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Aims for Learning 21st Century Competencies in National Primary Science Curricula in China and Finland

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ABSTRACT

Incorporation of aims for learning 21st century competencies in subject-specific curricula and education has been an important issue worldwide. This study explored the integration of aims for learning such competencies into the National Primary Science Curricula in China and Finland. Both Curricula showed an emphasis on aims related to science education, such as inquiry and information literacy. Yet the density of appearance of competencies for the 21st century in the Chinese Curriculum is lower than in the Finnish Curriculum. Additionally, the Chinese Curriculum illustrates the shortage of aims in the Living in the World category. The significant differences between the Curricula have to do with the educational theories underpinning each national curriculum. The Chinese Curriculum has a tendency to align with the Anglo-American curriculum tradition, whereas the Finnish Curriculum is more closely aligned with the German *Bildung-Didaktik* tradition. A national curriculum in different subject areas could be designed whose central purpose would be cultivating holistic individuals and targeting goals for disciplinary knowledge and skills. Merits of the different educational traditions need to be examined and considered in the curriculum design process.

Keywords: 21st century, competency, science curriculum, Finland, China

INTRODUCTION

The purpose of this article is to investigate how aims for learning 21st century competencies are incorporated into the Chinese and the Finnish National Primary Science Curricula. We also wish to identify and explain similarities and differences between the two science Curricula in terms of the elements of these competencies from the perspective of the different educational traditions that underpin the curriculum documents.

Goals for Teaching and Learning 21st Century Competencies Worldwide

Reforming education for 21st century needs has been an important topic of discussion worldwide (European Union, 2008; Finnish National Board of Education, 2016; National Research Council, 2012; Voogt & Roblin, 2012). International organizations, such as the European Union, have declared education to be the means by which we ensure that citizens acquire the key competencies needed to live in our changing world (European Union, 2008; Voogt & Roblin, 2012). The term *21st century competencies* refers to redefining the aims for education or learning outcomes according to the capabilities needed in the 21st century (Binkley, Erstad, Herman, Raizen, Ripley, Miller-Ricci & Rumble, 2012; Trilling & Fadel, 2009). Even though different terminologies are used to describe 21st century competencies (for example, key competencies or competences, generic competencies, transversal competences, interdisciplinary skills), all have similar connotations and compositions (Wang, Lavonen & Tirri, in press). The need for holistic education in the 21st century, not only naturalizing the cognitive domain, but also promoting values

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Contribution of this paper to the literature

- In general, most of the 21st century competencies listed in the framework have been integrated into the Curriculum in both countries.
- Both the Chinese and the Finnish Science Curricula show an emphasis on aims for science-related competencies, information literacy and inquiry.
- The Chinese Science Curriculum illustrates a significant deficiency in integrating competencies related to aims for moral and rational individual living.

and worldviews along with a growth mindset for learning and ethical skills has been discussed (Ornstein & Hunkins, 2013; Tirri, 2016). In the present research 21st century competencies are defined as an integration of the knowledge, skills, attitudes, and values that all young people of our time are required to have (Ananiadou & Claro, 2009; European Union, 2008; National Research Council, 2012; Voogt & Roblin, 2012).

Changes in the Chinese and the Finnish Curricula Echo Recent International Changes

With the emergence of educational goals for 21st century competencies, countries around the world have developed their own frameworks for teaching these skills, including China and Finland. In June of 2016, China published the latest version of its document ''Core Competencies for Student Development'' after four years of research and discussion among researchers, educators, policymakers and teachers. The essence of the document is to cultivate the individual as a whole by emphasising ''core competencies'' in the following areas: 1) learning to learn, 2) living in a healthy way, 3) taking responsibility as a citizen, 4) practice, creativity and innovation, 5) knowledge of one's cultural heritage, and 6) scientific literacy. In Finland seven areas of core competencies (called ''transversal competences'' in the Finnish National Core Curriculum 2014) have been proposed, including 1) thinking and learning to learn, 2) cultural competence, interaction, and self-expression, 3) taking care of oneself, managing daily life, 4) multi-literacy (''Multi-literacy is the competence to interpret, produce and make a value judgement across a variety of different texts, which will help the pupils to understand diverse modes of cultural communication and to build their personal identity''), 5) competence in information and communication technology, 6) working-life competence and entrepreneurship, and 7) participation, involvement and building a sustainable future (Finnish National Board of Education, 2016).

The questions of how to integrate 21st century competencies into a national curriculum and into school subjects and how to teach these competencies through learning activities are some of the most important challenges in education today (Benade, 2014; Burden & Hall, 2005; National Research Council, 2012; Finnish National Board of Education, 2016; Reimers & Chung, 2016). The Chinese national curriculum is revised about every ten years, as is the Finnish national curriculum. The previous Chinese National Curriculum (an experimental version) was published in 2001 and revised in 2011. Since 2016, a new round of revisions has been in progress whose purpose is to integrate the newly published core competencies into different subjects. Curricula for different subjects at each level have been officially published one by one. However, the new National Primary Science Curriculum officially published in 2017 has not yet been written with the intention of integrating 21st century competencies.

By contrast, the seven areas of transversal competences in the Finnish National Core Curriculum for Basic Education 2014 were integrated into every level of education and into every subject, including science at the primary school level (Finnish National Board of Education, 2016; Vahtivuori-Hänninen et al., 2014). Moreover, the momentum for cultivating generic competencies in the Finnish curriculum began gathering steam in the 1970s. Objectives such as cross-curricular themes of "cultural identity and internationality" and "well-being and sustainable future" were proposed and integrated into different subjects in the Finnish National Core Curriculum in 2004 (Autio, Kaivola & Lavonen, 2007). However, Finland faces challenges in fulfilling the aims for 21st century competencies in reality.

Curriculum Stability and Changes in China and Finland

A national curriculum is a plan of study outlining the goals for education at a national level, and as such, it guides and regulates the instructional processes throughout a country (Oliva, 1997; Ornstein & Hunkins, 2013). A national curriculum includes subject matters, skills and values that policymakers expect students to learn (Cuban, 1992). It is not a neutral document; rather, ''it is produced out of the cultural, political, and economic conflicts, tensions and compromises'' (Apple, 1993, p. 1) of a given country and reflects national values (van den Akker, 2003). Although the national curriculum changes with a society's changing demands and the development of psychological and educational theories, the constancy of culture, values and theories, and traditions of schooling, teaching and learning are deeply embedded in a country's curriculum (Cuban, 1992).

The European-Scandinavian *Bildung-Didaktik* and the Anglo-American curriculum are two major curriculum theories and practices embedded in western countries (Autio, 2014; Westbury, 2000). American curriculum theory today and *Didaktik* are not far apart from the perspective of the present, because they are concerned with similar issues in education, for instance, teaching and learning goals. They have also developed dynamically through increasing interaction and globalized influences. In this research, *Bildung-Didaktik* and the Anglo-American curriculum refer to a traditional perspective, and the arguments are built on their differences. Nevertheless, this research does not aim to dichotomize the two traditions. To be specific, these two traditions are fundamentally different in their aims for teaching and learning, in the functions of a national curriculum within the institutional systems and in the roles of individual teachers (Pantić & Wubbels, 2012; Westbury, 2000). The *Bildung-Didaktik* tradition aims at cultivating individuals to be competent to live successfully and participate in society and, ideally, to reconstruct the society (Autio, 2014). It is a tradition that highlights the discourse or conversations between the teacher and students about the subject matter in each lesson and shows respect for teachers' academic freedom and autonomy (Autio, 2014; Hopmann, 2007; Saari, Salmela & Vilkkilä, 2014; Sahlberg, 2015; Westbury, 2000). Thus, although there is a *Lehrplan* (literally, a teaching plan) in the *Bildung-Didaktik* tradition, such a plan could only be meaningful and educative when implemented by well-trained teachers (Autio, 2014; Hopmann, 2007; Pantić & Wubbels, 2012; Westbury, 2000). Teachers are considered to be professional experts with complete freedom within the framework of an illustrated *Lehrplan* and are not assessed solely on the basis of students' learning outcomes (Westbury, 2000). By contrast, the development of the Anglo-American curriculum has been based on Tyler's Rationale and theories of psychology, which involve standardization and accountability in the educational system. Educational practices developed from this tradition focus on "transmission of knowledge" from society to learners, rather than on educating the whole person (Pantić & Wubbels, 2012; Westbury, 2000). The curriculum and the teaching plans are well-articulated in this tradition, and the educational goals in schools are meant to achieve the stated objectives and the illustrated contents. The teachers are considered passive agents of the system: they can be trained and certified, and they are assessed by the students' learning outcomes (Autio, 2014; Westbury, 2000). Their responsibilities are to follow and implement the requirements of the national curriculum.

The Finnish curriculum developed as a hybrid of the *Bildung-Didaktik* and Anglo-American curriculum traditions (Autio, 2014; Hopmann, 2007; Saari, Salmela & Vilkkilä, 2014; Sahlberg, 2015). *Bildung*, which means educating the whole person, is a fundamental premise of Finnish education, although after the Second World War the Finnish curriculum was influenced by the Anglo-American curriculum tradition and psychology theories from the United States (Autio, 2014; Lampiselkä, Ahtee, Pehkonen, Meri & Eloranta, 2007; Saari et al., 2014). The Finnish tradition highlights the individual's subjectivity as well as intersubjectivity, which considers both the rights and duties of citizens. Citizenship has been considered as part of the school curriculum in Finland, thanks to the distinguished statesman and philosopher Johan Vilhelm Snellman (Saari et al., 2014). Since the curriculum reforms in the 1990s, Finland's national school administration has been transformed from a centrally governed system to a decentralized system, and Finnish teachers have been given more and more autonomy (Lampiselkä et al., 2007). The national curriculum turns out to be a guideline for teaching instead of a complete set of requirements with goals and prepared materials. The teachers themselves participate in the development of national, local and school curricula. They can choose content and textbooks and can organize classes as they want.

The development of the Chinese curriculum has taken cues from America, the Soviet Union and other foreign countries, such as Japan (Zhang & Gao, 2014). Curriculum theory in China has been affiliated with the two western theories mentioned above and developed into a new pedagogical field called "Curriculum and Didactics" (Ding & Wang, 2013). Since the 1990s, the Chinese curriculum has been significantly affected by the Anglo-American curriculum, for instance in its standards of science (Ding, 2015), which like the American curriculum explain the aims of science education in detail. However, since the curriculum reforms in the early 2000s, studies of Chinese curriculum theory have pointed up the merits of Chinese traditional educational theories, including ideas from Confucianism, Taoism, and Buddhism, and the value of combining these with experiences and theories learned from western and other Asian countries (Autio, 2014; Pinar, 2014; Zhang & Gao, 2014). Similar to the concept of *Bildung*, Chinese education has a tradition of targeting the development of the whole person based on Chinese traditional wisdom, including Confucianism, Buddhism and Taoism. For example, from the perspective of Confucianism, the ultimate aim of education should be to cultivate a human being's virtue. Although the Chinese have been trying to change from a centralized to a decentralized educational system that gives teachers more autonomy, the national curriculum still plays a main part in curriculum implementation. Teachers follow the national curriculum faithfully step by step. For example, primary school science teachers struggle to follow the well-organized but large amount of content called for by the national curriculum within the prescribed, limited number of weekly lessons (Zhong & Gao, 2007). This means that in reality teachers seldom have the freedom they are encouraged to have.

Science Education in China and Finland

Science education is an unavoidable part of modern education (Millar, 2006). The Finnish Science Curriculum is part of the Core Curriculum, which includes all subjects at different levels. By contrast, the Chinese National Primary Science Curriculum (referred to below simply as "Finnish/ Chinese Curriculum") is an independent document. In both China and Finland, "science" is taught in primary schools as an integrated subject that includes different topics, such as physics, chemistry and biology. However, topic coverage differs in each country. The Chinese Curriculum includes physics, chemistry, biology and geography, as well as technology and engineering. The Finnish Curriculum includes biology, geography, physics, chemistry, health education and, not least, technology as integrated topics. In the Chinese context geography means natural geography only, whereas in the Finnish context, it includes human or cultural geography as well as natural geography.

In Finland, all the subjects are seen as equal and all are important, because the education aims at the development of the whole individual (Lavonen & Laaksonen, 2009; Sahlberg, 2015). In Finnish primary schools, science is called environmental studies and is taught by a class teacher in two lessons (45 minutes per lesson) a week in Grades 1-2, and on average in 2.5 lessons a week in Grades 3-6. By contrast, Chinese primary science education is peripheral in comparison to the Chinese languages and mathematics, taught by a subject teacher in science. Two lessons per week (45 minutes per lesson) are required in Grades 3-6. However, in reality, schools often lack the time to arrange a sufficient number of courses. The status of science education at the primary level has been changing in Chinese schools. Beginning in the autumn of 2018, primary science education will be compulsory from Grade 1 to Grade 6, parallel with the implementation of the new National Primary Science Curriculum.

Significance of the Research and the Research Questions

Comparing the curricula in China and Finland is worthwhile. Comparative research can help identify similarities and differences and may even reveal the "power" system and system of ideas (Goedegebuure & Van Vught, 1996; Tröhler, 2013). The two countries are based on different educational cultures, yet perform similarly in international assessments. Both have exhibited high levels of performance followed by a decline in international assessments with educational reforms (for example, the OECD Programme for International Student Assessment or PISA; see OECD, 2014; OECD, 2016). Disciplinary knowledge in science has been regarded as a powerful source of intellectual and moral capabilities, which could fulfil the task for teaching and learning 21st century competencies (Aktamis & Ergin, 2008; Boh Podgornik, Dolničar, & Glažar, 2017; Deng, 2015; Kind & Kind, 2007). Hence, research on science curricula has significance.

In the current paper, we address the following research questions:

1. How are 21st century competencies described in the Chinese and the Finnish National Primary Science Curricula?
2. What are the similarities and what are the differences in the elements of 21st century competencies in the Primary Science Curricula of China and Finland?
3. How can we explain the similarities and differences in the integration of 21st century competencies found in the two Curricula?

ANALYTICAL FRAMEWORK

The analytical framework used in this research was developed in a pilot project that compared frameworks of 21st century competencies (Wang et al., in press). The framework has been revised by purposefully considering the intersection between the cultivation of generic competencies and science education.

Twelve competencies were identified, which were grouped into four categories that follow the Assessment and Teaching of 21st Century Skills (ATC21S) framework (Binkley et al., 2012); these are called Ways of Thinking, Ways of Working, Tools for Working and Living in the World (see **Table 1**). *Ways of Thinking* includes competencies focused on the cognitive domain (Cropley, 2011; Fisher, 1991; Hoskins & Fredriksson, 2008; Mason, 2007; Villalba, 2011). *Ways of Working* consists of competencies needed to carry out a project, including cognitive-based manners (Inquiry and Problem solving) and social-based manners (Communication and Collaboration) (Anderson, 2007; John-Steiner, 2011; Merriam-Webster online Dictionary; Ward, 2011). ''Inquiry'' and ''Problem solving'' were specifically revised in this research by considering their close relationship to science education (Abd-El-Khalick et al., 2004; Eylon & Linn, 1988). The category *Tools for Working* includes the competencies in comprehending or using ''tools''. Since ''Information literacy'' is the ability to recognize, locate and use information (concepts) needed for a certain context efficiently and effectively (Eisenberg, Lowe, & Spitzer, 2004), it can be seen as a ''tool'' in science-related issues. *Living in the World* includes the competencies to negotiate the changing world with respect to life, social and cultural responsibilities.

Table 1. Analytical Framework for 21st Century Competencies

Category	Subcategory	Operational definition	Example
Ways of Thinking	Creative thinking	Imaginative (thinking from various novel aspects), inventive competency, which involves the generation of new ideas (connecting and summarizing information or ideas in novel ways) (Fisher, 1991) and the production of relevant and effective novelty (Cropley, 2011).	[The curriculum is designed to] cultivate students' awareness of innovation, awareness of environmental protection and social responsibility, and learning to cooperate with others.
	Critical thinking	Involves the evaluation, analysis, synthesis and interpretation of something to provide a judgement or promotes thinking or valuing ideas, facts and methods from different perspectives, usually from an opposite perspective (Mason, 2007; Villalba, 2011).	Cultivate critical thinking skills.
	Using metacognition (Learning to learn)	Using metacognition refers to the ability to pursue and persist in learning, to organize one's own learning, reflecting on the learning, and adjusting the learning process, including through effective management of time and information, both individually and in groups (Hoskins & Fredriksson, 2008). Learning to learn refers to the competency for lifelong learning. (In this research, the main characteristic of the metacognition competency is seen as the manifestation of the Learning to learn competency.)	Makes students learn to regulate study by themselves and study individually.
Ways of Working	Inquiry	Refers to a systematic action process in investigating, collecting, and examining issues in a situation. In a science inquiry (science practice), it means that one is asking questions, planning and carrying out investigations; analysing and interpreting data; and developing explanations (Anderson, 2007).	The multidisciplinary nature of environmental studies requires students to learn to acquire, process, produce, present, evaluate, and appraise information in different situations.
	Problem-solving	Refers to a systematic process whereby the person overcomes obstacles and moves from a beginning state to a goal state (Ward, 2011). The problem can be science- or technology-related knowledge or life-situation related.	To make students learn to solve practical problems in life.
	Collaboration	A competency in studying or working with one or more individuals in groups, where participants help and support each other with complementary skills, interacting to create a shared understanding that none had previously possessed or could have come to on their own (John-Steiner, 2011).	Learning to co-operate with others
	Communication	The competency of using words, sounds, signs, or other behaviours to express or exchange information, such as ideas, thoughts and feelings, to someone else with respect or listening to other people (Merriam-Webster online Dictionary).	Students should learn to present the inquiry process and results and to discuss and communicate these with classmates.
Tools for Working	Information literacy	The ability to recognize and comprehend scientific concept, then locate, and use information (concepts) needed for a certain context efficiently and effectively, for example, to explain phenomena using scientific concepts (Eisenberg, Lowe & Spitzer, 2004).	In chemistry, it is central to explain their properties, structures and changes that take place in them.
	ICT literacy	Refers to the ability to recognize, locate and use information needed for a certain context efficiently and effectively via information and communication technology.	To instruct the pupil to use information and communication technology responsibly, safely and ergonomically for acquiring, processing and presenting information and as a means of interaction.
Living in the World	Citizenship	Refers to competency in participating in civic activities/ in society-related activities. It includes, but is not limited to environmentally-friendly activities, the economy or society development activities, energy-saving activities.	Improve the [students'] ability to facilitate the development of society and the economy.
	Life and career	A set of different competencies in understanding unstable situations, settling the challenges in a changeable world with intentions for a good, rational and moral life.	Promote the development of competence that supports health, well-being and safety.
	Personal and Social responsibility (cultural awareness and competence)	Refers to competency in tolerance and respect for people different from themselves and of other backgrounds, for example, in race, ethnicity, lifestyles. It includes cultural and global awareness and sensitivity and personal identification (Musil, 2009). It manifests in aspects of culture, humanity, and morality in science education.	The pupils practise their emotional skills and promote mental well-being, such as respecting themselves and others according to their age.

METHODS

The study went through the stages of defining categories and coding rules, a pilot test, a revision of the coding guidelines and a final coding of the text. The deductive content analysis process followed the examples of Weber (1990), Mayring (2015) and Schwarz (2015). The framework above offers an objective and neutral perspective for comparing the two Curricula. The coding examples and the approach to coding are shown below (for more examples, see **Table 1**). Each coding unit includes one idea. To increase validity and reliability, three authors

worked together and were involved in the pilot analysis. The first author is a doctoral student in Finland who is familiar with Chinese education and the Chinese curriculum and is doing research on science education and curriculum studies. The second author is a professor of science education and has 25 years of experience in science education research. He has participated in preparing the Finnish national level curriculum since the 1990s and has written several papers, supervised PhD theses and examined theses in curriculum research. Moreover, he has evaluated several foreign curricula in science and teacher education. The third author is a Finnish full professor in education who has done comparative research in teaching and learning for 25 years and whose expertise is comparing the educational aims of diverse countries. The first author translated the Chinese Curriculum into English. The first two authors then carried out a pilot analysis. Based on the pilot coding, the three authors further discussed and revised the categories and coding rules. Half the Finnish Curriculum was analysed independently by the first two authors. The agreement was 0.5. Then the description of categories was further clarified, and the units difficult to code were discussed by the three analysts. After the revision Cohen's kappa representing inter-rating agreement reached 0.87; as 0.81-0.89 is an almost perfect agreement (Viera & Garrett, 2005), the number demonstrates the reliability of the analysis.

Examples from the Chinese Curriculum:

[The curriculum is designed to] cultivate students' awareness of innovation, awareness of environmental protection and social responsibility, and learn to co-operate with others. (Chinese Curriculum, p. 2)

- Creative thinking (*''Innovation'' connects with the creative ideas and awareness, demonstrating the competency of creative thinking*.)
- Citizenship (*Both ''environmental protection'' and ''social responsibility'' demonstrate the requirements for competency of living as a responsible citizen.)*
- Collaboration (*''Co-operation with others'' demonstrates working together with others or peers, belonging to the competency of collaboration*.)

Examples from the Finnish Curriculum:

The multidisciplinary nature of environmental studies requires [students] to learn to acquire, process, produce, present, evaluate, and appraise information in different situations (Finnish Curriculum, p. 5).

- Inquiry (*''Acquire'', ''process'', ''produce'', ''observe'', or ''conduct research'' demonstrate the competency of inquiry*)
- Communication *(To ''present'' or ''discuss'' demonstrates the competency of communication*)

In chemistry, it is central to: … explain [different substances'] properties, structures, and changes that take place (Finnish Curriculum, p. 1).

- Information literacy (*''Explain'' is based on the usage of concepts, demonstrating the competency of information literacy*)

In health education, it is essential to understand factors in the environment and in human activities that support and protect health and promote the competence that supports health, well-being and safety (Finnish Curriculum, p. 1).

- Life and career (*Usually, ''well-being'' demonstrates the competency of life and career. Well-being means competency for living in a wellness way in a changeable world.*)

After the coding process, we calculated the observed frequencies and percentages for each category and subcategory to demonstrate how often the competencies appeared. The distributions between subcategory frequencies in the Chinese and Finnish Curricula were compared, using a Chi-Square Test (χ^2), which tests the hypothesis that the row and column variables are independent without indicating strength or direction of the relationship. The Chi-Square Test was done via an online tool (Preacher, 2001). The direct quotations from both curricula were shown to demonstrate how the aims of learning the competencies are presented similarly or differently in aspects of content (whether the description of a specific competency belongs to a similar area) or mode of description (what specific words used or from whose/ which viewpoint the aims for a specific competency were described).

RESULTS

Distribution of the Competencies as a Whole in the Two Curricula

Based on the total number, the Chinese Curriculum included more units of 21st century competencies (N=397) than the Finnish Curriculum (N=295). However, the length of the Finnish Curriculum text (9 pages, 3,942 words analysed) is much shorter than the Chinese (38 pages, 25,692 words analysed), which demonstrates that the density of appearance of 21st century competencies is higher in the Finnish Curriculum than in the Chinese.

Table 2. Frequencies and percentages of different 21st century competencies

Categories/ Subcategories	China	Ranking	Finland	Ranking
Ways of Thinking	*61 (15.4%)*		*41 (13.9%)*	
Critical thinking	20 (5.0%)	6	11 (3.7%)	8
Creative thinking	15 (3.8%)	8	10 (3.4%)	10
Using metacognition (Learning to learn)	26 (6.6%)	4	20 (6.8%)	5
Ways of Working	*155 (39.0%)*		*116 (39.3%)*	
Inquiry	102 (25.7%)	2	82 (27.8%)	1
Problem solving	23 (5.8%)	5	6 (2.0%)	12
Collaboration	11 (2.8%)	9	17 (5.8%)	6
Communication	19 (4.8%)	7	11 (3.7%)	8
Tools for Working	*151 (38.0%)*		*59 (20.0%)*	
ICT	1 (0.2%)	10	7 (2.4%)	11
Information literacy	150 (37.8%)	1	52 (17.6%)	2
Living in the World	*30 (7.6%)*		*79 (26.8%)*	
Citizenship	29 (7.3%)	3	36 (12.2%)	3
Life and career	0 (0.0%)	12	27 (9.2%)	4
Personal and social responsibility	1 (0.2%)	10	16 (5.4%)	7
Total	397		295	

χ^2=58.1, p<0.05 (according to the distribution of frequencies in each category)

The frequency distributions of 21st century competencies are, in general, significantly different in the two primary science Curricula (χ2=58.1, p<0.05; see **Table 2**). In the Chinese Curriculum, the frequencies and distribution of the competencies/subcategories are from 0 (Life and Career, 0%) to 150 (Information Literacy, 37.8%); the distribution of the main categories is from 7.6% (Living in the World) to about 39% (Ways of Working and Tools for Working) (see **Table 2**). It demonstrates a large gap between the categories, especially a minor emphasis on Living in the World category. In the Finnish Curriculum, the frequencies and distribution of the competencies are from 6 (Problem Solving, 2%) to 82 (Inquiry, 27.8%); the distribution of the main categories is from 13.9% (Ways of Thinking) to 39.3% (Ways of Working), the Tools for Working (20%) and Living in the World (26.8%) categories are compositions with numbers in the middle. As a whole, the spread of the distribution in the Finnish Curriculum is not as large as in the Chinese Curriculum.

The Curricula in both countries emphasized learning the competencies needed in inquiry-orientated work and information literacy. Ways of Thinking and Ways of Working are the two categories similarly weighted in both. The most emphasized feature was ''Inquiry'' in Ways of Working. The difference in emphasis is most strikingly manifested in the categories Tools for Working and Living in the World. ''Information literacy'' takes up the largest share of the Tools for Working category, which demonstrates that learning concepts are highly valued in Chinese science education. In the Finnish Curriculum, Tools for Working ranks third and has a significantly lower percentage (20%) than in the Chinese Curriculum (38%).

Similarities and Differences in Competencies in the Ways of Thinking Category

The distribution of frequencies in the Ways of Thinking subcategories in the two countries is not significant (χ^2=0.49, p=0.78; see **Table 3**). "Using metacognition (Learning to learn)" is the most highly emphasized competency in both Curricula (42.6% in the Chinese Curriculum, 48.8% in the Finnish Curriculum). There are both similarities and differences in the descriptions of using metacognition in the two Curricula. Both described using metacognition from a general perspective as well as from a subject-based perspective. In the general perspective, using metacognition is described as ''lifelong learning'' in the Chinese Curriculum and ''sustainable development'' or ''sustainable future'' in the Finnish Curriculum. Persistence in working is mentioned as a "Using metacognition" subcategory in both Curricula. In the subject-based perspective, learning to make plans and reflect on one's own research are highlighted in both Curricula. For example, ''[teachers should] guide and encourage the pupil to set personal study goals and make persistent efforts to achieve them and recognize his or her own competence in environmental studies'' (Finnish Curriculum, p. 6); ''The students should learn to reflect on their own inquiry process, methods, and results, as well as make self-evaluation and revise the research plan'' (Chinese Curriculum, p. 7).

Table 3. Distribution of subcategories in Ways of Thinking

Subcategory	China	Finland
Critical thinking	20 (32.8%)	11 (26.8 %)
Creative thinking	15 (24.6%)	10 (24.4%)
Using metacognition (Learning to learn)	26 (42.6%)	20 (48.8%)

χ^2=0.49, p=0.78

Table 4. Distribution of subcategories in Ways of Working

Subcategory	China	Finland
Inquiry	102 (65.8%)	82 (70.7%)
Problem solving	23 (14.8%)	6 (5.2%)
Collaboration	11 (7.1%)	17 (14.7%)
Communication	19 (12.3%)	11 (9.5%)

χ^2=10.2, p<0.05

Critical thinking is highlighted almost equally in each Curriculum (32.8% in the Chinese and 26.8% in the Finnish; see **Table 3**). Critical thinking is typically mentioned in science contexts in both Curricula. Students are encouraged to ask questions and to think deeply, based on activities or assignments related to the science context. For example, in the Finnish Curriculum, ''[Teachers] encourage the pupil to wonder, ask questions, and use collaborative discussions as the basis for small research assignments and other activities" (p. 2); in the Chinese Curriculum, ''in studying science, students learn to be critical and ask questions…'' (p. 8).

Creative thinking is referred to with the words "creativity" and "innovation" and has a percentage of around 24% in both science Curricula (see **Table 3**). Creative thinking is illustrated as encouraging students to think from different perspectives or to find different ways to solve a problem. "Creative", "different" and their derivatives are the typical keywords used to describe this competency. For example, "[Teachers] inspire pupils to experiment, invent, and be creative together" (Finnish Curriculum, p. 6); "[Students] experiment and find different alternatives and solutions to everyday problems" (Finnish Curriculum, p. 3); "[Students] try to use different materials, strategies, methods in conducting scientific inquiry and experience the joy of creativity and innovation'' (Chinese Curriculum, p.8). Both Curricula encourage students to transform their creative ideas into innovations that will connect science with technology or handiwork. For example, ''[Students] try to make models or real objects based on their creative ideas'' (Chinese Curriculum, p. 38); ''[Teachers need] to inspire the pupils to experiment, invent, build, and innovate together with other pupils'' (Finnish Curriculum, p. 2).

Similarities and Differences in Competencies in the Ways of Working Category

The distribution of frequencies in the Ways of Working subcategories is significantly different in the two countries (χ2=10.2, p<0.05). In both Curricula inquiry is the most highly emphasized competency in this category, and is well integrated into the science contexts (see **Table 4**). During the coding process, Inquiry is closely related to scientific literacy, such as the ability to explore or observe (Anderson, 2007). For example, ''Pupils observe motion and consider the reasons for changes in motion'' (Finnish Curriculum, p. 3). Some examples illustrating the different descriptions in the Chinese and Finnish Curricula involve the notion of ''scientific inquiry''. In the Chinese Curriculum, ''scientific inquiry'' as a word appears 26 times, whereas at no time is ''scientific inquiry'' mentioned in the Finnish Curriculum, although ''inquiry-based'' is mentioned twice. For example, ''Differentiation to meet individual needs may be supported by an inquiry-based working method and exercises completed at various levels of thinking skills'' (Finnish Curriculum, p. 9). Although the Chinese Curriculum describes the goals of inquiry as including such competencies as observation – for example, ''students learn to observe and compare phenomena and objectives, and propose scientific questions in which they are interested (p. 7)'' – it also mentions inquiry as a general word. However, the Finnish Curriculum presents the goals with specific verbs belonging to inquiry; for example, ''the pupils observe motion and consider the reasons for changes in motion" (p. 3).

Problem solving ranks as the second highest subcategory in the Chinese Curriculum (N=23, 14.8%), but it is the lowest subcategory in the Finnish Curriculum (N=6, 5.2%; see **Table 4**). In the Chinese Curriculum, Problem solving is not only described as a general concept, but also is integrated into content in the area of technology and engineering. For example, ''Students can use a lever, pulley, slope, axle, or other simple machines to solve practical problems in daily life'' (Chinese Curriculum, p. 37). However, in the Finnish Curriculum, Problem solving appears only as a general concept. For example, ''[Students] experiment and find different alternatives and solutions to everyday problems'' (Finnish Curriculum, p. 3).

The Chinese and Finnish Curricula show different emphases on the competencies of collaboration and communication. The Chinese Curriculum places more emphasis on communication (N=19, 12.3% in Communication, N=11, 7.1% in Collaboration; see **Table 4**). By contrast, the Finnish Curriculum places more

Table 5. Distribution of subcategories in Tools for Working

Subcategory	China	Finland
ICT	1 (0.7%)	7 (11.9%)
Information literacy (concepts)	150 (99.3%)	52 (88.1%)

$\chi^2=14.5$, $p<0.05$

emphasis on collaboration (N=17, 14.7% in Collaboration, N=11, 9.5% in Communication). But the total frequency of Communication and Collaboration mentioned in both Curricula is much lower than the total number of times Inquiry and Problem solving are mentioned. Both Curricula describe collaboration and communication from the perspectives of general competency and science-based content. Communication and collaboration are integrated as competencies in presenting the results of scientific research or as a process of doing research as part of a team. From this perspective, both Curricula present the goals similarly; for example, ''Students should learn to present the inquiry process and results, and discuss and communicate these with classmates'' (Chinese Curriculum, p. 7); ''To guide the pupil to recognize causal relationships, draw conclusions from his or her results, and present the results and research in different ways'' (Finnish Curriculum, p. 6). By comparison, the Finnish Curriculum also presents a different view of communication and collaboration. In describing collaboration, the Finnish Curriculum refers to ''community'' and ''well-being'', thereby demonstrating sustainable expectations of students and of society; for example, ''Working as a community supports learning together and drawing on different strengths'' (Finnish Curriculum, p. 4). In describing communication, the Finnish Curriculum lists goals for cultivating the whole person; for example, ''to inspire the pupil to express himself or herself and listen to others as well as to support the pupil in recognizing, expressing, and regulating his or her emotions'' (Finnish Curriculum, p. 6). This describes the goals for encouraging students to express not only their views, but also their emotions and attitudes. However, the Chinese Curriculum encourages the expression of views or ideas only, although both Curricula are pedagogically student-centred.

Similarities and Differences in Competencies in the Tools for Working Category

The Chi-Square tests for differences in distribution in the Tools for Working category are significantly different in the Finnish and Chinese Curricula ($\chi2=14.5$, $p<0.05$). Compared to the frequencies of Information literacy, ICT is seldom mentioned in either Curriculum (see **Table 5**).

In the Chinese Curriculum, ICT was mentioned once as a tool with which students could present what they had learned. ''Students learn to present their ideas via language or digital images, such as photos, videos, pictures…'' (Chinese Curriculum, p. 38). ICT was described in three ways in the Finnish Curriculum. One is the same as in the Chinese Curriculum, namely to present the results of student learning in different ways, for example, ''guide the pupil to recognise causal relationships, to draw conclusions from his or her results, and to present the results and research in different ways'' (Finnish Curriculum, p. 6). Elsewhere, ICT is described as a learning environment, as in this example: ''In addition to school facilities and the teaching group, the learning environments include a versatile range of local natural and built environments, various communities and interaction situations, ICT environments as well as local opportunities, including cooperation with 'nature schools', museums, companies, non-governmental organizations, and nature and science centres'' (Finnish Curriculum, p. 8). The third mention points directly to the goals and ethics of using ICT: ''to instruct the pupil to use information and communication technology responsibly, safely, and ergonomically for acquiring, processing, and presenting information and as a means of interaction'' (Finnish Curriculum, p. 6).

Verbs such as "describe" and "explain" are identified as symbols of Information literacy. For example, "describe the property of some material, such as magnetism and transparency..." (Chinese Curriculum, p. 11). In only one instance are the information literacy competencies apparently not closely related to a specific science content in the Chinese Curriculum: ''Stress learning by doing and cultivate students' ability in collecting and processing information about science'' (Chinese Curriculum, p. 6). One example from the Finnish Curriculum is the following:

> *[Teachers should] guide the pupil in perceiving the environment, human activities, and related phenomena using the concepts of environmental studies and developing his or her conceptual structures from preconceptions toward accurate use of concepts (Finnish Curriculum, p. 7).*

Similarities and Differences in Competencies in the Living in the World Category

Based on the total frequencies, the Finnish Curriculum (N=79) places a much higher value on Living in the World than the Chinese Curriculum (N=30). The Chi-Square tests comparing distribution differences in these subcategories are significant ($\chi2=23.8$, $p<0.05$). In the Chinese Curriculum, Citizenship is the most heavily weighted factor (N=29, 96.7%), while Life and career (N=0, 0%) and Personal and social responsibility (N=1, 3.3%) appear only rarely. In the Finnish Curriculum, the Citizenship subcategory is also the most highly ranked (N=36, 45.6%).

Table 6. Distribution of subcategories in Living in the World

Subcategory	China	Finland
Citizenship	29 (96.7%)	36 (45.6%)
Life and career	0 (0.0%)	27 (34.2%)
Personal and social responsibility	1 (3.3%)	16 (20.2%)

χ^2=23.8, p<0.05

Yet the apparent frequency of Citizenship, life and career (N=27, 34.2%), and Personal and social responsibility (N=16, 20.2%) varies less than in the Chinese Curriculum (see **Table 6**).

Citizenship as described in the science curriculum can be grouped in one of two categories: one is general, while the other is related to environmental issues. Both categories appear in both the Chinese and Finnish Curricula. Citizenship means knowledge, skills and attitudes open to participating in civic-related activities (van den Akker, 2003). From the perspective of the general category, the Chinese Curriculum typically describes citizens as being responsible for ''society''; for example, ''Improve the [students'] ability to facilitate the development of society and the economy" (Chinese Curriculum, p. 2), whereas the Finnish Curriculum normally holds citizens responsible for ''community''; for example, ''[The students] participate in improving the state of their surroundings and in promoting the well-being of the school community" (Finnish Curriculum, p. 4). From the perspective of environmental issues, one description in the Chinese Curriculum specifically connects citizenship with environmental issues: ''[Students] should be aware of their responsibility in protecting the environment and saving resources'' (p. 9). A description of environmental responsibility in the Finnish Curriculum reads, ''[To make students] become acquainted with the rights and duties associated with acting in the environment" (p. 8). The difference is that the Chinese Curriculum only demonstrates the duties of an individual, whereas the Finnish Curriculum contains both personal duties and individual rights.

Life and career are competencies that target happiness and working life in a changeable world. In the Finnish Curriculum, ''well-being'' is widely used in connection with ''health'' or ''safety''; for example, ''in health education, it is essential to learn to understand the factors in the environment and in human activities that support and protect health and promote the development of competence that supports health, well-being, and safety'' (Finnish Curriculum, p. 5). Concern for a healthy mental development is one of the most frequently mentioned aspects of Life and Career in the Finnish Curriculum; for example, ''… support the pupil in recognising, expressing, and regulating his or her emotions'' (Finnish Curriculum, p. 6). But all of the descriptions have a general meaning that is not specifically applicable to a science-related career. In the Chinese Curriculum, this subcategory is completely missing (N=0).

Personal and global social responsibilities involve tolerance and respect for people of other backgrounds, races, ethnicities and lifestyles; respect for one's own cultural heritage and the heritage of others; and expanded cultural and global awareness and sensitivity (Musil, 2009; van den Akker, 2003). This subcategory is lacking in the Chinese Curriculum (N=1, 3.3%), where we find only this description: ''Respect other persons' emotions and attitudes in inquiry activities'' (Chinese Curriculum, p. 8). In the Finnish Curriculum, Personal and social responsibility is mentioned 16 times, and different perspectives are illustrated. For example, this statement – ''using versatile regional examples and topical news items, the pupils learn to perceive the natural environment and human activities in Finland, the Nordic countries, Europe, and other continents'' (Finnish Curriculum, p. 8) – implies the need to understand other cultures and foster global awareness. The Finnish Curriculum also highlights the importance of respecting oneself and others: ''the pupils practise their emotional skills and promote mental well-being, such as respecting themselves and others according to their age'' (Finnish Curriculum, p. 3).

DISCUSSION

The length of the Chinese text is much longer than the Finnish text. Moreover, the Chinese Curriculum includes detailed and well-organized objectives closely related to a specific content of a scientific discipline. Although the Finnish Curriculum does outline objectives and goals (*Lehrplan*) as does the Chinese Curriculum, it does not provide a detailed list of requirements for specific science content. The Chinese Curriculum is written from the desired outcomes of student learning, which usually starts with the words "Students should …" By contrast, the Finnish Curriculum usually starts with the teachers' objectives, using the words "Teachers should …" These differences reflect the different functions of the national curriculum and the role of teachers in each country. The Chinese Curriculum is more closely aligned with the American curriculum tradition, in which teacher instructions follow precise checklists that describe students' expected outcomes. By contrast, the Finnish Curriculum adheres to the *Didaktik* tradition. Teachers are treated as active professionals, and given only a guideline for teaching; they themselves select the content and construct a meaningful curriculum for their students.

The quantitative data give the following results: the density of appearance of competencies for the 21st century in the Chinese Curriculum is lower than in the Finnish Curriculum; the variance between the frequencies of each competency in the Chinese Curriculum is greater than in the Finnish Curriculum. These quantity differences illustrate potentially different aims of teaching and learning, which connect with different educational traditions. In Finland there has been a long tradition of having a short national level curriculum in order to give more autonomy to the local level for planning and implementation, thereby leaning to the *Didaktik* educational tradition. In addition, the Finnish Curriculum with its relatively balanced statements of the different competencies shows a conformity with the idea of *Bildung*, which seeks to develop the whole person, even in a subject curriculum. By contrast, the character of the Chinese Curriculum appears to be closer to the Anglo-American curriculum tradition, whose tendency has been to guide and systematize school education, with an emphasis on aims in science itself with limited linkage to the broader goals of Living in the World and insufficient values in personality aspects.

The shortage of aims in the Living in the World category in the Chinese Curriculum makes the argument above stronger, as the category Living in the World is the one intended to highlight the non-instrumental domain in science education, thus revealing the expectation of holistic individual development. In this category, Life and career and personal and social responsibilities are almost totally absent from the Chinese Curriculum, although in Chinese educational systems rational living and moral aspects of education are usually discussed. This feature implies the influence of an Anglo-American curriculum, which concentrates on the instrumental aspect of education, instead of regarding science education as a means to develop the whole person. However, since "Society and Moral Education" is an independent subject in Chinese primary schools, it makes the failure to integrate the moral and cultural aspects into the science Curriculum to some extent reasonable.

The Living in the World category is well balanced in the Finnish Curriculum, which shows that non-instrumental aspects have been considered in its development. This aligns closely with *Bildung-Didaktik*, in which moral values are among the key features (Autio, 2014). Yet the *Bildung-Didaktik* tradition *per se* cannot fully explain the emphasis on competencies in Living in the World in the Finnish Curriculum. For example, most units belonging to its subcategory "Personal and social responsibility" relate to goals for learning cultural geography. The subject area of cultural geography is not covered at all in the Chinese Curriculum. In fact, there are many historical and social reasons that account for the differences in subject area coverage in both Curricula. Thus, quantitative data alone cannot fully explain these divergences or, in some cases, even cover the underlying differences.

Nevertheless, how words are used in the texts could help explain some of the variants in emphases and tentative alignments of the curriculum theories. In the Chinese Curriculum terms or key words used to describe general objectives are "scientific literacy" and "scientific inquiry". In the Finnish Curriculum, "well-being", "community" and "sustainable development" are the terms that appear as broad aims. This distinction suggests that the Chinese Curriculum was designed to achieve specific outcomes in knowledge and skills. The aims of science education have been emphasised but mainly limited to the domain of science in the Chinese Curriculum. By contrast, the Finnish Curriculum includes aims for cultivating individuality and the student as a whole, with complementary aims outside science *per se*. Overall, the Chinese Curriculum is written from the perspective of "transferring knowledge to the learner", instead of emphasising the holistic development of students in society and for society. This indicates that the Chinese Curriculum tends to align with the Anglo-American tradition, while the Finnish Curriculum follows the *Bildung-Didaktik* tradition.

Coverage of aspects in the same competency differs in the two Curricula, although similarities are also found in the quantitative data. For example, ICT is only described as a tool for student presentation in the Chinese Curriculum. But in the Finnish Curriculum, goals for ethical use of ICT have been mentioned, revealing an underlying difference in educational ideology. This relates to the moral aspect of the *Bildung-Didaktik* tradition. Another example is seen in the category of Communication. Here the Chinese Curriculum is concerned only with the knowledge and skill to communicate information, whereas the Finnish Curriculum includes how to communicate emotion. This implies that the Finnish Curriculum has given consideration to the formation of the students themselves and how they are linked it to the world, ideas that adhere to the tradition of *Bildung-Didaktik*. The limitation of the Chinese Curriculum to instrumental means of communication and its focus on knowledge or skills alone suggests a limited connection with the *Bildung-Didaktik* and the heritage of Chinese wisdom, both of which include moral and self-development considerations.

Each Curriculum shares similar emphasis on Critical thinking and Creative thinking in quantity. However, this apparent similarity originates from different historical backgrounds. In a *Bildung-Didaktik* culture, critical thinking and creative thinking have been encouraged for a long time (Autio, 2014). It is an educational culture that values dialogue in each lesson and encourages critical thinking and creative thinking in class. Moreover, these competencies are considered the founding rationale for developing the holistic individual. By contrast, in traditional Chinese educational cultures, for example, that of Confucius in the Song Dynasty, education was intended to cultivate obedient citizens or to be a tool for society. With the modernization of Chinese education after 1900, and extensively after the 1980s, the curriculum aims started to change, and critical thinking and creativity

became valued. In particular, the pursuit and discussion of cultivating citizens with critical and creative thinking competencies started from societal needs in the new century, especially the needs of talented global-level Chinese scientists. Thus, needs outside society or needs for political reasons were the starting points for the emphasis on these cognitive skills in the new Chinese Curriculum. Emphasis on the interaction of education and society is one of the features of the Anglo-American curriculum tradition. By contrast, the Finnish Curriculum can trace its origins back to *Bildung* culture, with its aims of cultivating holistic, moral individuals and individual rationality, even if the emphasis is inevitably influenced by current societal needs learned from the Anglo-American curriculum tradition.

The quantitative results of the present research show that aims for "Citizenship" in the Chinese Curriculum are only a few degrees lower than in the Finnish Curriculum. However, citizenship is typically described in the Chinese Curriculum as being the duties each person owes society. In the Finnish Curriculum the description of citizenship begins with both the rights and duties of an individual to society. These similarities and differences are related to how citizenship and freedom are understood in each country. Science education in Finland is seen as a tool that enables the development of the learners' individuality, which is consistent with the aims of the *Bildung-Didaktik* tradition. Finnish education has for years discussed the role of an active citizenry, whereby an individual lives in society and actively participates in constructing that society. It was Snellman who, in the nineteenth century, emphasised the role of *Bildung* and introduced questions related to citizenship into the Finnish education. By contrast, the Chinese Curriculum indicates that science education itself is the goal, and learning science is for educating the individual, who is expected to be a tool in building the society. However, the duty aspects of citizenship in both Curricula demonstrate a similarity. In Finland and China the idea of freedom is inward and limited: it rests on the premise that an individual lives in a society and must take responsibility for that society. However, the understanding of freedom in each country has evolved from different cultural traditions. The concept of freedom in the Finnish Curriculum derives from the *Bildung* culture. In China this understanding arises from traditional wisdom, such as Taoism.

Some similar features in the two Curricula show the resemblance of tasks or routes in designing a subject-based curriculum. "Inquiry" and "Information literacy" are the two major competencies appearing in both the Chinese and the Finnish Curricula, and are the competencies most closely related to knowledge and skills in science. This feature also relates with the aim changes of science education. Modern science education aims at cultivating reflective citizens with the ideas of science, understanding the nature of science, and ability to engage with science related issues at personal and social levels, instead of merely knowledge of science itself (Ferreira & Morais, 2013; OECD, 2013). Competency in the use of ICT is not emphasized in either primary science Curriculum, and the frequency of competency in ICT use is low in both, perhaps because ICT is a tool for building a learning and teaching environment or for supporting students' learning processes and outcomes or products. It is understandable that it is only a minor component of both Curricula. Moreover, ICT itself is an important discipline in the Chinese education as a whole, which dilutes the emphasis of ICT in the science Curriculum. Although there is no specific subject teaching of ICT in the Finnish educational system, the national curriculum has declared the importance of ICT as one of the "seven transversal competences" in the core curriculum and the aims of ICT are integrated into each subject. These similarities illustrate that, although many generic competencies are integrated, instruction in the competencies related to certain subjects is still the main task in each disciplinary area.

CONCLUDING REMARKS

This study investigated the integration of aims for learning 21st century competencies in the National Primary Science Curricula of China and Finland. Features that are both similar and different were found. In general, most of the 21st century competencies listed in the framework have been integrated into the Curriculum in both countries. Both Curricula showed an emphasis on aims related to science education, such as inquiry and information literacy. This echoes the aim changes of science education, which have been developed from narrow aims of knowledge or competencies within science itself to goals for understanding the nature of science, as well as being scientific literate.

But the results demonstrate more differences in the integration of the aims of 21st century competencies based on the adherence to different curriculum theories. The Chinese Curriculum has a tendency to align with the Anglo-American curriculum tradition, whereas the Finnish Curriculum is more aligned with the *Bildung-Didaktik* tradition. The aims for learning 21st century competencies that are integrated into the Finnish Curriculum are under the educational aims for development of a moral and holistic individual, which regards learning science as a means to that ends. However, the aims for learning 21st century competencies are not well integrated into the Chinese Curriculum. There is not enough consideration of cultivating the whole person in the science context. Formulating aims for scientific literacy is the main theme in the Chinese Curriculum, where a significant deficiency appears in the Living in the World category.

If we want to teach 21st century competencies by means of a disciplinary educational approach, it is important to clarify the purpose of education, which in our view should centre on cultivating a holistic individual. With that

purpose, moral, cognitive, aesthetic and practical elements all need to be considered in designing a curriculum. For example, in science education, both the Chinese and the Finnish Curricula show a shortage of aesthetic elements. Disciplinary knowledge and skills should not be left behind, but they must be seen as powerful resources for the ultimate educational ends. The Anglo-American traditions show an operational approach to implementing the teaching of 21st century competencies, and the Anglo-American national curriculum lists clearly expected outcomes. This could be helpful for subject teachers who lack experience in teaching these competencies. But the central purpose of education should be remembered as teachers become sophisticated in subject contents and skills. Countries can learn ways to achieve educational goals from each other. But ultimately, each country needs to develop its own theories and its practices in accordance with its particular history, society and traditions.

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