C·E·P·S Journal

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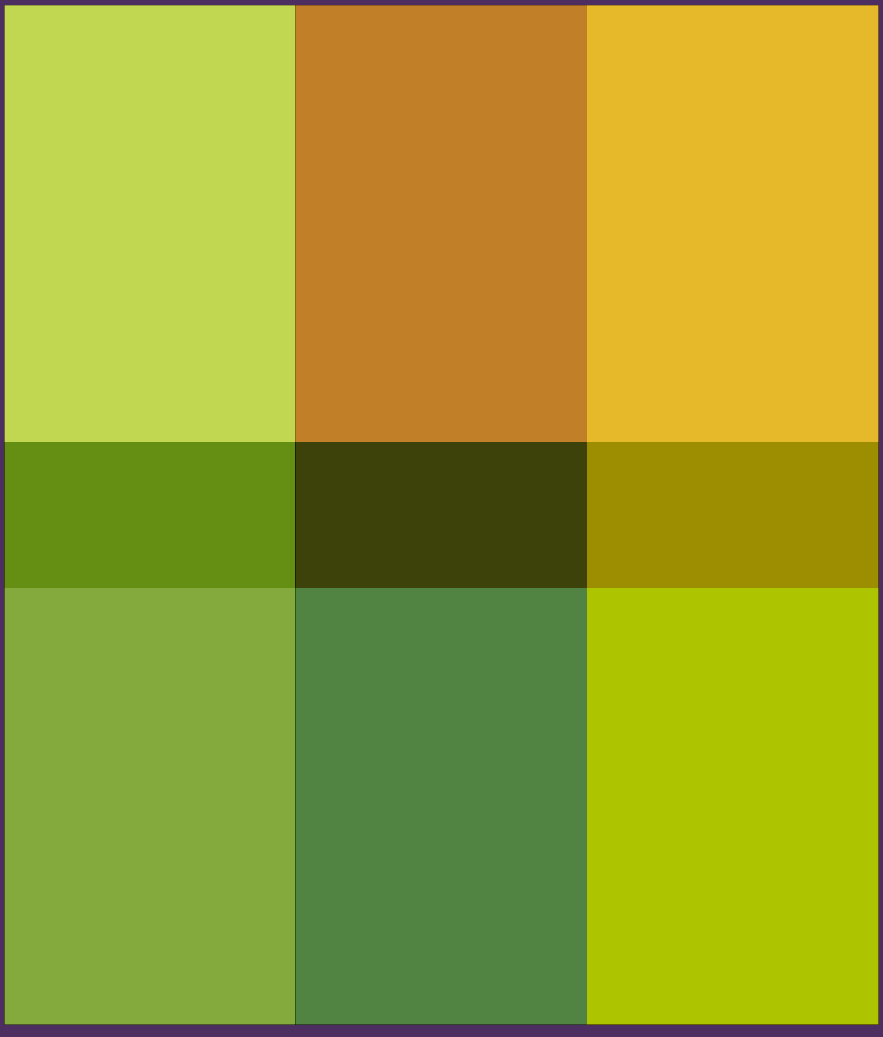

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C·E·P·S *Journal*

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The CEPS Journal is an open-access, peer-reviewed journal devoted to publishing research papers in different fields of education, including scientific.

Aims & Scope

The CEPS Journal is an international peer-reviewed journal with an international board. It publishes original empirical and theoretical studies from a wide variety of academic disciplines related to the field of Teacher Education and Educational Sciences; in particular, it will support comparative studies in the field. Regional context is stressed but the journal remains open to researchers and contributors across all European countries and worldwide. There are four issues per year. Issues are focused on specific areas but there is also space for non-focused articles and book reviews.

About the Publisher

The University of Ljubljana is one of the largest universities in the region (see www.uni-lj.si) and its Faculty of Education (see www.pef.uni-lj.si), established in 1947, has the leading role in teacher education and education sciences in Slovenia. It is well positioned in regional and European cooperation programmes in teaching and research. A publishing unit oversees the dissemination of research results and informs the interested public about new trends in the broad area of teacher education and education sciences; to date, numerous monographs and publications have been published, not just in Slovenian but also in English.

In 2001, the Centre for Educational Policy Studies (CEPS; see http://ceps.pef.uni-lj.si) was established within the Faculty of Education to build upon experience acquired in the broad reform of the national educational system during the period of social transition in the 1990s, to upgrade expertise and to strengthen international cooperation. CEPS has established a number of fruitful contacts, both in the region – particularly with similar institutions in the countries of the Western Balkans – and with interested partners in EU member states and worldwide.

Revija Centra za študij edukacijskih strategij je mednarodno recenzirana revija, z mednarodnim uredniškim odborom in s prostim dostopom. Namenjena je objavljanju člankov s področja izobraževanja učiteljev in edukacijskih ved.

Cilji in namen

Revija je namenjena obravnavanju naslednjih področij: poučevanje, učenje, vzgoja in izobraževanje, socialna pedagogika, specialna in rehabilitacijska pedagogika, predšolska pedagogika, edukacijske politike, supervizija, poučevanje slovenskega jezika in književnosti, poučevanje matematike, računalništva, naravoslovja in tehnike, poučevanje družboslovja in humanistike, poučevanje na področju umetnosti, visokošolsko izobraževanje in izobraževanje odraslih. Poseben poudarek bo namenjen izobraževanju učiteljev in spodbujanju njihovega profesionalnega razvoja.

V reviji so objavljeni znanstveni prispevki, in sicer teoretični prispevki in prispevki, v katerih so predstavljeni rezultati kvantitavnih in kvalitativnih empiričnih raziskav. Še posebej poudarjen je pomen komparativnih raziskav.

Revija izide štirikrat letno. Številke so tematsko opredeljene, v njih pa je prostor tudi za netematske prispevke in predstavitve ter recenzije novih publikacij.

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Dear Reader

The focus of this issue of CEPSj is mainly devoted to the PROFILES (Professional Reflection-Oriented Focus on Inquiry-based Learning and Education through Science) project. The PROFILES project is a four-year Framework Program 7 (FP7) project funded by the European Commission of the EU. PROFILES is one of several European FP7-funded projects in the field of "Science in Society" promoting IBSE (Inquiry-Based Science Education) and does so through raising science teachers' self-efficacy and promoting a better understanding of changes in teaching science in schools and the value of stakeholder networking. It is also based on 'teacher partnerships' implementing existing, exemplary, context-led, science teaching materials, guided by long-term teacher training, reflecting on challenges identified by participating teachers, in order to raise their skills in developing creative, scientific problem-solving and socio-scientific related learning environments; learning environments that embrace students' intrinsic motivation to learn science and enhance their competence in undertaking scientific inquiry and socio-scientific decision-making.

The first paper by Jack Holbrook and Miia Rannikmäe, entitled "The Philosophy and Approach on which the PROFILES Project is based," sets out to describe the PROFILES project on which subsequent papers in this issue are based. This paper presents the philosophy and teaching and learning strategies that are part of the PROFILES project. It discusses the theoretical three-stage model on which teaching is based and describes the learning modules used in teaching in relation to the PROFILES philosophy.

The second paper, entitled "Promoting Societal-Oriented Communication and Decision Making Skills by Learning about Advertising in Science Education," by Nadja Belova and Ingo Eilks presents the meaning of advertising in our lives and how this topic is appropriate to include within PROFILES-style science education. The authors connect advertising to the PROFILES philosophy as a socio-scientific approach befitting the three-part PROFILES model. They also emphasize the importance that students, as consumers, should understand the science in and behind advertising as a necessary educational component in becoming a critical consumer. Learning about the ways science is used in advertising also allows educationally desirable societal-oriented communication and decision making skills to be promoted in the science classroom.

The paper by Susanne Walan and Shu-Nu Chang Rundgren presents a pilot study. Its title "Investigating Preschool and Primary School Teachers'

Self-efficacy and Needs in Teaching Science: A Pilot Study" indicates how the authors adapted the PROFILES teacher needs instrument to the preschool and primary school level. In Sweden numerous teachers lack educational training in science subjects. Therefore, this study aims to investigate teachers' self-efficacy and needs in relation to science teaching. Presented results show that the participating teachers had relatively high self-efficacy and no significant differences were identified between the three groups of preschool, 1-3 and 4-6 grade teachers. However, even though the teachers had high self-efficacy, teachers still expressed the need for further education.

The third paper by Marc Stuckey, Marianne Lippel and Ingo Eilks from the University of Bremen group, is entitled "Teaching Chemistry about 'Stevia' – A Case of Cooperative Curriculum Innovation within PROFILES in Germany." This paper discusses a basic aim of PROFILES, which is implementing innovative science teaching practices, incorporating a socio-scientific context and inquiry-based science education. The authors present a chemistry teaching module, created around sugar and sweeteners and incorporating the use of advertising in science education. The paper also includes results regarding evaluation of the module in the classroom environment.

The last paper in this PROFILES CEPSj issue is an article by Finnish authors Sirpa Kärkkäinen, Jari Kukkonen and Tuula Keinonen, entitled "Scaffolding in a Medicine Education intervention for Student Teachers based on the PROFILES Three Stage Model." They attempt to transfer the PROFILES philosophy to medical education for pre-service primary school teacher education and explain the impacts of the effects of scaffolding on the pre-service teachers' learning process. The scaffolding is based on using information and communication technology within the PROFILES Three Stage Model of socio-scientific scenario, inquiry-based learning followed by decision-making. Two groups of students participate in the research – one scaffolded and the control, unscaffolded, during learning within the chosen topic. Findings show that the scaffolded group is quite effective in searching for information for their end presentation, whereas the unscaffolded group has difficulties in finding relevant information, suggesting that scaffolding, by structuring the activity, allows students to better focus when preparing their presentation.

This issue ends with two non-PROFILES papers, which nevertheless interrelate. The first on "The (Un) Attractiveness of Vocational and Technical Education: Theoretical Background" by Miha Lovšin, considers the problem of the lack of attractiveness of vocational and technical education. This is undertaken via a review of legislation on counselling practices, implementing documents, and the social factors by means of which the education system can

influence the individual's decision. It is apparent that legislation regulating the organisation and content of career counselling services in educational sector is inadequate. The or-ganisation of career counselling at the level of implementation is also inadequate. Counsellors advise individuals on the basis of their academic results and the results of aptitude tests. Counselling practices deriving from theories, which place career planning and management skills in the foreground, are more rarely represented. Theories, which treat career decisions as a social process, show that, at the level of the student population, the choice of the type of school is a rational decision based primarily on the economic position and level of education to which a specific educational pathway is generally supposed to lead. The lower attractiveness of vocational and technical education coincides with the fact that repre-sentatives of lower social classes have a weaker economic position and more frequently have vocational and technical education qualifications than representatives of higher social classes. Nevertheless, the trend of high unemployment among young people with academic qualifications, which is opposite to the traditional situation, indicates that it will be necessary to include career planning and management skills in the educational provision of institutionalised and formal education as a whole. This last point clearly interrelates with the 'education through science' aspects of PROFILES and its promoting of a context-based, career awareness, approach to science teaching.

The last paper by Dubravka Maleš, Barbara Kušević, and Ana Širanović, entitled "Child Participation in Family-School Cooperation," discusses the cooperation between families and schools from the perspective of the UN Convention on the Rights of the Child (1989). Given that the principal purpose of the cooperation between families and schools is children's well-being, it is reasonable to expect the child's participation in situations of direct parent-teacher cooperation. The theoretical part of this paper is grounded on contemporary scientific findings in family-school cooperation and the role of the child in the process, while the empirical part seeks to determine whether the requirement for child participation is being fulfilled in family-school cooperation in Croatia. While PROFILES focusses more on student self-determination than family-school cooperation, the society context promoted through PROFILES science teaching and the development of decision-making argumentation skills, puts relevance and students' interests and hence brings students' rights firmly into focus.

This CEPS issue ends with a review of the book "Critical Analysis of Science Textbooks: Evaluating instructional effectiveness" by Khine Swe, M. (Ed.), Dordrecht: Springer, 2013. ISBN 978-94-007-4167-6, written by Miha Slapničar.

The book review presents a recent publication in the series of Springer monographs covering different aspects of science education. This book deals with the analysis of science textbooks showing different aspects influencing science education internationally.

Jack Holbrook and Iztok Devetak

The Philosophy and Approach on which the PROFILES Project is Based

Jack Holbrook*[1] and Miia Rannikmäe[2]

This article sets out to describe the PROFILES project, an European Commission FP7 science and society project, addresses problems and issues in science education by guiding teachers to embrace a range of teaching factors, such as a context-based approach, motivational constructivist learning; student centred inquiry teaching; enhancing cognitive conceptualisation, and including socio-scientific decision making. The PROFILES project bases the teaching on a theoretically derived, 3 stage model, which is supported through carefully designed PROFILES modules, providing for both the students and the teacher. The major focus of the project is promoting more relevant school science education at the secondary level (grade 7 and above) by guiding teachers to gain ownership of the PROFILES philosophy and approach.

Keywords: PROFILES, Student motivation, Relevance, 3 stage model, Inquiry learning, Socio-scientific context

1 *Corresponding Author. University of Tartu, Estonia; jack.holbrook@ut.ee
2 University of Tartu, Estonia

Filozofija in pristop, na katerem temelji projekt PROFILES

Jack Holbrook* in Miia Rannikmäe

Prispevek opredeli projekt PROFILES. To je projekt o naravoslovju in družbi, ki se izvaja v okviru Evropske komisije (FP 7). Njegov namen je premostiti probleme v naravoslovnem izobraževanju z izobraževanjem učiteljev na različnih področjih, kot so: uporabljanje novega pristopa poučevanja, ki temelji na vsebinah, ki so učencem znane, promoviranje motivacijsko-konstruktivističnega učenja; učenje z raziskovanjem, pri katerem je v ospredju učenec; izboljšanje razumevanja pojmov in vključevanje odločanja v okviru socionaravoslovnega konteksta. Projekt osnuje poučevanje na tristopenjskem teoretično izpeljanem modelu, ki je za učence in učitelje podprt s skrbno oblikovanimi moduli PROFILES. Glavni cilj projekta je promoviranje pomembnosti naravoslovnega izobraževanja v šolah v višjih razredih (od 7. razreda naprej), in sicer prek tega, da učitelji prevzamejo oz. trajno ponotranjijo filozofijo PROFILES in pristop poučevanja naravoslovja.

Ključne besede: PROFILES, motiviranje učencev, pomembnost, tristopenjski model, učenje z raziskovanjem, socionaravoslovni kontekst

Introduction

> *I do not believe, after more than 30 years in science education and educational research that we are going to succeed where past generations have failed, unless we make major and fundamental changes in our approach to science education.* (J. Lemke, 2005).

A major concern in Europe is the issue of students not taking up science and technology related careers (EC, 2004), which is blamed, at least in part, on the abstractness, boring disposition and non-relevance of science being taught in schools (Osborne, Simons, & Collins, 2003). In fact, an underlying guiding factor is a European Report (2007) which focuses on the lack of student interest in science education, especially in the adolescent years and suggests that inquiry-based science education (IBSE) is an important component to include in school science education. This EC 2007 publication provides the base for PROFILES (Professional Reflection Oriented Focus Inquiry-based Learning and Education through Science).

Change in school science has traditionally been slow, whereas the pace of scientific and technological development within the society is great, so much so that there is a danger that the changing world is making the relevance of science education even more suspect. This is not only in terms of content and its related conceptual understanding, but also in its approach to developments, its changing field of operation and the changing skills demanded of the teacher. Focusing on learning relevant science for life (for the home, the workplace and interactions in the community), and embrace scientific or technologically related careers, is seen as a key change, not least by a high level commission commenting in an European Commission report entitled Europe needs more scientists (EC, 2004).

Research in a science education context has endorsed the lack of relevance and the out-of-touch science education for today's world and has shown:

a) science subjects are not popular among students and less students are thinking about careers in science and further study in science related areas (Teppo & Rannikmäe, 2008; EC, 2004);
b) science Is not relevant for students as taught in schools. Students do not see science useful for their lives and future developments (Osborne & Collins, 2001; Holbrook, 1998; NRC, 2010; Froiland & Oros, 2013);
c) science content is static in nature, overloaded with facts and theories taken from the past (Rannikmäe, 2001). These bear little relationship with everyday needs;

d) student perceive school science as dominated by content with too much repetition and too little challenge (Osborne & Collins, 2001; Sjoberg, 2001; Griffin, Care, & McGaw, 2012);
e) science education is isolated from the values components of education. Science education tends to be portrayed as values free, yet at the same time, the community needs increasingly to address moral and ethical issues and related problems (Anderson et al., 1992; Holbrook, 1992);
f) teaching lacks attention to higher order learning among students, limiting development of problem-solving and decision-making skills among school graduates (Zoller, 1993; Feinstein, 2010; Choi et al., 2011).

It seems there is a need to rethink the rationale for teaching science in schools, the context in which it is put forward and the manner in which teachers are supported professionally. Essential to this is reflecting on the meaning of "science education." Also essential is reflecting on the relationship of science, if any, to other subjects in the school curriculum and the operationalisation of science teaching to enhance its relevance for a changing world. The PROFILES project strives to promote such thinking and reflections.

Why teach science?

In reflecting on the place of science teaching in school, an important consideration is that the purpose of teaching science subjects in schools cannot be divorced from the goals of teaching in any subject and hence from the goals of education as a whole (Sjöström, 2011). Of course, the content, laws and theories are very specific to the subject, but the purpose of acquiring these, or why one set of particular set of content, laws and theories, as opposed to another, is put forward, is based on the underlying educational attributes to be developed. For example, should a capability to participate in decision making be very much intended, this value needs to be included in the education system and hence feature in science teaching. In the science teaching case, it can enabling citizens to make informed decisions, drawing on their science learning and to be able to apply this in tackling community issues (Hofstein, Eilks, & Bybee, 2011). This paints a far different type of a science course than the content, topic driven, science concepts approach which has been familiar to many science teachers (Fernandez, Holbrook, Mamlok-Naaman, & Coll, 2013).

Rapid changes in the world—including technological advancement, scientific innovation, increased globalization, shifting workforce demands and pressures of economic competitiveness—are redefining the broad skill set that

students need to be adequately prepared to participate in, and contribute to, today's society (Levy & Murnane, 2005). The general trend in European countries is towards a knowledge-based society, moving away from a workforce which is manufacturing based and thus drawing attention to the need for research into ways to reorient science and technology education into more conceptual and creative technological approaches that are innovative in their design. In fact, it is suggested there are four separate developmental components to which education and hence science teaching need to embrace or reject. These have been identified (Turner, 2008; Tytler, 2007) as (a) enhancing democratic development, (b) supporting economic development, (c) promoting skills development, and (d) the need for cultural development (Fernandez et al., 2013).

PROFILES subscribes to the inclusion of all these developmental components as integral to science education and thus puts forward the following objectives offering innovative scientific learning opportunities for pre- and in-service teachers:

- Establishing close cooperation and networking of the consortium with stakeholders (seen as going beyond teachers and include educationalists, scientists, researchers, employers).
- Providing teacher professional development in innovative teaching approaches based on teacher needs, especially associated with: student intrinsic motivation; scientific literacy; socio-scientific, context-based teaching; inquiry-based teaching and learning; a student-centred, education-through-science approach; classroom environment; interdisciplinary and cross-cutting learning; self-reflection.
- Developing stronger teacher professionalization by enhancing teacher self-efficacy in innovative teaching using PROFILES modules (based on the innovative teaching approaches).
- Convince teachers that the methods they have studied and tried in the training can and will strongly improve the quality of their own science teaching and thus guide teachers to provide evidence of ownership of the PROFILES approach and philosophy.
- Disseminating the PROFILES ideas.

The Scientific and Technological Literacy element

It is little wonder therefore that PROFILES focuses attention on clarifying the purpose of science and technology education in the 21st century. A common clarification, expressed in school curricula, is to subsume all the intended purposes into one expression, namely - promoting scientific and technological

literacy (STL). Alas, many definitions of STL have been developed and the actual intentions of schooling and science education, linked to STL, remain unclear. The trend for STL is associated with a wide meaning, going beyond science content and encompassing societal and workforce concerns. The science concentrates on a few big scientific ideas, rather than stressing a range of disconnected content informational knowledge. While Roberts (2007) identified two camps in defining scientific literacy – the science content emphasis orientation and the science in society focus, others e.g. Holbrook and Rannikmäe (2009) put forward definitions which encompass the creative use of evidence-based knowledge and skills, while recognising also the need for acquiring personal and social attributes. PROFILES recognizes these trends and thus strives to promote STL in its wider vision.

Education through Science

Many teachers think in terms of science education as, 'science through education' (Holbrook & Rannikmäe, 2007). This is very much the traditional, or the syllabus, content-component approach to the learning. The learning of the subject is taken as the overriding, and maybe the only, focus. Other aspects, which can play an important role in student motivation are ignored, or heavily downplayed. But whatever the intentions for science education, motivation cannot be ignored and needs to be appreciated as a major factor in science learning (Ryan & Deci, 2000).

An alternative approach, referred to as the '*education through science*' approach (Holbrook, 2010; Holbrook & Rannikmäe, 2007) is by first stimulating student motivation, so that students are inspired to want to gain education through the teaching. This direction for science education encompasses:

- cognitive learning;
- appreciation of the subject (the nature of science);
- the development of the person to be capable of functioning in a meaningful and responsible manner;
- the development of the person, especially in terms of social values (Holbrook & Rannikmäe, 2007).

Education through science is thus about intellectual or cognitive development plus personal development plus social development.

Through an 'education through science,' focus the stress is on educational learning to be acquired through science lessons. Education is thus the focus and science is the vehicle (that which is providing the content).

What is PROFILES?

The acronym PROFILES stands for Professional Reflection Oriented Focus on Inquiry Learning and Education through Science. From such a focus, this FP7 science in society project addresses four main components, the first two directed at the teacher and the teaching, while the remaining two are more philosophical in nature:

a) P stands for Professional. This refers to ways of enhancing the teacher as a professional in addressing the concerns and issues in science education.

b) The second area of focus is indicated by ROF, or the Reflection Oriented Focus of the teacher. PROFILES recognises the need for all teachers to reflect on any intervention in which PROFILES teaching is conducted.

c) A third area of concern is the IL, or Inquiry learning. This component is heavily stressed by the EC report (2007) and thus features strongly in PROFILES.

d) The last area of focus is ES, or the need to interpret science teaching as fundamentally about educating students rather than seeing science teaching in schools as being solely focused on the fundamentals of science.

What is PROFILES addressing?

In promoting more meaningful science education, PROFILES addresses 5 major aspects, above and beyond the need to recognise inquiry-based learning (IBSE).

Making Science Education Relevant

A major factor in making science in school more popular, and expected to lead to greater public awareness of science by students in the future, is the relevance of the learning in the eyes of students (Holbrook, 2008). This relevance is clearly associated with the establishment of meaningful goals for science education (and hence education itself) but also with giving attention to addressing emerging issues in science education.

In striving for relevance in science education, PROFILES goes beyond a consideration of the educational goals and reflects on an appropriate structure related to:

– the manner in which the teaching is approached (Holbrook & Rannikmäe, 2010);

– enabling the teaching to be initiated from society concerns, thus allowing the learning of science to better impact on its inter-relationship with society (Holbrook & Rannikmäe, 2007);
– being seen less about putting forward a series of scientific and technological conceptual topics that are, certainly at the lower levels of schooling, unrelated to the science and technology around us (Holbrook, 1998).

The rethink of science education within PROFILES requires consideration of a philosophy based on "education through science" (Holbrook & Rannikmäe, 2007). The philosophy sees science education as firmly within the realm of education. It sees educational gains as the target of science teaching and hence the science, in its appropriate context, as the vehicle. In so doing, science education within this philosophy tries to provide students with a better awareness of science and technology within society in line with the stimulated goals of education (e.g. MCEETYA, 2008). Thus, in appreciating the philosophy associated with science education, PROFILES sees it important to distinguish between:

(i) science (a body of knowledge, or perhaps more appropriately, a way of knowing), and
(ii) science education (education provided through science).

Enhancing Scientific and Technological Literacy

The "education through science" to which students strive can be referred to as education for enhancing scientific and technological literacy (STL). This literacy is far from a consideration of reading and writing and covers all the goals of education from knowledge, to skills, to attitudes, to values within a science and technology context.

In the context of relevance, it is suggested STL can be considered as meaning 'developing the ability to creatively utilise sound science knowledge (and ways of working), in everyday life, to solve problems, make decisions and hence improve the quality of life' (Holbrook & Rannikmäe, 1997). This is based on acquiring educational skills involving intellectual, attitudinal, communicative, societal and interdisciplinary learning. It identifies with the meaning of scientific literacy put forward by PISA (OECD, 2003) "scientific literacy is the capacity to use scientific knowledge to identify questions and to draw evidence-based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human activity" and also with the expanded version which goes beyond this ability and encompasses nature of science, its impact in society and a positive attitude towards this (OECD, 2007).

Context-based science education

PROFILES sees a more society-related learning approach gaining favour with many students. PROFILES sets out to do this by involving students in constructivist learning, initiated from a familiar socio-cultural base to allow students to bridge the gap between learning within society and learning at school (van Aalsvorst, 2004). The PROFILES belief is that:

– Teaching of science in school is 'science education' and care is need when referring to the teacher's task as 'teaching science.'
– Science education is much broader than science and tries to meet the needs of students as members of society (as citizen and for careers).
– Scientific literacy has little to do with solely gaining 'the' specific scientific knowledge, whether this is expressed as content, or as 'big ideas.'

It is important to point out that an 'education through science' approach does not mean abandoning the acquiring of scientific conceptual knowledge; 'far from it.' Science provides the vehicle for learning and is thus an integral component in enabling students to gain the education goals within a suitable content frame. However, while the subject matter can be put forward by scientists and can be organised in ways that are perceived to be logical from a scientists' point of view, the same cannot be said for other educational goals.

A socio-scientific teaching approach focusing on competence-based learning

In 'Science Education Now; A Renewed Pedagogy for the Future of Europe' (EC, 2007), a major concern expressed, in relation to science teaching, is that 'science in school' is both "irrelevant" and "difficult" (p. 9). Thus, the question arises – what approach and what learning is appropriate within the field of science education to promote scientific and technological literacy? PROFILES promotes a socio-scientific approach to address motivational concerns while incorporating inquiry-based learning. PROFILES advocates a 3 stage philosophical teaching approach, controlled by the teacher, while a modular structure is put forward to present student learning tasks as one learning continuum, as well indicating teacher guidance.

Student Centred Teaching

The PROFILES teaching approach relies heavily on student involvement. And as such, there is a need to base the learning on students' prior constructs, often coming from society. A common practice is to solicit students' prior learning by means of brainstorming and from there, involve students in

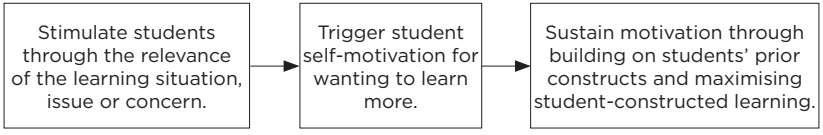
group work to develop plans for future scientific conceptual learning (investigating projects, jigsaw development of areas of learning, etc.).

Operationalising profiles

The major driving force behind the teaching of PROFILES relates to (a) the theoretical model and (b) the design of PROFILES modules.

The 3 stage model

The 3-stage model is based on the recognition that there is a need to initiate the learning from a *familiar and student relevant situation*. The diagram below illustrates how relevance is intended to trigger student's self-motivation (or intrinsic motivation) to promote student involvement in the learning. Such motivation is sustained by student involvement and also by any extrinsic motivational aspects supplied by the teacher.



As the model is the centrepiece of the PROFILES approach it is elaborated further.

The Stage 1 Scenario

The use of an 'appropriate' scenario is important. Not any situation is appropriate. Research shows that students identify with specific words, or expressions and these play an important function in determining whether the modules, or the scenario, chosen is appropriate. So important is the title and scenario that, if this fails to motivation students, the module should not be used further and the teaching associated with this module abandoned. This is because relevance is a very useful precursor for developing students' personal interest and a powerful stimulus for science learning. It provides students with a desire to pursue the learning further, going beyond the scenario and into the accompanying new science learning.

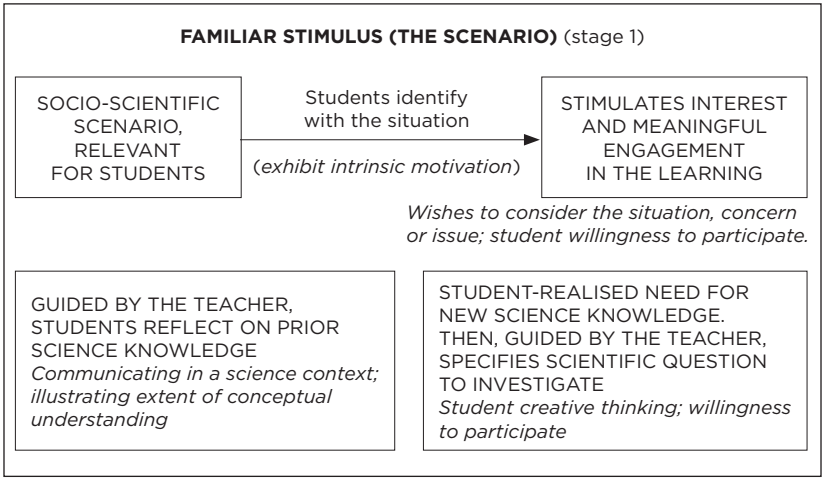
The learning approach is thus 'motivation first', leading to science learning second. This contrast with the usual suggested approach - make the science itself interesting so that it will then motivate the students (but, alas, in so many cases it doesn't!!). The theoretical construct is that motivation drives the learning of science and the scenario is intended to enable students to want to get

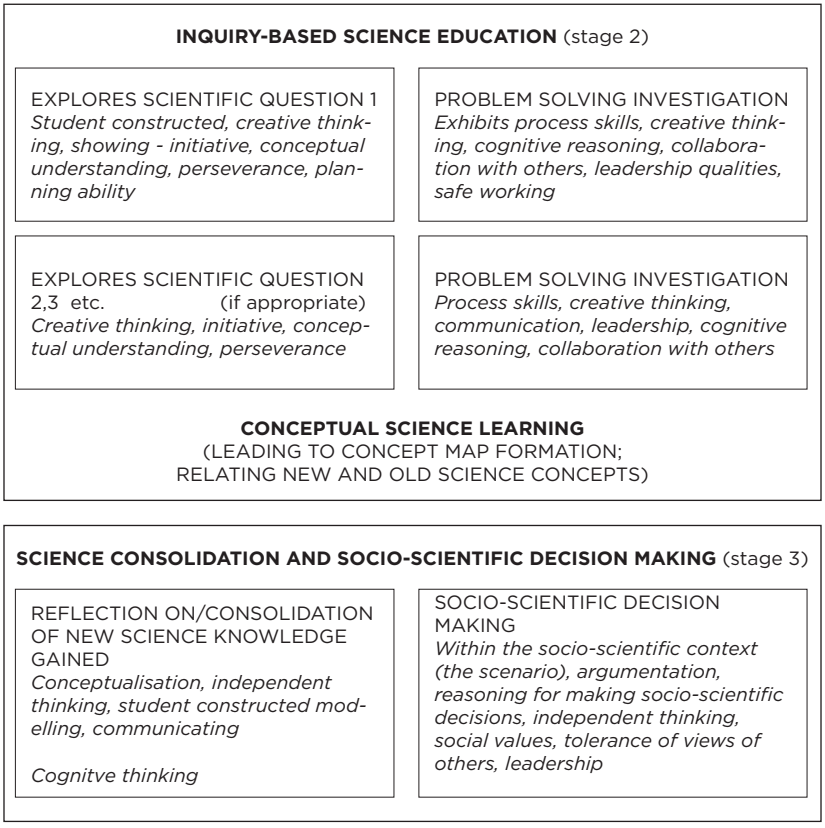
involved, even though this means learning some science. Unfortunately, standard approaches, which assume science is inherently interesting for students, if taught well, have been shown not to appeal to many students at the secondary level (Osborne et al., 2003).

Once motivation is established, the further learning is, in fact, the curriculum-based conceptual science ideas, which students acquire as steps towards enhancing their scientific literacy. For the learning to be meaningful as well as continue to be interesting, the science learning builds on a familiar, socio-scientific scenario as shown in the flowchart.

The purpose of the scenario is to *stimulate students' interest* and to do this from a familiar and student relevant perspective. It is thus importance to persuade teachers to *make changes* to the scenario, if appropriate, to ensure such an approach.

Starting from a carefully worded title (intended to be familiar and of interest to the target students), the teaching progresses, in three stages via a scenario, as follows:





Going beyond the scenario

Once teacher realise the need to *initiate motivational scientific thinking in their students*, the next step is to determine students' prior science knowledge in the area related to the socio-scientific scenario.

In most cases, the teacher should expect to find that the students' prior knowledge is limited and students will be unfamiliar with the science ideas associated with the scenario. However, if this is not the case and students really do have a background in the underlying science, then going further to discuss the scenario *will not involve science learning*. The teaching needs to re-focus so as to be seen to address learning.

Preparing for stage 2

While stage 1 is initially about raising student interest, stage 2 is the important stage for the learning of new conceptual science. Experience has shown (PARSEL project) that teachers need to be guided to appreciate how to move from stage 1 and into stage 2. The expected steps (considered within stage 1) are to:

(a) enable students to recognise that they can discuss little about the scenario without learning the underlying science ideas, and then;
(b) develop the scientific question(s) (by the students if possible, otherwise by the teacher guiding the students – trying hard to not tell), which are to be answered within stage 2.

Moving from the scenario to developing the scientific question is heavily dependent on the skill of the teacher. Collective teacher discussions, after teachers have tried out a module, can give strong consideration to the ways teachers have handled this component.

Undertaking stage 2

This is likely to be the stage where most of the module's teaching/learning time is spent and where students gain conceptually and also at a personal and social educational level (education through science). The approach here is one of maximising student-constructed learning (inquiry-learning or IBSE) and that the pace of teaching will depend heavily on students' skills, developed on prior occasions.

If students have much prior experience in carrying out process skills, then undertaking evidence-gathering learning (a key element within a scientific approach) will be much facilitated. IBSE can be expected to take far less time than in cases where students have not had prior opportunities for student-centred learning. There is a need to stress the importance of the evidence gathering aspects, whether by experimentation, or by other means.

Explaining inquiry learning

Teachers must have a clear notion of the intentions behind inquiry learning. This understanding must go beyond student attainment of manipulative process skills. The inquiry learning is intended to be student-constructed learning, with the teacher as facilitator. It is definitely NOT simply following a worksheet and recording a given answer.

The following are all very much part of IBSE (although not actually seen as process skills):

– identifying the science in a socio-scientific situation;
– putting forward scientific questions (questions that can be investigated scientifically);
– if necessary, breaking down questions into sub-questions that can be investigated separately.

Also, students can be expected to learn to use communication skills to

present their conclusions in suitable ways (written, oral, ICT) and, as appropriate, discuss the limitations associated with the solutions they reach in attempting to solve the problem (answers to the questions). Furthermore, inquiry learning is also very much interrelated with the development of social skills, especially interpersonal (student-student and student-teacher) developments and also personal skills, associated with aptitudes that support inquiry learning such as initiative, ingenuity, safe-working and perseverance.

Different degrees of student-constructed learning (within IBSE)

Although elements of IBSE are given above, teachers can undertake inquiry learning with their students in different ways. The ultimate goal is to enable students to undertake inquiry learning with no, or minimum, teacher interference (i.e. students undertake project work or 'open' inquiry). For that teachers will need to teach students to construct their thinking for the different stages of inquiry learning. And teachers must realise that the more practice students have in IBSE, the more easily and the more capable they will be in undertaking high levels of student-constructed IBSE. An example of the various stages (and sub-stages) that teachers can consider in planning specific IBSE experiences for students is illustrated by Smith (2011), who in turn modified that by Herron (1971), where 'given' means 'supplied by the teacher' and 'open' means 'supplied by the students.'

Level of Inquiry	Scientific Problem	Material/ Equipment	Planning/ Procedure	Answer/ Solution
*0**	Given	Given	Given	Given
1 Structured	Given	Given	Given	Open
2 Guided (option A)	Given	Given *(totally or maybe partly)*	Given *(totally or maybe partly)*	Open
2 Guided (option B)	Given	Open	Open	Open
2 Guided (option C)	Given	Partially given *(by providing a range of material that includes - as a subset - what is required).*	Open from pupils' perspective *(but given by teachers as the need to use materials as provided).*	Open
2 Guided (option D)	Partially open (given as broad parameters)	Open	Partially given *(e.g. through previous experience of controlling variables, analogy with other experiments or forms of investigation, but open in the sense of not being told what to do).*	Open
2 Guided (option E)	Open	Partially open *(this is what we have in the school)*	Open *(but teacher needs to be careful to check on safety aspects)*	Open
3 Open	Open	Open	Open	Open

*Cannot really be considered IBSE

Teachers need to recognise that progression through the approaches given in the paragraph above is NOT expected to be LINEAR. Thus the types within 2 and type 3 (open inquiry) will all depend on the module being promoted.

Preparing for stage 3

The solution to the scientific question, carefully detailed and recorded, is expected to be the gateway to stage 3. In stage 3, the science gained from the inquiry learning in stage 2 can be used to further consider the socio-scientific issue that was initiated in stage 1. A good approach for consolidating this science is to construct a concept map.

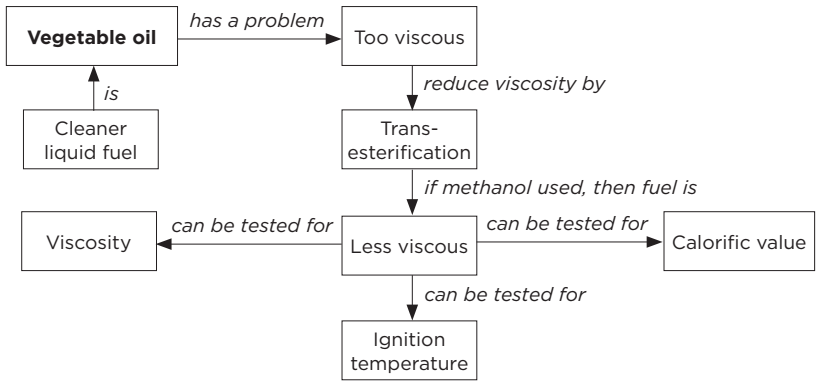
Creating concept maps

Stage 2 incorporates conceptual science learning. It brings in new science. To be useful, this science needs to be put into a scientific context and, in particular, interrelated with other science knowledge. Novak and Gowin (1984) have shown that scientific concepts can be interlinked by means of a concept map, based on a theoretical construct (Novak & Cañas, 2006). Compiling concept maps can be a useful assessment exercise in which students can illustrate their learning of scientific patterns – a valuable aspect in developing the science ideas further.

The width of the science teaching identified and promoted by the teacher (the range of scientific concepts) will depend on factors such as:

– the teacher's interest;
– the ability of the students;
– the level of interest which can be sustained by students, and, of course;
– external factors such as teaching time available.

An Example of a possible concept map for a PROFILES module related to Biodiesel



The module does not need to cover the conceptual science as per that indicated in the curriculum arrangement (or the textbook). A teacher always has the prerogative to determine the sequence (the curriculum should match the students; not the students struggling to match the curriculum!).

Undertaking stage 3

Stage 3 has two major components:

(a) To consolidate the science ideas introduced in stage 2. This is achieved by involving students in additional tasks (above and beyond the module) related to the concepts, preferable interlinking with the students' prior concepts which were identified in stage 1. These tasks may be presented in different formats e.g. oral discussions; answering written exercises; jigsaw method, etc.

(b) Utilise the science ideas gained, transferred to the original scenario situation, so as to enable students to discuss the scenario situation in more detail, using the newly acquired science. This is an important component of the learning and is expected to achieve two major learning targets (i) being able to transfer scientific ideas to a new, contextual situation, and (ii) participate meaningfully in a decision-making exercise to arrive at a justified decision related to the initial socio-scientific situation outlined in the title of the module.

Part (b) will involve student groups, or whole class interactions, in activities such as debates, role playing, or discussions. Students are expected to put forward their points of view, the teacher ensuring they incorporate the new science in a meaningful and *appropriately correct* manner. Students are thus involved in aspects of *argumentation*, as well as communicating the new science ideas in a *conceptually correct* manner. The end result is a set of small group decisions, or a consensus decision made by the class as a whole. The actual decision is not, in itself, as important as the justifications put forward, but would be expected to comply with social values accepted by the local society as a whole.

PROFILES Modules

The teaching approach is very much guided by the modules and the thrust is very much associated with the philosophy: from familiar to unfamiliar; social to scientific, social relevance to scientific conceptualisation. Student attitudes are thus of much importance and ensuring teachers do identify that motivation is being promoted and prolonged is a key component.

Modules do not explicitly indicate the various stages, often so as not to

convey to teachers and students that the learning is intended to be compartmentalised. Students are not expected to be aware of the 3 stages.

Structure of the modules

While the structure of these modules is not to be taken as an absolute, the following components are seen as important for the general approach to the development of modules: a frontpage; student activities or tasks; teacher's guide; assessment; background teacher notes (in science and pedagogy). They are further elaborated to appreciate their value and guide teachers in how best to make appropriate use of modules. Each component is described in turn. The following sub-sections explain further the structure of the modules as they actually appear.

The Frontpage

This is a double sided cover, attractively laid out to draw attention to the module title, a summary of the science content, as well as elaboration of the 'education through science' learning portrayed in the form of competences to be developed through the teaching using the module. The competences are important as they indicate the intended learning and hence the components that are to be assessed during the learning. As they are related to 'education through science', the competences go beyond knowledge and encompass skills, attitudes and value, relevant to the situation and the intended learning.

Student activities

In setting out the student activities, it is important to realise that this section is designed for the students. It directly involves the students in constructing their learning. Yet at the same time, it is not intended to take over from the teacher and dictate to the teacher how this aspect should be undertaken. With the recognition that the teacher needs to determine how the teaching should be conducted, the student activities as a single set and are not divided between the 3 stages, although the scenario is given. Also, although the student activities are listed, they are usually not explicitly supported by worksheets (worksheets, if provided, are purposely included in the teacher notes so that the teacher has the option of deciding whether they are appropriate for use or not).

Teacher's guide

Teachers need to recognise this as an important section in the module. It sets out to guide the teacher in appreciating the situation put forward by the designers of the module and the manner in which they intend the learning to develop. Nevertheless, the guidance given is advisory and it is expected that it can

be overridden by the teacher, as and when the teacher feels appropriate. Clearly the indicated freedom for the teacher is important, as the intention is to utilise 'relevance to the students' as a motivational factor and also to develop the learning in a constructivist fashion, based on the students' actual prior knowledge.

Assessment

In an 'education through science' setting, not all competences can be determined by using a pencil and paper assessment strategy. Furthermore, in new situations, it is valuable to determine and support student progress. This lends itself to formative assessment strategies and hence this section is intended to guide the teacher to develop this area. Once again, however, the suggestions are for guidance to suit the circumstances and not for the teacher to follow without modification. It is noteworthy that teachers had difficulty with formative assessment ideas during the PARSEL project (www.parsel.eu) and this aspect may need to be introduced to teachers slowly over much time and teachers being permitted to discuss among themselves at length.

Teacher notes

This section, which may or may not be present, is for additional supporting material that can be offered to the teacher to assist the teaching. Noting the inter-disciplinarity of modules, this section can provide notes on the wider science content which may be unfamiliar to the teacher, suggested worksheets for students, provide answers to questions raised in the student activities, or detail experimental and safety aspects.

Conclusion

PROFILES is an ongoing project. The impact of the project so far, in promoting innovative teaching and the incorporation of the PROFILES ideas, is illustrated in the following articles and in other publications (Bolte, Holbrook, Mamlok-Naaman, & Rauch, 2014; Bolte, Holbrook, & Rauch, 2012; Special issue of Science Education International – accessed on www.icaseonline.net/seiweb). Access to PROFILES modules is via the project website www.profiles-project.eu, or the local websites of the partners.

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Biographical note

Jack Holbrook, visiting professor in science education at the University of Tartu, was educated in the UK and obtained a PhD in Chemistry from the University of London. He was a secondary school science teacher before moving into teacher education in various countries. He is also a freelance international consultant in science education, curriculum and assessment. He is a past president of ICASE (international council of associations for science education), journal editor and chair of the international projects committee. Jack is a major instigator in developing the PROFILES project ideas.

Miia Rannikmäe is professor and chair of the Centre of Science Education, University of Tartu, Estonia. She teaches science education at the M.Ed and PhD levels and runs a number of research projects. She has published extensively in science education journals, particularly in the field of scientific and technological literacy. Miia is chair of the University liaison committee for ICASE and an active member of the local chemistry teachers association. She is a workpackage leader for the European Commission, FP7 PROFILES project.

Promoting Societal-Oriented Communication and Decision Making Skills by Learning about Advertising in Science Education

Nadja Belova[1] and Ingo Eilks*[2]

In our everyday lives we are surrounded by advertising in its various forms. Thus in the school context it is not surprising that the issue of advertising is addressed by different subjects, with the main foci being advertising-specific language, images and illustrations, use of stereotypes, strategies of persuasion etc. But advertising also contains factual information, being explicit or implicit, to make a campaign more credible and underline the effectiveness of a certain product. Dealing with the use of factual information in advertising critically is important for the consumer. For many products this information is derived from science and technology. Understanding the science in and behind advertising is necessary to become a critical consumer. Learning about the use of science in advertising also allows promoting societal-oriented communication and decision making skills in the science classroom. Unfortunately, only a few examples on the use of advertising in the science classroom exist. This paper provides a justification for the use of advertising in science education. Examples from the classroom developed in the framework of the PROFILES-project are provided by way of illustration.

Keywords: Science education, Science-technology-society, Socio-scientific issues, Communication skills, Critical media literacy, Advertising

1 PhD student at the University of Bremen, Germany
2 *Corresponding Author. Institute for Science Education, University of Bremen, Germany; eilks@uni-bremen.de

Promoviranje družbeno usmerjene komunikacije in sposobnosti sprejemanja odločitev prek učenja o oglaševanju v naravoslovnem izobraževanju

Nadja Belova in Ingo Eilks*

V vsakodnevnem življenju smo obkroženi z oglaševanjem v različnih oblikah. Tako ni presenetljivo, da je v šoli oglaševanje obravnavano pri različnih predmetih; obravnavajo pa se predvsem: specifičen jezik oglaševanja, podobe in slike, uporaba stereotipov, strategij prepričevanja … Vendar oglasi vsebujejo tudi dejanske podatke oz. informacije, ki so eksplicitno ali implicitno podane; z njimi skušajo podkrepiti kredibilnost in poudariti učinkovitost nekega izdelka. Kritično analiziranje podatkov, informacij v oglasih, je za potrošnike pomembno. Veliko teh podatkov oz. informacij je pogosto pridobljenih iz naravoslovja in tehnologije. Da bi postali kritični potrošniki, je pomembno razumevanje naravoslovja v oglaševanju. Učenje o uporabi naravoslovja v oglaševanju pripomore tudi k promoviranju družbeno usmerjene komunikacije in sposobnosti odgovornega odločanja v razredu. Žal poznamo le nekaj primerov uporabe oglaševanja v naravoslovnem poučevanju. V prispevku argumentiramo upravičenost uporabe oglaševanja v naravoslovnem izobraževanju. Prikazani primeri so nastali v okviru projekta PROFILES.

Ključne besede: naravoslovno izobraževanje, naravoslovje – tehnologija – družba, socionaravoslovne teme, sposobnost komuniciranja, kritično presojanje medijev, oglaševanje

Background

For the first time ever, nationwide standards for lower secondary science education were applied in Germany in 2004 (KMK, 2004). The standards led to various reforms and initiated constant debate about curricula and pedagogies appropriate for science education. More student-centred and inquiry-based science teaching, methodological variety, and a more thorough use of meaningful contexts to promote more effective and situated learning were demanded. Part of this movement is a stronger focus in science education on promoting general educational skills which has parallels in many countries, especially with a focus on preparing the young generation for their life today and in the future in a changing world (Aikenhead, 2007; Burmeister, Rauch, & Eilks, 2012; Roth & Lee, 2004).

A greater societal orientation of science education is suggested for better preparing students for living in society (Elmose & Roth, 2005; Hofstein, Eilks, & Bybee, 2011; Ware, 2001) and to raise their perception of relevance of science education (Fensham, 2004; Lee & Erdogan, 2007; Stuckey, Hofstein, Mamlok-Naaman, & Eilks, 2013). There is a need for change towards more societal-oriented science education and a more thorough focus on argumentation and decision-making skills gains growing support from different theoretical resources. In the German-speaking realm, this view coincides with the concept of *Allgemeinbildung* (Hofstein et al., 2011; Marks, Stuckey, Belova, & Eilks, 2014), defined as the educational upbringing of students to be responsible citizens characterized by the abilities of self-determination, participation, and solidarity in a democratic society (Klafki, 2000). This specific German view is in accord with an understanding of scientific literacy as being multidimensional (Bybee, 1997), or rethinking traditional science education from a "*Science through Education*" approach, in order to adapt science lessons into a program of "*Education through Science*" (Holbrook & Rannikmäe, 2007) – as it is represented also be the "ES" in the acronym PROFILES. But even though the debate in Germany has been going on for almost ten years now, learning about the interrelationship between science and society seems still to be insufficiently implemented; this is also the case for other countries, as discussed by Hofstein et al. (2011).

In the German Federal State of Bremen, the science education debate came to a climax when a new type of secondary comprehensive school, the "Oberschule", was recently implemented. In this context science was transformed into an integrated subject for students from grade 5 to 8 (age 10-48 14) where Chemistry, Biology and Physics formerly were taught as being three separate subjects. The new governmental science syllabus has now been structured

by different contexts which should promote student-active and problem-based learning. A thorough societal orientation has also been emphasized. As a consequence, teachers were not only supposed to deal with a new type of school but also with a new subject and curriculum. For that reason the continuous professional development (CPD) program in Bremen, operated within the framework of the EU-funded project PROFILES (Bolte et al., 2011), focused on "Oberschule" teachers. PROFILES in Bremen undertook an Action Research driven development as a strategy for teachers' CPD, aiming at implementing inquiry-based and societal-focused science education (Schindler et al., 2014). Part of the development focuses on the use of advertising in science education.

A theoretical framework for operating advertising in science education

Within the framework of more societal-oriented science education one sub-set of innovations focuses the use of socio-scientific issues (SSI) in the science classroom (Sadler, 2004, 2011; Zeidler, Sadler, Simmons, & Howes, 2005). SSI's should not only serve as a motivating context for science learning, but also as a catalyst to promote general educational skills through science education, especially argumentation and decision making skills (Albe, 2008; Simon & Amos, 2011).

The SSI-movement in science education has emerged from different curricular approaches, especially the Science-Technology-Society framework (e.g. Solomon & Aikenhead, 1994; Yager & Lutz, 1995). In recent years, this movement has suggested that students need to learn more intensively about how science is interacting with society and its related problems (Sadler, 2004). In a democratic society, every citizen is asked to contribute to the respective debates and decisions, even if the citizen is not an expert in science or technology (Hofstein et al., 2011). Learning about the use of science in societal debates should be seen as important to enable learners to become future responsible citizens (Roth & Lee, 2004). Students should learn to cope with their life individually within the society in which they live, but also to participate actively in societal discourse concerning SSIs (Sjöström, 2011).

Within the SSI-based science education movement some ten years ago, the socio-critical and problem-oriented approach to science education was developed in Germany (Marks & Eilks, 2009; Marks et al., 2014). Today, the approach and its corresponding curriculum model has been introduced in a large variety of different lesson plans for science education, e.g. on low-fat- and low-carb diets (Marks, Bertram, & Eilks, 2008), musk fragrances in shower gels (Marks &

Eilks, 2010), the use of bioethanol as an alternative fuel (Feierabend & Eilks, 2011), or the evaluation of conventional and alternative sorts of plastics (Burmeister & Eilks, 2012). The socio-critical and problem-oriented approach to science education focuses on increasing learners' motivation and perception of relevance in science teaching, as similar approaches do (Osborne, 2003; Holbrook & Rannikmäe, 2010). It attempts to explicitly prepare students for understanding and taking part in societal consensus-building and decision-making processes on techno-scientific queries as suggested by e.g. Feierabend and Eilks (2011) or Burmeister and Eilks (2012). The approach attempts to construct a consistent curriculum model to operate SSI-based science teaching and is operated using a five stage model for each of the curriculum units (Marks & Eilks, 2009), which has parallels to the three-stage model by Holbrook and Rannikmäe (2012) described in the theoretical framework of the PROFILES-project.

In this curriculum model, the introduction to the topic is undertaken by the use of authentic media artefacts, e.g. newspaper articles, brochures printed by pressure groups, reports broadcasted by TV stations, and of course advertising. The topics need to allow for real decisions to be negotiated. Issues are inappropriate whenever only one-sided solutions are possible or which are not openly debatable due to scientific, ethical, or sociological reasons (Marks & Eilks, 2009). Activities within the lesson plan challenge the students to make up their own minds and express their opinions on the topic in an open forum. Such conditions make it possible to express one's personal point-of-view without being judged, censored or condemned as an outsider by the rest of the group. The reflection on how society is handling and evaluating the SSI is undertaken by mimicking an authentic societal practice of dealing with respective issues. Different methods are suggested, which allow contrasting societal perspectives on the topic and societal decision making processes. These can include conventional elements like role-playing and business games (Feierabend & Eilks, 2011) or more innovative pedagogies as working like a journalist (Marks, Otten, & Eilks, 2010), a professional product tester (Burmeister & Eilks, 2012), or advertiser (Stuckey, Lippel, & Eilks, 2012).

In the German national standards for science education at the lower secondary level, two of the four domains of competencies, which students are asked to develop, are evaluation and communication competencies. Communication – in particular argumentative communication – is the essential mediator of discourse and debate in society (Nielsen, 2013). Debate in society takes place in public discussions, parliaments, the Internet, other mass media, or personal communication. It is influenced by communications in newspapers, digital media, publications by interest groups and political stakeholders, and certainly

advertising. The individual as a responsible citizen has to have skills to evaluate and to respond to this kind of information to make up her or his mind and to participate in the debate – both with the presented information as well as with the way the information is presented to him (Hofstein et al., 2011). Dealing with advertising in the science classroom, therefore, is necessary to show the students how this medium deals with scientific information and how it presents this information to the public. Furthermore, advertising itself is a very special form of mass communication (O'Guinn, Allen, & Semenik, 2012), which students need to learn to understand.

What is special about advertising is that, besides being used as a medium for learning ("learning *with* advertising"), it can also be the SSI itself ("learning *about* advertising"). Not only can we motivate certain scientific topics with appropriate advertising, we can also discuss the scientific information used in advertising, how it is presented, which effect it has on the credibility of the advert, whether wrong and misleading information is used, etc. Recently Stolz, Marks, Witteck and Eilks (2013) and Eilks, Nielsen and Hofstein (2014) suggested five criteria, in an operationalized form, to justify whether a topic from society might become a good classroom context to promote general educational skills in the framework of SSI-teaching. These criteria can be well applied to advertising, justifying advertising itself to be a good SSI for the science classroom, as it is outlined in Table 1.

Table 1. *Criteria for reflecting potential topics with respect to the socio-critical and problem-oriented approach to chemistry and science teaching, illustrated using the example "Advertising".*

Criterion	Description and testing	Example: "Advertising"
Authenticity	The topic is authentic, because it is currently being discussed by society. *Test*: The topic is checked for media presence in the everyday newspapers, magazines, TV, advertising, etc.	Advertising is all around us. We are confronted with various forms of advertising daily (print, TV, internet etc.). Misleading advertising or false promises is a frequent cause of discussion in society. Many adverts are directly aimed at young people.
Relevance	The topic is relevant, because any societal decision in this area will affect the current or future lives of our students. *Test*: Scenarios on potential societal decisions are tested to see which options emerge for individuals to decide for themselves in the sense of consumption and behavioral choices.	Political decisions on advertising (like the recent EU regulation on health claims) affect the way a product is presented to the consumers and therefore impacts the consumption choices of the individual.

Open evaluation situation with respect to a societal relevant question	Societal evaluation is open and allows for different points-of-view. *Test*: Everyday life media is analyzed out to see if controversial viewpoints are represented (by special interest groups, the media, politicians, scientists, etc.).	The public discussion about advertising is strongly dominated by stakeholder groups (companies, consumer protectors, politicians, etc.). The debate centers around advertising laws and regulations being too strict or too permissive concerning the gap between consumer information and manipulation.
Allows for open discussions	This topic is able to be discussed in an open forum. *Test*: Thought experiments are used to test opinions stating various points-of-view. The resulting arguments are checked to make sure that no individuals, religious or ethnic groups would feel themselves to be insulted or pushed to the fringes of society by their use.	It is possible to discuss the legislation around advertising in the public forum. EU-politicians, industry representatives and consumers discuss this topic from wide-ranging, controversial viewpoints. Should advertising take more responsibility with respect to its societal influence? How do companies use loopholes in the legislation for misleading advertising? In which way are studies that prove the effectiveness of a product conducted?
Deals with an issue based on sciences (chemistry) or technology	This topic concerns itself with a techno-scientific query, which contains scientific facts and the networks between them at its most basic level. *Test*: Discourse in the media is analyzed. The question is raised, whether scientific concepts are addressed and either explicitly or implicitly used for argumentation.	Advertising for many everyday-life products uses scientific information to show how effective a product is, e.g. in domains like cosmetics, foods, mobility, or cleaning agents. While new products are developed with the participation of scientists, advertising agencies often don't employ experts in the fields of science so the information is often presented in a distorted, simplified, whitewashed, or misleading way.

Speaking about scientific information, one has to be aware that the information presented to us through different channels is no longer authentically scientific, whether the source is TV, radio, newspapers, brochures, or advertisings (Eilks et al., 2014). Every citizen is confronted with this kind of altered information, or better named 'filtered' information (Hofstein et al., 2011). Everyone has to deal with it and make up her or his mind. In other words, for every non-scientist, the way suitable information for understanding a socio-scientific issue takes is very long and indirect. In a series of single steps, the original information is processed and filtered from one domain to another, but also within the domains. This is done by individuals or groups through processes of selecting, simplifying, and interpreting the information in each of these steps. This process is illustrated by Eilks et al. (2014) through a model shown in Figure 1.

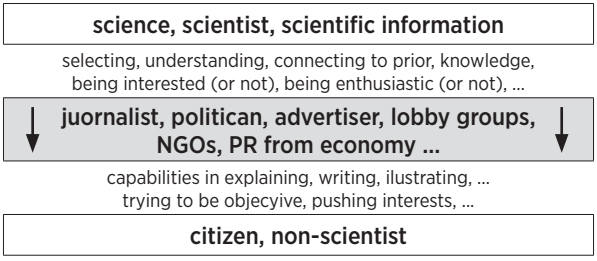


Figure 1. The doubled filtering process of scientific information transfer.

The further we move from science towards everyday life, the more the information most probably is filtered and altered. The further we leave the domain of authentic science itself, the greater the chance that the persons involved do not apply comprehensive subject matter knowledge necessary for securing reliability of the information transfer. As a result, the interaction with science-related information in everyday settings does not just need a simple evaluation of the pertinent scientific facts. Frequently, it is just as – if not more - important to understand which pathway the information followed and which interests have played a role in its transfer.

In the case of advertising, one can certainly assume that any information used will be very strongly filtered. To begin with, advertising slogans or spots are, in most cases, very short. The information provided and the whole setting must convince the consumer to buy the product, and of course the main interest is not objective product information. Figure 2 shows the filtered-information-model adapted for advertising. One can see that the actors involved are not science experts, even if bigger advertising agencies sometimes also employ experts from the natural sciences or technology. As evidence for a lack of expertise, advertisements often contain scientific information that is simply wrong. A prominent example is a big German cosmetic corporation that recently launched a campaign for a deodorant containing "silver molecules." After several months of heavy broadcasting, a critical response grew on the internet and the slogan was changed to "silver ions."

Seen altogether, we have shown the movement of SSI-based science education and the model of a socio-critical and problem-oriented approach to science teaching (Marks & Eilks, 2009) with its parallels to the PROFILES three-stage-model for curriculum modules (Holbrook & Rannikmäe, 2012). Together with the ideas of mimicking authentic societal practices and filtered information to learn about science-related information transfer and use in society, we have illustrated a substantive framework that justifies interaction with advertising in science education, both from a scientific and societal view.

Figure 2. The doubled filtering process of scientific information transfer in advertising.

Learning about advertising in science education – scenarios and examples

Only very little can be found in the literature on the use of advertising in science education. In the case of Germany, a thorough literature review of educational journals from all available domains showed that advertising is primarily a topic of language education (Belova & Eilks, 2014). The main foci lie in advertising language, cultural references in advertising and stereotypes. A search in the NCTE-database (National Council of Teachers of English) showed similar tendencies for English language education in the US, although most of the papers dated back to the 80s (e.g. Frazier et al., 1985). UNESCO emphasizes the language aspect in learning about advertising, too, even defining "advertising literacy" as a part of media literacy (UNESCO, 2011). The UNESCO curriculum also addresses the role of commercial forces in the media landscape in general, advertising placement and regulations, political advertising, the evaluation of claims, as well as advertising design (UNESCO, 2006, 2011). However, in all the literature, there is a lack of a perspective on the factual content and its reliability. Though terms, like "misleading claims," do appear in UNESCO curricula, these are not connected with a reflection on the use of any scientific information and background.

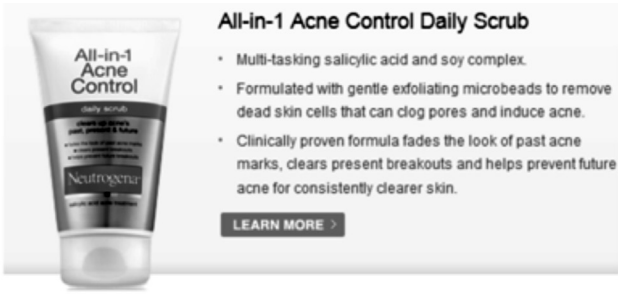
Only very few science education papers were found dealing with aspects of advertising. In the case of Germany, advertising so far is only suggested to play a role as an introduction to a certain topic, a data- provider for tasks, or an inducement for experiments where claims have to be experimentally tested (Belova & Eilks, 2014). In all these cases, advertising is used to contextualize science learning, a reflection on advertising itself is rarely put into question. Also, in the international literature, there are very few papers on advertising

in the science classroom. Scheibe and Rogow (2012) provide rough teaching ideas on advertising in their book on media literacy. They suggest, namely, the examination of advertising and other media, in relation to the image of science, or experimental testing of scientific claims. McSharry and Jones (2002) also suggest the potential of advertising for science education and conclude that it is a very fruitful medium in the science classroom, but also without specific teaching ideas. Only very few ideas go further. For example, Stuckey et al. (2012, 2014) reported the motivating potential of chemistry lessons on sweeteners in which the students are supposed to create an advert themselves and reflect on the role of the scientific information involved (also with respect to a certain target group).

Based on the existing literature, Belova and Eilks (2014) suggested four potential scenarios for including advertising in the science classroom. The scenarios differ in their complexity and contribution to critical media literacy:

Motivation and illustration: Advertising is used as an illustrative opening towards a new topic with advertising being mainly used for motivation purposes. An example for this scenario is discussed in Stolz et al. (2013) and concerns a lesson plan on doping in chemistry education. A print advertising on shampoo against hair loss is used which is described as "Doping for the hair." The advertising is used to introduce the term "doping" and to motivate the students to think about it. The advertising itself is not further discussed in the lessons since the lessons take another focus.

Contextualization for scientific inquiries and tasks: In this case, advertising is used to contextualize scientific inquiries and learning. Advertisements are used to provoke science-related questions and inquiries which often result in experiments (e.g. von Borstel, Böhm, & Hahn, 2006). From the advertising, the students are asked to formulate questions on the reliability of the given claims and then to develop scientific inquiries to answer them. An example is presented in Figure 3. Similar uses are described in the case of mathematical tasks in physics education by Vogt (2011).



A scrub is a cosmetic product which helps to remove dead skin cells. Scrubs sold in drugstores are mostly mechanical scrubs. That means that they contain small particles which clear the skin. In advertisings it is often promised that a scrub is very gentle and can be used even daily, even if the skin is sensitive. So is your scrub really that "gentle"? Simple tests will help you to find out.

1) **Apply a pea-sized amount of the product on a spot plate and determine the pH-value of the product with the help of indicator paper. Compare this value with the pH of your skin.**
2) **Put on a thin layer of scrub on a slide and look at it under the microscope. Can you see the solid particles? Describe what you see!**

Figure 3. An experimental task on facial scrub advertising. The students are supposed to confirm the slogan stating that the product is very "gentle" and can be used every day. (Image taken from www.neutrogena.com)

Reflecting the role of how science-related information appears in advertising: This approach suggests analysis on how science and technology-related factual content appears in advertisements. The reflection concerns the intention of using science-related information in advertising to support claims, but also how they might contribute to misleading or suggestive advertising, by truncated, falsified, or false scientific information. An example for this role can be found in Jungbauer (2009) who suggested reflecting advertising, in which health supporting claims are not sufficiently evident.

Meta-cognition on the interplay of science and advertising: In this approach, a thorough socio-scientific skills-oriented perspective is suggested. This perspective puts the interaction of science and technology with advertising into focus and thus includes questioning the transfer of information about science and technology to advertising. The difference that makes this role most relevant for multidimensional media literacy is that advertising itself, the development of it, and the principles behind it are addressed explicitly and connected with the scientific content. One example is described by Stuckey et al. (2012). They suggest a chemistry education module where the students themselves create advertising in order to question what kind of role subject-related information can (and should) play (possibly considering a specific audience).

Implementing advertising into science education within PROFILES Bremen

Inspired by the lesson plan by Stuckey et al. (2012), pedagogies and further examples on the use of advertising in science education were developed by groups of teachers within the PROFILES project in Bremen. The development took place with teachers, in cooperation with science educators, following the model of Participatory Action Research in science education, as suggested by Eilks and Ralle (2002). One of the pedagogies developed within this framework was the so-called "advertising method." Students receive pre-selected information about a product. The first step is to sort the information into positive and negative information – scientific-technical (using scientific knowledge) and other (such as economic). Based on the analysis of the information, the students, in small groups, create their own advertising. They select potentially the most fruitful set of information concerning a product for a certain target group. During the presentation of the advertisements created, the students reflect on which advertisements are the most convincing and for what reasons. It is discussed whether inclusion of scientifically-based information is reasonable in an advertisement for a specific target group and whether this might be a different case for different products and target groups. From the practical implementation, such an activity was seen as very motivating and led to intense discussions. An example for information on natural cosmetics is shown in Figure 4.

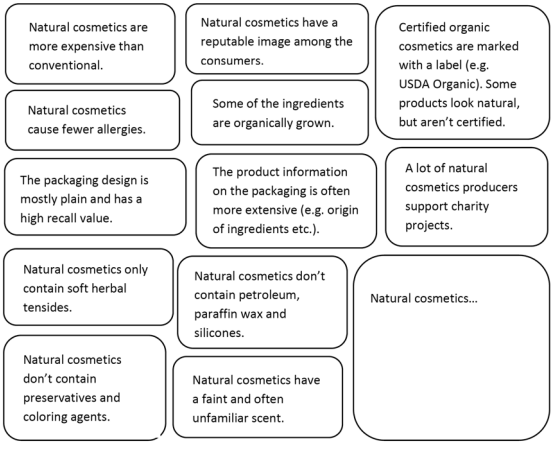


Figure 4. Possible pre-selected promotional information about natural cosmetics. The students evaluate the statements on their suitability for advertising. First, negative or potentially negative statements have to be sorted out. Of the positive or apparently-positive statements a selection must be made with regard to the target group.

Another method was also developed: "reflecting slogans" (Eilks et al., 2012). In this method, the students receive a selection of real slogans for a specific product. Along three scales, the students evaluate these slogans, namely regarding credibility, attractiveness, and its relationship to the scientific information behind them (using their gained science knowledge). The students realize the different perceptions in different advertising slogans. Discussion is initiated on which of the slogans are based on scientific facts, or address scientific thinking (based on prior science conceptualisations). Reflected also is the role science-based information plays, how it is selected and displayed, and whether it affects the credibility and/or attractiveness of advertising in a positive or negative way. An illustration of this method is given in Figure 5.

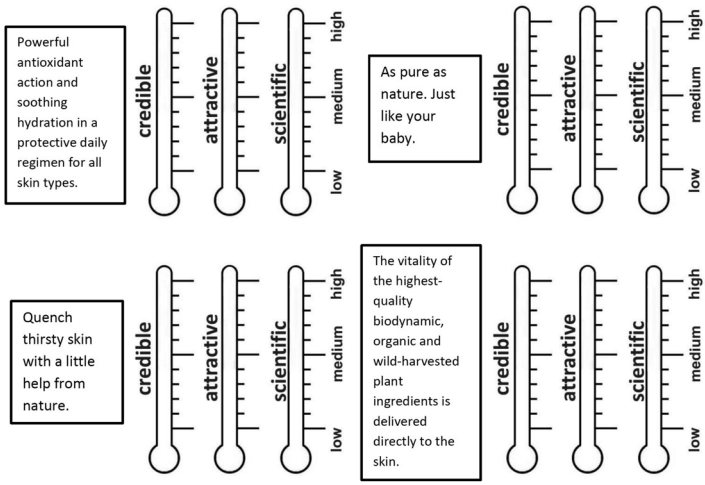


Figure 5. Advertising slogans for natural cosmetics (excerpt from a corresponding worksheet). The students evaluate the credibility, attractiveness, and science relatedness of advertising slogans.

A combination of different activities on advertising in science education was also developed as a case study within PROFILES, on a lesson plan on cosmetics (Stuckey et al., 2012). In this, advertising is first of all used as an authentic and motivating introduction to the topic, but this time, also, as a starting point for scientific inquiry. The students are confronted with slogans like "pH-neutral," or "skin friendly" and inquire into their meaning through different experiments (which may be suggested by the students). The authentic advertising at the beginning is used for motivation for the topic. Slogans contextualize scientific inquiry on cosmetic products. Finally, reflection on information like

"pH- neutral" and "skin friendly" are discussed to decide whether they are scientifically reliable for the cosmetic products and why they are used.

However, the module also incorporates a fourth scenario. In the practical work, the students make their own cosmetic product, a body lotion. At the end of the module, the students develop an advertising campaign for their self-made product. To aid this, the students watch different TV spots on related products, which are judged with the help of a list of criteria (Figure 6). The criteria raise the students' awareness for scientific aspects in advertising and help them set priorities in their own advertising. At the end, the advertisements are produced, compared and discussed as indicated above.

Product / Criterion	A:	B:	C:
General			
Do you know the brand?			
Do you know the product?			
Have you used the product before?			
Scientific aspects			
Scientific terms in the advert			
Scientific terms in the packing			
Scientific images/charts/graphs in the advert			
Study results in the advert			
Study results on the packaging			
Survey results in the advert ("9 out of 10 women ...")			

Figure 6. Criteria for judging scientific aspects in the presentation (advertising, packaging) of a product (excerpt from the corresponding worksheet).

Implications

More than a decade ago, McSharry and Jones (2002) concerning science in advertising draw a fairly harsh conclusion:

> "*The majority of people watch television and buy products which are advertised on it, but do not realize that these products are science-based. […] If the great majority of people are unable to relate their own experience to forms of science then science education has failed to provide them with a great deal of useful information for their lives.*"

Until today, the issue of advertising is underrepresented in the science education literature, although other media types are more and more widely used in the science classroom. E.g., news from newspapers, television, as well

as from the Internet, are often suggested when it comes to science educations' contribution to media literacy. Being capable of engaging with, and arguing about, science-related news critically is seen as a requirement for being a modern citizen (Elliott, 2006; Hodson, 2008; McClune & Jarman, 2010). Fictional television shows with a scientific background, as well as documentaries or writing news about science, are also suggested for implementation in schools (Dhingra, 2003; Marks, Otten, & Eilks, 2010).

This paper suggests that the use of advertising in science education can contribute the development of a multidimensional scientific literacy. This paper shows that its application can be well justified and conducted in multiple ways. Objectives encompass both focusing scientific inquiry and content knowledge, but also contributing to critical media literacy, as well as socio-scientific communication and decision-making skills. Advertising is a highly authentic and in many cases also motivating medium. Dealing with advertising opens up new opportunities for social contextualization in the learning of science and technical content. Innovative and student-oriented pedagogies, some of which are presented in this paper, can help counteracting the lack in the perception of relevance among students in the science subjects. First trials of using advertising in the science classroom within the PROFILES project show intense discussions and high student motivation (Stuckey et al., 2012).

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Biographical note

Nadja Belova, M.Ed., studied chemistry, German language teaching and education. Since 2011 she is a PhD student at the University of Bremen, Germany. Her research work is about learning with and about advertising in science education.

Ingo Eilks, Prof. Dr., FRSC, was a secondary school teacher in chemistry and mathematics. Since 2004 he is a professor in chemistry education at the Institute for Science Education at the University of Bremen, Germany.

Investigating Preschool and Primary School Teachers' Self-Efficacy and Needs in Teaching Science: A Pilot Study

Susanne Walan[1] and Shu-Nu Chang Rundgren*[2]

In recent years, the curricula reforms at the levels of preschool and primary school in Sweden have caused new demands on the teachers. In particular, numerous teachers lack the educational training in science subjects. Therefore, this study aims to investigate teachers' self-efficacy and needs in relation to science teaching. A total of 71 teachers, divided into three groups of preschool, 1-3 grades and 4-6 grades, were invited to join this pilot study. From the EU FP7 project, PROFILES, a Likert scale questionnaire (with scores from 1 to 3 to represent *strongly disagree*, *agree* to *strongly agree*, and *I don't know* was scored 0) was used and revised for the data collection in this pilot study. The results showed that the participating teachers had relatively high self-efficacy and no significant differences were found among the three groups of teachers. However, even though the teachers had high self-efficacy, the needs of further education were expressed by the teachers to a large extent. In particular, the group of preschool teachers addressed the need for more content knowledge (CK) in physics and chemistry (>41%). In terms of the groups of 1-3 and 4-6 grades teachers, the needs relating to scientific literacy were revealed, with a focus on engaging students in socio-scientific problems (52%, 56%) and assessment (44%, 61%). The implication of this study is discussed in the hope to contribute to teachers' professional development for both pre- and in-service teachers in science education.

Keywords: Preschool, Primary school, Science, Self-efficacy, Teacher's need

1 PhD student, Department of Environmental and Life Sciences, Karlstad University, Sweden
2 *Corresponding Author. Department of Engineering and Chemical Sciences, Karlstad University, Sweden; shu-nu.chang-rundgren@kau.se

Preučevanje učiteljeve samoučinkovitosti in učiteljevih potreb pri poučevanju naravoslovja v predšolskem in osnovnošolskem izobraževanju: pilotna študija

Susanne Walan in Shu-Nu Chang Rundgren*

V zadnjih letih so učitelji na Švedskem zaradi kurikularnih reform na področju predšolskega in osnovnošolskega izobraževanja postavljeni pred nove zahteve. Konkretneje – veliko učiteljev ima primanjkljaj na področju naravoslovnih predmetov. Namen raziskave je preučiti samoučinkovitost in potrebe učiteljev, povezane s poučevanjem naravoslovja. Vključenih je bilo 71 učiteljev, ki so bili razdeljeni v tri skupine – učitelji v predšolskem obdobju, učitelji, ki poučujejo v prvih treh razredih, in učitelji, ki poučujejo od 4. do 6. razreda. Podatki so bili zbrani s pomočjo vprašalnika Likertovega tipa (od 1 do 3 – se nikakor ne strinjam, se strinjam, se popolnoma strinjam; 0 – ne vem), ki je bil pripravljen za projekt PROFILES (EU FP 7), in sicer z dopolnitvami za to raziskavo. Izsledki so pokazali, da imajo učitelji, ki so sodelovali, sorazmerno visoko raven samoučinkovitosti, med skupinami pa ni bilo statistično pomembnih razlik. Kljub temu pa je bila potreba po nadaljnjem izobraževanju močno izražena. Podrobneje – predšolski učitelji so izrazili potrebo po več strokovnega znanja na področju fizike in kemije (> 41 %). V drugih dveh skupinah se je potreba pokazala pri vsebinah, povezanih z naravoslovno pismenostjo: vključevanje učencev v družbeno-naravoslovno problematiko (52 %, 56 %) in vrednotenje (44 %, 61 %). Uporabnost izsledkov študije je podana z namenom prispevka k profesionalnemu razvoju študentov in učiteljev naravoslovnega izobraževanja.

Ključne besede: predšolsko obdobje, osnovna šola, naravoslovje, samoučinkovitost, učiteljeve potrebe

Introduction

Developing teachers' professional knowledge, which includes content knowledge (CK), pedagogical knowledge (PK) and pedagogical content knowledge (PCK), has been addressed during past decades (e.g. Shulman, 1986; Bergqvist, Drechsler, de Jong, & Chang Rundgren, 2013). Researchers especially emphasized the role of the teacher as one of the critical factors in relation to students' achievement (e.g. Goodrum, Hackling, & Rennie, 2001; Hattie, 2008; McKinsey, 2007). In line with the importance of developing teachers' professional knowledge and the importance of the teacher's role, a great need has been identified to improve teachers' CK and PCK in preschool and primary school in Sweden (Nilsson, 2008a, 2008b), especially since there have been recent curriculum reforms for both preschool (Lpfö 98, revised 2010) and primary school (Lgr 11) (Swedish National Agency for Education, 2011a, 2011b). The new primary school curriculum has embedded the perspectives of science education, in which students skills in making socio-scientific decisions has been stressed. Besides, science was treated as one subject in the earlier versions of curricula, but now, science has been divided into biology, chemistry and physics. Accordingly, it was not hard to perceive that the demands on teachers have been increasing in Sweden. Similar situations were also reported in other countries. Researchers found that teachers at 1- to- 6-grade levels, either lacked educational training in science, or had received only a small part of science training in their earlier teacher education programs and this had been shown to reflect in the teachers' low self-efficacy (Appelton, 1995, 2006; Hackling, Peers, & Prain, 2007; Palmer, 2001; Riggs & Enochs, 1990; Yates & Goodrum, 1990).

Based on the above-mentioned important role of teachers and the need for developing teachers' PCK and CK, this study aims to investigate teachers' self-efficacy and needs in science teaching. Preschool to primary school teachers were invited to express their self-efficacy concerning aspects of scientific literacy, the current curriculum at each level and arrangements for a student learning environment in science subjects. A Likert scale instrument, developed by EU FP7 project, PROFILES (Grant No. 266589), was revised according to the Swedish context and the related educational levels in this study.

Background

Self-efficacy is defined by Bandura (1993) as a person's belief in an ability to succeed in a particular situation. According to Bandura (1993), self-efficacy determines how people feel, think, behave and motivate themselves, and

he also indicates that individuals with a strong sense of self-efficacy can view difficult tasks as challenges and try to deal with the difficult tasks rather than avoid them. He also claims that there is a marked difference between possessing knowledge and skills and being able to use them well. It means that even if people have the same knowledge and skills, they may perform differently, depending on their self-efficacy (Bandura, 1993). According to Bandura (1993), self-efficacy is mainly about teachers' beliefs in how they can motivate themselves in promoting students' learning.

In the literature, numerous researchers discuss teachers' confidence (e.g. Anderson, Bartholomew, & Moeed, 2009; Harlen & Holroyd, 1997; Nilsson, 2008a), but no definitions are put forward to differentiate the concepts of self-efficacy, self-confidence, or confidence. However, Hackling and colleagues (2007), in their study, evaluate primary teachers' confidence and self-efficacy. According to Hackling (an e-mail communication dated 2013-08-27), self-efficacy is a belief about the effectiveness of teaching, whilst confidence for teaching science is a more general attitude and disposition towards teaching science. In this study, we see self-efficacy as competence and confidence defined by PROFILES project and we tested teachers' beliefs about the effectiveness of their organization while teaching science, which is also in line with Hackling's point of view. Also, we want to reveal how teachers feel, think, behave and motivate their science teaching, based on the definition presented by Bandura (1993), not simple as a general attitude.

The curricula reforms for preschool and primary school and the influence on teachers

In 2010, the Swedish curriculum for preschool education was revised (Swedish National Agency for Education, 2011a). The revision introduced goals of embedding science and technology at preschool level. Since the earlier teacher education programs for preschool teachers did not include science as a compulsory part, current in-service teachers might be expected with the lack of educational training associated with science subjects (i.e. Biology, Chemistry and Physics) and hence a professional development might be needed. This situation is not unique to Sweden. In Australia and New Zealand, research shows that preschool teachers' lacked scientific knowledge, which has caused a great impact on the degree of science content included in the teaching in preschools (Fleer, 2009; Garbett, 2003).

Roehring, Dubosarsky, Mason, Carlson and Murphy (2011) claim that science is often avoided during early childhood education. For example, in

their study, the reasons provided by early childhood teachers for the exclusion of science were: teachers' own science anxiety and their low self-efficacy with respect to teaching science. The same phenomenon was reported by Greenfield and his colleagues (2009). There was a concern on how to tackle this problem? Yoo (2011) indicated that science teachers at the early childhood stage needed to develop positive attitudes toward science teaching and enhance their practical knowledge so that science could be brought into the classroom. Gropen, Clark-Chiarelli, Chalufour, Hoisington and Eggers-Pierola (2009) described a three-year study working with preschool science teachers where they showed that a strong impact was from developing teachers' knowledge and practices towards improving four-year-olds understanding of basic physical science principles. The researchers concluded that successful professional development programs require evaluation at every level, from the teachers' knowledge to their ability of applying the knowledge with children. Yoo (2011) also pointed out that teachers' reflective thinking led to early childhood teachers' empowerment for child development in science education, and at the same time, the teachers changed their attitudes and became more positive toward science teaching. The more positive teachers became towards science teaching, the more they were willing to prepare science materials and understand children's curiosity about scientific phenomena. To conclude, the importance of developing continuous professional development (CPD) programs is recognized to help preschool teachers and to develop their professional knowledge in teaching science and technology.

Curriculum reforms in Sweden

The Swedish curricula reforms for compulsory school (grade one to nine) (Swedish National Agency for Education, 2011) which occurred in 2011, indicated a similar situation to that with preschool teachers, as the new curricula raised the demands on primary teachers' scientific knowledge and confidence in teaching science, particular since science was not separated into the subjects of biology, chemistry and physics in the pre-1994 curricula. Again, in Sweden, teachers in compulsory schools might lack educational training in science subjects, and that has been discussed as a problem for teachers' professional development internationally. In the study undertaken by Harlen and Holroy (1997) in the UK, it was found that the primary school teachers' lack of confidence in teaching science was sometimes due to lack of knowledge. To tackle this issue, primary teachers' professional development with the focus of CK and PCK were addressed (Anderson et al., 2009; Hackling et al., 2007).

Following the curricula reforms in Sweden and their influences on teachers, this study embedded the common content in the curricula for preschool

and primary school in a Likert scale questionnaires to investigate teachers' self-efficacy and needs.

Scientific literacy

Scientific literacy is the goal of science education, but there is no consensus concerning its definition (e.g. Champagne & Lovitts, 1989; Millar, 2011; Smith, Loughran, Berry, & Dimitrakopoulos, 2012). The *National Science Education Standards* (National Research Council, 1996, p. 2), states that "students need to know, understand and be able to be scientifically literate at different grade levels" and connects scientific literacy with learners' everyday experiences, curiosity in the hope that students become able to describe, explain and predict, read about science in popular press, discuss and evaluate information with science content. Later, Roberts (2007), in his review, discussed scientific literacy in terms of two visions. Vision I, the subject matter (nature of science was also addressed), aims to foster content in the scientific disciplines and Vision II addresses to enhance students to function as life-long and responsible participants in their everyday lives (i.e. a science-in-society oriented aspect). No matter the preferred definition for developing students' scientific literacy, Smith and colleagues (2012) argued that teachers' understanding of scientific literacy was of utmost importance and this had not been well addressed in science education research. Smith and colleagues (2012) studied how primary teachers understood scientific literacy and how their scientific literacy understanding developed during discussions and how their teaching was affected. At the beginning of the Smith et al. study, the teachers viewed science as something characterized by experiments and investigations, but the meaning of scientific literacy was, however, unclear, for example, some teachers related it to only the use of scientific language. After participating in the project for two years, new perspectives of scientific literacy emerged among the teachers. Accordingly, based on the crucial role of teacher in relation to students' science learning and light shed on the importance of teachers' understanding of scientific literacy, we include an aspect of scientific literacy (with a focus on the nature of science and science-in-society aspects) in the teachers' self-efficacy and needs questionnaire in this study.

The learning environment

How to organize the learning environment for the benefit of science teaching and learning has been stressed within PCK (Shulman, 1986) and teachers' self-efficacy (Bandura, 1993). "*The task of creating learning environments rests heavily on the talents and self-efficacy of teachers. Evidence indicates*

that classroom atmosphere has been partly determined by teachers' beliefs in their instructional efficacy" (Bandura, 1993, p. 140). To date, research has shown that the influences of learning environment are especially important in science, compared to other subjects (e.g. Haworth, Kovas, Dale, & Plomin, 2008). Teacher-student and student-student interactions in the learning environment have also been of interest in science education research (Haworth et al., 2012). Hence, to investigate teachers' self-efficacy and their needs for their further education, the aspect of leaning environment could not be avoidable and should be included in our questionnaire survey in this study.

Aim and research questions

The aim of this study is to contribute to the development of the CPD program, by exploring with the help of PROFILES, in-service teachers' self-efficacy and needs in science teaching at the preschool to primary school levels. The research questions are:

1. What self-efficacy needs related to the teaching of science are expressed by in-service teachers?
2. Are there differences in self-efficacy and needs among in-service teachers related to the teaching of science at the different levels of preschool, 1-3 grade and 4-6 grade?

Method

The participants

A total of 71 in-service teachers from preschool (22 teachers) and primary schools (27 grade 1-3 teachers and 22 grade 4-6 teachers) were invited to participate in this study. The majority of the participating teachers were women; only one male teacher was teaching in grade 1-3 and five male teachers were teaching in grade 4-6. The participating teachers were all involved in a university networking project started in 2004, in a mid-size region, located in the middle-south of Sweden. The participants joined this project voluntarily and the data were treated anonymously. Details of the teachers' backgrounds are shown in Table 1.

Table 1. *The participants' teaching experiences and educational backgrounds in science.*

Teaching experiences	Preschool (N=22)	Grade 1-3 (N=27)	Grade 4-6 (N=22)	Education in science subjects (8 hours/ week)	Preschool (N=22)	Grade 1-3 (N=27)	Grade 4-6 (N=22)
< 1 year		1		None	12	6	1
1-5 years	2	5	4	5 weeks	3	12	3
6-10 years	1	5	4	10 weeks	1	1	4
> 10 years	19	16	14	> 10 weeks	6	8	14

The instrument

The Likert scale questionnaires used in this study were revised based on the PROFILES project aiming to fit the aims of the Swedish Curricula for preschool (Lpfö98, revised 2010) and compulsory school (Lgr 11) (Swedish National Agency for Education, 2011a, 2011b). In PROFILES, the self-efficacy was relate to nine key areas of motivation, scientific and technological literacy, goals of education, inquiry-based science education, nature of science, class environment, assessment, education theories and self-reflection with a total of 50 items. However, after considering the practical issue (i.e. teachers' limited time in answering the questionnaire) and teachers' understanding of the items shown in the PROFILES questionnaire, we decided to provide only three main sections to compose the questionnaires. The three sections were re-named as scientific literacy, curriculum and learning environment and the three sections were decided after interviewing two schools teachers and science educators. These three main sections were also strongly linked to the development of teachers' professional development programs later.

The scale ranges from 1 (*strongly disagree*) to 3 (*strongly agree*). Minor changes were made to the different versions of the questionnaire for collecting data in different groups (preschool, grade 1-3 and grade 4-6) of teachers. For example, the word, 'children,' in the preschool questionnaire was changed to the word, 'students,' in the questionnaire sent to teachers in primary schools. The questions in the category concerning curricula were changed according to the curricula for preschool and primary school as well as the different emphasis on science education. And since assessment is a new part of compulsory school, a question about self-efficacy and needs concerning how to develop assessment instruments in science was added to the questionnaire the questionnaire for primary school. The teachers' backgrounds concerning their education in science subjects and teaching experiences were also collected through the questionnaire survey. The questions for pre-school (16 tiems) and primary school (13 items) teachers were as presented below.

Questions for pre-school teachers

Category	Items
Scientific literacy	1. I can explain to children that science cannot provide complete answers to all questions. 2. I can explain to children how scientists work. 3. I use/can include a social orientation to problems working with children in science. 4. I can guide the children to think creatively and justify the socio-scientific problems.
Curriculum	5. I can realize the general objectives of education within science teaching in pre-school. 6. I can specify objectives for activities in preschool that develops children's knowledge and skills in science. 7. I can guide the children to develop interest and understanding for circles in nature and how humans, nature and society affect each other. 8. I can guide the children to become acquainted with common plants and animals. 9. I can guide the children to develop understanding and knowledge about simple chemical and physical processes. 10. I can guide the children to develop their ability to identify, investigate, document, ask questions about and discuss science.
Learning environment	11. I can implement children centered work/teaching at pre-school. 12. I can consider children's prior knowledge. 13. I can promote the children's communication skills. 14. I can promote peer-peer learning through children working in groups. 15. I can involve the children in learning through experiments, discussions and play. 16. I can provide suitable positive feed-back to help the children to understand science according to the curriculum Lpfö 98 revised in 2010.

Questions for primary school teachers

Category	Items
Scientific literacy	1. I can explain to students that science cannot provide complete answers to all questions. 2. I can explain to students how scientists work. 3. I use/can include a social orientation to problems working with students in science. 4. I can guide the students to think creatively and justify the socio-scientific problems.
Curriculum	5. I can support students when it comes to reaching the objectives of the compulsory school curriculum in chemistry. 6. I can support students when it comes to reaching the objectives of the compulsory school curriculum in physics. 7. I can support students when it comes to reaching the objectives of the compulsory school curriculum in biology. 8. I can guide the students to develop their ability to identify, investigate, document, ask questions about and discuss science.
Learning environment	9. I can implement student centered work/teaching in the classroom. 10. I can consider the students´ prior knowledge in science. 11. I can promote peer-peer learning through students working in groups. 12. I can provide suitable positive feed-back to help the students to understand science according to the curriculum. 13. I can undertake assessment in science.

Data collection and analysis

An on-line survey was developed and the link was sent to the participants in the university networking project by email. The data were analyzed by a statistical programme, SPSS software (version 12). The one-way ANOVA analytical method was conducted to compare the answers from the different groups of teachers. The reliability (Cronbach Alpha) was 0.75.

Results

The results showed that the preschool teachers had the highest self-efficacy among the three groups of teachers concerning the category of learning environment (Mean=2.32, SD=0.42) and curriculum (Mean=2.17, SD=0.12) (Figure 1). The self-efficacy regarding scientific literacy had similar values among the three groups of teachers. There was no significant difference ($p<0.05$) found among the above-mentioned categories and the three groups of teachers. The highest need for further education was found in the group of 1-3 grade teachers concerning the category of scientific literacy (Mean=2.27, SD=0.55) (Figure 2). Again, there was no significant difference ($p<0.05$) among the three groups of teachers concerning the needs in any of the categories.

Investigating the teachers' self-efficacy and needs in depth in each item addressed in the questionnaire, the preschool teachers expressed their need for further education in physics and chemistry to a high degree (>41%). Within the curriculum category, the need to know how to guide the children to develop their ability to identify, investigate, document, ask questions about and discuss science was addressed highly by 49% teachers. Also 41% preschool teachers also showed the need on how to guide the children to think creatively and justify the socio-scientific problems (connected to the category of scientific literacy) to a high degree.

There were 56% 1-3 grade teachers who presented the need concerning how to engage students in socio-scientific problems. In addition, 44% 1-3 grade teachers indicated the need for further education in how to work with assessment in science. The 4-6 grade teachers pointed out their need in learning how to develop assessments to a high degree (61%) and how to work with socio-scientific problems in their science teaching was approximately 52%.

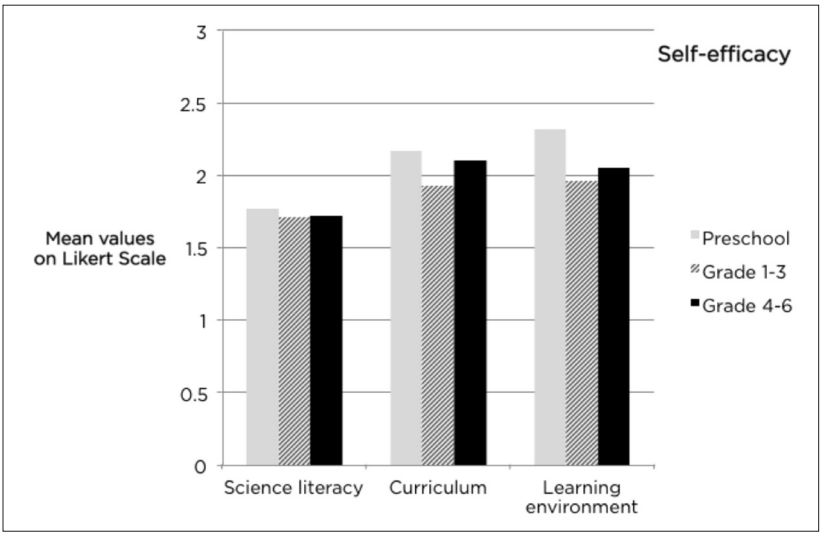

Figure 1. Teachers' self-efficacy in teaching science.

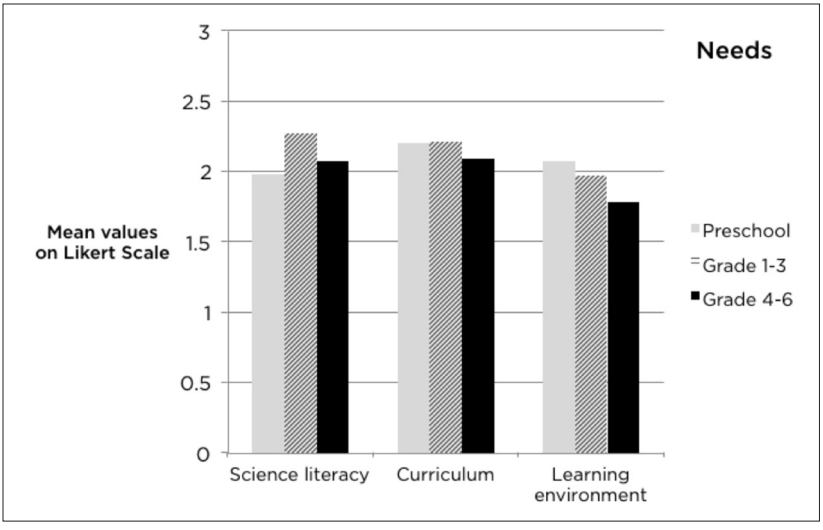

Figure 2. Teachers' needs in science teaching.

Conclusion and Discussions

Following the curricula reforms for preschool and primary school in Sweden (Swedish National Agency for Education, 2011a, 2011b), there was a new demand on teachers' CK and PCK in science subjects. Research showed that the

lack of subject knowledge could influence science teachers' teaching and might cause low self-efficacy (Appelton, 1995, 2006; Hackling, Peers, & Prain, 2007; Palmer, 2001; Riggs & Enochs, 1990; Yates & Goodrum, 1990). In line with the importance of developing teachers' CK/PCK and the related CPD programs (Nilsson, 2008a, 2008b) while facing the curriculum reform, this study aims to investigate in-service teachers' self-efficacy and needs concerning scientific literacy, curricula and learning environment. The results of this study were expected to contribute to the development of a CPD program in the near future.

The results from this pilot study (with 71 participating teachers) showed that there was no significant difference ($p<0.05$) among the three groups of teachers concerning their self-efficacy and needs. From our results, we discovered that the participating teachers had generally high self-efficacy (mean score was over 1.5), but still, the needs for further education were addressed to a high degree (also, mean score was over 1.5). The group of preschool teachers expressed their highest need for further education in CK, specifically in physics and chemistry, which was not surprising, because more than half of the participating teachers (55%) did not have any earlier educational training in science subjects (Table 1). In despite of this, their self-efficacy was not low. An explanation for this could be that most of the teachers in this group have taught in schools for many years and felt secure in their roles as preschool teachers. Harlen and Holroyd (2007) claimed that education backgrounds and years of teaching experience both played important roles in teachers' confidence.

Many of the primary school teachers (86%) had undertaken at least 40-hour of education in science and most of them had teaching experiences for more than 4 years (Table 1). Compared to earlier studies, our findings showed that the participating teachers generally had quite high self-efficacy, even though their educational backgrounds lacked science training. How could this be explained? It might be the long teaching experiences making teachers have high self-efficacy. But another explanation could be that the teachers were invited from the university networking project, which had been running since 2004. Within the network, the teachers had been offered to participate in workshops twice a year. Workshops had included lectures, practical exercises and discussions on science and technology. Many of the participating teachers had participated in those activities, especially the preschool teachers. So, in some way, the participating teachers in this study had gained education during the past years, even though it had not been considered as courses with credit points.

According to Smith et al. (2013), exploring contemporary issues and events made classes more meaningful for both teachers themselves and their students, and moreover, teachers constructed a meaning for scientific literacy

in a more personally relevant and evident way in their classroom practice, which also made teachers feel more self-confident. Dolan and colleagues (2009) claimed that socio-scientific issue (SSI) could be used to enhance scientific literacy in the fifth grade. SSI teaching strategies have shown positively impact on students' learning based on a multidimensional approach to learn science concepts and SSI containing elements of the real world (e.g. Chang Rundgren & Rundgren, 2010; Chang Rundgren, 2011). In our findings, both the groups of 1-3 and 4-6 grades teachers indicated the high need for further education in dealing with socio-scientific-oriented teaching. Linking to SSI research in science education, this was not a surprise, since SSI was something new for teachers, especially in primary schools (Dolan et al., 2009). Also, SSI are complex issues (e.g. Chang Rundgren & Rundgren, 2010) and co-teaching with teachers from difference subject areas was discussed as a way out (Chang Rundgren, 2011), which needs to be developed in CPD more.

Several studies have shown that preschool and primary school teachers need further education in science (e.g. Appelton, 2003; Harlen & Holroyd, 2007; Nilsson, 2008b; Palmer, 2006). Most of the above researchers also addressed explicitly that teachers needed both CK and PCK. In a study carried out by Morgan (2012), teachers expressed the need for more opportunities to engage with each other to discuss science teaching science teaching and to improve their scientific literacy and teaching skills, which gave them more confidence to teach science. Smith and colleagues (2011) suggested: "*A greater sense of self-confidence in science teaching emerged for primary teachers in their project, as a consequence of engaging in more meaningful ways with the derived sense of scientific literacy through a form of scaffolding that occurred through a multi-domain approach*" (p. 147). Concerning the learning environment, the preschool teachers in our study had their highest need for further education in how to involve the children in learning through experiments, discussions and play. They also addressed the needs on how to provide suitable positive feed-back to help the children understand science according to the curriculum. There was also a need among 4-6 grade teachers for further education concerning assessment. This was reflected as an expectation by the Swedish National Agency for Education. According to the new reform, teachers in grade six were required to give grades to their students from December 2012 onwards (Swedish National Agency for Education, 2013). The primary school teachers wanted more education regarding how to implement student-centered work/teaching in the classroom. All of these questions were considered as part of PCK.

Based on this pilot study, we showed that the Likert scale instrument used in this study was feasible (reliability=0.75; time cost reasonable) as a

pre-survey before conducting CPD programs for science teachers at preschool and primary school levels. Even though there was no significant difference among groups of teachers, teachers were shown to possess different needs for preschool and primary school, which could be used for the development of a suitable CPD in the coming future. Reliability of the data could be raised using a bigger sample size of teachers from different regions in Sweden so as to provide a bigger picture of teachers' self-efficacy and needs in Sweden nationally. A comparative study with other countries would be of importance as well, due to the globalization age.

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Biographical note

Susanne Walan is currently a PhD student in biology education at Karlstad University. In her dissertation, she focuses on context- and inquiry-based science teaching in both formal and informal education.

Shu-Nu Chang Rundgren is the professor of science education at Karlstad University. Meanwhile, she is the scientific leader and coordinator of the Center of Science, Mathematics and Engineering Education Research (SMEER) at Karlstad University. Her research interests are teaching and learning socioscientific issues (SSI) and SSI-argumentation, teachers' professional development on context- and inquiry-based science education as well as the public understanding of science and health.

Teaching Chemistry about 'Stevia' – A Case of Cooperative Curriculum Innovation within PROFILES in Germany

Marc Stuckey[1], Marianne Lippel[2] and Ingo Eilks*[3]

PROFILES is a project of teacher education and curriculum innovation funded by the FP7-programme of the European Union. The aim of PROFILES is implementing innovative science teaching practices incorporating a societal perspective and compassing inquiry-based science learning. The University of Bremen, Germany, as one of the partners, combines teacher continuous professional development with the research-based design of new teaching and learning modules for science teaching. This paper presents – as an exemplary case – how the University of Bremen is operating PROFILES. This case is illustrated according to the development of a teaching and learning module on sugar and sweeteners, incorporating the use of advertising in science education.

Keywords: Chemistry education, Curriculum development, PROFILES, Participatory Action Research, Sweeteners, Stevia, Advertising

1 PhD student at the Institute of Science Education, University of Bremen, Germany
2 Secondary school teacher, Bremen, Germany
3 *Corresponding Author. Institute for Science Education, University of Bremen, Germany; eilks@uni-bremen.de

O steviji pri pouku kemije – primer inovacije v okviru projekta PROFILES v Nemčiji

Marc Stuckey, Marianne Lippel in Ingo Eilks*

PROFILES je projekt o izobraževanju učiteljev in kurikularnih inovacijah, ki ga je financirala Evropska unija v okviru programa FP 7. Eden izmed namenov projekta je bil vpeljevanje inovativnih pristopov v naravoslovnem poučevanju, v katere sta vključena družbeni vidik in učenje naravoslovja z raziskovanjem. Univerza v Bremnu, Nemčija, ena izmed projektnih partneric, združuje stalno strokovno spopolnjevanje učiteljev z oblikovanjem novih raziskovalno usmerjenih učnih modulov v naravoslovnem izobraževanju. V prispevku je predstavljeno – kot vzorčni primer –, kako projekt PROFILES poteka na Univerzi v Bremnu. Prikazan je primer razvijanja modula o sladkorju in sladilih z navodili za učitelje in učence, vključen pa je tudi pomen oglaševanja v naravoslovnem izobraževanju.

Ključne besede: poučevanje kemije, razvijanje kurikuluma, PROFILES, akcijsko raziskovanje z udeležbo, sladila, stevija

Introduction

One of the central foci of activity in the PROFILES-project at the University of Bremen is to associate with school reform in the State of Bremen (one of the 16 states making up Germany) in the field of science education. In 2010, the State of Bremen implemented a school reform through the establishment of a new type of secondary comprehensive school: the Oberschule. In the Oberschule, science in the lower grades of secondary education (grades 5-8, age range 10-15) combines the previously independent disciplines of chemistry, biology and physics into one subject, namely 'science'. At present, textbooks and official curriculum materials for teaching integrated science following the new syllabus are still unavailable. This means that since 2011, the science teachers in the State of Bremen have been developing their own curriculum materials for their teaching requirements.

Unfortunately, most science teachers in Bremen are not trained in more than one of the science subjects, such as biology, chemistry and physics. The teachers feel they themselves are not particularly competent and self-confident enough in developing integrated science curriculum materials, especially in the areas where they consider themselves being non-experts. The University of Bremen, therefore, took the initiative to help science teachers in Bremen in their reform and curriculum implementation efforts within the PROFILES project (Schindler et al., 2014). PROFILES-Bremen assists the reform by forming networks of teachers and helping them in the development of their curricula and teaching practices in accordance with the philosophy of PROFILES (Bolte et al., 2011). The joint curriculum development aims on contributing to teachers' continuous professional development. It takes into focus promoting teacher's self – efficacy in different identified educational areas, including the implementation of socio-scientific issues-based science education, the promotion of inquiry learning, and fostering general educational skill development (Bolte et al., 2012; Holbrook & Rannikmäe, 2012).

The central focus of the supporting activities of PROFILES-Bremen is the collaborative curriculum development of teaching and learning modules within teachers' networks. The design and developmental process is following the model of Participatory Action Research in science education as proposed by Eilks and Ralle (2002). With regard to the development of materials, the teachers meet regularly once a month in small groups (3 to 8 teachers per group) accompanied by researchers and curriculum experts from the University of Bremen. Five to six teaching and learning modules are conceived, tested and cyclically refined per year. The materials are distributed via a local website

and in-service teacher training that all PROFILES teachers have access to and which are then available to be implemented by them in their classes. One exemplary case is the development of a module on sugar and sweeteners, integrating a newly developed pedagogy on incorporating advertising in science education.

Background and framework for the curriculum design

Within the PROFILES project a group of teachers suggested developing a teaching and learning module aiming at students' learning about different sweeteners (sugar, sugar-substitutes and artificial sweeteners, e.g. xylotol, isomalt, cyclamate/saccharin and aspartame) and their respective properties. The module was also suggested to focus the debate on the socio-scientific issues of healthy nutrition and the influence of advertising on student behavior. Sugar gives a lot of calories, having a calorific value of 17 kJ/g. There are alternatives to sugar, such as sugar substitutes, artificial and natural sweeteners, with lower calorific values. There are differences between sweeteners, for example in the calorific value, properties and intensity of sweetness. Artificial sweeteners, such as aspartame, acesulfame k, cyclamate, or saccharin, have practically no calorific value, while sugar-substitutes have a calorific value around 8-10 kJ/g. Due to their low physiological calorific value, sweeteners in particular are used in low-calorie diets and also by persons who suffer from diabetes. These alternative products are frequently linked to aggressive advertising campaigns and their effects softened by terms such as "sugar-free", "light" or "without any sugar".

In addition to artificial sweeteners, natural sweeteners do exist besides sugar. One of the currently most discussed groups of sweeteners is based on the Stevia plant. Stevia extracts have a very intense level of sweetness, comparable to some artificial sweeteners (about 200 times higher than sugar) (Stuckey, Lippel, & Eilks, 2012). Stevia is advertised as being a good alternative, e.g. to aspartame or saccharin, because it is plant-based and, as a result, is 'natural'. However, approval of Stevia has been the center of controversial discussions within the EU for many years. The EU prohibited its use in food and drinks for a long time. However, the EU finally approved its use in food and drinks in December 2011 (EC, 2011) and advertising instantly started referring to the 'green nature' of the new sweetener (Stuckey et al., 2012).

The questions of Stevia approval and the use of scientific arguments in advertising were suggested to allow for the module opening a broad educational focus as suggested by Sjöström (2013), or Roth and Lee (2004) by integrating a societal perspective (Ware, 2001). The students are introduced to the related controversial societal debate, as it has been proved that such authentic

and controversial societal debates can be very motivating for learning science as well as very powerful for promoting general educational skills in science teaching (Marks & Eilks, 2009; Sadler, 2004, 2011; Stolz, Witteck, Marks & Eilks, 2013). The controversial debate concerns the approval of natural sweeteners based on the Stevia plant for food and drinks by the EU and potential implications (Nehrdich, 2013) as well as the use of science related information in advertising (Belova & Eilks, 2014).

The discussion around Stevia-based food and drinks is an authentic and controversial socio-scientific issue with a lot of potential to initiate learning in and beyond chemistry and science. It allows for learning about societal controversies in general (Nehrdich, 2013) and on chemistry related topics in particular (Stuckey et al., 2012). Connecting the societal controversy with authentic societal practices of information transfer allows also to learn about information transfer and information use in society, as it was suggested by Hofstein, Eilks and Bybee (2011) and later elaborated under the term 'filtered information' into different educational models (Eilks, Nielsen, & Hofstein, 2014; Marks, Stuckey, Belova, & Eilks, 2014). In this example, creating advertising was suggested by the teacher group as an authentic societal practice where science related information is selected and transformed for public use (Belova & Eilks, 2014).

As a curriculum model for integrating these different objectives and pedagogies the model of socio-critical and problem-oriented science education as suggested by Marks and Eilks (2009) was selected. The module suggest five steps to structure the learning process: (1) contextual approach and problem analysis based on authentic, everyday-life media, (2) clarifying the scientific background under inclusion of practical work, (3) resuming the socio-scientific question with respect to the initial questions, (4) discussing and evaluating different perspectives by mimicking a societal practice of information transfer and use, and (5) meta-reflection on information handling and decision making in societal controversies. This model is very much in line with the PROFILES three stage approach in which a socio-scientific issue provides the motivational introduction to the learning of science (Holbrook & Rannikmäe, 2010), but puts an even stronger emphasis on reflecting societal practices of use and potential misuse of scientific information in society.

Method

Research design

The innovation process, curriculum development and teacher training in PROFILES-Bremen are operated according to the model of Participatory

Action Research (PAR) in science education (Eilks & Ralle, 2002; Mamlok-Naaman & Eilks, 2012). This model is very much in line with the PROFILES philosophy for continuous professional development (CPD) integrating the three most effective practices for CPD suggested by Hofstein, Mamlok-Naaman, Rauch and Namsone (2012): Action Research, the teacher as a curriculum developer, and focus groups.

PAR acknowledges evidence-based knowledge from educational research and practical experience from the classroom to compose the two ends of the knowledge spectrum of teaching and learning, both of which are equally important and have their own strengths (McIntyre, 2005). Evidence from educational research and the practical experience of teachers are united through focus group discussions. Within teacher-researcher group processes, knowledge from the different domains is compared and reflected upon with respect to its relevance for innovating teaching practices in the teachers' specific educational environments (Eilks & Ralle, 2002). PAR in science education is a collaborative process of curriculum design and classroom-based research (Eilks & Feierabend, 2013). From the starting point of the focus group discussions, teachers and researchers cooperatively conceive and investigate science teaching practices. Design, reflection and research are based on a cyclical process. Module components are drafted, tested, analyzed, and revised. Central foci – as in any kind of Action Research – are the evidence-based improvement of authentic practice and contributions to the CPD of the practitioners (Mamlok-Naaman & Eilks, 2012). The teachers participating become better trained and actively involved in developing, exploring and documenting innovative teaching practices.

PAR also aims for innovative teaching concepts and materials to be widely disseminated as the end-products of this model, as well as evidence regarding their effects in class (Marks & Eilks, 2010). The accompanying research collects general evidence, which covers both the effects of changed teaching strategies and teachers' and students' personal perceptions of the new teaching approaches and pedagogies. More detailed descriptions and reflections of the design and development process are described, e.g., in Marks and Eilks (2010), Feierabend and Eilks (2011) or Eilks and Feierabend (2013). General findings encompass both justified educational strategies and practical suggestions (e.g. Stolz, et al., 2013) as well as case studies about effects of classroom innovations on student achievement or motivation (e.g. Stuckey & Eilks, 2014).

Participants

The development of the teaching and learning module on Stevia took place in a group of eight teachers working on this example for roughly one year. The group consists of teachers from various secondary schools in north-western Germany. The group met once a month for three hours to discuss their developments. Proposals were discussed during the meetings, reflected upon and revised until a rough draft of the lesson plan was ready.

To assist with the development process, several preliminary tests of specific parts of the module took place. Later reflection was based on experience and feedback from tests applying the module in its fully-developed form in different learning groups. A pilot study was conducted in the end by one of the participating teachers with the fully-developed material in two classes in Grade 7 (age 12-13 years, 31 students) at a secondary comprehensive school (Oberschule) in Bremen, Germany.

Data was collected in a portfolio by one of the teachers covering both reflections on the developmental process in the PAR group as well as experiences and observations from teaching the module in the two learning groups. Two student feedback questionnaires were applied. An open feedback questionnaire recorded students' reflections covering three open questions about (I) what they considered to be the most important thing they might have learned, (II) their opinions on the module, and (III) what they now thought about the different sweeteners in food. Additionally, a Likert-type feedback questionnaire recording students' opinions of the module was used (8 items, 4 step).

Intervention

Objectives of the teaching and learning module were suggested to be, that the students learn about different sweeteners (natural sweetener, sugar-substitutes and artificial sweeteners, such as sugar, Stevia, xylotol, isomalt, cyclamate/saccharin and aspartame), and their properties (Stuckey et al., 2012). Therefore, chemistry content knowledge was introduced through the Internet, theoretical texts and investigative experimentation to inquire into the properties of sugar as a natural sweetener, artificial sweeteners and Stevia.

Another focus of the module was suggested as aiming at students' communication and decision-making skills as seen as an integral part of 'education through science', as indicated by the 'ES' in PROFILES. Communication and decision-making skills were encouraged through discussions about authentic advertising and enhanced by learning about how advertisings are made for learning about filtered information as a contribution to promote civil scientific and critical media literacy (Belova & Eilks, 2014).

To emphasise the societal importance of the topic and the focus on advertising, the scenario for the module presents five advertising spots from the Internet concerning different sugar-free sweets. The students make notes regarding the intentions of each spot. Students are asked to search for similarities and differences. To discern the personal connection of the topic with the students, the teacher presents various statements and the students physically assign themselves to one of two signs which are placed in the classroom: "for it" or "against it". Examples of the different statements are:

1. I would buy more sugar-free than ordinary food with sugar in it.
2. Sugar-free products are more healthy.
3. Sugar is a better option, because sugar is a natural substance.
4. I buy many things which are advertised on TV or Internet.
5. …

From this activity, different questions are derived. One group of questions regularly relates to issues of chemistry behind the adverts. These questions are used for motivating investigation of the properties and caloric value of the different sweeteners used in the sweets described as 'light'. Comparison of the substances and properties is initiated by giving each pair of students two similar sweets – one containing sugar, the other one is sugar-free. The students are asked to investigate the ingredients from the list of ingredients specified on the package. The students find out the sweetening components by using a list of potential sweetening ingredients and respective theoretical resources on the Internet.

The learning of the theory aspect in respect of sugar, sugar substitutes and sweeteners, including their current uses, is performed by a jigsaw classroom (Aronson et al., 1978). The investigation of the properties of the different sweeteners is operated in the lab in accordance with the learning-at-stations method (Eilks, 2002a). In the learning-at-stations different experiments inquiring sugar, sugar substitutes and sweeteners are offered at stations and can be conducted by the students in the sequence and intensity of their choice.

To switch from learning the science aspect back to the societal debate on the use of sugar, sugar-substitutes and the different sweeteners, the students return to the initial confrontation with the adverts. It is ascertained which questions concerning the adverts are already answered and which are not. The students are then asked to create their own advertisements. They are divided up into small groups, each given the task of producing an advertising leaflet (in paper size A5) by working on the substances xylitol, isomalte, Stevia, sugar and saccharin/cyclamate. To create their advertisements, each group of students is provided with a list of arguments containing the pros and cons regarding 'their'

sweetening substance as described in Belova and Eilks (2014). The students then prepare a table containing only the pros because only these aspects should appear in the advertising. The students are asked to compile positive arguments which they consider have the highest potential to be used in advertisements. The students then produce their own advertisement (on paper or computer). When doing this, the students have to consider the speed of awareness, comprehensibility, illustration, and also consider the presentation format, colours and appearance. During the presentation of the adverts, the students are asked to outline the reasons for their decisions, highlighting which arguments are used. The students are asked to justify why they have chosen these arguments and not others. The students also discuss the meaning of their choice with respect to making an attractive advertisement.

The module ends with a meta-reflection about the processes leading to the students' adverts. The discussion concerns the criteria by which information for advertising is selected and filtered and how we can treat this information as critical consumers. The class considers what amount of science and chemistry-based information is used in the adverts and whether it is deemed helpful to use science and chemistry-related information in advertising for different products. A discussion is also encouraged concerning how scientific literate an informed citizen needs to be to recognise the science and chemistry aspects in adverts and how to deal with this. Table 1 provides an overview of the module.

Table 1. *Overview of the module*

Stages of the module	Task
Textual approach and problem analysis	– Watching advertising spots about "sugar-free" sweets – Reflecting own positions on different statements – Comparing sugary and sugar-free products by inquiring the declaration of the ingredients on the packages
Clarifying the chemistry background in a lab environment	– Jigsaw classroom and learning-at-stations: Theory learning and making different experiments and investigations on various sweetening substances in small groups
Resuming the socio-scientific dimension	– Reflecting which aspects of the topic were answered, and which were not
Discussion and evaluating different points of view	– Preparation of own advertisements for different sweetening substances in small groups - Presentation of the different advertisements and explanation why specific arguments were chosen for the advertisement and others were not
Meta-reflection	– Reflecting how advertisings are made and which role scientific information plays in the creation of different advertisings

Findings and discussion

To date, the fully-developed teaching and learning module has been implemented in several lower secondary learning groups. As part of the PROFILES strategy for evidence-based continuous professional development and reflective practice (Hofstein et al., 2012), one of the participating teachers did a case study in two relatively lower achieving Grade 7 science classes in the Bremen Oberschule (age range 12-13; 31 students). The lessons were reflected in a teaching and learning portfolio about the module by the teachers. Two feedback questionnaires were used to ascertain the students' view of the topic and the module. The questionnaires consisted of open and Likert-type questions.

In the reflective teacher portfolio, the use of advertising as an introduction to science teaching was described as having been very authentic and motivating. The discussion on the 'light' products was considered highly motivating for the students (see also Marks, Bertram, & Eilks, 2008). From the view of the teacher, it was obvious that the students had a great deal of fun in analysing the adverts provided and creating their own. The activities around the advertisements led to very intensive discussions on the arguments to use. The teacher considered that the students generally liked the teaching module.

In the open questionnaire, the students were mainly positive about the modified teaching methods. The inquiry nature of the module, the open pedagogy of the experimental phase and the creative challenge during the production of the advertisement were also found as being very positive. In the students' opinion, the module was not 'just' pure science, which is something that they were very positive about. The students also enjoyed the cooperative character of the teaching and learning module, e.g. carrying out experiments. Criticism was rare and mainly touched the question of demands in reading and writing. This criticism could be justified because these learning groups had a high proportion of students with a non-German speaking migration background and were considered by the teachers, on average, as having great deficits in the use of the German language.

The Likert-items support both the point of view of the teacher and the summary of the student feedback to the open questionnaire (Figure 1).

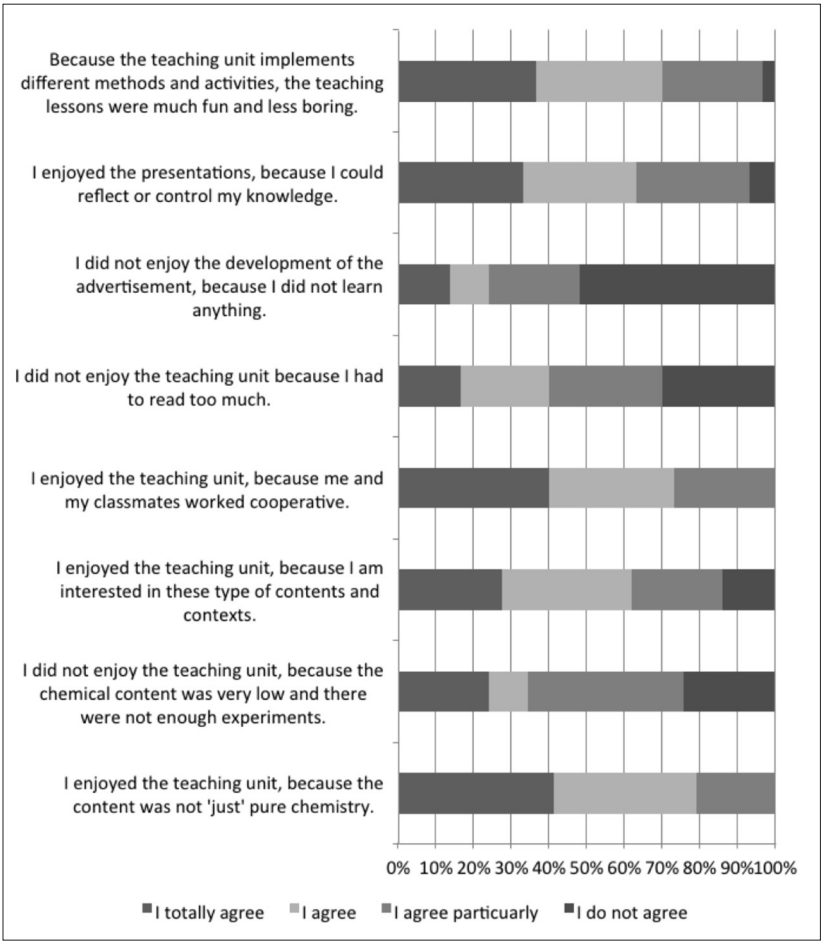

Figure 1. Results of the questionnaire regarding the module 'Stevia'.

Implications

From the example, it appears that the PROFILES philosophy of inquiry-based and societal-oriented science teaching (Holbrook & Rannikmäe, 2012) encourages students' motivation in science lessons. These findings support experience gained in similar modules, e.g. teaching about fats and carbohydrates using the debates surrounding different types of diets (Marks, et al., 2008), environmental and health issues surrounding musk flavours in shower gels to learn about fragrances, cosmetic products and tensides (Marks & Eilks, 2010), tattooing (Stuckey & Eilks, 2014), or implementing the debates on climate change and alternative fuels for cars in science classes (Eilks, 2002b; Feierabend & Eilks, 2011).

The case proved that it is basically the authenticity and relevance of the topic and the sharing of social communication processes as an essential part of the PROFILES philosophy that made science education in this example relevant in the eyes of these relatively young and, on average, lower achieving students (see also Stolz et al., 2013; Eilks et al., 2014; Stuckey & Eilks, 2014). The use of advertising as an additional motivational pedagogy for science lessons is still rare (Belova & Eilks, 2014). However, used as a tool to learn about filtered scientific information in public debate (Hofstein et al., 2011) it proved to be valuable to enliven the pedagogy of societal-oriented science education and contributed to the perception of relevance of science education in the eyes of the students.

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Biographical note

Marc Stuckey, M.Ed., studied chemistry, biology and education. Since 2010 he is a PhD student at the Institute of Science Education at the University of Bremen, Germany. His research work is about the meaning of relevance in science education.

Marianne Lippel, M.Ed., studied chemistry, biology and education at the University of Bremen. Since 2011 she is working as a secondary school teacher in Bremen, Germany.

Ingo Eilks, Prof. Dr., FRSC, was a secondary school teacher in chemistry and mathematics. Since 2004 he is a professor in chemistry education at the Institute for Science Education at the University of Bremen, Germany.

Scaffolding in a Medicine Education Intervention for Student Teachers Based on the PROFILES Three Stage Model

Sirpa Kärkkäinen*[1], Jari Kukkonen[2] and Tuula Keinonen[3]

This paper focuses on describing the effects of scaffolding on the student teachers' learning process. The scaffolding is based on using information and communication technology in the PROFILES Three Stage Model; Scenario, Inquiry and Decision-making Stages. Six hours of medicine education intervention is conducted as a part of the student teachers' program in biology education. The scaffolded group is encouraged to work with the case and presentation templates, online, in Google Sites; the unscaffolded group work only with Word documents. During the Scenario Phase, student teachers discuss the important symptoms of flu, its prevention, and sources from which to find reliable information. In the Inquiry Phase, in the light of online materials and resources, student teachers recall and elaborate on these symptoms. In the Decision-making Phase, student teachers conclude their investigation by making a presentation with suggestions for treatment, and justify it with respect to reliable sources. The learning design is mainly based on the existing Internet site (Teaching children about the proper use of medicines). After their presentations, students reflect on questions that arise and discuss the subject. Results show that both groups discuss the reliability of different websites in the same way. However, the scaffolded group is quite effective in searching for information for their presentation, whereas the unscaffolded group has difficulties in finding relevant information. This suggests that by structuring the activity with Google Sites and presentation templates, scaffolding helps student teachers to work intensively and to prepare their presentations. Presentation modelling seems to be beneficial to the students' sense making process during the investigation, and it also supports them in coping with the collaborative case-based reasoning process.

Keywords: Medicine education, Presentation modelling, Scaffolding, Teacher education, Three Stage PROFILES Model

1 *Corresponding Author. School of Applied Educational Science and Teacher Education, University of Eastern Finland; sirpa.a.karkkainen@uef.fi
2 School of Applied Educational Science and Teacher Education, University of Eastern Finland
3 School of Applied Educational Science and Teacher Education, University of Eastern Finland

Uporaba tristopenjskega modela PROFILES pri zdravstvenem izobraževanju za prihodnje učitelje

Sirpa Kärkkäinen*, Jari Kukkonen in Tuula Keinonen

V prispevku so predstavljeni učinki podpiranja učenja v procesu poučevanja prihodnjih učiteljev. Podpiranje učenja temelji na uporabi informacij in komunikacijske tehnologije v tristopenjskem modelu PROFILES – scenarij, raziskovanje in sprejemanje odločitev. V program študija prihodnjih učiteljev biologije je vključenih tudi šest ur izobraževanja o urgentni medicini. Skupino, ki je bila vključena v podpiranje, se je spodbujalo, da preučuje primer in uporablja že pripravljene osnutke predstavitev, dostopne na spletnih straneh Google Sites; skupina, ki ni bila vključena v podpiranje, pa je uporabljala le Wordove dokumente. V fazi scenarija so študentje razpravljali o pomembnih simptomih gripe, preventivnih ukrepih in o virih, ki nam nudijo zanesljive informacije. V fazi raziskovanja so s pomočjo prostodostopnih spletnih gradiv in virov analizirali te simptome. V fazi sprejemanja odločitev so študentje svoje raziskovanje končali s pripravo predstavitve predlogov zdravljenja, ki so jih podkrepili z zanesljivimi viri. Učni proces je bil večinoma oblikovan v okviru obstoječe internetne strani (Učenje otrok o primerni uporabi zdravil). Po predstavitvah so študentje razpravljali o vprašanjih, ki so se pojavila, in o tematiki, ki so jo obravnavali. Izsledki kažejo, da obe skupini podobno razpravljata o zanesljivosti različnih spletnih strani. Vendar pa je bila skupina, ki je bila vključena v podpiranje, učinkovitejša pri iskanju informacij za predstavitev, medtem ko je imela druga skupina težave pri iskanju relevantnih informacij. Predpostavljamo lahko, da strukturiranje aktivnosti z Google Sites in s predstavitvenimi osnutki s podpiranjem pomaga študentom pri intenzivnejšem delu in pripravi predstavitve. Modeliranje predstavitve pripomore k temu, da študentje smiselno usmerjajo raziskovanje, prav tako pa jim to pomaga pri soočanju s procesom razmišljanja o specifičnih primerih v skupini.

Ključne besede: zdravstveno izobraževanje, modeliranje predstavitve, podpiranje, izobraževanje učiteljev, tristopenjski model PROFILES

Introduction

Research shows that when properly scaffolded, the use of ICT (Information and Communication Technology) and collaboration have positive effects on students' learning (e.g. Demetriadis, Papadopoulos, Stamelos, & Fischer, 2008; Kukkonen, Kärkkäinen, Dillon, & Keinonen, 2013; Kukkonen, Kärkkäinen, Valtonen, & Keinonen, 2011; Quintana et al., 2004). Scaffolding is nowadays not only seen as originally being an activity belonging to a more capable person, but teacher and peer scaffolding can also be successfully accompanied with symbols, numeracy, representations of discipline, or forms of technology (Sherin, Reiser, & Edelson, 2004; Quintana et al., 2004).

Innovative, knowledge based, societies need young people who are equipped with a range of skills, such as problem solving, decision-making, communication skills, collaboration skills and reasoning skills (e.g. Hofstein, Eilks, & Bybee, 2010). In science education, one of the approaches to develop these skills is via the PROFILES Three Stage Model (e.g. Bolte, Streller, Holbrook, Rannikmäe, Hofstein, Mamlok Naaman, & Rauch, 2012). This aims to arouse students' intrinsic motivation through a student-familiar, socio-scientific context (the Scenario Stage), to offer a meaningful inquiry-based learning environment (the Inquiry Stage), and to use science learning in deciding on socio-scientific issues (the Decision-making Stage).

In this study, the PROFILES Three Stage Model is applied to the design of an integrated medicine education learning environment 'Flu' that aims to emphasise the development of critical thinking. The medicine education learning environment utilizes the Three Stage Model guidelines by: 1) awakening interest and critical thinking through a scenario, related to flu, 2) modelling scientific inquiries and developing problem solving skills, and 3) promoting decision making, applying the knowledge gained through inquiries, based on the Internet site 'Teaching children about the proper use of medicines.' The learning process is scaffolded through structuring as our interest is to discover what effects the scaffolding has on the learning process.

Theoretical framework

Reiser (2004) offers two aims for scaffolding: the first is to support the learner in accomplishing the task, and the second is to support learning from the task and the improvement of future performance. These two goals imply two scaffolding strategies: namely scaffolding by structuring the task and scaffolding by problematizing. These strategies are connected to the learner's needs

for systematic investigation and profound argumentation, in order to overcome the challenges of learning in the discipline of science. According to Reiser (2004), in the assessment of information, tools can be a critical factor in tasks that involve accessing, manipulating, storing and reasoning; for example, visualisation with tools can provide conceptually meaningful representations and help users form deep models of the underlying system. Quintana et al. (2004) define three central processes for scaffolding during inquiry learning: 1) sense making as a process for testing hypotheses and interpreting data, 2) process management for controlling the inquiry process, and 3) articulation, as well as reflection, on the learning. Furthermore, according to Reiser (2004), situations where scaffolding is mainly needed in collaborative inquiry learning are: unfamiliar strategies (e.g. inquiry strategies), unfamiliar interaction practices (e.g. collaborative planning, evaluation, keeping track of alternatives), unfamiliar discourse practices (e.g. expressing hypotheses, arguing about evidence, "falsifying"), non-reflective work (learners tend to focus on the superficial aspects of products instead of the explanations and arguments they produce) and superficial understanding (e.g. non-scientific constructs and formal representations).

Teacher education should offer possibilities for students to develop skills, knowledge and habits required in conducting inquiry learning processes. According to the study of Holbrook and Rannikmäe (2007), the Three Stage Model promoted students' intrinsic motivation; students became more interested and engaged in the learning of conceptual science ideas and the undertaking of inquiry. The Scenario Phase motivated students towards recognizing the importance of attaining the science underlying the socio-scientific scenario; the Inquiry Phase promoted students towards creative thinking, encouraging student-student collaboration and an awareness of safe working, self responsibility and self-determination; The Decision-making Phase promoted students' argumentation and reasoning skills. Valdmann, Holbrook and Rannikmäe (2012) argued that through continuous professional development, there was a need to strengthen the interconnectedness of the Model components (the three phases should not be handled separately), to promote the teaching of argumentation and reasoning skills, and to increase teacher's first-hand experiences through practising decision making skills (see also Simon, 2012).

In this study, rational medicine use (the goal of medicine education) is defined as the right medicine taken in the right way, at the right time, for the right problem. Schools are increasingly considered to have excellent potential to impact on young people´s health, and teachers are the key persons for promoting this in schools. According to the study of Hämeen-Anttila, Airaksinen, Timonen, Bush and Ahonen (2006), the habits and attitudes of teachers

towards the use of medicines inevitably influence how they react to medicine education. Teachers are responsible for the choice of teaching methods, materials and topics and are therefore also ethical actors.

Leurs, Bessems, Schaalma and de Vries (2010) pointed out the importance of teachers' self-efficacy in the context of health education, to which medicine education also belong. Speller, Byrne, Dewhirst et al. (2010) also found that teachers who had received training in health promotion were more likely to be involved in health promotion activities in schools, their personal competence and motivation having an effect on the amount of health promotion undertaken. These two studies were in accordance with the study of Jourdan, Stirling, Mannix Mcnamara and Pommier (2011). The main factors that teachers identified as shaping their commitment were their perceptions of the health programme, particularly in its congruence with the teachers' own role and practice.

Method

Participants and Data collection

Six primary school teacher students participated in the study. They formed two groups: one group of three students was scaffolded while the other was not. Data was compiled from what had been produced by the students during the inquiry process and the recorded discussions relating to this. The discussions were recorded from both groups during (a) the Scenario, Inquiry, as well as the Decision-making Stages of the medicine education intervention; (b) from the general discussion at the end of study process and (c) during the student teachers' presentations that related to their inquiry.

Medicine education intervention

Medicine education was part of the course "Teaching Approaches to Human Biology". The medicine education intervention altogether lasted six hours and its main aims were for student teachers to: learn to search for home resources in order to cure different symptoms of the flu; understand the proper use of self-care medicines; search for and evaluate information found on the net; learn group working skills; learn to present ideas to others; justify their arguments, and to understand that when home resources and self-care medicines do not help, a physician's evaluation is necessary.

The medicine education study module 'Flu' was based on the assignment and the information found on the Internet site "Teaching children about medicines" (which is planned, to be available in English). One group of three students was scaffolded, while the other group of three students was not. The

lecturer formed the scaffolded and unscaffolded groups which undertook to study "Flu" at random. The scaffolded group was encouraged to work with the case and presentation templates online in Google Sites, while the unscaffolded group worked only with Word documents. The study module 'Flu' concerned information on home treatment and self-care medicines, as well as on the proper use of medicines. The 'Flu' study module (www.uef.fi/profiles) was originally designed for medicine education in primary school (grades 4-6).

At the beginning of the intervention, using a shared blog, student teachers were asked to write about medicines and medicine education (Table 1). Student teachers discussed their preconceptions and created a list of all the facts concerning medicine education at the primary school level. A lecturer then briefly presented the idea behind the Three Stage Model that had been used in the medicine education module. During the first stage, based on the scenario, student teachers elaborated on different flu symptoms. In the Inquiry Stage, they were asked to recall and further elaborate on these features in the light of materials and resources found online; in the Decision-making Stage, both groups were asked to conclude their investigation by making a suggestion for the treatment and justify their recommendations based on information found from reliable sources.

The scaffolded presentation template included all phases belonging to the Three Stage Model: the Scenario, Inquiry and Decision-making Stages. The student teachers annotated and uploaded it to the Google Docs-environment; the unscaffolded group made their presentations themselves. At the end of the intervention, students were asked both to reflect on their own presentation and give peer assessment.

Table 1. *Content of the teaching sequences and aims of the 'Flu' study module.*

Lesson (90 minutes)	Content and aims of the lesson
1st unit Scenario Stage	Student teachers' perceptions about medicine education (writings in shared blog). Groups formed by the teacher (3-4 student teachers in each group). The scaffolded group works with the presentation templates Online in Google Sites. The unscaffolded group works with Word documents. Presentation of Veijo's problem. Discussion about Veijos problems (pre-knowledge).
2nd unit Inquiry Stage	Teacher provides material for the study- three webpages. The student teachers familiarize themselves with symptoms of flu, the cure for flu with home resources and self-care medicines. The student teachers evaluate the reliability of information on the Net.
3rd unit Decision-making Stage	In small groups, student teachers ponder the prevention of flu, as well as possible further action if home cures and self-care medicines do not provide effective treatment. Finally, class discussions are held in which justifications are to be presented.

The scenario was the following:

> "Veijo's best friend Elmo, has not been at school for a couple of days because of flu. Now Veijo too has a sore throat and is sneezing. Is Veijo getting the flu and what are the symptoms? How can the flu be medicated with home resources or with self-care medicines? Veijo uses the word "flu" to search on the Internet. He gets lot of sites, but which of them can he trust? First discuss in your group: Which site can you trust?"

The task in the Inquiry Stage was for groups to become familiar with the cure of flu, using home resources, self-care medicines information from the Internet. Through group work, the student teachers pondered the following questions and recorded the answers to: What are the symptoms of flu? How can the flu be treated? What kinds of self-care medicines are used to treat the flu? When is a physician needed to treat the flu? How can the flu be prevented? From where can you find reliable information about flu symptoms and their treatment? The student teachers used three Internet sites that were concerned with flu symptoms, home resources for the treatment of flu, and self-care medicines:

> Site: http://www.uku.fi/laakekasvatus/sairaus-flunssa.shtml (medicine education)
> In English: http://www.uku.fi/laakekasvatus/english-introduction-dear_reader.shtml
> Site: http://www.tohtori.fi/?page=9401470 (health clinics, flu)
> Site: http://murobbs.plaza.fi/yleista-keskustelua/725707-flunssan-hoito.html (discussion forum)

The student teachers ranked the reliability and the clarity of the websites used by giving points for each site. The scale was 1=poor 2=moderate, 3=good, 4=excellent.

The Decision-making Stage included the following instruction: "Suggest to Veijo which website is reliable when searching for information about flu symptoms, its treatment, and the use of home resources and self-care medicines. Justify your proposal. In groups, discuss when and why flu symptoms need to be treated by a physician." The group also presented practical recommendations for the prevention of flu at school and at home.

Data analysis

Qualitative research methodology was used during the analysis of student teachers' discussions (see Patton, 2002). In this study, in addition to the discussions, written language was also seen as a discourse. The focus was not on language as an abstract entity, but as the medium for interaction; analysis of discourse then became the analysis of what people did, or how they did it. Language was not taken simply as a tool for description and a medium for communication,

but as a practice, as a way of doing things. In this study, text-based documents were seen as social products that were situated constructions; particular kinds of representations shaped certain connections and understandings, which were properly studied through discourse analysis. (see Jørgensen & Phillips, 2002). According to Wood and Kroger (2002), discourse analysis is primarily an analysis that is carried out by using words, rather than by numbers or quantitative techniques. Thus, categorization is not included in discourse analysis.

Results

The student teachers' learning process is here described, in the three phases studied, so as to answer to the research question "How does scaffolding influence the different phases of the learning process?"

Scenario Stage

In the Scenario Stage, the scaffolded and the unscaffolded group basically gave the same list of symptoms. Both groups also pointed out in their discussions that flu symptoms typically include a runny or blocked nose, sore throat, sensation of pressure in the forehead and cheeks, as well as a cough. They also mentioned that a fever, cold sweats, shivers, headache, aching joints and limbs are symptoms of flu. For example, two girls in the scaffolded group drew up a list of symptoms:

G2: Cold, fever, cough, sore throat and headache.

G1: Cough, sore throat, headache.

Both groups gave many explanations as to how the flu could be treated and discussed it through their own experiences. They mentioned that alcohol, used externally (e.g. in the throat) eased a sore throat and cough; the scaffolded group additionally pondered whether alcohol was a bactericide:

G3: Is it so that alcohol kills bacteria?

G1: Okay

G2: Home treatment: alcohol…

Garlic with warm milk, warm woollen socks, inhaling steam over a pot of water, all helped a stuffy nose. According to the student teachers' own experiences, it was also important to drink and ensure a sufficient amount of fluids were taken. The unscaffolded group pondered various home resources:

G1: What are home resources?

G2: A hot water bottle

B2: Yes, also eucalyptus pastilles, the aromatic ones

B1: Yes, and boiling a pot of water, removing it from the heat and breathing deeply through the nose

G1: I've done it so many times!

Both groups pointed out self-care medicines intended for the treatment of the flu, naming several brands, such as Burana, Panadol, Finrexin and Strepsils. The scaffolded group also pondered the role of vitamins and the definition of self-care medicine:

G1: D-vitamin. This is in itself a treatment …it is not a medicine

G2: It is a vitamin

G3: so, but…C-vitamin. I think that although it cannot prevent flu…. it obviously keeps up the resistance if you get the flu

In the Scenario Stage, both groups highlighted their own experiences, and came to the conclusion that when the symptoms lasted for over two weeks, the flu needed to be treated by a physician. Both groups had good pre-knowledge about flu symptoms, home remedies, as well as self-case medicines, although the scaffolded group had a misconception concerning alcohol.

Inquiry Stage

There were few differences during the inquiry stage discussions between the scaffolded and unscaffolded groups' knowledge about flu symptoms, home resources and self-care medicines (Table 2). Both groups were of the opinion that although medicines could not cure a common cold, they could be used to relieve the symptoms. Both groups also discussed the order of the symptoms. For example, the scaffolded group highlighted nasal symptoms (runny nose) when the cold started, after which came the cough. Only one difference was noted, the scaffolded group pointed out that symptoms might vary depending on the specific virus.

Table 2. *The Inquiry Stage, the scaffolded and unscaffolded groups' responses to the treatment of flu, using home resources and self-care medicines.*

Flu symptoms	Home resources	Self-care medicines
runny nose sore throat fever headache cold sweats shivering aching joints and limbs	alcohol, warm woollen socks, vitamins, fruits, "alcohol socks", honey, garlic milk, saltwater drops, hot water bottle drinking plenty of fluids	Burana; Strepsils, throat pastilles, hard candy, goach fluid (cough medicine), Bafucin, Vicky, Finrexin, Nasonex, Resilar, C-vitamin, D-vitamin

During the inquiry process, student teachers discussed how to prevent flu. The unscaffolded group considered that antibiotics should not be used to treat symptoms, arguing that they thought antibiotics should be avoided:

B1: Antibiotics decrease your own resistance

G1: I rarely want to take antibiotics, only if I am really sick

G1: Is it possible to say that preventing the use of antibiotics (is one solution to treat symptoms)

B1: I think that this is one of the aims of medicine education… people do not need to take antibiotics all the time. Nowadays doctors easily give a prescription for antibiotics…

G1: My opinion is also the same, doctors give antibiotics too easily

G2: I have so many unnecessary prescriptions in my home, but I did not want to take antibiotics from the pharmacy

G1: So antibiotics always reduce peoples' resistance

The student teachers named different vitamins, such as vitamin C and vitamin D, which could prevent the flu. They mentioned their own experiences, for example, asthma symptoms could become worse as a result of a viral infection. One girl in the scaffolded group said that she increased her asthma medication for the duration of a cold, also that she had pain radiating to her ears due to a post-cold complication. Both groups considered that after two weeks it was important to go to the doctor, and mentioned symptoms, such as shortness of breath and a high fever.

Instead of the websites suggested, the unscaffolded group used Google when they searched for general information. The following is an example of the scaffolded group's discussion that related to information found while preparing their 'flu' presentation:

G1: Are those the sources which we must use?

G2: We put it here … up [made presentation]

G1: What are the symptoms of flu?

G1. Flu. Symptoms [read presentation template]

G3: Do we have such a question here? [read presentation template]

G1: There we have the symptoms, we must fill… here [fill presentation template]

Both groups pondered on the reliability and clarity of the websites. The scaffolded group used all three websites that were given in the task. Although the unscaffolded group mainly used Google when they searched for information, they also briefly read the given websites. Both groups gave points for each given website: 1=poor, 2=moderate, 3=good, 4=excellent. Results showed that both groups pointed out that the Medicine Education website was the best,

because there were no commercials and that the University was the administrator of the site. The reliability of the website discussion forum was low because no administrator of the site was found and there were also many commercials (see Table 3).

Table 3. *The Inquiry Stage, students' evaluation about the reliability of the websites. (1=poor, 2=moderate, 3=good, 4=excellent)*

Classification	Medicine Education		Doctor.fi		Discussion forum	
	scaffolded	unscaffolded	scaffolded	unscaffolded	scaffolded	unscaffolded
Administrator of the site easily found	4	3	3	3	1	1
Administrator of the site is a reliable organisation	4	3	3	3	1	1
Information on site is justified	4	4	4	4	1	1
Sites include few commercials	4	4	4	4	1	1
Text is understandable	4	4	4	4	1	1
Total	**20**	**20**	**18**	**18**	**5**	**5**

The unscaffolded group read many websites other than those recommended. However, both groups assessed all three of the recommended websites in the same away. Also the student teachers indicated misconceptions which might come to influence their medicine education teaching (cf. Hämeen-Anttila et al., 2006)

Decision-making Stage

In the Decision-making Stage, the unscaffolded group discussed the benefits of the website 'Medicine Education' and the deficiencies of other websites; although they gave a list of solutions to Veijo, explanations were lacking. This same group also highlighted the role of Google in the decision making.

B2: Is it possible to recommend the website Medicine Education? It is fast, good and clear. Obviously Veijo does not need anything … he is not so ill that he needs to search for information from the website Tohtori.fi

B1: Okay

G2: What website was good?

B1: Medicine Education was good and concise. The second best website was Tohtori. fi, but it was too extensive

B2: Because it is meant for doctors

G2: The example of pancreatic cancer. (Before this, B1had talked about his experiences

when he was searching for information on pain symptoms.)

B1: These two websites were quite reliable and rational, but the Discussion forum on the website was the lowest of the low. (Earlier B1 had said that he found a diagnosis of pancreatic cancer when he read the text about symptoms of pain)

B1: Sports, good health, good diet, healthy lifestyle

G2: Being glad, sunshine, outdoor activities

B1: Vitamins

G2: One's own attitude

B2: Washing hands

In their presentation, the scaffolded group highlighted that if someone wanted to prevent getting the flu, it was important to understand what caused it. Their discussion also highlighted that when making practical recommendations for flu prevention at school and at home, it needed to be emphasized that the flu was a contagious disease; people either inhaled infected droplets in the air or came in direct contact with an infected person's secretions. To prevent flu, one should be sure to keep one's hands clean, wash them frequently and thoroughly to remove germs.

G3: It is good hygiene

G2: This is possibly the main thing

G1: Warm clothes

G1: But preventing it. Covering a cough helps

G2: Even though you don't sneeze you must still wash your hands…. (she explains how the flu virus can transfer to your hands by touching surfaces.) Do we have enough arguments in our presentation?

The scaffolded group also mentioned two types of vaccines that give protection against flu.

G2: The influenza vaccine

G1: So can you prevent flu?

G3: But is the vaccine for the common cold or is it for influenza?

G1: Yes, the vaccine is for influenza and the annual flu

G2: Nowadays there is a vaccine for the annual flu

G1: Yes, in the newspaper it was said that many people go to the health station and book a time to get the flu vaccine. This is just the annual flu vaccine.

After their oral presentations, both groups discussed the Three Stage Model and evaluated their presentations, as well as their own work; they also gave peer assessment to the other group. Table 4 presents the conclusion of both

this self-assessment and the peer assessment concerning the Three Stage Model. In this respect, there were no big differences between the groups. The scaffolded group's inquiry process was more intensive, because they used the given websites (not Google); they also highlighted the reliability of the websites in their presentation and in the Decision-making Stage, and included arguments and multiple decisions for treatment suggestions. This group also answered the given questions and pondered on how to prevent the flu.

Table 4. *Teacher students' conclusion of their self and peer assessment evaluation. (+++ = very good, ++ = good, + = poor)*

	Scaffolded group	Unscaffolded group
1. Scenario (pre-knowledge)	+++	+++
2. Inquiry process (searching for information)	+++	++
3. Decision-making Stage (argumentation)	+++	++

In their inquiry, the student teachers seemed to benefit from the structuring of the task. Argumentation in the Decision-making Stage was also shown to be better with the aid of structuring (see Reiser, 2004; Quintana et al., 2004).

Conclusions and Implications

One group of student teachers, whose studies related to medicine education, was scaffolded with a structured environment, while another group, undertaking the same studies, was not scaffolded. The scaffolded presentation modelled on the Three Stage Model, seemed not only to have been beneficial for the sense-making process during the inquiry, but also supported the collaborative inquiry process. This suggested that the approach of using a Google Sites template, which included the Scenario, Inquiry and Decision-making Stages, helped in the formulation of conclusions and fulfilled the learner needs that Reiser (2004) claimed to be important in collaborative inquiry learning.

The student teachers had extensive experiences related to the flu; they had general knowledge, their own experiences of flu symptoms, as well as knowledge of home resources and treatment. Nowadays, the Internet provided valuable resources and opportunities to seek for information about medicines, but it was important for Teacher Education to highlight the importance of evaluating their reliability. During the Inquiry stage and the discussion with peers, it was possible to argue against treatment. Because the habits and attitudes of teachers concerning medicines inevitably influenced how they reacted

to Medicine education (see Hämeen-Anttila et al., 2006), it was important for them to share their own perceptions about medicines as well as medicine education. The Decision-making Stage helped in understanding the real-life connections between the task and the topic, and coupled with the Inquiry Stage, improved student teachers' critical thinking ability, one of the aims of science education (see Hofstein et al., 2010).

Medicine education must not only offer information, but must also foster motivation and provide the skills necessary to accomplish the health goal (Hämeen-Anttila et al., 2006). The scaffolded groups' Inquiry Stage is particularly active and intensive: arguments are proposed when evaluating the information. The content of both groups' presentations is good; both highlight that the common cold is regarded as a viral disease and is the most common human ailment. The treatment proposal is in agreement with the website on Medicine Education: rest, plenty of drink, and vapour inhalation therapy is recommended to relieve the symptoms. The student teachers point out that, although home treatment is sufficient, it is also possible to use over-the-counter medicines to treat symptoms, such as pain, fever and nasal congestion. This is also in accordance with the aims of the Medicine Education website. It is interesting that only the scaffolded group point out that cold viruses easily spread through the air at close range and via direct contact through people or inanimate objects and surfaces. This is an important point relating to the prevention of the flu.

The PROFILES Three Stage Model gave student teachers the possibilities to work collaboratively and enabled them to make comparisons between the Scenario, Inquiry and Decision-making Stages. Both the scaffolded and unscaffolded groups had multiple solution paths, as no final goals were stipulated at the beginning of the task. The scaffolded presentation model helped progressive inquiry learning especially in information seeking, and this same group gave more argumentation concerning the treatment of the flu, as well as suggestions for its prevention. Student teachers needed scaffolding for the learning process to be effective. Despite the fact that this study increased and broadened researchers' and teacher educators' knowledge about the challenges of medicine education in Teacher Education, there was still a need for further research concerning scaffolding and the role of information and communication technology in medicine education. The recommendations made in the study by Valdmann et al. (2012) as well as in the study by Speller et al. (2010) concerning continuous professional development, were also possible to include in our further studies. One example of these was that in the medicine education context, it was important to give student teachers first-hand experiences by undertaking decision making exercises coupled with continuous professional development.

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Biographical note

Sirpa Kärkkäinen, Doctor, is a Senior Lecturer in Biology and Geography at the University of Eastern Finland. She works with primary and secondary school teacher students and gives lectures focusing on science education especially biology, geography and environmental education. Her research areas focus on Teacher education both at the primary and secondary school level, in particular inquiry based learning and collaborative learning. In addition, more current research deals with issues such as informal learning environments, education about medicines and education for sustainable development (plant/animal identification, biodiversity). She has taught biology and geography for nine years in a variety of secondary schools. Her qualifications are M.Sc. in Biology (1992) and Ph.D in Education (2004) concerning biology didactics.

Jari Kukkonen, MSc (Mathematics), currently a project researcher and has worked in the field of information and communications technology (ICT) in education since 1990. Jari Kukkonen's main interest is in the use of ICT in education, teacher learning.

Tuula Keinonen, professor in research on general education, has experience in the fields of science education research and physics research. Currently her research focuses on science and environmental education in all levels of education from primary school to university. Particularly research focuses in science education on socio-scientific approaches, in environmental education on the relationships between environmental attitudes, knowledge, actions and participation and their influences on environmental education. New field in the research is medicine education, teaching about proper use of medicines.

The (Un)Attractiveness of Vocational and Technical Education: Theoretical Background

Miha Lovšin[1]

This paper considers the problem of the lack of attractiveness of vocational and technical education via a review of legislation on counselling practices, implementing documents, and the social factors by means of which the education system can influence the individual's decision. It is apparent that legislation regulating the organisation and content of career counselling services in educational sector is inadequate. The organisation of career counselling at the level of implementation is also inadequate. Counsellors advise individuals on the basis of their academic results and the results of aptitude tests. Counselling practices deriving from theories that place career planning and management skills in the foreground are more rarely represented. Theories that treat career decisions as a social process show that at the level of the student population the choice of the type of school is a rational decision based primarily on the economic position and level of education to which a specific educational pathway is generally supposed to lead. The lower attractiveness of vocational and technical education coincides with the fact that representatives of lower social classes have a weaker economic position and more frequently have vocational and technical education qualifications than representatives of higher social classes. Nevertheless, the trend of high unemployment among young people with academic qualifications, which opposite of the traditional situation, indicates that it will be necessary to include career planning and management skills in the educational contents of institutionalised and formal education as a whole.

Keywords: Vocational and technical education, Gimnazije, Career choice, Information and counselling, Lifelong career guidance

1 Institute of the Republic of Slovenia for Vocational Education and Training, Slovenia; lovsinm@cpi.si

Nekateri vzroki za nizko privlačnost poklicnega in strokovnega izobraževanja

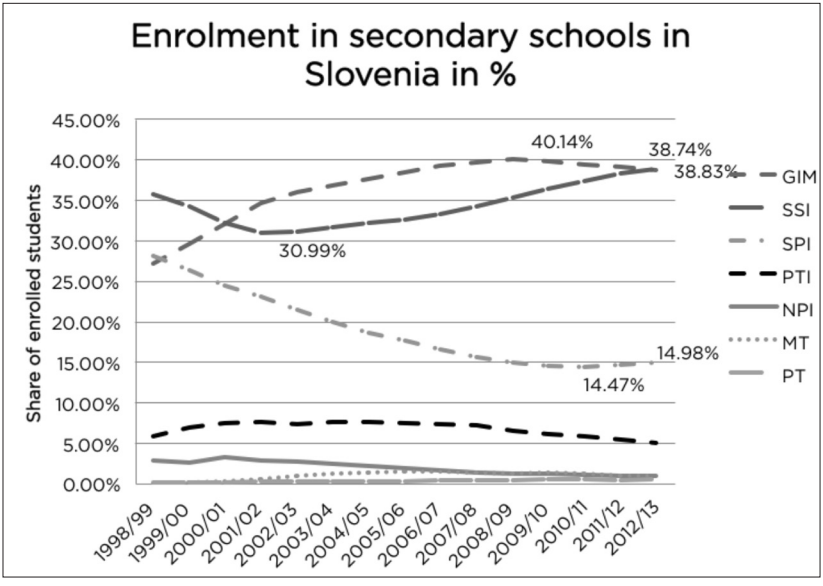
Miha Lovšin

Problem nizke privlačnosti poklicnega in strokovnega izobraževanja obravnavamo ob pregledu svetovalnih praks, zakonodaje, izvedbenih dokumentov in družbenih dejavnikov, prek katerih lahko šolski sistem vpliva na posameznikovo odločitev. Izkaže se, da je zakonodaja, ki ureja organizacijo in vsebino kariernega svetovanja, na področju izobraževanja pomanjkljiva. Prav tako je pomanjkljiva tudi urejenost področja kariernega svetovanja na izvedbeni ravni. Svetovalci posameznikom svetujejo na podlagi njihovih učnih rezultatov in rezultatov testov sposobnosti. Svetovalne prakse, ki izhajajo iz teorij, ki v ospredje postavljajo veščine načrtovanja in vodenja kariere, so redko zastopane. Teorije, ki karierno odločitev obravnavajo kot družbeni proces, pokažejo, da je izbira vrste šolanja na ravni populacije racionalna odločitev, ki temelji predvsem na ekonomskem položaju in stopnji izobrazbe, do katere naj bi posamezna izobraževalna pot navadno peljala. Nižja privlačnost poklicnega in strokovnega izobraževanja sovpada s tem, da imajo predstavniki nižjih družbenih razredov slabši ekonomski položaj ter pogosteje poklicno in strokovno izobrazbo kot predstavniki višjega družbenega razreda. Vendar pa trend visoke brezposelnosti mladih z akademsko kvalifikacijo, ki je tradicionalno pomenil nasprotje pravkar povedanega, nakazuje, da bo treba v izobraževalne vsebine celotnega institucionaliziranega in formaliziranega izobraževanja vključiti veščine načrtovanja in vodenja kariere.

Ključne besede: poklicno in strokovno izobraževanje, gimnazija, karierna odločitev, informiranje in svetovanje, vseživljenjska karierna orientacija

The imbalance between supply and demand in the labour market

For years, the European Commission has been saying that there is a shortage of workers with vocational and technical education in EU countries. In more than half of EU member states, a constant downwards trend in enrolment in secondary vocational and technical education programmes can be observed. Slovenia is among the countries where enrolment in such programmes is constantly falling (Eurostat, 2012). Particularly striking is the constant fall in enrolment in secondary vocational education programmes, which has fallen from 28.15% of the total school population (1998/99 academic year) to just 14.47% (2010/11 academic year). Up to the 2001/02 academic year, enrolment in secondary technical education programmes also fell, mainly on account of the growth in enrolment in *gimnazija programmes*[2]. This trend reversed in the 2002/03 academic year, largely due to the continuation in the fall in enrolment in secondary vocational education programmes (Graph 1).



Abbreviations: GIM – gimnazija, SSI – secondary technical education, SPI – secondary vocational education, PTI – vocational-technical education, NPI – lower vocational education, MT – matura course, PT – vocational course.
Source: Šol-S(M) Začetek: Centralne obdelave, 2012.

Graph 1. Trends in secondary school enrolments 1998/99–2010/11.

2 Term the gimnazija programmes stands for general secondary educational programs. Regular enrolment in *gimanzija programme* takes four years and finishes with national final exam called matura.The main goal of *gimanzija programmes* is to prepare students for tertiary education.

It is necessary to emphasise here that the rate of transition of students from secondary vocational education to further vocational-technical education is more than 75%. More than 90% of students in secondary technical education go on to tertiary education, while this figure is almost 100% for students in general secondary education (Krek & Metljak, 2011).

However, the percentage of unemployed young people with vocational education stands at 18.1%, while those with secondary technical or general education (secondary technical school and gimnazija) account for 33% (Strokovna izhodišča za leto 2013, 2012). The total share of unemployed young people with secondary education is therefore 52.1%.[3] Given the almost 100% transition of young people with a general education qualification to tertiary education, we can assume that the majority of these 52.1% of young unemployed people have secondary vocational or technical education.

Current conditions in the labour market in Slovenia are broadly comparable to those across the 27 countries of the EU. In 2010, 49.5% of employees in the EU had secondary education, compared to 58.29% in Slovenia. Employees with tertiary education accounted for 27.7% at the EU level and for 26.10% in Slovenia. The share of employees with primary or lower secondary education (equivalent to lower vocational education) was 22.9% at the EU level and 15.1% in Slovenia. EU-27 forecasts up to 2020 show that the demand for a workforce with secondary vocational and technical education, i.e. having completed education at the secondary level, will remain at a constant level of around 50%, or 55 million jobs. (Delovno aktivno prebivalstvo…, 2012; Skills Supply…, 2010; Skills needs in Europe…, 2008).

A comparison of figures for 2007 in 2012 shows that the share of unemployed young people with secondary education (secondary vocational school, secondary technical school and gimnazija) fell from 58.0% to 51.1%, while the share of unemployed young people with tertiary education increased from 13.1% to 19.5%. The share of unemployed young people with elementary education or less grew from 28.0 % to 29.3%. (Strokovna izhodišča za leto 2013, 2012.) Although this last figure is a cause for concern, it is especially the falling trend in the share of unemployed young people with secondary education and the simultaneous increase in the share of unemployed young people with tertiary education that are essential for our analysis. This trend may be understood as a consequence of the fact that the majority of the secondary school population continues education at the tertiary level.

3 Deviations from this finding are possible, since ESS figures do not indicate what population is actually included by the term 'young people'.

Unfortunately, the figure for the share of unemployed young people with secondary education does not allow us to distinguish unemployed gimnazija students from those who attended a vocational or technical school. On the basis of the European Commission's findings regarding the shortage of workers with vocational and technical education and the ESS's findings that there is already a shortage of domestic workers with, in particular, secondary vocational education (Strokovna izhodišča za leto 2013, 2012), we may conclude that an even greater imbalance between supply and demand for workers with secondary vocational and technical education is highly likely in the future.

Within the question of the imbalance of supply and demand regarding a workforce with vocational and technical education, we shall focus on the problem of the lack of interest among young people in this kind of education, and on the great interest of young people in tertiary education. We shall consider the problem via the activity of lifelong career guidance, the key objective of which is to help the individual make decisions about further educational and career options. In this sense, we shall look at how the field of lifelong career guidance is regulated in legislation, implementing documents and implementing practices in elementary schools.

Career guidance in legislation and its implementation in elementary schools

No uniform consensus has yet been arrived at in Slovenia with regard to the translation of the English term 'career guidance' and complementary terms such as 'educational and vocational guidance'. The concept of career guidance thus appears under a variety of names including (lifelong) career guidance, vocational guidance, careers advice, information and guidance counselling, counselling work in (adult) education, and orientation. In this article, we will use the term 'career guidance' as defined in the career guidance glossary published by the Employment Service of Slovenia (ESS): '[…] Services and activities that help individuals make decisions about education, training and career and enable them to manage their life paths in learning, work and other environments […]' (Kohont et al., 2011, p. 22).

The field of career guidance is covered in Slovenia by the Labour Market Regulation Act (UL RS 80/2010), the Organisation and Financing of Education Act (UL RS 16/2007), the Vocational Education and Training Act (UL RS 79/2006) and the Elementary Education Act (UL RS 81/06, 102/2007).

The Labour Market Regulation Act (ZUTD) deals with the field in considerable detail. Among other things, it stipulates that career guidance

counselling services are provided under this act as support for the career guidance programme of a school or faculty (ZUTD, 2010). The Organisation and Financing of Education Act (ZOFVI-UPB5) is rather less explicit, merely providing, in Article 67, that in the provision of career counselling, the school's counselling service should liaise with the ESS (ZOFVI-UPB5, 2007). As the umbrella law in the field of education, the ZOFVI-UPB5 applies to elementary schools, secondary vocational and technical schools and gimnazije. The Gimnazije Act (ZGim-UPB-1, 2007) does not mention career counselling, while acts covering other types of schools only mention it in remarkably general terms. Article 2 of the Elementary Education Act (ZOsn-UPB 3) provides that the objective of elementary education is to furnish students with the necessary skills for further educational and vocational development, with an emphasis on competences for lifelong learning (ZOsn-UPB 3, 2006). There is thus not even a direct mention of career counselling as a service, but merely of an objective, which is simultaneously the objective of career counselling. Career counselling is mentioned in the Vocational Educational and Training Act (ZPSI-1), but only in the part relating to cooperation between social partners and competent ministries with vocational and technical schools. Article 18 of the act provides that social partners and, in the case of regulated professions, the competent ministries should, in the exercise of their functions, cooperate with schools on vocational guidance, the planning of deployment of education programmes and enrolment levels, and the definition of the open curriculum (ZPSI-1, 2006). The two points that stand out when reviewing these laws is that career guidance is given adequate coverage in the ZUTD and that the cooperation of school counselling services with the ESS is required by the ZOFVI-UPB5.

Regarding how implementation is regulated, the business plan of the ESS in the field of career guidance highlights work with the unemployed and other jobseekers. Career guidance services for primary and secondary school students and their parents and for university students are only defined in the sense of support for school counselling services (Poslovni načrt za leto 2012…, 2012).

A key document regulating the work of the guidance counselling service at elementary schools in the field of career guidance is the Programme Guidelines of the Elementary School Counselling Service, prepared by the Curriculum Committee for Counselling Work and the Class Community. These guidelines define in detail the activities covered by career counselling services, stating, 'vocational guidance should include the following activities: careers information, diagnosis, careers advice, careers education, placement, representation, feedback and monitoring' (Čačinovič Vogrinčič et al., 1999, p. 24). However, they set a relatively modest standard regarding the amount of time to be dedicated to these activities (ibid.).

We can reach conclusions about the scope and content of the implementation of career guidance in schools on the basis of the analysis of the survey on the state of career guidance at elementary schools carried out among school counselling staff by the ESS. The analysis confirms that career guidance at elementary schools includes all four groups of activities called for by the guidelines, which have their basis in the annual plan of work of the ESS and in legislation. However, in accordance with the standards regarding the time defined in the guidelines, they are implemented in an extremely narrow context of activities, for which time is extremely limited. The analysis states that these activities are not part of the regular education programme. In this sense, it has become the practice to implement these activities during substitution periods, which means that they cannot be planned and performed systematically with regard to individual classes (Gabor et al., 2008).

Career guidance activities, which are carried out by more than 90% of the counselling staff who responded to the survey, often in conjunction with the ESS, are the following: individual talk with a school counsellor for parents, individual talk with a school counsellor for students, team talks (with fellow teachers), external testing in Year 9, testing with a multi-factor test battery (MFTB), careers guidebook, career questionnaire, lectures on choice of career and special career education lessons (ibid.). The analysis highlights the close connection of activities such as individual talks with a school counsellor for students and parents and MFTB testing and career questionnaires. The results of testing, in fact, represent one of the bases for these individual talks (ibid.).

We are able to draw more conclusions on the use of MFTB in the context of guidance with regard to further education on the basis of the Zois Scholarship Reports at the ESS. Although other tests (e.g. creativity tests and tests of intellectual ability) are also used for the awarding of Zois scholarships, we anticipate a connection between an individual's achievements in a MFTB and his or her success in applying for a Zois scholarship. The report shows that most secondary school students who win scholarships are enrolled in gimnazija programmes (83.3% of the total), after having achieved very good or excellent results in primary school in the majority of cases (Nagy, 2012). At the same time, we can conclude that these are students who on average were also more successful in MFTBs. The smallest number of gifted pupils are, by contrast, enrolled in secondary technical education programmes, while according to figures from the ESS, gifted students do not enrol in secondary vocational education programmes (ibid.).

Similar indications are provided by statistical data on the enrolment of Zois scholars in the first year of secondary schools, i.e. for the student population

for which selection procedures take place while they are still in elementary school. A review of the figures from 2008 to 2011 indicates a roughly constant percentage of Zois scholars enrolled in individual programmes. In 2011, for example, 97.35% of all successful Zois scholarship applicants were enrolled in the first year of gimnazija, 2.44% were enrolled in secondary technical education programmes, and 0.21% were enrolled in secondary vocational education programmes (Študenti in dijaki štipendisti po vrsti štipendije…, 2012). The correlation between the choice of school and academic results is also confirmed by the study Dejavniki šolske uspešnosti v poklicnem izobraževanju (Factors of Academic Success in Vocational Education). Gimnazija students achieved an average grade in elementary school of 4.63, compared to 3.43 for students of secondary technical schools and 2.75 for students of secondary vocational schools (Flere, 2008).

In view of the fact that in the process of reaching a decision on a student's further educational career guidance counsellors use MFTB results to provide individual guidance to students or their parents, and given that a connection exists between achievement in these tests, academic results and the selected type of education programme, we can state with considerable certainty that guidance counsellors influence the individual's choice of general education or vocational and technical education on the basis of MFTB results, and also on the basis of academic results. We may also assume with considerable certainty that parents advise their children with regard to their choice of further schooling on the same basis. As an example supporting this assumption, we cite the finding that parents also influence the (general) belief that enrolment in technical and vocational education is for those who are not capable of anything better (Sankovič et al., 2010).

On this basis, we may state with considerable certainty that while career counselling services are provided among the target population in Slovenia at the transition from elementary school to secondary school, this is done so in a rather reduced form in terms of both time and content. Counselling on the basis of aptitude tests is the prevailing activity. It has the effect of discouraging students from choosing vocational and technical education programmes. In a significant percentage of cases, vocational (careers) education[4] (which should

4 Careers education is defined in the Programme Guidelines of the Elementary School Counselling Service as '[…] one of the activities of vocational orientation [and] represents a programme of planned experiences with the help of which the student develops the concepts, knowledge and skills that enable him or her to make suitable decisions and help in transitions from one level of education to another and in the transition to employment. It is provided in the context of regular subject classes, the class community and other activities at the school (interest activities, afternoon lectures) and outside the school (school trips, visits to businesses and organisations, work experience, etc.)' (Čačinovič Vogrinčič et al., 1999, p. 24).

represent an integral part of career guidance) is also missing, owing to its absence from education programmes. In the sections that follow, we shall explore the theoretical concepts that are the basis for the above-described counselling practices in Slovenia.

Theoretical background of current counselling practices

Numerous views and theories on what influences career decision-making[5] in young people have emerged since the beginning of the twentieth century. According to Osipow, the three prevailing theories among guidance professionals are the following: trait and factor theory, developmental theory and social learning theory (Osipow, 1990). By examining all three of these theories, we shall aim to establish their influence on counselling practices in Slovenia.

The trait-and-factor theory understands the purpose of lifelong career guidance and the essence of career decision-making as the search for a connection between the individual and his or her placement.[6] The theory grew out of the needs of the industrial workforce market, which needed workers who were willing and able to perform specific types of tasks. A suitable connection between the individual's abilities and the requirements of a specific occupation, also guaranteed workforce stability, which was also significant for the efficient functioning of the industrial system of production. This connection was supposed to be established on the basis of identification of the individual's personality traits and the skills and interests necessary to perform a specific job. Various types of tests were developed for this purpose, among them the MFTB referred to earlier.

Developmental theory, which also prevails among lifelong career guidance professionals, asserts that different stages exist in the process of career decision-making, while the 'right' decision can only be taken when the individual develops his or her competences to a sufficient level and becomes sufficiently mature as a person (Lapajne, 1996). This theory is characterised by a connection between the individual's chronological age and the behaviour expected in connection with a professional career at a specific age. Authors differ in particular in terms of how precisely they define the stages of career development. Donald Super, for example, identifies a special category within the individual's development, which he calls 'vocational maturity'. In the same way that intellectual, emotional and physical development presumes intellectual, emotional and physical maturity, so too does career development presume differences between

5 Young people understand career decision-making above all in the sense of deciding on the choice of type and level of education. Career as a broader concept, however, suggests a connection with the wider context of the individual's educational and career path.

6 As used here, the term 'placement' refers to an actual placement in the labour market.

individuals in vocational maturity, according to Super. Two elements are involved here: (1) the position of the individual on the diagram of behavioural development, which ranges from the stage of exploration to the stage of decline and (2) the actual behaviour of the individual with respect to his or her chronological age. Super defines five factors of vocational maturity, where vocational maturity at the age of 15 only relates to two factors: orientation of the individual towards a choice of occupation, and information about and planning of career development and decisions. According to Super, Indications of vocational maturity in this period are: information about how to prepare for a future career; information about the material conditions of work in a future career; the level of practical preparation in the direction of the future career (Lapajne, 1996).

The theory of social learning, as the third prevailing theory among career guidance professionals, is based on behaviourism and on theories that understand the career decision as the result of the individual's social learning. An significant step forward was taken in the 1990s by Krumboltz, who shifts from the theory of career decision-making to the theory of career counselling. Like Super, Krumboltz begins with a critique of the trait and factor theory and claims that people should not base their decisions merely on existing characteristics but need to expand their capabilities and interests. He believes that such an approach is required because careers are no longer stable, which requires people to prepare for changing work tasks, in which, in addition to performing work tasks, they are also expected to market themselves within the context of their organisations. In this sense, the main task of counsellors is to encourage learning in those they advise: '[T]hey should not look on themselves as someone who matches workers to jobs, but rather as trainers, educators and mentors' (Lapajne, 1996, p. 50). Krumboltz's theory of social learning or career counselling manifests itself in numerous models of counselling practices, one of which, very familiar to counselling professionals, is the so-called DOTS model (decision-making, opportunity awareness, transitions, self-awareness). The model is based on the idea that through the counselling process, the counsellor prepares the individual in four areas: (1) getting to know oneself (identifying one's characteristics, interests, knowledge, capabilities and talents, etc.); (2) discovering opportunities for education, training, employment, learning about careers and the world of work in general; (3) decision-making (learning about types of decision-making and the factors that must be considered); (4) realisation of goals set (Law, 1996). The skills that individuals obtain through learning in all four of these areas are characterised as career planning and management skills.

A comparison of the counselling practices employed in elementary schools in Slovenia and the theoretical background from which these practices

derive shows that the influence of the trait and factor theory, which derives from the needs of industrial society, is still extremely powerful. We likewise detect the influence of the developmental theory, and in particular the concept of vocational maturity, which introduces the category of practical preparation in the direction of the future career, information about how to prepare for a specific career and information about the material conditions of work. Our observation is that these activities, in the final year of elementary school, can be understood above all as learning about different occupations, career opportunities within individual occupations, and the education programmes which are a condition for entering these occupations. Preparation for a specific occupation in this period does not yet mean, in fact, the acquisition of knowledge and skills to perform that specific occupation. The social learning theory is crucial, especially in the sense that it represents a leap in the understanding of the counsellor as not merely a passive 'facilitator' but as an active educator, trainer and teacher. This requires a new approach in the counselling process which includes vocational (career) education in school curricula. This, however, is poorly represented, not only in Slovenia but also in a number of other countries (Gabor et al., 2008; Karierna orientacija: priročnik za oblikovalce politike, 2006; Niklanovič, 2007).

Numerous meta-analyses have been carried out and research reports written in connection with the effectiveness of counselling practices based on trait and factor theory, developmental theory and social learning theory (Brown & Krane, 2000; Folsom & Reardon, 2003; Kidd & Killeen, 1992; Killeen, 1996; Oliver & Spokane, 1988; Spokane & Oliver, 1983; Whiston, 2002). The general finding of these analyses and reports is that counselling practices are generally effective regardless of the form in which they are implemented (ibid.). In the counselling activity described above, we have found that individual elements of the counselling process (identifying the individual's capabilities, academic success, information about the future career, learning about opportunities in education, training and employment, learning about occupations on the world of work in general) correspond with trends among elementary school students in Slovenia with regard to choosing (or not) a vocational and technical or general educational pathway.

As used here, the term 'placement' refers to an actual placement in the labour market. The question that needs to be asked, in the light of the above findings, is what else, besides counselling practices, affects this correspondence? We proceed from the assumption that the individual, as a social being, is subject to the influences of the environment. This also applies to deciding about further educational and vocational pathways. In this sense, we shall look at the decision of the individual from the point of view of society.

The individual's career decision-making as a social process

Sociological analyses of career decision-making are extremely rare. For the most part, they proceed from the assumption that the individual's life chances and career pathway are the result of actual decisions and/or social and structural determinants. This is also the basis on which Hodkinson and Sparkes build their model of career decision-making, which includes three key, interrelated components: (1) pragmatically rational decision-making; (2) interactions with others who have unequal resources within the education system; (3) the location of the decision within the partly unpredictable pattern of turning points and routines that make up the life course of the individual (Hodkinson & Sparkes, 1997). In order to explain their model of career decision-making and these three components, the authors use the concept of habitus, defined as follows by Bourdieu: '[…] Habitus is the system of acquired dispositions [from the environment] functioning on the practical level as categories of perception and assessment or as classificatory principles as well as being the organising principles of action […]' (Bourdieu, 2003, p. 19). In this sense, the concept of habitus represents three pertinent facts, also taken into account in their model by Hodkinson and Sparkes: (1) the construction of the individual's categories of perception and assessment, which does not take place in a social vacuum but is subject to the structural limitations of the environment; (2) the individual's cognitive structure, which is in itself socially structured because it has a social origin; (3) the construction of social reality, which is not only a fact of the individual but can also become a collective fact (Bourdieu, 1989).

With their interpretation of career decision-making as a pragmatic and rational process that takes place in interaction with others and that is based on the partly unpredictable pattern of turning points and routines, Hodkinson and Sparkes offer an interpretation for understanding the background to career decision-making: '[…] Everything [the career decision-making process] takes place within a macro-context which has social, political, economic, cultural, geographic and historical dimensions […]' (Hodkinson & Sparkes, 1997, p. 41). Within this context, a game of interaction, measuring of strength, alliances and negotiations takes place among individual players in the process of social decision-making, where the rules of the game are determined by these interactions and by formal rules. Within this game, people make (at various turning points in their lives) pragmatic, rational decisions that are located in their horizon for action, i.e. in the arena within which it is possible for the individual to act and make decisions. The horizon for action referred to here derives from the

individual's cultural environment. Periods of routine take place before and after these turning points, where these routines are located within the game itself and in the macro context. Periods of routine and turning points are interconnected and, therefore, cannot be understood outside the whole. The transition from one turning point to another can be predictable and smooth or unpredictable and complex (ibid.).

The idea of the inequality of resources that influences the individual's career decision as a process that takes place in interaction with others is derived by Hodkinson and Sparkes from Bourdieu's concept of positions of power. According to Bourdieu, positions of power are reflected in the quantity of economic, cultural and social capital possessed by the individual, along with symbolic capital, which is the form the different types of capital take once they are perceived and recognised as legitimate (Bourdieu, 1989). The concept of cultural capital offers an explanation of why the level of education is one of the key elements in the process of career decision-making.

Bourdieu defines three states in which cultural capital exists: (1) the embodied state; (2) the objectified state; (3) the institutionalised state (Bourdieu, 1986). Institutionalised cultural capital has distinctive characteristics that distinguish it from embodied and objectified cultural capital. In this sense, an academic qualification, as one of the forms of institutionalised cultural capital, likewise has distinct characteristics. Obtaining an academic qualification is, in fact, one way of neutralising some of the properties that [cultural capital] derives from the fact that, being embodied, it has the same biological limits as its bearer. An academic qualification is a certificate of cultural competence that confers on its holder a conventional, constant, legally guaranteed value. It should be emphasised here that an academic qualification has a relative autonomy vis-à-vis its bearer and even vis-à-vis the cultural capital that the bearer already possesses. An academic qualification also makes it possible to compare qualification holders and even to substitute them. Furthermore, it makes it possible to establish conversion rates between cultural capital and economic capital by giving a monetary value to academic capital (ibid.). At the same time, Bourdieu points out that academic qualifications are a means of enriching cultural capital. An academic qualification is, in fact, a condition for legitimate access to a growing number of prominent positions in society (Bourdieu, 1986). In this way, Bourdieu explains the reason why an academic qualification is so desirable: it belongs to the individual and at the same time conditions legitimate access to powerful positions in society while enabling a conversion between economic and cultural capital.

The combination of academic qualification and economic status is also decisive for positioning in a specific social class or fraction within a particular

class. In the chapter entitled Distinction, dealing with the distribution of different classes and fractions within individual classes, Bourdieu shows by means of a diagram that a characteristic of the upper class is that it is well provided with economic and cultural capital. This coincides with a high rate of representation of economically well-situated and highly educated individuals. Lower social classes are by contrast characterised by poor provision with economic and cultural capital and a high rate of representation of individuals who are economically poorly situated and have a low level of education (Bourdieu, 2001).

In connection with the economic aspect of professions, the analysis shows that better salaries and therefore better economic status are achieved by those with higher education (Medveš, 2008). The study on factors of academic success in vocational education referred to earlier further highlights the fact that the population attending vocational and technical education programmes also has lower cultural capital than the population attending general or specialist gimnazije (Flere, 2008). In this sense, we may conclude that the representatives of lower social classes more frequently have vocational and technical education than representatives of higher social classes.

However, recent changes in the labour market, and also in education, point to a possible redefinition of the role of academic qualifications. Employment data from 2010 show that the unemployment rate among economically active young people aged 25–29 with a tertiary education qualification has grown from 3.8% in 2000 to 13.9%, while among the same population with secondary education unemployment has grown from 9.0% to just 14.8% (Lavrič, 2010). The convertibility of an academic qualification in the labour market has thus come remarkably close to the convertibility of a secondary school qualification.

At the same time, trends of enrolment in education are changing, although slightly. The proportion of students enrolled in gimnazije has been falling since the 2008/09 academic year; by the 2012/13 academic year, it had fallen from 40.14% to 38.74% of the overall secondary school population. The proportion of students enrolled in secondary vocational education has been growing since the 2009/10 academic year, rising from 14.53% to 14.98% of the overall secondary school population in the 2012/13 academic year. Although enrolment in secondary technical education has been growing since 2002/03, in the 2012/13 academic year it exceeded the proportion of enrolments in gimnazije for the first time in 12 years (Graph 1). As can be seen from Table 1, there is also a clear drop in the number of gimnazija programmes with enrolment restrictions in the 2012/13 academic year. Meanwhile, the number of secondary vocational and technical education programmes with enrolment restrictions has remained relatively constant.

Table 1. *Number of secondary schools with restrictions on enrolment by years by type of education Restrictions on enrolment in gimnazije by points for individual academic years in 2008/09–2012/13.*

	2008/09	2009/10	2010/11	2011/12	2012/13
number of schools with restrictions – SPI/SSI	28	24	31	36	34
number of schools with restrictions – GIM	31	33	27	27	13

Abbreviations: SPI – secondary vocational education programmes, SSI – secondary technical education programmes, GIM – *gimnazija* programmes, classical *gimnazija*, sports *gimnazija*, technical *gimnazija*, art *gimnazija*
Source: figures from the Srednješolski izobraževalni programi, 2012b.

We understand the changing trends in education merely as an indicator of the declining potential of academic qualifications, but not as an alternative. In an article on career management paradigm shifts, Philip S. Jarvis compares the key terms of the old and new paradigms. In the field of education, he cites, among other things, changes in terminology: from entitlement (to education, employment, etc.) to personal responsibility (for education, employment, etc.), from occupational titles to skills clusters, from diploma or degree to skills certification, from degree attainment to non-linear perpetual (lifelong) learning, from (institutional) keepers of knowledge to democratisation of knowledge, from career guidance to career development/building/management, etc. (Jarvis, 2003). He goes on to say that while academic and technical qualifications open doors to employment, it is career planning and management skills that largely determine selection, success and advancement (ibid.). The absence of career planning and management content in education programmes can, therefore, have an effect on the exchange value of knowledge in the labour market, and also on the attractiveness or otherwise of an individual educational option. Jarvis makes some fairly radical predictions with regard to education which suggest the future institutionalised and formal forms of education may become less attractive in comparison to non-formal methods of education. If we look at this from a Bourdieuian perspective, this may mean that academic qualifications will lose their value as an institutionalised form of cultural capital. This could further mean that the role of higher education qualifications (compared to secondary school qualifications) will also change in the future regarding access to key positions in society and in terms of the conversion rate between economic and cultural capital.

Conclusion

We have considered the problem of providing a workforce with vocational and technical education in its origin, i.e. with regard to the question of why this type of education is unattractive to young people or, in other words, why young people less frequently choose this type of education. We have examined the situation in the field regarding the orientation of this type of education towards a career through the concept of career guidance. It appears that legislation in the field of the labour market is more influential than legislation in the field of education. A review of implementing documents shows that the range of contents is adequate, but that the amount of time in which these contents are supposed to be provided is not.

An investigation of the theoretical concepts influencing counselling practices in Slovenia reveals that the prevailing concepts are those from the industrial period, which place the individual and his or her capabilities and achievements in the foreground in aptitude tests. The worst represented theoretical concepts are those that understand a career as a process for which the individual needs to be trained by learning career planning and management skills. In Slovenia, then, we may talk about the passive role of the counsellor as a 'facilitator'. For the time being, conditions that would allow the counsellor to take on the active role of educator, trainer and teacher are not present at the systemic level. Learning career planning and management skills would require both inclusion of these contents in the curriculum and personnel with adequate professional training – something currently lacking in Slovenia.

The choice (or not) of vocational and technical education from the point of view of society further confirms the role of the counsellor as 'facilitator', since it shows that this is actually a rational and pragmatic decision at the level of the population. The importance of an academic qualification, as conceived by Bourdieu, is key to understanding the rational nature of this decision. An academic qualification belongs to the individual, and as such, no one can take it away. It conditions legitimate access to key positions in society, while the possibility of giving a monetary value to the academic qualification at the same time enables a rate of conversion between economic and cultural capital. We proceed from the assumption that the basic imperative and driving force of consumer society is consumption itself, for which economic capital is essential. Those practices that enable the individual to enrich his or her economic capital (in this concrete case of the attainment of an academic qualification) are rewarded. The quantity of economic and cultural capital also influences the quantity of social capital. Together with the quantity of symbolic capital, these

four types of capital also represent the amount of power that individual groups possess in the game of society. Consequently, a characteristic of the upper class, as the class with more power in society, is that it is well provided with economic and cultural capital. Lower social classes, by contrast, are characteristically less well provided with economic and cultural capital. It is, however, necessary to realise that this is a generalisation that is unjustified at the level of considering an individual's career path.

A certain amount of caution is nevertheless necessary when treating academic qualifications as the key to success in a career and in society. In Slovenia, the recent statistics on the increasing unemployment rate among young people aged 25–29 with higher education can be seen as an indicator of the weakening convertibility of academic qualifications. The recent decline in interest in enrolment in gimnazije and the simultaneous growth in enrolment in vocational and technical education programmes can indicate the same. We admit the possibility that career planning and management skills have the potential to partially substitute or complement the power of academic qualifications. It is our assumption that given the omission of career planning and management skills from education programmes and a strict adherence to institutionalised and formal forms of education, it is possible to expect non-formal forms of education to become more attractive. This will be the case irrespective of whether this involves general or vocationally specific knowledge.

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Biographical note

Miha Lovšin is a PhD candidate in Educational science with the thesis title Career Choice of Youngsters in Social and Cultural Context. Working as Senior Advisor at the Institute of the Republic of Slovenia he represents Slovenia in the European Lifelong Guidance Policy Network, acts as technical delegate in European Skills Promotion Organisation and takes part as lecturer in training programmes for school councillors in Slovenia. This diversity of his professional roles inspires his research work on various aspects of career choice as individual and societal category. Part of it is also the above article.

Child Participation in Family-School Cooperation

Dubravka Maleš[1], Barbara Kušević*[2] and Ana Širanović[3]

This paper discusses the cooperation between families and schools from the perspective of the UN Convention on the Rights of the Child (1989). Given that the principal purpose of the cooperation between families and schools is children's well-being, it is reasonable to expect the child's participation in situations of direct parent-teacher cooperation. The theoretical part of this paper is grounded on contemporary scientific findings in family-school cooperation and the role of the child in the process, while the empirical part seeks to determine whether the requirement for child participation is being fulfilled in family-school cooperation in Croatia. As a theoretical basis for the research, Hart's (1995) 'Ladder of Participation' model has been used; the results can serve as guidelines for improving the existing school practices and introduce changes in school legislation relating to cooperation with parents.

Keywords: Child participation, Family, School, Cooperation

1 Department of Pedagogy, Faculty of Humanities and Social Sciences, Zagreb, Republic of Croatia

2 *Corresponding author. Department of Pedagogy, Faculty of Humanities and Social Sciences, Zagreb, Republic of Croatia; bkusevic@ffzg.hr

3 Department of Pedagogy, Faculty of Humanities and Social Sciences, Zagreb, Republic of Croatia

Udeležba otroka pri sodelovanju šole in družine

Dubravka Maleš, Barbara Kušević* in Ana Širanović

V prispevku razpravljamo o sodelovanju med družino in šolo z vidika Konvencije ZN o otrokovih pravicah (1989). Glede na to, da je glavni namen tega sodelovanja otrokovo dobro počutje/blaginja, se pri neposrednem sodelovanju staršev in učiteljev upravičeno pričakuje udeležba otroka. V teoretičnem delu razpravljamo o trenutnih znanstvenih ugotovitvah o sodelovanju med šolo in družino ter o vlogi otroka v tem procesu; v empiričnem delu ugotavljamo, ali je zahteva po vključitvi otroka pri sodelovanju družine in šole na Hrvaškem izpolnjena. Kot temeljno teoretično izhodišče za raziskavo je bila uporabljena Hartova (1995) »lestvica udeleženosti«; izsledki lahko služijo kot smernice za izboljšanje trenutne šolske prakse in kot predlogi sprememb v šolski zakonodaji na področju sodelovanja s starši.

Ključne besede: udeležba otrok, družina, šola, sodelovanje

Introduction

The UN Convention on the Rights of the Child (1989) has created a Copernican revolution in the perception of the child. This international document acknowledges that the child is a subject with rights; consequently, for the first time in history, the child is seen as holder of rights, and not merely an object of adult protection.

This new image of the child has affected not only children, but also those who care for them and educate them, and are responsible to ensure that they enjoy their rights. Parenting has thus ceased to be a matter of privacy, and entered into the public domain. Because the rights of the child are guaranteed by national laws, any violation of those rights by a parent or any other adult requires national authorities' legal protection of the child's integrity. However, the extent to which children enjoy their rights also depends upon adults' attitudes towards them. Adults are thus required to alter their attitudes in a way that they respect children's rights and recognise each child's individuality. Sadly, adults are often the ones who hinder children from exercising their rights, since they still frequently hold the traditional image of the child as someone in need of protection, and not as subject with rights and agency. The child is, therefore, often seen merely as a future adult and childhood a transitional period, namely a preparation for the adulthood (Verhellen, 2001). Nevertheless, from the viewpoint of seeing the child as subject with rights, every child is regarded an individual, and childhood is a period in which children live their rights, rather than waiting for their time to come.

Participation rights – a reflection of the new perception of the child's nature

Based on the concept of the child as subject with rights, the Convention on the Rights of the Child has brought forth a set of rights demanding that the child's voice be heard and taken into consideration. These are known as participation rights, and they guarantee children's active involvement in society. It is precisely these rights that have made a substantial shift in the acceptance of the child as an active member of his/her community. Participation rights reflect a belief in the child's abilities to be actively involved in his or her growth and the development of the environment in which he or she lives and learns.

Participation is expressed in two ways in the Convention: as one of the four guiding principles of the Convention (together with those of non-discrimination, the right to life, survival and development and adherence to the best interests of the child), and as the core of a set of rights that guarantees children

participation in their social context. The right to participate is explicitly stated in several articles of the Convention, while in others it is implicit (Flekkøy & Kaufman, 1997). Article 12 states that the child who is capable of forming his or her own views has the right to express those views freely in all matters affecting the child and that the views of the child are given due weight in accordance with his or her age and maturity (Convention on the Rights of the Child, 1989). In addition to Article 12, participation is explicitly stated in Article 13 (the right to freedom of expression and freedom to seek, receive and impart information and ideas of all kinds, regardless of limits, either orally, in writing or in print, in the form of art, or through any other media of the child's choice), Article 14 (the right of the child to freedom of thought, conscience and religion), Article 15 (the rights of the child to freedom of association and peaceful assembly), Article 31 (the right to participate freely in cultural life and the arts), and Article 40 (the right to participate in legal proceedings against the child).

In other parts of the Convention, participation is also rather implied than overtly stated. The preamble of the Convention states that the child should be fully prepared to live an individual life in society (Convention on the Rights of the Child, 1989). Having that in mind, it is unfair to expect a young person coming of age to know how to participate in the grown-up world if he/she has not actively participated prior to adulthood and thus practiced a variety of participatory mechanisms (Flekkøy & Kaufman, 1997). In that respect, Article 5 of the convention states that the child's parents and other educators have to provide appropriate direction and guidance for their children. Adult guidance does not imply making decisions for children or taking control over their lives. Rather, it supposes that the adults gradually involve children in decision making about all issues that affect them. Growing-up is thus seen as a process of gradual empowerment and a period of learning how to take responsibility for one's own actions, which is not possible if the child's participation rights are not respected.

In addition to legal obligations of child participation set forth by the Convention on the Rights of the Child, research has also shown that participation has its developmental and educational value. Active involvement supports a sense of group membership, collective ownership and shared responsibility (Hart, 1992; Lansdown, 2001). It facilitates the development of collaborative decision making and problem solving (Smith, 2007), as well as the development of skills for taking control over one's own life (Carr, Lee, & Jones, 2005, in Smith, 2007) and for changing the adverse conditions of life (Razzini & Thaplyial, 2005, in Smith, 2007; Lansdown, 2001). A sense of control over oneself and one's actions supports the process of assuming responsibility for one's behaviour, as illustrated by Wood, Larson and Brown's research (2009).

Their research showed that young people who participated in various youth programs 'reported becoming more responsible through their participation' because of their 'adherence to their commitments and their consideration of the consequences of their actions on others' (2009, p. 295).

Student councils and class and school projects are often considered to be key mechanisms for practicing participation in schools. However, our belief is that genuine student participation implies that school life is holistically permeated with participatory principles. Student participation and collaborative conduct must be reflected in everyday school life, patterns of communication and parent-teacher-student relations. Therefore, the next chapter discusses the necessity of involving students in processes of family-school cooperation.

Child participation in family-school cooperation

Schooling is one of a child's most essential activities. It affects the child's entire cognitive, social and emotional development. Given that the child spends most of his or her time with his or her family or in school, not only is it crucial how the two institutions perceive participation rights, but also to what extent they are coordinated in the promotion of child participation. Since both family and school constitute significant sources of influence on the psycho-educational development of children, the best results are achieved when these two institutions work together (Comer & Hayness, 1991). Family-school cooperation[4] is one such mutual area of activity in which participation rights can be both respected and denied, depending on the context and quality of cooperation.

Family-school cooperation is defined in this paper as the process of reciprocal information-sharing, counselling, learning, arranging and spending time together, with the aim of sharing responsibility for the child's development in family and school (Maleš, 1996). Therefore, the principal objective of family-school cooperation is *the child's well-being*. The importance of parent involvement in the child's school life has been repeatedly confirmed. For instance, it has been shown that the chief prediction of the child's school success or failure is not the family's socio-economic status, nor its culture or structure, but parent involvement in the child's learning and development (Clark, 1983; Dornbush et al., 1987, all in Amatea, 2008). This is crucial to any educational institution when evaluating their approach to families. If teachers acknowledge that parents are competent, because they know their children best and strongly

4 The authors primarily focus on family-school cooperation, while the empirical part further elaborates the cooperation between family and other educational institutions, such as kindergartens, children's homes and other.

influence their school progress, then one can expect that they will find ways to reach out to parents, hear them out, detect their strong points and use all the knowledge parents have to improve the child's developmental outcomes.

If the principle objective of family-school cooperation is indeed the child's well-being, then it is reasonable to expect that the child be given an active role in situations of direct family-school cooperation, in the light of Article 12 of the Convention, which emphasises the right of the child to express his or her own views freely in all matters affecting him or her. Paradoxically, researchers and practitioners seem to be more interested in teachers' and parents' roles in the process, while the child is usually treated as a passive object of adult care. For instance, Olsen and Fuller (2008) discuss child participation in parent-teacher conferences only incidentally, as an option decided upon by teachers and parents and never by children, and dependent upon the child's age and the purpose of the child's participation. Epstein (2001) indicates the following roles of the child in family-school cooperation: *courier, communicator, commentator, observer and targets of attention in both settings*, also fairly detached from the perception of the child as an agent and subject equal to adults in the process of decision making.

Such practices are in conflict with the concept of participation rights, which imply the child's active involvement in all activities of family-school co-operation, such as the possibility to express his or her views freely, propose solutions to problems, or even organise a family-school meeting by him/herself. It is the child's fundamental right that protects not only the child's best interests, but also supports enhanced decision-making, since children possess unique knowledge (Lansdown, 2001) of themselves, of which adults may not be aware. These arguments are respected in Hart's 'Ladder of Participation' model (1992), which incorporates eight levels of participation of children in projects. The authors of the paper used Hart's model as a theoretical framework for their research. The model is presented in the following chapter.

Theoretical framework of the research - Hart's 'Ladder of Participation' model

Hart's (1992) 'Ladder of Participation' of children in projects is a model of children's involvement in collaborative activities with adults. The first three levels of the ladder (*manipulation, decoration, tokenism*) are, in fact, examples of pretend participation, i.e. non-participation, which is characterised by adults' use of children for the fulfilment of their own goals. The purpose of the pretend participatory levels is to point to situations where it may seem that children participate, when, in fact, they are excluded (Shier, 2001). The next five levels

(*assigned but informed; consulted and informed; adult initiated, shared decisions with children; child initiated and directed; child initiated, shared decisions with adults*) represent situations of genuine and gradually empowering child participation. Table 1 presents Hart's 'Ladder of participation' model.

Table 1. *Levels of Hart's 'Ladder of Participation' model (in Hart, 1992).*

Level name	Description of the form of participation
Manipulation	Adults use children's ideas, but do not give any feedback on how they were used. Children have no real understanding of their roles.
Decoration	Children participate, but the purpose of their participation is known solely to adults. Children are used to fulfil adults' goals.
Tokenism	Children are asked for their opinions, but have little or no choice about the way they will express them or the scope of the ideas they can express.
Assigned but informed	Children are familiar with who made the decision about their participation in the project; they understand the aim of the project and the purpose of their participation. They volunteer to participate.
Consulted and informed	The project is designed and managed by adults who consult children. Children understand the process and their opinions are taken into consideration.
Adult-initiated, shared decisions with children	Children participate in decision-making together with adults.
Child-initiated and directed	Children plan the project and decide how it is to be carried out. Adults are available for consultation, but do not take control over the process.
Child-initiated, shared decisions with adults	Children design the project by themselves, realise it and decide to involve adults as support.

The model has been repeatedly adapted and variously interpreted. For instance, Shier (2001) devised a five-level model of child participation. At each level, he argues, 'individuals and organizations may have differing degrees of commitment to the process of empowerment' clarified 'by identifying three stages of commitment at each level: *openings, opportunities and obligations*' (Shier, 2001, p. 110). Jensen, in contrast, suggested that the rungs of the ladder are described as 'different forms rather than different levels of participation' (Jensen, 2000, in Hart, 2008, p. 23), while Treseder (1997, in Hart, 2008) developed a circular model, and Mannion (2003, in Hart, 2008) devised something similar to a fountain of participation.

Reddy and Ratna (2002) developed an intriguing adaptation of Hart's model which reflects upon different roles that adults play in relation to child participation. They suggested two additional levels of non-participation to be placed below Hart's pretend participatory levels – active resistance of child participation, and hindrance to child participation, by which adults intentionally or unintentionally undermine children's abilities or make them feel incompetent.

We used Hart's 'Ladder of Participation' model as the theoretical framework for our research. As far as we are aware, the model has not yet been used for examining the scope of child participation in family-school cooperation. The methodology of the research on the existing practices of child participation in parent-pedagogue[5] cooperation in schools in Croatia is presented in the next chapter.

Method

The main research question was to determine the most frequent levels of child participation in situations of direct parent-pedagogue cooperation in various educational institutions. Eight levels of Hart's 'Ladder' were used as a framework for investigating the practices of child participation in the processes of tackling various educational issues, which usually takes place during parent-pedagogue consultation. In that sense, the consultation process was imagined as a collaborative activity between adult and child, and Hart's model adapted accordingly, as presented in Table 2.

Table 2. *Adaptation of Hart's 'Ladder of Participation' model to parent-pedagogue cooperation.*

Level name	Description of the form of participation
Manipulation	Parent and pedagogue are familiar with the child's views, which they may use without the child's awareness. Adults make all the decisions by themselves.
Decoration	The child has to attend parent-pedagogue consultation, even if he/she does not understand the reasons for his/her participation. Adults make all the decisions by themselves.
Tokenism	The child is given an opportunity to state the facts of an event, without his/her own interpretation of the event.
Assigned but informed	The child is familiar with the reasons of parent-pedagogue consultation and aware of his/her role. The child can freely decide to participate, or not to participate.
Consulted and informed	The child volunteers to attend parent-pedagogue consultation. He/she freely expresses opinions, which adults take seriously and inform the child about the outcomes of the meeting.
Adult-initiated, shared decisions with children	The child is actively involved in parent-pedagogue consultation, suggests possible solutions to problems, and decides upon the best one together with adults.
Child-initiated and directed	The child suggests possible ways to solve problems, while parent and pedagogue try to help the child find the best solution. The child makes the final decision by him/herself.
Child-initiated, shared decisions with adults	The child initiates parent-pedagogue consultation with the aim of jointly deciding on the best solution to a problem.

5 In the Croatian educational system a pedagogue is an educator who, among many other duties (from administrative to managerial) does student and parent counseling for the purpose of preventing or dealing with various educational and other problems.

The *instrument* was designed by the authors of the paper on the basis of Hart's 'Ladder of Participation' model (Table 2). It consists of three sections:

1. general data (type of educational institution, location of employment institution and age of respondent);
2. frequency of involving children in consultation with parents;
3. eight graded levels of child participation in parent-pedagogue consultation.

Reliability analysis of the questionnaire produced Cronbach's alpha coefficient of 0.79.

A total of 217 pedagogues who work in various educational institutions in the Republic of Croatia participated in the research. Almost two thirds of the respondents work in elementary schools (64.5 per cent), while substantially smaller number of respondents works in secondary schools (14.7 per cent), kindergartens (11.1 per cent) or some other educational institution (9.7 per cent).

With regard to location of employment institution, the majority of respondents works in urban areas (77.3 per cent), while the rest of the respondents work in smaller rural areas (16.1 per cent) or municipalities (11.5 per cent).

With regard to age of the respondent, our average respondent was between 41 and 50 years old. This particular age span covers more than a third of all respondents, while the smallest number covers those aged 60+. The distribution by age is presented in Table 3.

Table 3. *Age of respondents.*

Age groups	f	%
under 30 years	45	20.7
31-40 years	36	16.6
41-50 years	78	35.9
51-60 years	52	24.0
61 years +	6	2.8
Total	**217**	**100.0**

Findings and discussion

We aimed to investigate several things. Firstly, we wanted to determine general practices of involving children in individual consultations with their parents, frequency of child involvement, and the reasons for their involvement. By doing so, we wanted to see how pedagogues perceive the role of the child in situations of the child's direct concern, which parent-pedagogue consultation

certainly is. The results (Table 4) suggest that the majority (75.6 per cent) involves children *often* or *always*. Almost two thirds of the respondents believe child participation is the best way to come to solutions to problems, while a tenth of the respondents who always involve children believe that participating in parent-pedagogue consultation is the child's right. A smaller but nonetheless significant number (one fifth) of respondents involve children *rarely*, while 3.7 per cent of respondents *never* involve children.

Table 4. *Frequency of involving children in individual consultation with parents.*

Description of frequency	f	%
Never, it is a matter between us adults	8	3.7
Rarely, when it is necessary in order to solve problems	45	20.7
Often, because I believe it is the best way to come to a solution to a problem	138	63.6
Always, the child has the right to know what is discussed with regards to him/her	26	12.0
Total	**217**	**100.0**

The respondents who involve children *never* or *rarely* (24.4 per cent) stated different reasons for such practices. The respondents had the possibility to choose more than one answer. The most frequent reasons were: it is easier to talk to a parent when the child is not present (40.4 per cent), to avoid parent-child confrontations (34.6 per cent), to protect the child from embarrassment (23.1 per cent).

Although the greatest number of respondents who do not include children do so for the reason of protecting the child (from embarrassment or confrontation with a parent), which is indeed in legitimate some cases, excluding children from the processes which affect them directly goes against the Convention's basic principles and the concept of participation rights. It is even more problematic when children are excluded from facilitating the consultation process, which is in fact the most frequent reason. Since the purpose of the cooperation between family and educational institution is the child's well-being, it is precisely the child's well-being (and not making the work of school services easier) that should be the prime reason for all cooperative activities. Even if it is indeed easier to consult with parents without the child's presence, such consultation is deprived of the child's specific views and suggestions for solutions, as well as opportunities to stand up for him/herself and make decisions, all of which are skills that the child will surely need in the future.

After examining the way pedagogues perceive the role of the child in situations of the child's direct concern, the respondents were presented with

eight graded statements representing different levels of child participation in parent-pedagogue consultation (Table 2). Frequency of the occurrence of participatory practices was determined on a scale from 1 to 5, 1 denoting *never*, 2 *rarely*, 3 *sometimes*, 4 *often* and 5 *always*. The results were first analysed separately for every level of the model, and then in correlation with *type of educational institution*, *location of employment institution* and *age* variables. To determine to what degree the practices of child involvement in parent-pedagogue consultation are actually present, as well as for the reason of greater clarity of the findings, we summarised the results of frequency denominators *never* + *rarely* and *often* + *always* for each level of the model.

Figure 1 presents the percentage of the respondents who answered that they involved children *often* and *always* on different levels of the model.

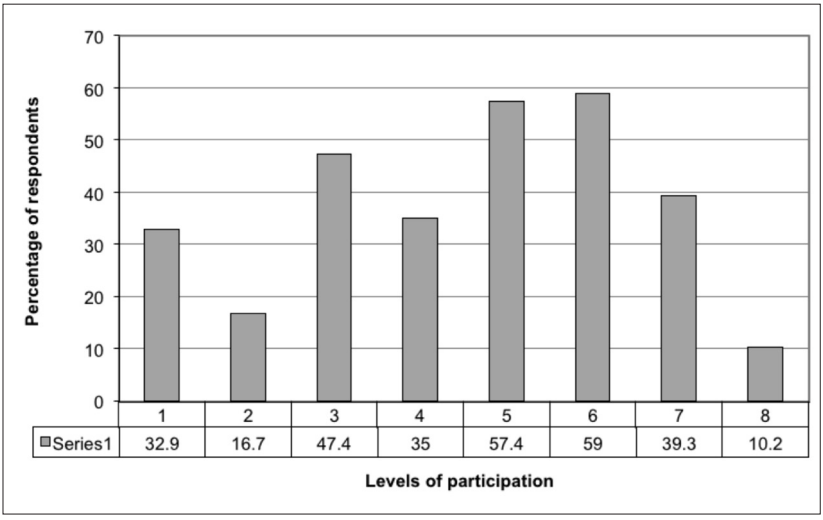

Figure 1. Children involved often/always in individual parent-pedagogue consultation.

Given that the first three levels represent pretend child participation, while the next five represent genuine participation, a regular distribution of results on the levels of genuine participation (4 to 8) is discernible from Figure 1. The greatest number of respondents (59 per cent) stated that they involved children on the sixth level, *adult initiated, shared decisions with children*, which implies the child's active involvement in parent-pedagogue consultation, his/her active contribution to problem-solving and joint child-adult decision-making. A fairly large number of respondents stated that they involved children *often*

or *always* on the fifth level, *consulted* and *informed*, which implies the child's participation by his/her free will, as well as opinion-stating taken into serious consideration. Generally, the findings suggest that fairly positive practices of child participation in family-school cooperation exist in Croatian schools.

However, only 10.2 per cent of respondents stated that they involved children on the last level of the 'Ladder'. Nevertheless, such results are not disconcerting since, according to Hart (2008), participation on the highest levels of the 'Ladder' is not obligatory. Rather, it is vital that children are given opportunities to ultimately reach those levels. However, it is worth noting that we expected such small percentage of responses concerning child participation on the highest level of the 'Ladder' because such participation implies a wholly novel perception of the child and adult-child relationship. By encouraging such child participation, the adult has to gradually renounce his/her absolute power and authority over the child.

In contrast, the responses that suggest that children are *often* or *always* involved on the levels of pretend participation (Levels 1, 2 and 3) are somewhat disturbing. Figure 1 shows that, except for on the decorative level, pretend child participation is practiced often or always by almost a third of all respondents. However, the lack of decorative participatory practices can be explained by the fact that that level was, in our instrument, defined in a negative manner. That is to say, on the decorative level, the child is required to attend parent-pedagogue consultation, even if he/she does not understand the reasons for his/her participation, while adults make all the decisions by themselves. Such a depiction could have prompted the respondents to give what they considered desirable or appropriate responses, by which they denied the existence of decorative practices in their work with parents and children. Furthermore, the decorative level is the only level described in an explicitly negative manner.

Additionally, almost half of the respondents stated that they involved children on the third level of pretend participation (*tokenism*), which we find alarming. Such findings suggest that every other Croatian pedagogue insists that the child does not give his/her version of an event or a problem, but that he/she states mere facts. Moreover, such practices suggest that the majority of respondents still do not recognise the importance of the child's unique knowledge of him/herself nor the child's possible contributions to joint problem-solving.

In order to obtain a more complete outlook on the practices of child participation in parent-pedagogue consultation, it is crucial to examine the percentage of respondents who *rarely* or *never* involve children on different levels of the model (Figure 2).

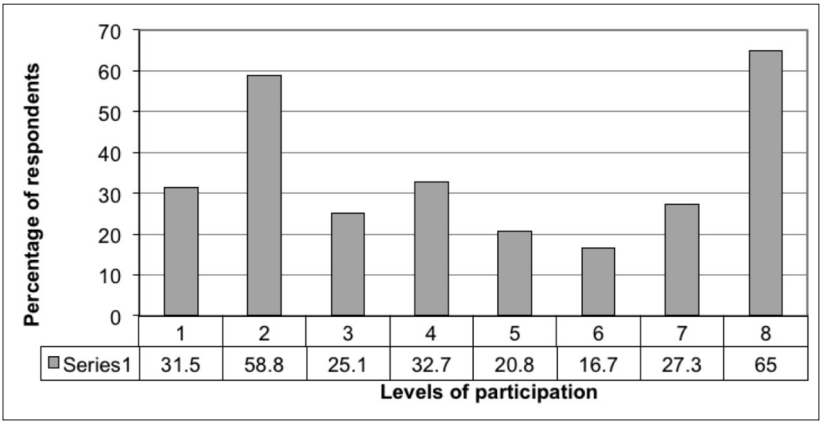

Figure 2. Children involved rarely/never in individual parent-pedagogue consultation.

The findings are compatible with the results for *often/always* frequency denominators. They also confirm that child participation is less frequent on Levels 6, 7 and 8 of the model, as well as on Level 2 (pretend participation), probably for the reasons suggested above.

In general, the overall findings imply that there is not one dominant level of participation practiced in parent-school cooperation in Croatian schools, but that the most frequently practiced levels are those positioned centrally in the model. Concerning the levels of genuine child participation, the lower levels of the ladder are most frequently practiced; in relation to pretend participation, manipulation and tokenism are most common in Croatian educational institutions.

We also wanted to determine whether there existed any differences in child participation with regard to type of educational institution and location of employment institution, as well as age of respondents. For that purpose, we used a regression analysis. The independent variables consisted of the type of educational institution and the location of employment institution, while the criterion variables consisted of each of the eight levels of the model of participation.

The examination shows that the independent variable of location of employment institution is statistically significant only in relation to *decoration*, but not in relation to other levels of the model of participation. Furthermore, the age of respondents proves not to be statistically significant in relation to different levels of participation. This suggests that there is no statistically relevant difference between the frequency of different participatory practices in

relation to the location of employment institution, nor the age of respondents. The lack of correlation between age of respondents and the practices of child involvement in parent-pedagogue consultation is somewhat surprising, since it is reasonable to expect that younger pedagogues have different concepts of the child's role in the processes of cooperation with parents than older pedagogues, due to differences in their education and the powerful influence the Convention has had in the previous twenty years. Therefore, we suggest that future research focuses on the nature of the connection between age of respondents and location of employment institution and the possibilities of child participation in parent-pedagogue cooperation.

The type of educational institution was shown to be in correlation with all three levels of pretend participation (beta coefficient 0.191 for *manipulation*, 0.183 for *decoration*, 0.324 for *tokenism*), as well as with the five levels of genuine participation (beta coefficient 0.284 for *assigned but informed*, 0.310 for *consulted* and *informed*, 0.261 for *adult initiated, shared decisions with children*, 0.311 for *child initiated and directed* and 0.313 for *child initiated, shared decisions with adults*). These findings confirm that the institutional framework is indeed a factor in the nature of child participation. Moreover, it is reasonable to expect that the conception of the child's capabilities to participate differs given different types of institution (early childhood education institution in comparison to secondary school) since the concept of the child is significantly determined by the child's developmental characteristics. Nevertheless, even pre-school children are in fact competent to express their views. Therefore, the respect of their participation rights is equally valuable as of those attending elementary and secondary schools. Since the way the instrument was constructed does not allow unambiguous determination of the nature of the relationships between the variables in question (therefore, the interpretation is based solely upon logical assumptions), the findings can serve as an initial indicator of the diverse roles the child can play in the processes of parent-pedagogue cooperation. The nature of these relationships should be investigated more thoroughly in the future.

Conclusion

The research sheds some light on the practices of involving children in the processes of direct parent-pedagogue cooperation. An adaptation of Hart's 'Ladder of Participation' served as guidance for examining these practices. The findings suggest the existence of different forms of child participation in parent-pedagogue consultation: from a complete lack of participation, through pretend

participation, to genuine participation characterised by the child's agency in decision-making. Such findings point to a gradual shift in the perception of the nature of adult-child relationship. It should be emphasised that the real complexities of parent-pedagogue cooperation and the role of the child in the process had to be reduced in order to fit the eight levels of Hart's 'Ladder'. Therefore, the approach described in the paper does not serve as a framework for evaluating respondents' educational work, just as Hart's participatory model is not an evaluative tool. Quite the opposite: these kinds of analyses should encourage critical examination of the child's role in educational institutions, and of the extent to which children's participation rights are respected. If this is taken into consideration, the findings can serve as a motivation for improving the existing school practices and introducing changes in school legislation in relation to the cooperation with parents, as well as for raising awareness about the importance of respecting the rights of the child in education.

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Biographical note

Dubravka Maleš, Ph.D. is Full Professor at the Department of Pedagogy at the Faculty of Humanities and Social Sciences, University of Zagreb. The family as a factor in childhood education, the issues of co-operation between family and educational institutions and the human and child's rights are in the focus of her scientific interest. She is the chief editor of journal Zrno (Seed), a journal for the family, nursery school and primary school and author or co-author of ten books, more than fifty scientific and professional papers in the field of family pedagogy, early childhood development and education for human and child's rights.

Barbara Kušević, PhD, works as a research and teaching assistant on the project *New paradigms of early childhood education* at the Department of Pedagogy at the Faculty of Humanities and Social Sciences, University of Zagreb. The special area of her interest is family studies. In that area in 2013 she defended her doctoral thesis, dealing with child-rearing implications of delayed parenting. She published three book chapters and a dozen of scientific and professional papers in Croatia and abroad.

Ana Širanović, works as a research and teaching assistant on the project *New paradigms of early childhood education* at the Department of Pedagogy at the Faculty of Humanities and Social Sciences, University of Zagreb. The special area of her interest are human and children's rights. She published several scientific and professional papers in Croatia and abroad. Currently she is writing her doctoral thesis in the field of children's rights.

Khine Swe, M. (Ed.) (2013) Critical Analysis of Science Textbooks: Evaluating instructional effectiveness [Kritična analiza naravoslovnih učbenikov: ocenjevanje učinkovitosti poučevanja]. Dordrecht [etc.]: Springer. ISBN 978-94-007-4167-6.

Reviewed by Miha Slapničar

Science educators agree that textbooks play a crucial role in teaching and learning processes (Clement, 2008; Koppal & Caldwell, 2004); consequently, numerous research studies have been conducted in the analysis of science textbooks. In 1941, Graham noted that 'The textbook is an old instrument in learning and teaching processes' and traced the origin of the textbook back to the classical Greek era. With the invention of the printing press, textbooks became omnipresent in every school. Since textbooks are being used as a major source of information in teaching a particular subject, the quality and accuracy of the content is crucial for their educational effectiveness.

Critical Analysis of Science Textbooks: Evaluating instructional effectiveness includes contributions by authors from various backgrounds, theorists and practitioners. In analysing science textbooks, researchers look into the balance between theoretical and practical knowledge, the portrayal of minorities, women and gender fairness, the treatment of socio-scientific and controversial issues, and the depiction of graphical information, vocabulary load, comprehensibility and readability at the intended level, the representation of indigenous knowledge, the role of textbook questions, and cultural and religious sensibility.

This book is organized in four parts. While Part 1 introduces the theoretical background, criteria and protocol for evaluating the quality of science textbooks, Part 2 covers textual and language analysis of the science textbooks. Part 3 of the book presents research efforts in content analysis of the textbooks. Part 4 summaries the findings and issues presented by the international researchers.

In Chapter 1, Devetak and Vogrinc note that textbooks are an important source for students to obtain knowledge, and that inadequate and inconsistent science knowledge presented in the textbooks can affect students' conceptions about scientific phenomena. They present the criteria for evaluating the quality of science textbooks, using didactic principles.

In Chapter 2, Slough and McTigue observe that in recent years school-based science textbooks have become similar to the design of web pages and science trade books with photographs, table, textboxes, flow charts, drawings,

and other visual representations. It seems that teachers state that while an increasing visual presence in science has been noted by many and explored in middle and high school science textbooks, information about the graphical demands of science textbooks are not widely available. In this chapter, the authors discuss the development of a new instrument, the Graphical Analysis Protocol (GAP), based on four principles: (1) graphics should be considered by form and function; (2) graphics should help a viewer build a mental model of a system; (3) graphic and texts should be physically integrated; and (4) graphic and texts should be semantically integrated. The authors discuss three research articles that used GAP as an analytical instrument.

Chapter 3, entitled 'Understanding the Disciplines of Science, Analysing the language of science textbooks' (authors Muspratt and Freebody), examines textbook analysis from the perspective of language. They argue that there is systematic variation in the ways the authors of science textbooks deploy linguistic features in representing scientific knowledge. As a consequence, texts present different ways of understanding the world.

Dimopoulus and Karamanidou, in Chapter 4, assert that currently science is presented as static and absolute knowledge in school, but in reality it is dynamic and subject to negotiation in meaning making.

In Chapter 5, Orgill explores the use of analogies in science textbooks. She observes that science instructors and textbook authors often use oral and textual analogies with the intention of helping students learn new concepts. The chapter summarizes the methods and results of several published analyses of analogy use, and presents classroom teaching models in the effective use of analogies.

Bryce, in Chapter 6, discusses the textual features and language demands of primary school science textbooks. She describes reading comprehension as a part of science teaching and learning, similar to the exploration of concepts through hands-on activities. As a result, language and literacy demands of reading science textbooks continue to challenge students. The chapter calls for more informational texts in primary grades.

As previously mentioned, Part 3 presents research efforts in the analysis of the content of the textbooks. It has eight chapters composed by fourteen different authors.

King, in Chapter 7, describes a review of the earth science contents of all the science textbooks for 11–16-year olds in schools in England and Wales. In this study, the contents of the textbooks were evaluated against the earth science statements in the National Curriculum for Science. They were found 531 'misconceptions', analysis of which showed that the parts of the earth science

curriculum most prone to misconception are processes and plate tectonics.

Chapter 8, by Rillero, investigates the science contents in 19th century United States reading textbooks, which helped students to read and learn about the world in this era. The chapter presents the results of the analysis that determines the quantity of science and type of science in 20-year periods during the 19th century. The science content in the books was probably the first formal science education of most students, and biology content increased relative to other since subjects.

Caravita and Valente, in Chapter 9 present a cross-country analysis of educational approaches to environmental complexity in life sciences school manuals. The authors describe the importance and concerns of educational institutions in European countries on this important issue.

Chapter 10, by Niaz and Coştu, analyse a Turkish general chemistry textbooks based on a history and philosophy of science (HPS) perspective. The chapter presents the results from the analysis of general chemistry textbooks published in Turkey. The detailed findings of this study can aid in the design and implementation of HPS perspectives to assist students' conceptual understanding.

Park and Lavonen's chapter addresses the development analysis of standards-based school physics textbooks in Finland and the United Stated. In this chapter, they report the differences between a curriculum based on the National Science Education Standards (NSES) in the United States and a curriculum following National Core Curriculum in Finland. They present general features, questioning style, and laboratory activities.

In Chapter 12, Binns presents a qualitative method to evaluate how textbooks portray scientific methodology. He notes that a key aspect of scientific literacy is to have a clear understanding of how scientists work. The chapter describes the qualitative methods and how the instrument was used to identify the quality of a textbook's presentation of scientific methodology.

Valanides et al. report the findings of an analysis of the set of science textbooks used in Cyprus' school curriculum, in Chapter 13. The set includes teacher's book, worksheets, and evaluation sheet for the sixth-grade primary classes. The authors suggest the use of analogies and the integration of ICT, and encourage teachers to use tools for scaffolding pupils' thinking and meaning construction.

The last chapter, by authors Treagust and Yang, reports on an analysis of nine science textbooks used in Western Australian high schools. Their study reveals that the use of humour is higher than other categories. The authors note that humorous diagrams are effective for showing learners scientific entities

and phenomena, and also suggest exploring more deeply the pedagogical value of diagrams and how these can help students in their conceptual understanding of science subjects.

In conclusion, we can say that textbooks are an indispensable part of the educational process, not just in science, as described in this book, but also in other school subjects. Therefore, it is essential that students can become accustomed to learning from good textbooks with no scientific mistakes and with up-to-date research-based approaches to learning the subject. For this reason, it is important that textbooks undergo systematic and thorough analysis using adequate and objective criteria. There are many criteria in science textbook analysis set by the different stakeholders and users with a variety of emphases, and what constitutes a good science textbook is an open-ended question. Textbook researchers attempt to look at the issues related to the quality of the textbook from different perspectives. Apart from the various approaches described in this book, others also evaluate the prevalence, function, and structure of graphics and photographs and inclusion of history of science, assessing comprehension demands and language structure (Bezemer & Kress, 2010), balancing gender representation, and examining the text book as a cultural object (Izquierdo & Gouvea, 2008).

The editor of the Springers' volume about textbooks analysis, Myint S. Khine, said that the contributors to this monograph have considered challenges and potentials in textbook analysis and presented their findings. It is hoped that this collective work will continue and lead to more rigorous attempts and establish a framework for analysing science textbooks in the future.

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