

Teacher views on the use of scenarios to enhance scientific literacy through raising career awareness

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Summary

Current literature recognises that science teaching aims to promote scientific literacy (Holbrook & Rannikmäe, 2007; Roberts & Bybee, 2014). There is an important need for scientifically literate persons at higher levels of education to enable solutions to scientific content problems and address socio-scientific issues that have a societal impact. The first steps need to be taken in science classes where students are made aware of and encouraged to reflect on science-related careers to achieve the goal mentioned above. Moreover, choosing a science-related career in the future is seen as influenced by an understanding of the nature of science. With this in mind, improvement of scientific literacy within the school needs to relate to career awareness (Rannikmäe et al., 2017).

Previous studies have shown that, in general, students' science-related career awareness is low, and they tend to prefer choosing careers in other fields (Maltese & Tai, 2011; Salonen et al., 2018). The possible reasons for this are given as – teacher's low competence for introducing modern science careers, teaching focusing on science content knowledge and skills, and a lack of suitable and high-level teaching-learning materials (Cohen & Patterson, 2012; Margot & Kettler, 2019; Soobard et al., 2020). However, the Estonian curriculum requires that all science subjects introduce science careers to a level that enables students to make reasoned decisions about their future career choices.

One approach to introducing science-related careers is to use context-based scenarios, focusing on relevant and upcoming science careers (e.g. those pertaining to scientists) through socio-scientific situations from real life (Holbrook & Rannikmäe, 2009; Soobard et al., 2020). This enhances science contextual learning and relates the learning to the everyday life of the society as a way

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of widening perceptions of scientific literacy (Holbrook & Rannikmäe, 2007). No previous research in Estonia focusing on career awareness as a component of scientific literacy has been carried out. No studies are currently focusing on teacher's willingness or even readiness to include science-related career awareness in their teaching to enhance scientific literacy.

A self-determination theory (Deci & Ryan, 2000) has been widely used to investigate teacher's readiness to make changes in their teaching or their approach to teaching. This theory highlights three critical components – competence, autonomy and relatedness. Competence relates to a person possessing the appropriate knowledge, skills and experience to complete the task effectively (Deci & Ryan, 2017). Autonomy means that person is responsible for and free to enact his/her actions, make choices and have the confidence to choose the best way forward (Deci & Ryan, 2000). Relatedness in this context relates to belongingness, getting support, working in collaboration and being valued by others (Deci & Ryan, 2017).

The current study aims to determine science teacher's readiness to use science-related career scenarios to enhance students' scientific literacy. The research questions put forward are:

1. Which components of scientific literacy do science teachers promote in lessons within and following the use of a career-related scenario?
2. What awareness and with what readiness do science teachers address within career-based scenarios in science lessons?

Methods

The sample consisted of 10 science teachers (one subject being taught was biology) who participated in an Autumn 2020 teacher in-service course that focused on modern biology trends and how to develop and use career-oriented scenarios for introducing science-related careers. Five career-based scenarios following the 1st stage from 3-stage model (Holbrook & Rannikmäe, 2010) were developed and introduced to teachers. In the 1st stage, student motivational socio-scientific situation was presented with possible links to science-related careers. However, no exact guidelines were given to teachers how to implement scenarios in the classroom because we were interested in what was teachers' awareness about career-oriented scenarios and readiness to use such scenarios (in terms of competence, autonomy, relatedness) to enhance career awareness as a component of scientific literacy. Data was collected using five open-ended questions about scenarios focusing on awareness and readiness. Data for these questions were analysed using content analysis methods. A separate question was included on developing components of scientific literacy in science classes.

Main results and discussion

Teachers in the current study agreed that, during their classes, they promoted all the given components of scientific literacy emphasised in the in-service course. Nevertheless, the teachers mainly focused on enhancing the nature of science (including how scientists work) and science content knowledge. However, much less focus was placed on developing science-related career awareness. This raised the contradiction because previous studies had shown that students did not fully understand the nature of science (Rannikmäe et al., 2017). The reason for this might be that, for the teacher, the nature of science mainly equated to science content knowledge (Rannikmäe et al., 2008), and teachers did not fully understand how to develop career awareness, which refers to a lack of competence in this area. This suggested that teachers needed more support in this area. However, the current results confirmed that the meaning of more support tended to mean more technical aspects (e.g. detailed guiding materials on how to use scenarios and on what aspects to concentrate on) rather than paradigmatic understanding or changes in this understanding. At the same time, a 'real' readiness to use career-oriented scenarios was perceived to mean a paradigmatic change (Valdmann et al., 2020).

In general, teachers agreed that they could use all scenarios in their classes. Their general awareness about scenarios, in terms of content knowledge and career awareness, was high. They named many topics within the curriculum that could be promoted within the scenarios and were able to put forward how they could develop career awareness using these scenarios. They agreed that the scenarios were interesting and supported the development of skills and knowledge needed in the related careers. Previous research also confirmed that the starting point for career awareness was the interest shown towards the contexts of scenarios (Salonen et al., 2018).

The teachers' readiness was investigated through competence, autonomy and relatedness. Teachers were competent (according to their responses) in using different teaching methods and developing content knowledge. However, they preferred to use teaching methods, which led students to investigate possible careers by themselves. In terms of autonomy, teachers agreed that all scenarios could be used as provided, but still, they would like to make changes. Namely, they would like to add extra information to slides and multiple activities (e.g. role-play, group work). However, there was no explanation as to why they would like to make such changes. In terms of relatedness, some teachers (depending on scenarios) agreed that they would like to teach by themselves, although many teachers agreed that they would like to present scenarios in collaboration with others. Those teachers who agreed that they liked to collaborate

in some of the scenarios also expressed a need to get extra competence in a particular scenario setting (e.g. support from scientist, experts from the career field). Furthermore, they would feel more involved with the given task if they could receive extra guidance on presenting the scenario in the classroom.

It can be concluded that teachers have an awareness and readiness to use science-related career-oriented scenarios in science classes for promoting scientific literacy. At the same time, teachers are expecting clear and complete guiding materials for this and need to be aware of the context of the material (e.g. field experts, scientist, laboratory visits). This leads to a situation where teachers mainly focus on multiple teaching-learning methods and content knowledge rather than fully seeking to develop scientific literacy in its entirety.

Based on the current study, it can be suggested that there is a need for further investigation with a larger sample size in the areas of teacher's understandings about science-related career scenarios and how they are using those in classes. Based on this, an investigation should be carried out about which type of scenarios are most effective for raising students' science-related career awareness for promoting scientific literacy.

Keywords: scientific literacy, career-awareness, teachers' readiness