination. Gay (2016) considered that interdisciplinary work with teachers of other subjects supported collaboration and provided different insights.
Nevertheless, implementing culturally-responsive mathematics teaching needs to be done with care so that cultural artefacts are not simplified, to the detriment of both the culture and the mathematics. An example of simplification is to claim that the tipi, which is similar to the Sámi’s làvvu, is a cone:

That is surely wrong; the tipi is not a cone. Just look at a tipi with open eyes. It bulges here, sinks in there, has holes for people and smoke and bugs to pass, a floor made of dirt and grass, various smells and sounds and textures. There is a body of tradition and ceremony attached to the tipi, which is completely different from and rivals that of the cone. (Doolittle, 2006, p. 20)

According to Doolittle, there is a risk that Indigenous students who are presented with such oversimplifications feel that their culture has been appropriated by a powerful force for the purpose of leading them away from their culture. Thus, a teaching unit about làvvu has to respect the tradition and ceremony attached to it. Traditionally, a làvvu consists of two cloths that are wrapped around a set of poles and is a place for sleeping, working, relaxing, storytelling and even more (Nergård, 2006). It is easy to set up and take down and its permanent material, cloth and skins are transported when the family moves between living places. Other materials are gathered from the area where the làvvu is placed, making it local as well as mobile. There are rules for where to sit in the làvvu for parents, grown up children, workers and smaller children. According to Petterson (1905), the innermost area is sacred and only the bear hunter returning from a successful hunt is allowed there. He enters from the back bringing the bear meat with him. Nowadays, people sleep anywhere and in modern làvvu, the floor is covered with carpets and stoves are used for cooking. Still, the tangible and the intangible cultural heritage remain important.

The workshops

Teachers from two Sámi schools participated in two two-day workshops, with six months in between. The workshop participants were a) teachers from the subjects duodji, Sámi language and mathematics at Guovdageainnu nuoraidskuvla, b) all teachers for grades 1-10, from a small Sámi school in another municipality and c) some pre-service teachers from Sámi University College, who had practicum at Guovdageainnu nuoraidskuvla. Five teachers from Guovdageainnu nuoraidskuvla participated in both workshops and their responses to the workshop are analysed in this paper. The teachers work in a school where North Sámi is main language and they are educated as Sámi teachers. They joined the workshops so they could contribute to the further development of culturally-responsive teaching in their schools. Guovdageainnu nuoraidskuvla had already started developing culturally-responsive mathematics teaching (Fyhn et al., 2015; Fyhn et al., 2016b) and the principal is one of the mathematics teachers.

The two workshops included lectures and school-based group work. The group work was about the culturally-responsive mathematics teaching done in the period between the workshops. At the first workshop, the mathematics teachers who participated in the earlier project (Fyhn et al., 2015) presented their work. In addition, researchers presented theoretical perspectives connected to Indigenous mathematics education, mainly through examples from Sámi and Māori classrooms. The second workshop continued with theoretical perspectives and included an online lecture with two Indigenous mathematics teachers and researchers from New Zealand. At the first workshop, each school chose a theme for the culturally-responsive mathematics teaching and started the planning.
The schools presented the results of their culturally-responsive mathematics teaching at the second workshop. Guodvageainnu nuoraidskuvla focused on lávvu and eight teachers from this school co-authored a paper about their work (Fyhn et al., 2016a).

**Method**

Our analysis is of the notes made by five teachers who attended both workshops: Bigga, Duiri, Vide, Sire and Aile. All five are north Sámi native speakers and experienced teachers who teach two, three or four subjects each. Two of them teach duodji, Sámi handicraft, four of them teach mathematics, and four teach Sámi language. The work between the workshops contributed to strong cooperation between the teachers in these three subjects. Sámi language and duodji are subjects that, among other things, aim at strengthening the students’ cultural identity.

At the bequest of the researchers, the participants wrote about their expectations and experiences of the workshops at the beginning and end of each day. Fyhn et al. (2016b) studied relations between teachers’ autonomy and their development of a culturally responsive mathematics exam. In this study, we chose to focus on more aspects of self-determination, and thus we included being competent and relatedness to others into the theoretical framework. In alignment with self-determination theory (Deci and Ryan, 2012), we analysed the teachers’ writings in regard to a) being competent, b) being autonomous and c) being related to others. Designing and implementing a culturally-responsive teaching unit about lávvu requires the teachers to have the necessary competence about how to integrate cultural knowledge with mathematics teaching. As well, they need a capacity for and a desire to experience autonomy; that the work is regulated by themselves and that their integrity is kept through the work. When teachers from one school work together as a group, they are related to others and not alone in facing possible resistance or other difficulties in implementing a culturally-responsive teaching unit.

**The teaching unit about lávvu**

The description of the culturally-responsive mathematics unit came from the teachers’ presentation at the second workshop. During workshop one, the Sámi language teachers suggested the focus on lávvu because many students did not know the names of central parts of the lávvu. The mathematics teachers agreed that lávvu would provide possibilities for teaching mathematics, by having the students make a small lávvu model. Students could discuss different aspects of mathematics related to lávvu. Consistent with cultural symmetry (Trinick, Meaney & Fairhall, 2016), the teachers designed the teaching unit so that it started with a history section that discussed lávvu and goahti (another common Sámi housing) and central concepts regarding these. The teachers highlighted the different parts of the lávvu construction and how each part functioned. Each part was connected to specific traditions and the students had to learn the North Sámi words for them. In this way, the teaching valorised the local culture, as recommended by Trinick et al., (2016) and Doolittle (2006).

The mathematical aspects of the unit focused on the three válddahat, the structural poles, the location of árran, the fireplace, and the size of the floor. The válddahat have a Y-shape in one end and are the first three poles raised. This triangular construction is common for Sámi frameworks; as constructions made by three sticks are stable and reliable (Fyhn et al., 2016a). Locating the árran can be done through eye estimation, which includes trial and error for those who are not skilled.
Árran may also be located just below a skerttet, or iron hook, which hangs in a chain from the top of the lávvu. Locating árran can be connected respectively to a numerical approach or a geometrical approach, with both providing appropriate answers. The size of the floor depends on how many people are to stay in the lávvu; the steeper the walls are, the smaller the floor’s area. In earlier times, people could determine from a distance how many people lived in a lávvu, based on the angle between the wall and the ground. The lávvu floor is covered with layers of duorggat, twigs. Eye measuring is used to estimate the amount of duorggat needed. The students used a trial and error approach to determine this, while skilled people fetch the correct amount first time.

The students raised a lávvu near the school. The teachers focused the students’ attention on the three válddahat. The students also made a mini lávvu, which became a gift that the students appreciated giving to an old people’s home. The model’s scale was 1:8. Afterwards the teachers regretted that they had chosen this scale, because the task would have required more mathematics if the students had to decide the scale themselves. Still the model proved mathematically challenging for the students, who had to choose materials and decide how to make everything in correct proportions.

The teachers’ experiences of self-determination during the workshops

At the beginning of the first workshop, the teachers expressed expectations toward the three issues; autonomy, competence and relatedness to others. The analysis reveal different subcategories of these issues, presented in Table 1. The term culturally-responsive teaching is not easily translated to Norwegian and thus the teachers use the term culturally based teaching. Before the workshops the teachers’ expectations mainly concerned their individual autonomy and competence, but during the workshops a large extent of their experiences focused on relatedness to others. The analysis of the teachers’ written notes reveal that their need for autonomy manifests as a need for encouragement and for ideas or inspiration. These findings are in line with Fyhn et al (2016b). The need for competence can be subdivided into a need for learning theories and a need for learning to do things. The teachers’ needs for relatedness to others can be subdivided into three categories, relatedness to other teachers at their school, relatedness to teachers at other Sámi schools and relatedness to (teachers from) other Indigenous peoples.

The first morning, the teachers expressed their expectations towards the workshops. Sire and Aile referred to a need for supported autonomy, “I hope that I dare to do more interdisciplinary work”, (Sire, expectation notes, March 2, 2015) and “Hope it motivates to more interdisciplinary work”, (Aile, expectation notes, March 2, 2015). Vide, Aile and Duiri expected ideas or other input from others, “to get some ideas and hear about some experiences with culture based mathematics”, (Duiri, expectation notes, March 2, 2015). Aile expected ideas about how to connect different subjects, and Vide (expectation notes, March 2, 2015) wrote, “To get input from other teachers about how to integrate more subjects in an interdisciplinary work where all subjects feel included”. The teachers’ references to interdisciplinary work are in line with Gay (2013), who points out that interdisciplinary work leads to collaboration, plus expectations about knowledge. Interdisciplinary work in this setting means culturally responsive mathematics teaching; mathematics that treats Sámi traditional knowledge with dignity and respect. Nystad, Spein and Ingstad (2013) identified traditional knowledge as a community resilience factor; relatedness to others.
Table 1: Subcategories; issues connected to the three categories

<table>
<thead>
<tr>
<th>Autonomy</th>
<th>Competence</th>
<th>Relatedness to others</th>
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<tbody>
<tr>
<td>Inspiration/ ideas from others</td>
<td>To learn theory</td>
<td>Other teachers at their school</td>
</tr>
<tr>
<td>Becoming encouraged</td>
<td>Ability to integrate culture and mathematics</td>
<td>Teachers at other Sámi schools</td>
</tr>
<tr>
<td>Awareness about competence</td>
<td></td>
<td>Other Indigenous peoples</td>
</tr>
</tbody>
</table>

Ability to integrate culture and mathematics was among Bigga and Sire’s expectations. Bigga (expectation notes, March 2, 2015) expected to “be able to base more of the subject mathematics on culture”. Four of the teachers explicitly referred to Tamsin’s lecture about other Indigenous people, “We have learned about others’ challenges, Indigenous thinking and perspectives”, (Duiri, experience notes, March 2, 2015). This is categorized as to learn theory, because they referred to a lecture and not to an Indigenous teacher presenting her experiences. This can also be categorized as relatedness to other Indigenous peoples, “we have learned that other Indigenous peoples have many things similar to us, the same challenges”, (Sire, experience notes, March 3, 2015).

Four of the five teachers had experiences that concerned their relatedness to other teachers at their school, like “the final part with concrete reflections and discussion/talk about duodji/mathematics at our school was very useful.”, (Bigga, experience notes, March 2, 2015) and “good to focus on culturally based mathematics again, so that we can coordinate it in our school’s plans”, (Vide, experience notes, March 2, 2016). The second day of workshop one, the teachers wrote short notes. Four of them wrote together instead of writing individual notes. Their notes mainly concerned relatedness to other teachers at their school and to other Indigenous peoples, “the group work constitutes a basis for further work at our school. Informative to see that other Indigenous people have similar thoughts about this work. We see that they have similar challenges”, (Aile, Sire, Duiri and Vide, experience notes, March 3, 2015). Bigga’s also noted that she experienced relatedness to teachers at the other Sámi school. “Everyone have contributed with something and this motivates me to keep on thinking. This leads to the idea of a new culturally-responsive mathematics project”, (Bigga, experience notes, March 3, 2015). Two teachers experienced relatedness to other Sámi teachers, “It is useful to share experiences. I got some new ideas from the other school”, (Sire, experience notes, March 3, 2016).

None of the teachers referred directly to being competent, but three of them made implicit references to this, “Alan Bishop’s six fundamental activities makes us teachers more aware of our actions, teaching and thoughts about mathematics and language”, (Duiri, experience notes, March 3, 2016), “I become more aware of my solid knowledge about Sámi culture. I can base more of my teaching on this knowledge… The theoretical part was more useful this time”, (Sire, experience notes, March 2, 2016). Three of the teachers referred to supported autonomy, which was caused by the increased awareness about their competence and the fellow teachers’ positive attitude and contributions to the workshop. These are examples of overlap between the basic needs autonomy and competence; the three basic needs do not constitute distinct categories.
Only three of the teachers wrote down experiences for the second workshop’s first day. Thus, the analysis of the second workshop’s experiences focus on the last day. The teachers had to start this day one and a quarter hours earlier, in order to have a Skype meeting with two Māori mathematics teachers/researchers in New Zealand. The Skype meeting took place the day after the workshops’ final conference dinner and this commitment to the early attendance confirmed the participants’ commitment to talking with the Māori teachers/researchers. They really looked forward to this meeting. The analysis reveal that three of the teachers experienced relatedness to other Indigenous people from the Skype meeting, “This day has been useful in many ways … what Uenuku [Fairhall] said about the importance of how you teach mathematics … throw away the textbooks and teach mathematics at theme level :-)”, (Aile, experience notes, October 21, 2015).

**Summing up**

The teachers expected increased competence and supported autonomy when they joined the workshops. They had no expectations regarding relatedness to others, but which seemed to become their most characteristic experience. The analysis of the teachers’ needs for autonomy, competence and relatedness to others identified the ways in which these needs appeared. Subtypes of the three needs revealed information about the important factors that the teachers considered that they needed to succeed in developing their self-determination. Regarding autonomy, the teachers expected and experienced inspiration and being encouraged. They experienced competence in regard to learning theory and abilities. Relatedness to others was linked to: Indigenous peoples; other teachers at their school; and teachers at other Sámi schools. The teachers’ notes showed that culture based mathematics was a central issue in their expectations. The development of such work needs competent teachers from many subjects. In this project, there was more than one skilled teacher from each of the subjects Sámi language, duodji and mathematics. The teachers’ notes also revealed that they would have benefitted from group work related to the introduced theory, but this did not always occur. They wanted and expected to learn more about how to integrate culture in their mathematics teaching. Future workshops need to keep a more narrow focus on theory and link it more closely to the group work.

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**References**


