

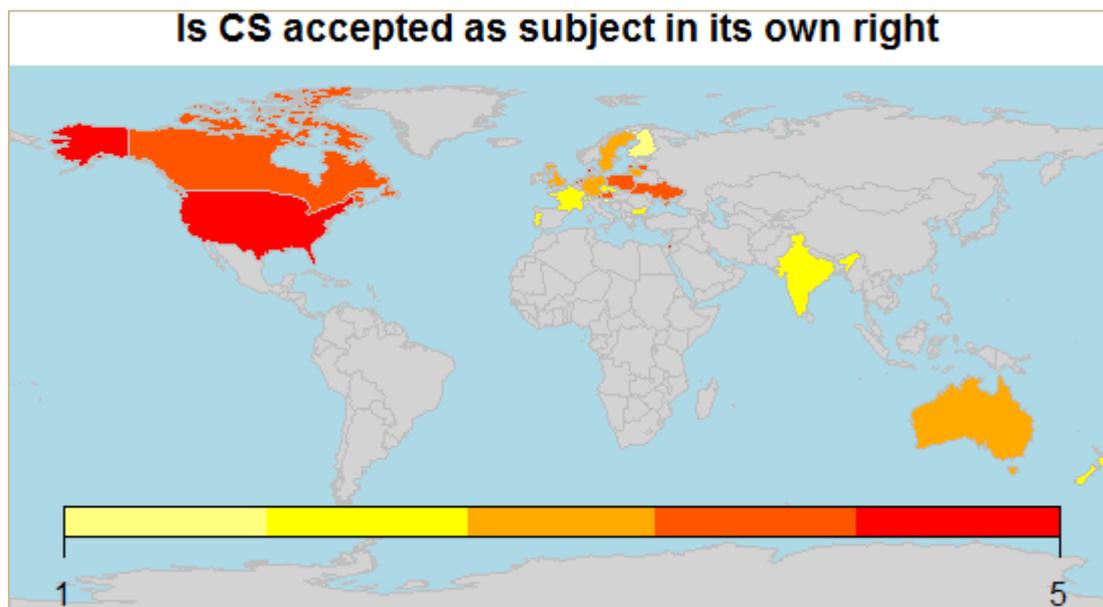
# *The Future of Teaching Computing at School - Computing Teacher Education*

November 17

# 2011

The aim of this report is to collect the state of the art and current activities regarding Teaching Computing at School / Computing Teacher Education in multiple countries; and to use this overview to develop a vision and/or identify trends of what to do next. Basis is an online survey with 84 experts for CS teaching, who expressed their opinion on the topics, and provided detailed information on the current status in 23 countries. During Koli Calling 2011 the draft of the report will be refined and finished via online collaboration after the conference.

***Preliminary  
Report /  
Information  
package for  
the Koli  
2011  
workshop***



(1=not much; 5=fully accepted)

## *Table of Contents*

Background: Method and Procedure .....	2
The questionnaire has been completed up to the last page for 51 times. Data records/invokes of the questionnaire altogether: 98.....	2
For data analysis 84 questionnaires are included. Those without giving the country-name or a name that couldn't be mapped to a country (like for example 'TEST') were excluded. ....	2
First part: CS at school .....	2
Describe current problems of CS at school .....	3
Describe current initiatives to improve CS at school (please indicate which type of school / age range of students you are referring to) .....	8
Describe trends: What will be the changes or situation / demands of CS at school in 5-10 years from now? (please indicate which age range of students you are referring to) .....	12
URL to School curricula.....	15
Describe / name organisations / institutions supporting CS at school, like CSTA .....	16
Second part: CS teacher Education.....	19
Describe current problems of CS teacher education in your country .....	22
Describe current initiatives to improve CS teacher education in your country .....	24
Describe trends: What will be the changes or the situation / demands of CS Teacher Ed in 5-10 years from now? .....	26
Is there a National / state wide curriculum for CS teacher education? (if possible, provide an URL).....	27
Organizations supporting CSTEd .....	28
Appendix A: The Questionnaire .....	29
Computer Science Education and Computer Science Teacher Training.....	29
Computer Science as subject at School .....	30
Initiatives and Developments regarding Computer Science as subject at School .....	31
Initiatives and Developments regarding Computer Science Teacher Education.....	32
Computer Science Teacher Education.....	37
Thank you for participating! .....	40
Appendix B: List of variables.....	40
Variables Listing.....	40

# Background: Method and Procedure

- As Participants were asked experts in different countries, basically by e-mail, and known from conferences like Koli and ISSEP. In some countries, like UK and Germany, the call was distributed to lists of CS educators. In addition the call was distributed by the SIGCSE list (this explains the rather high contribution from Germany, UK and USA).

A	A	B	C	C	C	D	D	F	F	G	I	I	L	L	N	N	P	P	S	S	U	U
U	U	G	A	H	Z	E	N	I	R	B	N	S	T	V	L	Z	O	R	V	W	K	S
S	T	R	N	E	E	U	K	N	A	R	D	R	U	A	D	L	L	T	N	E	R	A
1	3	2	3	2	1	12	1	3	1	20	1	3	2	3	5	2	2	5	1	2	1	8

Table 1: Number of answers from the different countries

- Questionnaire draft was circulated among some of the above described group (experts from UK, New Zealand, France, Germany, Lithuania) and refined with regard to their feedback.
- Responses: The questionnaire has been completed up to the last page for 51 times. Data records/invokes of the questionnaire altogether: 98. For data analysis 84 questionnaires are included. Those without giving the country-name or a name that couldn't be mapped to a country (like for example 'TEST') were excluded.

Working in School	43
Working in University	46
Working in Industry	3

Table 2: Affiliation of experts (multiple responses allowed)

- The questionnaire has two parts: First on CS<sup>1</sup> at school, second on CS Teacher Education. Some rating questions gather information on the current background, like topics and goals. The important questions are those with free text answers. They are:
  - Describe current problems of CS at school (please indicate which type of school / age range of students you are referring to)
  - Describe current initiatives to improve CS at school (please indicate which type of school / age range of students you are referring to)
  - Describe trends: What will be the changes or situation / demands of CS at school in 5-10 years from now? (please indicate which age range of students you are referring to)
  - Describe / name organizations / institutions supporting CS at school, like CSTA
  - And similar for CS teacher Education)

## First part: CS at school

Some rudimentary data on answers to rating questions regarding CS at school:

	Yes	No
Primary School	2	82
Lower Secondary School	27	57
Higher Secondary School	75	9

Table 3: Availability of CS in different school types / age ranges

<sup>1</sup> We use CS (=Computer Science) synonym to Computing or Informatics.

## Importance of topics:

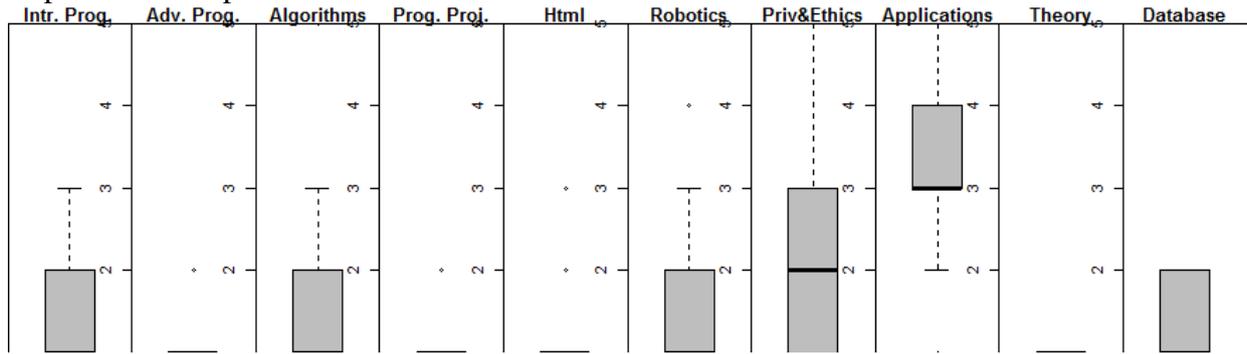


Figure 1: Importance of Topics in Primary School (1=very unimportant, 5=very important)

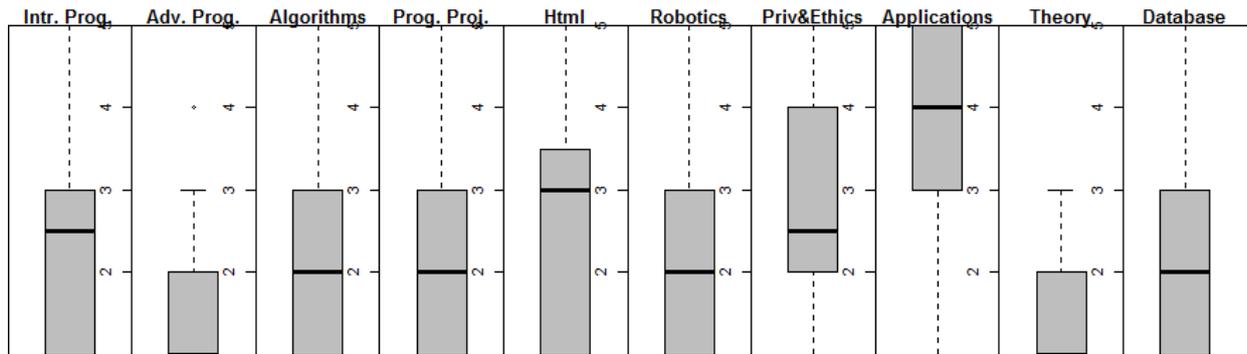


Figure 2: Importance of Topics in Lower Secondary School (1=very unimportant, 5=very important)

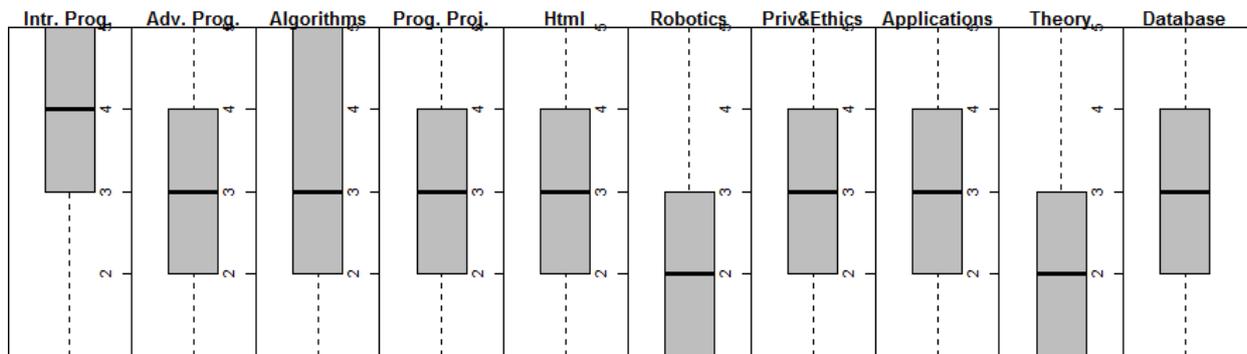


Figure 3: Importance of Topics in Higher Secondary School (1=very unimportant, 5=very important)

### Importance of goals

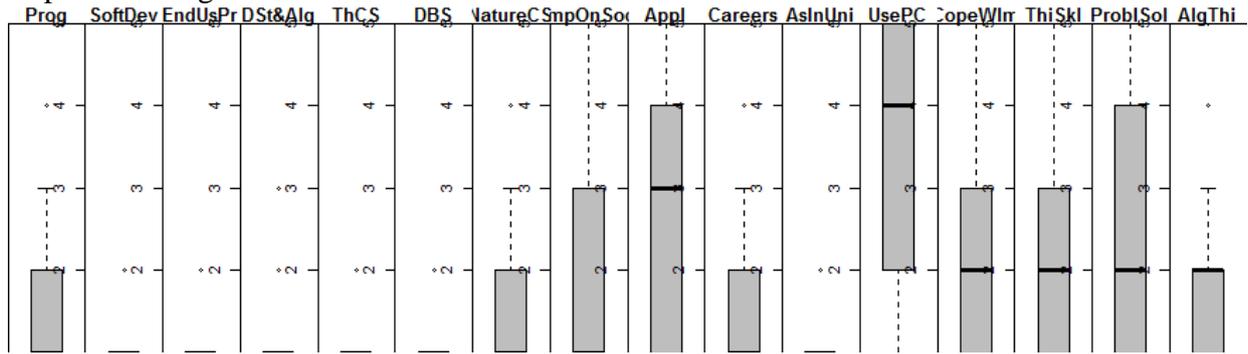


Figure 4: Importance of goals in Primary School (1=very unimportant, 5=very important)

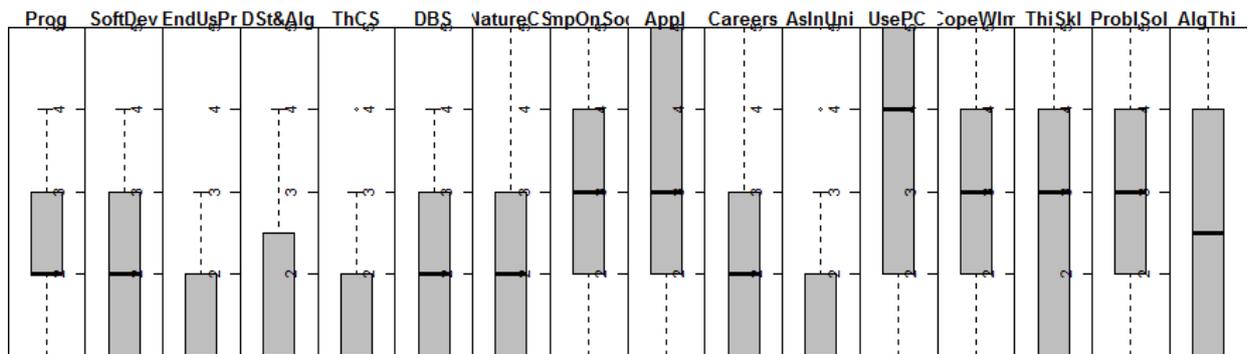


Figure 5: Importance of goals in Lower Secondary School (1=very unimportant, 5=very important)

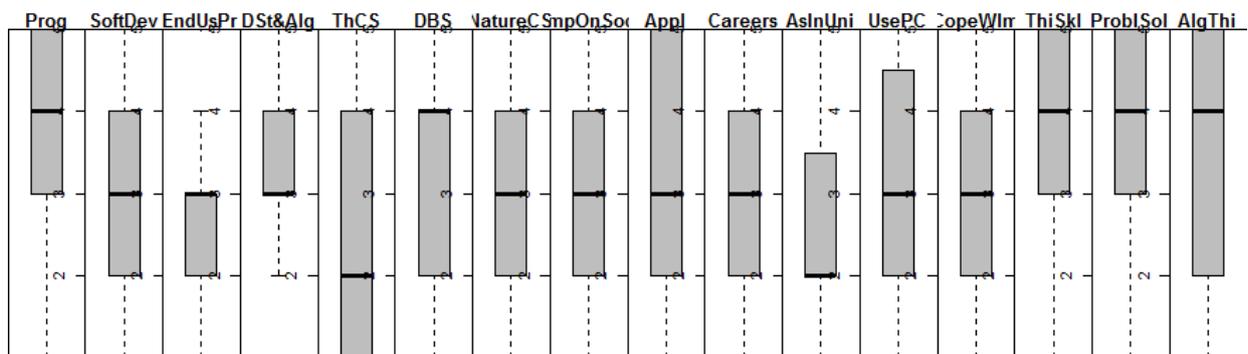


Figure 6: Importance of goals in Higher Secondary School (1=very unimportant, 5=very important)

### Free Text Question: Describe current problems of CS at school

[1] "In high school there is a competition over students with other sciences (chemistry etc) since CS is under 'technology' and not 'science' according to the National Ministry of Education. CS is optional and sciences are mandatory (at least one subject)."

[2] "Programming/CS is incorporated in IT subject. However it is changing from compulsory to optional module of IT in grades 9-10. In grades 11-12 CS is optional module of IT subject also, however for maturity exam programming is compulsory module."

[3] "New curriculum has only just recognized computer science and CS-related standards. CS is still not seen as distinct from 'using a computer' in many respects, although this change will change this."

[4] "No teachers that are able to teach CS"

[5] "CS is just being introduced into the last three years of high school, rolling in from 2011 through 2013. There has not been any computer science per se in high school ever. Some

schools have taught programming, but very little curriculum or assessment support for it, and required special work by teachers. A major difficulty is the lack of computer science trained teachers (there are a small handful round the country). There are also few resources for teaching it. NZ teaching culture has a strong emphasis on individually created courses for each school and a distain for textbooks that makes adopting new courses in new areas even more challenging for teachers."

[6] "There is a push to get CS more integrated into current ICT courses from year 5 upwards as well as to be offered as a stand alone qualification for pupils in years 10 and 11."

[7] "Problems(in secondary schools 11-18 years) are availability of teachers with experience of Computer Programming. The other theory topics are easily acquired by teachers with a mathematics background, or skilled ICT teachers."

[8] "optional subject only for "

[9] "Leadership don't see the difference between IT and CS"

[10] "School management do not understand the difference between Computer Science and ICT. In my school, we teach ICT because management think this is the same as Computing! In Northern Ireland, our examining body discontinued Computing in 2003 because 'There was no need for it '. Any schools that continue to offer a-level Computing must do so through an English examining body."

[11] "Probably not."

[12] "Lack of trained teachers lack of training available CS not offered as an option as exam choice in all schools. No CS curriculum at 11-14"

[13] "Age: 17-18 Classroom tool choices overridden or limited by technical staff in the name of security. Age: 15-16 Lack of teachers qualified to deliver technical concepts such as CRC, data structures, algorithm development, and programming Age: 12-14 Lack of teachers qualified to teach, even entry level, programming as an intellectual activity instead of engagement with an attractive tool, like Scratch"

[14] "There is currently no discrete teaching of CS as part of the school curriculum. The curriculum is very proscribed and there is little opportunity to teach outside it"

[15] "I currently work in a Secondary Modern School (11-19 years) with students who have failed the 11+ tests, so many of our brighter students are 'creamed ' off. My personal issues are that the HeadTeacher of my school does not recognise the current ICT curriculum (the local authority has ensured all schools maintain a digital literacy and multimedia content over the past 8 years) and so does not recognise the subject as relevant. He has to allow ICT to be taught as it is compusory but is eager to drop the subject, particularly following recent comments from the government about how irrelevant the subject is. However, he does not see Computer Science as an alternative either, I think mostly because he does not understand it (despite being a mathematician)"

[16] "Lack of teacher expertise History of low expectations in CS where included within ICT curriculum for children aged 9-16 Confusion between ICT and CS within curriculum designers and school managers"

[17] "Those deciding on what to include in education at school (regardless of level) equal CS with computer literacy, and hence focus is put on integrating the use of computers and software in other subjects. "

[18] "lack of time to develop courses. Clash wit IT system technicians"

[19] "Only available for schools with numerous students, when school may apply for several different education programmes with different subject selection in each (high school)"

[20] "High school ages 11-18 years. ICT is taught to all year groups but focuses on teaching competence in using Microsoft Office Suite. Over last couple of years we have introduced Game Maker and Scratch to 13-14 year olds with mixed success. No programming is taught."

[21] "networked computers"

[22] "No education at all in CS in primary school and lower secondary school. Lack of coordination between the curricula of the different school types. CS is only optional in the upper secondary high school. "

[23] "In Germany there is noch mandatory subject CS in lower secondary level. So in upper secondary level, we have to start at a rather low level to avoid the exclusion of some pupils while boring others."

[24] " different politics in different states"

[25] "Shortage of qualified CS teachers. In grades below 9 (esp. in primary school) the extent of CS and ICT education depends largely on autonomous decisions by individual schools"

[26] "CS is at the moment offered in secondary school (children between 15 and 18 years old) in an elective basis. Problems at the moment are: - status of the discipline, being still non mandatory - lack of quality control, being the discipline only evaluated at school level (no national exams available) - lack of teachers with CS background, being most of the teachers certified in other disciplines (e.g. mathematics, Dutch, economics, etc). "

[27] "Gymnasium (Secondary School) Age: 15-18 Students have very different conceptions about CS or misconceptions about CS. For example they think they need no mathematics for CS, they think learning is not necessary for CS or they think CS is teaching how to use a Computer. Some of them want to programm games and don't think how difficult this is. A minor group of students has the right conception of CS. They know that they need mathematical knowledge and they like it to create algorithms. "

[28] "mentioned as a part of ICT (or replaced by ICT), not mandatory at any level, only optionally(or mandatory at special types of high school) teachers are not prepared, not qualified very small number of lessons at elem, and LS level absence of informatical skills in state educational documents no interest in the society for including informatics into standard curricula, prejudices"

[29] "Low enrollments. An emphasis on IT skills in junior high school means that students do not have an informed basis for choosing computing courses for senior high school -- many kids think that the computing subjects in senior high school will continue to be about skills in Microsoft Office. "

[30] "16-18 year of age. If we define CS as Informatics (Webdesign, Multimedia, Databases and programming) much of the courses are offered as optional. Students commonly have a fluency in shallow knowledge in interactions with tools like Flash (graphical) and Dabases (like Access). Commonly teaching is focusing on declarative knowledge, while only the techy students embrace deeper understanding of how CS/Informatics correlate with other areas/domains. Procedural knowledge is more of an individual explorative journey where teachers commonly acts as tutors. The situation could therefore be perceived as excluding for students who are dependent on a socially constructive way of learning"

[31] "Comprehensive age range 11-18. Subject optional at 16. Most don't know the difference between CS and ICT, and assume that CS and ICT are same subject. Not many choose to opt for CS, because they are not enthused by ICT content, and have not experienced CS. Some also believe that CS is a difficult subject, and grades tend to be lower than in other subjects at this level"

[32] "Higher secondary school: Pupils choose CS as a new subject because they failed at everything else. CS cannot be chosen as one of the prescribed courses but is an additional 'free ' subject only. Curricula are modified to please short term industrial interests, e.g. replacing theoretic computer science by 'how to write correct XHTML '. Perception of excellence in CS still focuses on knowledge of interior mechanisms of (outdated) MS operating systems. "

[33] "At primary level the computer is integrated within the curriculum At lower secondary level CS varies from school to school. Through school autonomy this can be mandatory or optional. On average 90-100% of all pupils participate in CS. At upper secondary level CS is

mandatory in all technical and economical schools, in higher general educational schools it can be mandatory or optional. "

[34] "No unified opinion on what to teach and why to teach it. Quality depends very much on the individual teachers. Lack of good teaching material. Equipment is no longer the biggest problem, though appropriate tools are still an issue. This is generally the case; across all levels"

[35] "Many secondary school CS teachers are not able to teach the basics of computer science (or even computer programming). The courses offered have good goals, but are taught as web design courses, as opposed to computer science courses."

[36] "Please read about these issues in the many papers published on CS education in the international literature."

[37] "The Finnish policy is that the IT teaching is mostly integrated in other subjects, especially in lower levels. Also even in the higher levels, CS or IT is not mandatory. The challenge is that there seems to be less and less high schools and upper secondary schools that offer CS or IT related courses as optional studies. There are some schools that have reasonable good range of CS studies available, but there are some schools, especially, high schools that do not offer anything. Therefore, there are lot of students who do not really have a realistic view of what computer science really is."

[38] "When high school students need to decide whether to choose CS as an elective, they have little knowledge to base their decision on."

[39] "A- Information technology (applications like Excel) is taught at 7th and 8th school years.(This was the result of a change 3 years ago. Before it was taught at 9th and 10th with a little more depth. So the change has at least this negative result) B- At 12th there is an optional course 'Applied Informatics ', but with a very very light introduction to programming, if we can call it programming. C- CS is restricted to technological (more vocational orientation) programmes (10-12th years) and more recently to professional programmes (in Portugal there are several kinds of 'programmes ', like: scientific/humanistic, technological, professional and two more). Here, at the technological, they learn programming and are also introduced to other topics like Operating systems, but these without detail. The previous government, in the last years tried to give greater emphasis to the 'professional ' programme. This 'professional ' programme has no quality. The technological is good in preparing students for the workplace but not so good for higher education because, courses like mathematics are too light. Note: A (till 9th grade) refers to the general education programme followed by all students. B refers to the programme (cientific/humanistic) the majority of students follow (to prosecute their studies at higher education institution, university or polytechnic)."

[40] "Number of pupils chosing CS can drop, which can lead to CS being dropped as choice subject al together. Squeezing the education budgets by governement means that schools tend to offer less extra (not mandatory) subjects as CS, only 30% of dutch secondary schools offer CS. Number of teachers with the right qualifications is dropping. And those who are being trained to be teachers often chose different carrieers."

[41] "Currently school reform goes on. Reform introduces to grades 1-6 (primary school) new subject "Working with computer" (Zajecia komputerowe). It's definitely not CS but one of the aims is to prepare pupils to CS. In lower secondary (grades 7-9) there is a subject called "Informatics" which is partially devoted to CS. Some topics are very demanding (searching & sorting algorithms). "

[42] "In France lower secondary school is mandatory and the same for all pupils, with a national curriculum. At lower secondary school, CS has been part of the mandatory 'technology ' courses. However, the weight of CS in technology has decreased since 5 years, and now it depends on teachers. At higher secondary school, CS is part of optional courses in technological trends of studies (for instance 'information system managment ' in management studies). But it concerns few pupils. There are no programming courses for everyone. "

[43] "ICT teachers often would like to include computing but do not have the skills or academic background There are a lack of training courses for teachers to up skill them ICT teaching has got a bad press in the uK in the last few years as 'boring ' which has put students off A-Level Computing (ages 16-18) numbers have been dropping"

[44] "Still many teachers and other people, also students, consider CS as ICT. Lack of teachers to run CS classes. "

[45] "16-18 years upper secondary - hard to keep up the program with new developments - no central examination - no obligatory teacher training - small groups of pupils, only one ( 'lonely ' ) teacher"

[46] "There is no certification for teaching CS. In our state Massachusetts, a person needs to be certified to teach science/math/social sciences. To be a teacher, a student needs to get a degree in Education/Second Education/Middle School Education/Elementary School Education AND IN ADDITION should get a degree in the subject area. For example, to teach math at the high school level, a student should major in Math and Education. A bachelor's degree in Education is a straight-jacket program and CS is a straight-jacket program. There is no way students could major in both CS and Education in 4 years - so it keeps students away from CS programs if they want to teach CS in schools - not to mention the fact there is no certification in CS."

[47] "The scope for our current concerns and initiatives is upper secondary (high school), not primary or lower secondary. The current situation in Danish high schools wrt. computing is rather chaotic. We have three types of high schools: <tab>common (26,500 students/year) <tab>business (7,000 s/y), and <tab>technical (2,700 s/y) In each of these, a number of computing courses have emerged over the past ten years or more (with no coordination). Currently there are six different computing courses in nine flavours (different levels), and they all represent a specific and rather narrow view on computing, e.g. programming, multimedia, information technology, and communication/IT (it is highly debatable whether the latter qualifies as a computing course at all). Danish high school was reformed in 2005. Before then there were very few students choosing computing in high school; after the reform there are even fewer! "

[48] "The subject is not recognised as the traditional subjects and as a consequence teachers in courses about CS is not properly educated."

[49] "there are not enough teachers, not enough interest at the pupils the equipment ist often very old, because of absence of money"

### **Free Text Question: Describe current initiatives to improve CS at school (please indicate which type of school / age range of students you are referring to)**

[1] "Trying to bring more high school girls into CS - a joint project of the National teacher center and Google. Working with leading CS high school teachers and encouraging them to help their colleagues."

[2] "Olympiads in Informatics and Bebras contests, different international contests in Web (like Topcoder, Google Code Jam) promoting CS ideas between students. Extracurricular activities like Robotics, programming for LEGO Mindstorms robots, integration of some features of programming in computerized Physics or Chemistry labs. Extracurricular distance schools for programming (JPM, NMA) provides possibilities for gifted student to learn CS before university. All these things available for 10-12 grade students in some schools. "

[3] "Major work programme over the last three years including significant advocacy from industry (through the local computer society), agreement with Ministry of Education to address, big work on curriculum/body of knowledge and new assessment standards in place."

[4] "No initiatives!"

[5] "Assessment 'modules' (strictly, new NCEA achievement standards) for Computer Science and Programming have been introduced as one strand of a Digital Technologies component of the Technology domain in the assessment regime that drives the final three years of high school (leading to the dominant secondary school certificate/qualification and to the national University Entrance requirement). The computer science and programming modules represent one half of a course (typically 5 or 6 courses per year) for each of the grade 10 (year 11) and grade 11 (year 12), and a bit more than half a course for grade 12 (year 13). They are expected to be combined with other material from the Digital Technologies component (ie, Digital Infrastructure, or Digital Electronics, or Digital Media, or Digital Information). Altogether, the modules should cover a bit more than is expected of the first CS1 course at university. In particular, it would have about the same level of programming, but have a wider knowledge of issues and topics across computer science, though not at the depth that would be expected in university courses. "

[6] "Computing at Schools"

[7] "Training of staff by existing Computer Science staff. Educating senior managers in the difference between Computing and ICT. Involving younger students (11-14) in programming by including it in ICT lessons."

[8] "Apps For Good"

[9] "I run an after-school club, with support from a local University (age 14-18)."

[10] "Learn alternative office (Open Office, Libre office), ages 13-18"

[11] "Intro of computing GCSE CAS group"

[12] "Age: 12-18 Teacher Development Agency encouraging trainee ICT teachers to engage with the philosophy of computing. However, this is hampered by the ability of the trainees, who don't usually possess a degree related to computer science. Age: 15-16 Some government policy discussions about the possibilities of incorporating computer science as a science rather than as a relation to ICT All ages: Many dedicated and enthusiastic teachers who try their best for their students."

[13] "We are now offering the gcse in computing, we have always offered the a level computing"

[14] "11-19 Secondary Modern School - I have worked to set up BTEC curriculum which allows CS units to be taught alongside ICT units and more general communication/soft skills units - this is for students aged 14-19. I am currently in the process of setting up a CS after school club for students one day a week. There is little interest in the subject from the rest of the teachers teaching in my department, including the Head of Department."

[15] "Development of CS GCSE (age 14-16) Promotion of CS by Computing at School (all ages but particularly 10-16)"

[16] "\* Web based studies in CS offered to high school students. \* Extracurricular activities at middle and high school level"

[17] "No initiatives. Regular curriculum. (high school)"

[18] "High school 11-18 years. We are planning to use Game Maker and Scratch again this year and are hoping to run some lunch time sessions in using other software to promote 'logical thinking'. Initially, Flash then some Python or Alice"

[19] "new GCSE in Computing"

[20] "Special activity weeks for students of upper secondary high school. Advanced training course for teachers of CS in upper secondary high school. Promoting the competition 'Informatik Biber' in all types of schools. "

[21] "trying to get more CS teachers; competitions in CS (5.-12.)"

[22] "IMST-initiative, regional informatics-didactics center. At the ICT level also initiatives by the federal ministry (eLSA, e-Learning-Cluster, notebook classes)"

[23] "The initiative taken at the moment is to improve the status of CS in the Dutch curriculum, by requiring CS to be nationally examined. Also the Dutch scenario is being analyzed in terms

of Dutch teachers' Pedagogical Content Knowledge and from the results local solutions will be suggested. As for teachers' competency, in 2006 a Master's in Computer Science Education has been introduced. However, students' enrolling in such courses are very few every year"

[24] "In NRW there is no real initiatives to improve CS at school. CS is only optional for the students."

[25] "elem., LS: preparation of textbooks of ICT including some CS topics (programming, data understanding) HS: preparing state final exam and including CS topics into this exam elem., LS: preparing new state educational documents with qualitative changes towards CS in ICT part beaver contest as a motivating and enlightening factor"

[26] "I am not aware of any current initiatives."

[27] "Royal Institute of Technology (KTH) have a teaching programme for engineers becoming teachers. These students receives a double exam; one in engineering and one in teaching for upper secondary school"

[28] "Comprehensive age range 11-18. Subject optional at 16. Trying to introduce computing concepts in ICT lesson for younger pupils 11-14."

[29] "same: Most initiatives target computer literacy and prevention of misuse. "

[30] "There is a project for standardisation of digital competences of pupils age 14. It is mandatory to use the computer and the new media in all types of subjects and schools."

[31] "I do not know about this."

[32] "The Canadian Computing Competition: adds enrichment activities for grade 9-12 students. CS Circles On-line: On-line, self-guided learning activity for students with no programming experience to learn programming. Aimed at grade 8-12 students. PC4G (Programming Challenge for Girls): Introduce computer science (via Alice programming) to grade 9/10 girls."

[33] "I think most of the initiative have been carried out by Universities. For example in University of Eastern Finland, Joensuu Campus we have been running an online ViSCoS study programme for over ten years. The programme was originally aimed to high schools students in order to provide CS courses for those high schools that do not themselves teach CS. There are still couple of active high school in the programme, but there would be room even for more schools. In University of Turku they have had close collaboration with local schools in CS subjects."

[34] "Computer science is now gradully entering junior high schools (grades 7-9). Currently it is only in some schools, mostly as part of a program promoting excellent students towards STEM subjects"

[35] "I am not aware of any initiative. The previous government politics for education at all levels was really bad (personal opinion and can be removed if necessary)"

[36] "Number of computers available is no longer a problem. There is more teacher training available. "

[37] "Grades 4-9. There is a growing interest in SCRATCH as a tool to introduce programming. "

[38] "Since 2010, algorithmics is part of mathematics teaching at grade 10. In 2012 a new optional course will be open, at grade 11 and 12, for pupils enrolled in Scientific studies. It is called 'Informatique et Science du numérique (ISN) ' which may be translated by : 'CS and Digital science '. Teachers will have 3-month training."

[39] "Computing At School organisation to support teachers teaching computing New GCSE Computing for age 14-16 year olds - pilot just completed "

[40] "We work on: 1. New textbooks for CS in high schools. 2. New preparation standards for technology and CS teachers, which will be more operational than before - they will show what teachers should do in a class with students. 3 Introducing computational thinking approach. "

[41] "16-18 years upper secondary - Our teacher of informatiss is supported in time to follow training courses "

[42] "There are many workshops to incorporate CS related activities that can be incorporated into the math curriculum. Teachers who want to teach CS could attend these workshops. There is also local chapters of CSTA - Computer Science Teachers Association that hold meetings and workshops. "

[43] "Our current approach is to substitute all of the current rather specific courses with one more 'holistic' course. We have identified six core topics or perspectives on computing which we think is a reasonable way to present the discipline. The idea is that these topics can be exemplified in different ways in the different types of schools while still presenting computing as its own discipline. The six core topics are: 1. Importance of computing and influence on human behavior 2. The architecture of IT systems 3. Representation and manipulation of data 4. Programming 5. Modeling and structuring of data, processes and systems 6. Interaction design Below you'll find a short description of the six core topics and the associated required competencies. Last year, we prepared the initial version of the official requirements for this new course (controlled by the Ministry of Education). The new 'holistic' course is offered since summer 2011 for a trial period of three years. Currently we work to develop teaching material and teacher training. Unfortunately, the Danish Ministry of Education has not provided resources for this work, but we are a group of people working to attract various kinds of external funding to support this work. We have managed to attract quite some funding, and we have organized some development work jointly between selected high school teachers and people from academia. \* \* \* \* \*

1. Importance of computing and influence on human behaviour To truly understand and appreciate the importance of computing in modern society, the pupils must be presented to a portfolio of important and for the students relevant systems and innovations (e.g. facebook, iTunes, GPS-based navigation systems, email, health care systems, etc.) -- systems that the students know and can relate to. The design of an IT systems has strong consequences for the people, organisations, and sociale systems who use it. Designers do not only design the system but also use patterns and workflows that unfold through the use of the system. The purpose is to make the pupils aware of the interplay between design of a system and the use patterns which the system intentionally or unintentionally generates. Pupils should be able to - give examples of the impact of IT systems on human behaviour - analyse and assess the importance and implications of IT systems and how they impact human behaviour - apply user-oriented techniques for construction or modification of IT systems

2. The Architecture of IT Systems (three-tier model) The majority of IT systems are structured according to the so-called three-tier model consisting of a presentation tier, a logic tier, and a data tier. The model is relevant partly because it provides a general framework for understanding a very large class of IT systems, their components, and the interplay between these, and partly because the model is useful for qualified use of concrete systems, e.g. the Office package, Photoshop, iTunes, Facebook and general types of systems, e.g. simulation tools, accounting systems, content management systems, mobile technology, and computer games. Pupils should be able to - describe principles for the architecture of IT systems - apply specific architectures for construction of simple IT products and adjustment of existing IT systems

3. Representation and manipulation of data In order to understand the basic characteristics of the computer, the pupils must understand and work with representation and manipulation of data. The main point is that data need to be digitised in order to be represented in a computer and manipulated by programs. The purpose with this topic is that the pupils gain concrete experience with (and hence understanding of) representation and manipulation of data including the fact that digitising often results in loss of information. The other side of the coin is that digitising and manipulation makes it possible to create new data. IT security is another important issue which must be addressed. Pupils should be able to - describe the representation of selected types of data (e.g. images, sound, text, etc.) and construct IT products (programs) that make simple manipulations of data - integrate various types of data in simple IT products and extend functionality of existing IT systems by adding new types of data

4. Programming Computers are indeed very simple machines that gain their power through scale. The defining characteristics of the computer is its programmability and universality. Programming comes in many forms, but common to these is the principle of defining and hence automating computations which can be executed again and again with arbitrary data and data sets. Pupils should be able to - identify basic structures in programming languages, construct IT products (simple programs) and adjust existing programs - apply programming technologies for development of IT products and adjustment of existing IT systems

5. Modeling and structuring of data, processes and systems The purpose with this topic is to provide insight into modeling where data, processes and systems are described at an abstract level where design alternatives and properties can be evaluated and choices and decisions can be made. Pupils should be able to - give examples of models of data, processes and systems and describe the relation between a concrete model and the relevant associated parts of an IT system - implement selected models in a concrete IT product and adjust existing models and implement these adjustments in existing IT systems

6. Interaction design The previous topic is primarily about models for elements of the presentation and logic tiers of the three-tier model. This topic is about models and design principles for the presentation tier -- the interface where users and other systems meet an IT system. It's the purpose that the pupils understand the premises for as well as the consequences and importance of interaction design. Pupils should be able to - describe and analyse selected elements of a user interface design, construct simple user interface designs and adjust existing designs - implement selected interaction design in a concrete IT product and adjust existing designs and implement these adjustments in existing IT systems "

[44] "not much, some university offers courses or special days for pupils"

**Free Text Question: Describe trends: What will be the changes or situation / demands of CS at school in 5-10 years from now? (please indicate which age range of students you are referring to)**

[1] "There is a great demand for CS in high schools but lately the universities decided to lower the bonus credits given to CS in high school and therefore number of high school students might decrease. There are efforts (from university, researchers, teachers, parents, and students) to change that decision. "

[2] "Most students are divided in groups of users and creators of programs. Group of users is much bigger. However, use of some technologies, like creation of your own blog, creation of your own game, requires higher understanding of technology than user level. Sometimes it pushes students to invest in this subject. Another reason for interest is possibility to get job rather easily. Almost all CS students can find some work in web or at friends office even if they are students. In comparison to medicine it is possible to get job in very early stage of education. Situation can be changed rather quickly by really big need for new workers in high-tech companies. At moment best students are emigrating and it is not easy to find good candidates. This can force government to think twice... "

[3] "I don't think that within 5 or 10 years anything will substantially change. Maybe we will see some minor achievements in one state (Bundesland) and some setbacks in another. But I believe that educational change at an administrative level is much slower than at the individual level. Much depends on the school principal's attitude towards CS and on the qualification of the teachers. A single capable teacher can make a difference. Therefore we need to improve (CS and non-CS) teacher education and support CS teachers in their day-to-day work."

[4] "This is likely to increase dramatically based on the early uptake of the new standards"

[5] "To exclude teaching of CS in secondary school at all!"

[6] "We do not know. The universities will need to change their first year programmes from 2014, first of all to introduce a 'fast track' for students who have done the new CS & Prog material at high school. As more students take these high school courses (we hope), the universities will need to turn the fast track into the standard track, and have a 'catch up' track for those who didn't take those courses. I would expect to see more introduction of preliminary material in both CS and programming at earlier years of high school (years 9 & 10 = grades 8& 9). I would hope to see more formal training in CS & Prog for both new and existing teachers. There will also be refinement of the 'achievement standards' in the light of experience teaching them. "

[7] "In my school (secondary. 11-18 yrs)the senior management are getting the message and they will be raising the profile of Computing at Keystage 3 (15+ years) and making ICT a skill shared between several subjects."

[8] "Many students ask for CS and they say ICT is boring. However, school management want to have easy subjects, because they deliver better exam scores. The local examining board (CCEA) discourage CS, and undermine efforts of CS teachers to bring CS into their schools again. Unless CCEA change their view, there will be few people left who can teach CS, 10 years from now. They will have retired, or left teaching. "

[9] "Would be helpful to teach the classes 8, 9 and 12"

[10] "I hope that more CS will be taught at secondary school level 11-18"

[11] "Age: 15-18 Computer science, taught as a science, will demand teachers with related first degrees. In order to better prepare for this, there should be a joined up curriculum in computer science from ages 15-18."

[12] "A lot I hope! There is a new curriculum coming and hopefully CS will be a much greater part of it. It may be that any ICT or Computing will simply be dropped off the curriculum which may be good in the short term as the facilities are in place and we will have more flexibility but would probably be bad in the long term as the facilities to teach the subject are more expensive than the facilities to teach other subjects"

[13] "Following a very recent announcement by a Government Minister I believe that the profile of CS is likely to increase, possibly not as much as we would like, but I feel that the Government is probably starting to understand the difference between CS and ICT, and is starting to realise what is missing from the curriculum."

[14] "Uncertain - possible increase in CS examination courses at aged 16. Probable decline in CS within ICT curriculum for ages 7-14."

[15] "No signs of changes for now."

[16] "We are concerned that too many pupils are competent in using IT technologies (mobile phones, computers/laptops etc) but have very little knowledge about what goes on 'under the hood'. Even trying to engage enthusiastic game-players in creating their own games in Game Maker has led to resistance as they are unwilling to stretch themselves and think about the skills/techniques required to build a game. Being able to think clearly and logically about a problem (not just in IT) is a life-skill necessary for all sorts of situations."

[17] "Intentions to introduce a mandatory course of fundamentals of CS in the upper secondary high school. "

[18] "less CS teacher because of retirement (5.-12.), more CS lessons with non-educated teachers (5.-9.)"

[19] "Providing compulsory ICT-education at the level of lower secondary schools in order to provide room for in depth CS-education at the upper levels.. Teacher training initiatives. "

[20] "According to a study, the number of CS teachers in the next 5 years will be dropping. The reason is that most teachers teaching CS are very close to retirement and replacement teachers (those coming from the Master's in Computer Science in Education) are not enough. In order to support CSE without teachers, it might be necessary to deliver this discipline in an online environment. "

[21] "CS at school includes OOP-Elements and basics of algorithms and datastructures. But CS at school is far away for actual developments of CS in the industry. This should not imply that school has to adapt every development of CS out of school, but fundamental ideas of CS should be part of CS at school, e.g. petri nets and basics of parallel programming or neuronal networks and so on."

[22] "the slow return of CS to the previous positions in ICT school curricula - at all levels HS: mandatory part of final exams (choose from math, informatics or social science) will improve the interest for CS at HS schools risks: approach of the teachers at LS, elem."

[23] "I don't know."

[24] "From 2011 Sweden will have a new curriculum for CS/Informatics which influence the content and the name of different subject matters. As an example: Programming will have mainly the same content divided into two courses instead of three. There is also an experimental work on the fourth year for the technology programme with IT & Media or Software design (this is not the proper names). It is conducted for the moment at three different upper secondary schools. Next year it will be extended further."

[25] "Numbers opting for CS are falling (Age 16-18)"

[26] "same: Programming 'in world ' applications for virtual reality. Adopting pervasive computing currently represented by proliferation of smartphones probably followed by augmented reality devices. "

[27] "All teachers have to have digital and didactical competences to integrate CS in their teaching. All pupils will have digital competences, they will be confronted with digital learning environments and they will have to create an e-portfolio during their schooling."

[28] "Again, I do not know."

[29] "I think more resources will be available for students on-line. CS Teachers in high schools will be more facilitators, and more self-guided tutorials become available and easy to use via on-line activities. Python programming will start to be the pervasive language used in secondary schools (i.e., grade 9-12), replacing Java (or Visual Basic)"

[30] "It seems that the tendency of integrating IT teaching to other subjects continues also in future. From university and industry perspective there has been demands of introducing IT as a mandatory subject in grades 7-9, but it seems that such a change will not happen. There are more and more concerns about the progress of Finland in the IT sector. In my opinion, it would be important to increase the IT teaching in grades 7-9 and also in high schools (grades 10-12)."

[31] "CS will probably be taught in junior high schools as a mandatory subject (my guess) and will continue to be an elective subject in high schools, with the students' choice based on a more solid basis."

[32] "There is a new minister of education. I can say that he wants to introduce more final examinations at the end of the main cycles."

[33] "Awareness of management on the importance of CS is slowly growing. The need for basic computerskills training is growing. A standardised national examination needs to be set up. At present although the CS subject description is standard, the final exams differ for each school (teachers discretion). "

[34] "Grades 10-12 (CS as a subject to choose): Teachers were mainly using Pascal as programming language, but now C and PHP are more common, in a few years there will be probably Java."

[35] "Since 20 years, CS was not a subject matter. ICT were seen as a tool for other subject matter. Teachers were strongly fostered to use ICT during lessons. There is a system of skill certification of all pupils. Since few years, we had the opportunity to introduce optional courses in high school. A group of people interested in CS education proposed a project to the government. The result is the 'ISN ' optional course. Next step would be a mandatory course, and/or an optional course in lower secondary school"

[36] "I feel quite positive because of the impact that Computing At School are having and other initiatives such as Computer Science for Fun, Greenfoot, CS Inside etc. GCSE Computing will be more successful once we have more teachers trained There will be a new National Curriculum from 2012 - it looks as if there will be more freedom to set your own curriculum for ICT/Computing up to age 14 - but this is speculative as it is not published yet We are awaiting the results of the Royal Institution Investigation in to Computing in school due out early January 2012 "

[37] "We hope that more school students will interested in CS studies and jobs so they will be more interested to learn CS in schools. The same applies to teachers. "

[38] "16-18 years upper secondary Hopefully a new curriculum, probably a central examination"

[39] "It looks as if the numbers might slightly go up but not drastically - students come to the major with a wrong conception that the major is about gaming and surfing the web."

[40] "In three years from now, we expect the new computing subject to replace all the other computing courses and thus become the only computing subject in high school thus providing a common. The new computing course in high school is supposed to be relevant for all (the educated citizen in 2011) and at the same time inspire for tertiary education in computing. The new computing subject does not give credit at universities. This is not a problem; it is a relief. It allows us to compose a subject for high school that makes sense on its own (and avoid the all too common situation of just in case teaching). Some people think it is a problem that the high school subject doesn't give credit at universities We don't. We will prioritize that computing becomes a mandatory subject in high school."

## URL to School curricula

[1] "<http://www.csit.org.il/>"

[2]

"[http://www.pedagogika.lt/get\\_file.php?file=bUdOaDJwN0VuS3RxbFpXbm1hbG5xNTFvbnFPVHFfaJtJCYnlwS1dvRzJtYjIjMSG9HT1RhdGJLcVhESllGJTJGRm41Ump5cVp3ajVPZm5LSEp6NWVkwktWdmxNbXJaY3B4ekpTbGI4dVdvNVpoWXBxZG9taWNhSjVwYk1lWnlYQ2FZSnZWblpocHlweWVsSUpxMUphV202R1VwcDJtYUpGcG5KNmhuZEhLbLphbGNNU2NxR0hKYWNhYm9XclVaSiUyQmFubUtqeUtCd21aV2pjYWVWVWMBabW1LS2F5WjJhbHA5eG5wdyUzRA==](http://www.pedagogika.lt/get_file.php?file=bUdOaDJwN0VuS3RxbFpXbm1hbG5xNTFvbnFPVHFfaJtJCYnlwS1dvRzJtYjIjMSG9HT1RhdGJLcVhESllGJTJGRm41Ump5cVp3ajVPZm5LSEp6NWVkwktWdmxNbXJaY3B4ekpTbGI4dVdvNVpoWXBxZG9taWNhSjVwYk1lWnlYQ2FZSnZWblpocHlweWVsSUpxMUphV202R1VwcDJtYUpGcG5KNmhuZEhLbLphbGNNU2NxR0hKYWNhYm9XclVaSiUyQmFubUtqeUtCd21aV2pjYWVWVWMBabW1LS2F5WjJhbHA5eG5wdyUzRA==)

[http://www.pedagogika.lt/get\\_file.php?file=eW1OajJtakVuS3VjbFpLbmtxbG5xNVZvY0tOaXFXMmJ4NUthb0dpbVo5TEpvR1dUbXRiSnFadkphRiUyQlduMkjqbWFhZGo1U2ZjS0dkejUlMkjkWktXWmxKaXJZY3FjekppbGNjdG9vOGRoYVpyS29uR2NsSjZiYWNTWXpHeGthNXlUblpocDAyakduWFNjdkpXRnhuU1doSlZaY1dlVfFdXbW9udFdYb1dSZ25aT2RZbUhIY012S3AyalZZcHITb1dTYnlxS2FtbVNvY2F2S2tjeWNIYUZyeUpSdmxK0Xc=](http://www.pedagogika.lt/get_file.php?file=eW1OajJtakVuS3VjbFpLbmtxbG5xNVZvY0tOaXFXMmJ4NUthb0dpbVo5TEpvR1dUbXRiSnFadkphRiUyQlduMkjqbWFhZGo1U2ZjS0dkejUlMkjkWktXWmxKaXJZY3FjekppbGNjdG9vOGRoYVpyS29uR2NsSjZiYWNTWXpHeGthNXlUblpocDAyakduWFNjdkpXRnhuU1doSlZaY1dlVfFdXbW9udFdYb1dSZ25aT2RZbUhIY012S3AyalZZcHITb1dTYnlxS2FtbVNvY2F2S2tjeWNIYUZyeUpSdmxK0Xc=) "

[3] "[www.informatikstandards.de](http://www.informatikstandards.de)"

[4] "<http://ceea.org.uk/ict/>"

[5] "<http://visc.gov.lv/saturs/vispizgl/standarti.shtml>"

[6] "<http://www.wjec.co.uk/index.php?subject=28&level=21>"

[7] "<http://curriculum.qcda.gov.uk/key-stages-3-and-4/subjects/key-stage-3/ict/index.aspx>"

[8] "<http://curriculum.qcda.gov.uk/key-stages-1-and-2/subjects/index.aspx> and <http://curriculum.qcda.gov.uk/key-stages-3-and-4/subjects/key-stage-3/ict/index.aspx>"

[9] "[sqa.org.uk](http://sqa.org.uk)"

[10] "[visc.gov.lv/saturs/vispizgl/standarti.shtml](http://visc.gov.lv/saturs/vispizgl/standarti.shtml)"

[11] "<http://curriculum.qcda.gov.uk/key-stages-3-and-4/>"

[12] "<http://www.edk.ch/dyn/13723.php>"

- [13] "[http://www.kultusministerium.hessen.de/irj/servlet/prt/portal/prtroot/slimp.CMReader/HKM\\_15/HKM\\_Internet/med/f9a/f9a5418f-7d7a-921f-012f-31e2389e4818,22222222-2222-2222-2222-222222222222,true](http://www.kultusministerium.hessen.de/irj/servlet/prt/portal/prtroot/slimp.CMReader/HKM_15/HKM_Internet/med/f9a/f9a5418f-7d7a-921f-012f-31e2389e4818,22222222-2222-2222-2222-222222222222,true)"
- [14] "<http://www.informatikstandards.de/>;  
[http://www.kmk.org/fileadmin/veroeffentlichungen\\_beschluesse/1989/1989\\_12\\_01\\_EPA\\_Informatik.pdf](http://www.kmk.org/fileadmin/veroeffentlichungen_beschluesse/1989/1989_12_01_EPA_Informatik.pdf)"
- [15] "There are several, depending on type and level for school. See <http://www.bmukk.gv.at/>"
- [16] "<http://www.standardsicherung.nrw.de/cms/>"
- [17] "<http://en.vuppraha.cz/>"
- [18] "[http://www.skolverket.se/forskola\\_och\\_skola/gymnasieutbildning/gymnasieskola\\_fore\\_ht\\_2011/2.3034/sok\\_amnen\\_och\\_kurser/13845/func/amnesplan/id/DTR/titleId/Datorteknik](http://www.skolverket.se/forskola_och_skola/gymnasieutbildning/gymnasieskola_fore_ht_2011/2.3034/sok_amnen_och_kurser/13845/func/amnesplan/id/DTR/titleId/Datorteknik)"
- [19] "[www.informatik-lehren.de](http://www.informatik-lehren.de)"
- [20] "<http://www.bmukk.gv.at/schulen/efit21/index.xml>"
- [21] "[http://www.slo.nl/downloads/archief/Examenprogramma\\_informatica\\_DEFINITIEF.pdf](http://www.slo.nl/downloads/archief/Examenprogramma_informatica_DEFINITIEF.pdf)"
- [22] "[http://www.edu.gov.on.ca/eng/curriculum/secondary/computer10to12\\_2008.pdf](http://www.edu.gov.on.ca/eng/curriculum/secondary/computer10to12_2008.pdf)"
- [23] "that would be in Hebrew..."
- [24] "[http://www.min-edu.pt/data/docs\\_destaquas/organizacao\\_ensino\\_basico2011\\_12.pdf](http://www.min-edu.pt/data/docs_destaquas/organizacao_ensino_basico2011_12.pdf)"
- [25] "[http://www.slo.nl/downloads/archief/341330003\\_Vakdossier\\_2007\\_informatica.pdf](http://www.slo.nl/downloads/archief/341330003_Vakdossier_2007_informatica.pdf)"
- [26] "<http://men.gov.pl>"
- [27] "<http://eduscol.education.fr/cid45766/ressources-pour-faire-la-classe-au-college-et-au-lycee.html>"
- [28] "[http://bip.men.gov.pl/men\\_bip/akty\\_prawne/rozporzadzenie\\_20081223\\_v2.pdf](http://bip.men.gov.pl/men_bip/akty_prawne/rozporzadzenie_20081223_v2.pdf)"
- [29] "[http://www.examenblad.nl/9336000/1/j9vvhinitagymgn\\_m7mvi0sgg8bampk/vg41h1h6n8to](http://www.examenblad.nl/9336000/1/j9vvhinitagymgn_m7mvi0sgg8bampk/vg41h1h6n8to)"
- [30] "<http://www.informatikstandards.de/>"
- [31] "[http://www.skolverket.se/2.3894/in\\_english](http://www.skolverket.se/2.3894/in_english)"
- [32] "<http://informatik.bildung-rp.de/lehrplaene.html>"

### Free Text Question: Describe / name organisations / institutions supporting CS at school, like CSTA

- [1] "The National CS Teacher Center (called 'Machshava ' in Hebrew)"
- [2] "LiNMA Association of Lithuania teachers of Informatics. It is joining teachers of Informatics, but at moment it is more promoting IT than CS... VU IMI - Vilnius University Institute of Mathematics and Informatics. It started distance teaching of CS in 80-ties and still have big influence to IT programs in schools. "
- [3] "Gesellschaft für Informatik ([www.gi.de](http://www.gi.de)) with reservations (i.e. CS is on par with Natural Sciences only if it is taught by qualified teachers): MNU ([www.mnu.de](http://www.mnu.de)) as an integral part of Technology as subject at school: VDI ([www.vdi.de](http://www.vdi.de)) and BITKOM ([www.bitkom.org](http://www.bitkom.org))"
- [4] "New Zealand Computer Society (NZCS), all Universities and Polytechs, other industry bodies"
- [5] "National team for olympiads in Informatics stil make some efforts"
- [6] "NZACDITT (teachers association) The university CS departments across the country have agreed to support the process with faculty members at several of the universities very active at present (Tim Bell at U Canterbury, Anthony Robbins at U Otago, and Peter Andreae (me) at Victoria U in particular). "
- [7] "CAS"
- [8] "Computing at School"

- [9] "Computing at School (UK). CAS are supported in England, but are currently ignored by the authorities in Northern Ireland."
- [10] "County governments"
- [11] "Computing at School group BCS Royal Society"
- [12] "Computing at School (UK) Specialists Schools and Academies Trust (UK) British Computer Society (UK) "
- [13] "CAS is the main one"
- [14] "Computing At Schools organisation is supporting and petitioning for the raising of CS profile and supporting teachers in doing this. Some universities also support (City University London is sending a tutor to talk to students)"
- [15] "Computing at School (CAS) British Computing Society OCR (examination board) through Computing GCSE development"
- [16] "CS is the same subject as all others, so, state educational bodies are responsible for it."
- [17] "CAS - I am a (watching) member of CAS and we are hoping to use links found through CAS to engage and interest our pupils in CS."
- [18] "SVIA: Schweizerischer Verein für Informatik in der Ausbildung Schweizerische Hasler Stiftung"
- [19] "GI (to get a standard), BMBF (competitions)"
- [20] "OCG, Österreichische Computer Gesellschaft (Austrian Computer Society) and various local initiatives"
- [21] "www.jsi.cz Jednota skolskych informatiku (Unit of school informaticians) - globally CZ.NIC, some universities, Jednota ceskych matematiku a fyziku (Unit of czech mathematicians and physicians) - organizing programming contests"
- [22] "Australian Council for Computers in Education <http://acce.edu.au/> ICT Educators of New South Wales (ICTENSW) <http://ictensw.org.au/cstaJan10/>"
- [23] "The Swedish National Agency for Education (Skolverket) evolve CS/IT-courses together with teacher experts, recruited from upper secondary school. Me myself has started together with Uppsala university (Anders Berglund and Anna Eckerdal), Stockholm University (Inga-Britt Skogh), Microsoft and KTH a network for teachers concerned with programming education. The network meets ones every semester to dwell into didactical trends and discussions."
- [24] "CAS"
- [25] "GI"
- [26] " Teachers´ training institutes"
- [27] "Traditionally, the Informatics Olympiad has driven an interest in computer science through programming, aimed at upper high school level. However, participation in the Netherlands is low; also organizationally they encounter difficulties. The International standing is good, but nationally they are hardly visible. The Beaver competition was started more recently (as a European initiative) and involves all levels in high school; there is an interest in involving the upper grades in primary school (in some countries this is already the case). This competition covers a broader range of topics."
- [28] "CEMC (Centre for Education in Mathematics and Computing)"
- [29] "The system is central, so the under the minstry of education there is a supervisor in charge of CS studies. There is also a CS teacher center that initiates promoting activities for CS teachers (such as CS teacher conferences, courses for leading CS teacher, etc.)"
- [30] "I believe none."
- [31] "SLO is involved, [www.informaticaVO.nl](http://www.informaticaVO.nl) is a collectivly run website to share CS courseware CODI was the first responsible organisation for training teachers for CS but I think it no longer exists."

- [32] "Universities (Warsaw, Wroclaw, Torun...), PTI, Microsoft, Intel... CS Olympiad sites:  
<http://www.oi.edu.pl/> <http://main.edu.pl/pl> <http://oig.edu.pl/> Delta monthly:  
<http://deltami.edu.pl/temat/informatyka/>"
- [33] "No official organisation. An association of people interested in CS education and trying to propose changes (teachers, reseachers, etc) : le groupe ITIC : <http://www.asti.asso.fr/groupe-itic/>"
- [34] "Computing At School (<http://www.computingschool.org.uk>) CS4Fn "
- [35] "Polish Computer Science Society University of Torun OEliZK, Warsaw and many other teachers' training centers"
- [36] "Union of informatics and information literacy"
- [37] "CAITE - Commonwealth alliance for Information Technology education - an NSF funded project that includes state universities, community colleges and research universities in Massachusetts. "
- [38] "Centre for Science Education, Aarhus University It-vest Datalærerforeningen for gymnasiet og hf National network of computing department chairs Ministry of Education "
- [39] "Technical University Kaiserslautern University Koblenz-Landau University Trier some local business"

## Second part: CS teacher Education

Some rudimentary data on answers to rating questions regarding CS Teacher Education:

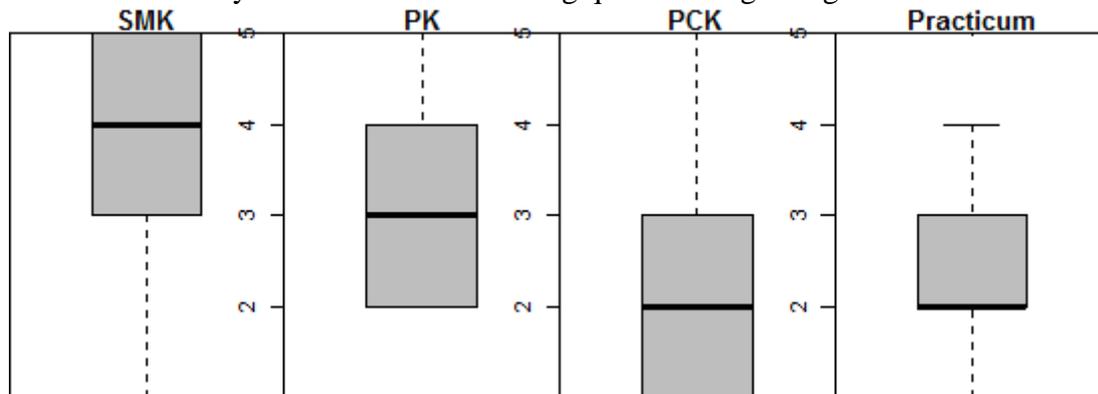


Figure 7: Please give a rough estimation of the workload required for the different parts of CS Teacher Education (5= >120 ECTS, 4= 120-61, 3=60-31, 2=30-15, 1=<15; SMK= Subject Matter Knowledge, PK=Pedagogical Knowledge, PCK=Pedagogical Content Knowledge, Practicum=Internship at (local) high school)

### Goals of CS Teacher Education

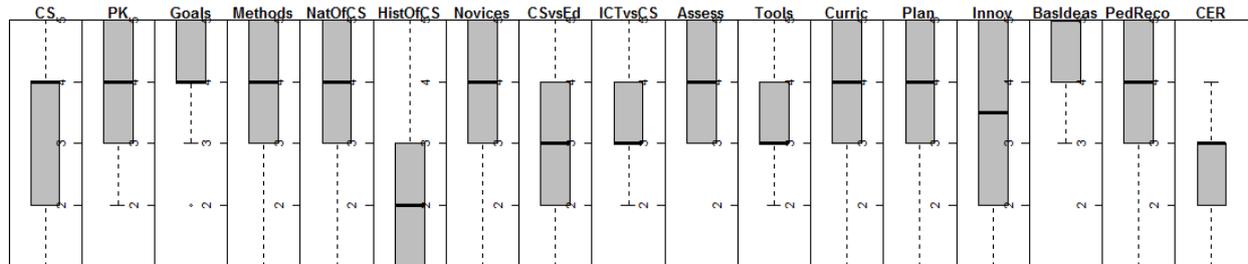


Figure 8: Goals of CS Teacher Education, explanation of items below

1. All aspects of Computer Science as university subject
2. (general) Education / Pedagogy
3. Computer ScienceEducation goals
4. Computer Sciencespecific teaching approaches / methods
5. The „Nature of Computer Science“ (What is Computer Science?)
6. History of Computer Scienceas subject in School
7. Introductory learning of Computer Science(How to introduce students to Computer Science)
8. The relation of Computer ScienceEducation and general Education
9. IT / ICT Education vs. Computer ScienceEducation
10. Student Assessment
11. Computer Science-specific learning tools (e.g. educational IDE's)
12. School-related Computer Science-Curricula
13. Lesson planning
14. Innovation of Computer Science Education
15. Basic concepts of Computer Science
16. Reconstructing Computer Science-content for learners
17. Conducting Research about teaching Computer Science

### Is there a National / state wide curriculum for CS teacher education?

[1] "There is no National curriculum. There is a new book written by three Israelies with a lot of experience - the book suggests such a curriculum.

<http://www.springer.com/computer/general+issues/book/978-0-85729-442-5> "

[2] [www.informatikstandards.de](http://www.informatikstandards.de)

[3] "No"

- [4] "no"
- [5] "Don't think so"
- [6] "No, there isn't a nationwide curriculum for CS teacher education."
- [7] "no"
- [8] "no"
- [9] "Curricula are defined on the university level (Sec I + II) or at the level of teachers colleges (prim, sec I). However, there is a substantial degree of national coordination and national consent within the respective type of organization."
- [10] "No"
- [11] "<http://en.vuppraha.cz/>"
- [12] "The national government is preparing a nation-wide curriculum. Many states already have curricula. For example, in New South Wales: For senior high school, see [http://www.boardofstudies.nsw.edu.au/syllabus\\_hsc/ipt.html](http://www.boardofstudies.nsw.edu.au/syllabus_hsc/ipt.html) and [http://www.boardofstudies.nsw.edu.au/syllabus\\_hsc/software-design-development.html](http://www.boardofstudies.nsw.edu.au/syllabus_hsc/software-design-development.html) For junior high school ... [http://www.boardofstudies.nsw.edu.au/syllabus\\_sc/pdf\\_doc/info\\_soft\\_tech\\_710\\_syl.pdf](http://www.boardofstudies.nsw.edu.au/syllabus_sc/pdf_doc/info_soft_tech_710_syl.pdf) For elementary ("primary") school ... [http://k6.boardofstudies.nsw.edu.au/files/science-and-technology/k6\\_scitech\\_syl.pdf](http://k6.boardofstudies.nsw.edu.au/files/science-and-technology/k6_scitech_syl.pdf)"
- [13] "No"
- [14] "somewhere on bildung-rp.de"
- [15] "<http://www.ph-noe.ac.at/studienangebot/lehrgaenge/medienpaedagogik-informatik.html>"
- [16] "Not that I am aware of."
- [17] "[http://www.edu.gov.on.ca/eng/curriculum/secondary/computer10to12\\_2008.pdf](http://www.edu.gov.on.ca/eng/curriculum/secondary/computer10to12_2008.pdf)"
- [18] "Yes. Please read the papers published about it. "
- [19] "No, each university offering CS teacher education can themselves decide the curriculum."
- [20] "No. Every university or college defined ita own guidelines"
- [21] "No as long as I know. Informatics teachers come from distinct programmes, like: engineering, computer science, Informatics teacher. In the latter case, I think that depends on each higher education school."
- [22] "?"
- [23] "There are prepared standards of teacher education, but universities are independent.. Prof. M.M. Syslo is best person to ask. "
- [24] "Not yet"
- [25] "We are working on such a document"
- [26] "[http://www.cfi.nl/Public/CFI-online/Images/d805201\\_tcm2-742.pdf](http://www.cfi.nl/Public/CFI-online/Images/d805201_tcm2-742.pdf) "
- [27] "I am not aware of it. As far as I know, there is none. There are some states (I think New Jersey is one of them) that has CS certification at the state level."
- [28] "[http://www.kmk.org/fileadmin/veroeffentlichungen\\_beschluesse/2008/2008\\_10\\_16-Fachprofile-Lehrerbildung.pdf](http://www.kmk.org/fileadmin/veroeffentlichungen_beschluesse/2008/2008_10_16-Fachprofile-Lehrerbildung.pdf)"
- [29] "No."
- [30] "Bildungsstandards Informatik <http://www.informatikstandards.de/> EPA Informatik "

### **What do you estimate is the percentage of CS teachers in your Country that have gone through formal teacher education?**

- [1] "30%"
- [2] "100%"
- [3] "All teachers would have gone through formal teacher education. Extremely few would have had a formal computer science education. None would have learned any computer science in their teacher education programme"
- [4] "They will all be trained teachers but not necessarily qualified in CS"
- [5] "Formal teacher education: 100%; Education to teach CS: 40% "

- [6] "99% "
- [7] "All of them have some formal teacher training, but it will not have been in computer science because there is not CS training course available"
- [8] "All will have trained as teachers, just not specialising in Computing"
- [9] "90% - need formal qualification to be able to teach, but don't need qualification in subject, so perhaps 20% of CS teachers have a CS qualification"
- [10] "estimation: 80% "
- [11] "30% "
- [12] "CS-teachers degree program: ~ 10 %; general CS-program (with educ. in service training) ~ 10 %, formal courses of different degree of depth ~ 60 % "
- [13] "A formal Master's in CSEd was established in 2006. Yearly there are around 10 new students teachers (nationwide). The number of total teachers at the moment is of around 350."
- [14] "30% "
- [15] "elem. 0 %, LS 10 %, HS 25 % "
- [16] "I don't know."
- [17] "10% real CS / 85% teaching something different + CS addendum "
- [18] "30% "
- [19] "100% have been certified to \"teach\", but 5% have been certified to \"teach CS\""
- [20] "?"
- [21] "80% "
- [22] "100% - general teacher education"
- [23] "80% - they have to have a certification to teach but not CS"
- [24] "20% "
- [25] "65 % "

**Please describe the organisation of Teacher Education: at University, at school, only possible for in-service teachers as an add-on, ...**

- [1] "There are many options. Almost all universities and colleges provide some sort of CS teacher education."
- [2] "Do you mean teacher education in computer science? if so, there is none. If you mean teacher education in general, it is at Colleges of education that are now part of a university, and at a variety of other tertiary institutions that offer approved qualifications in teacher education."
- [3] "Teachers must find out about courses and do them in their own time. Teachers study a degree in CS, then do a 1-year teaching certificate."
- [4] "Latvian University, Daugavpils University, Liepajas University etc."
- [5] "I graduated second level higher education programm at Latvia University"
- [6] "The Teacher Education ist divided in two parts: 1) Students have to go through a normal CS study at the university. 2) The education in didactics an pedagogy of CS takes place at \"Pädagogische Hochschule\", a university related institution. "
- [7] "at university: CS can be chosen as one of two subject areas each teacher-student has to enroll in. at Teachers colleges: rather ICT than CS education (Question 21 below is answered only from a university perspective)"
- [8] "I don't know."
- [9] "University Bachelor/Master of Education in CS followed by 2-Year practical training with exams."
- [10] "<http://www.ph-noe.ac.at/studienangebot/lehrgaenge/medienpaedagogik-informatik.html>"
- [11] "At university, in the School of Education."
- [12] "Teacher Education is held at various Universities (in Faculties of Education). Usually a one-year (or sometimes two-year) program. Mostly, Teacher Education students take many psychology, pedagogy, legal courses, with very little exposure on their actual teaching subject (i.e., very little Math curriculum in Math Teacher training)."

[13] "The basic teacher education is done at University. The student applied to subject teacher education usually in the first or second year of university studies, but they can also apply later on. The students need to complete during the bachelor and master studies the following 1) completed advanced studies in the main subject area (e.g. Computer Science) 2) completed 60 ECTS of pedagogical studies 3) completed either 60 ECTS in one minor subject or 25+25 ECTS in two minor subjects. The pedagogical studies include the practical training in the University practice schools + theoretical oriented courses related to teaching, learning and teacher's occupation. Some specific CS related studies are also included in the pedagogical studies. The advanced studies in the main subject are can include courses that are providing skills and competences for CS education teachers. For instance, in Joensuuwe offer educational technology related courses to the CS teachers."

[14] "Master, 2 years, University, Master of Education, including 2 short internships at secondary school. and recently, a Minor, with limited qualifications (only lower secondary)"

[15] "1. University studies 2. Postgraduate University studies for teachers"

[16] "The teachers in public primary and secondary schools are all state civil servants. To become teacher, one have to succeed in a national competitive examination (specific to a subject matter) . Until last year : teachers had a Licence level diploma. After succeeding the national examination, they had a one-year training at schools like universities, before to begin teaching in a school. Today, teachers must have a Master diploma. If they succeed in the national examination, then they have no more training at university. They began teaching at school. "

[17] "Most secondary school teachers take a one year course after their degree to become a teacher. Some train in school under a Graduate Teacher Programme scheme They spend 120 days on placement in school and less time at university They are assumed to have the subject knowledge and are taught how to teach However training is only in ICT. There is not a CS teacher education qualification. Some lucky teachers go to enlightened universities to learn to teach ICT and come out being able to teach both "

[18] "Regular organization, no spetial path."

[19] "at university, p.e. <http://www.cs.uu.nl/info/studie/master/stei.php> at university of Utrecht"

### **Free Text Question: Describe current problems of CS teacher education in your country**

[1] "Many teachers don't have an academic degree in CS (they can come from areas such as Mathematics, Geography, Psychology etc.). The national curriculum changes every few years and it's hard for teachers to keep updated."

[2] "CS teacher education is in rather complicated situation as best students emigrating or selecting work in business companies. However we still have aprox. 10-30 students per year, which selecting Mathematics/IT teacher studies. However most student learns subjects which are more related to Mathematics than to IT or CS. And last, but not least - only some of these students are going to work at school..."

[3] "The most pressing problem is that there are no students who study CS to become a teacher. There are some advanced training courses for teachers who can thus study an additional subject. But I think that those will seldom acquire the same level as a full-fledged CS teacher. I think that it is important that CS teachers are well trained in their subject."

[4] "There is very little teacher education for CS in New Zealand which is very concerning"

[5] "Teachers are educated in 'Math & CS' and really are not teachers in CS"

[6] "There isn't any."

[7] "It is hard to find. Teacher training colleges train ICT teachers not Computing teachers."

[8] "You can't train as a CS teacher, only ICT"

[9] "I left programming to become a teacher, in 2000. CS was still on the curriculum then. If I knew it was about to be removed, I would not have become a teacher. I know many programmers who are interested in teaching, but when they see the nonsense I have to teach, decide not to become teachers. Many ICT teachers are re-trained from being Maths teachers or Business Studies teachers. They have no passion for CS."

[10] "It's OK"

[11] "There is no dedicated training program for CS teachers. CS teachers are usually trained through the ICT program, if at all. That means only a small minority have the correct subject knowledge."

[12] "I was trained as a teacher of ICT not computing. On the course we were mainly taught how to teach ICT concepts and practice and though computing skills were mentioned as useful almost no time was spent on how to teach them. I am not sure how many Computing teacher training courses there are if any"

[13] "Most teachers teach ICT and many come from design backgrounds or Business Studies backgrounds. Very few actually have degrees in CS and therefore do not have the understanding. Traditionally, most ICT teachers move into it from other subjects, although this is now changing. However, the graduates training often have multimedia or design backgrounds. There is very little support for improving subject knowledge. My personal degree is science and I have moved into IT by accident, however I am working on my MSc in Computing to support my subject knowledge, with no support from the school."

[14] "Lack of knowledge for teachers Lack of recruitment of CS graduates Lack of developmental expertise within education Expertise, where it exists, not valued No desire on part of teachers to develop further Too many teachers involved in this area of the curriculum remain limited in their commitment to the subject"

[15] "Since there is no CS education at school, CS teacher education is not attracting students. In fact, I'm not even sure how many CS departments offer a specialization of this kind."

[16] "Lack of CPD courses / time to go to them"

[17] "Teacher education is sufficient."

[18] "I would imagine that graduates of CS would not see teaching as their first choice career path. "

[19] "ICT training for teachers - not Computing"

[20] "Too many students in CS and therefore too many students in CS teacher education. No teacher education in CS in lower secondary high school teacher education."

[21] "to less students"

[22] "A formal teachers education curriculum exists only since 2000. Hence most informatics teachers got their expertise by (relatively short) in service courses or due to self-study as personal initiative."

[23] "The main problem of CS teacher education in the Netherlands is the low number of student teachers. "

[24] "In the scope of the Bologna-Prozess students are earlier in contact with the reality of schools, what can be seen positive. On the other hand the scientific qualification of the alumnus is declining. "

[25] "teachers are without support, no conferences, no didactical education teachers are isolated (even electronically) - not many teachers are in contact teachers are not interested in trends how to teach, they interest more in technical or technological trends .. many graduated CS teachers leave the range of schools and education (not only smaller salary but no places at schools for them)"

[26] "Few teachers have a tertiary education in computing. Many are self taught."

[27] "At the moment it seems to be rare. Some universities seem to offer opportunities for teachers to collect themselves an exam for teaching in CS/IT"

[28] "Too few people wanting to teach CS. Salary differences between teachers and employees in companies."

[29] "the digital competences of teachers"

[30] "There are not so many students that go into this programme. Industry is more attractive, and in many schools the positions for CS education have been occupied now by younger teachers. So, replacement rates are currently not very high."

[31] "There are very few people interested in being CS teachers. There are even less people who are qualified to be CS teachers who are interested. Those that are currently teaching (for the vast majority) are not qualified to teach CS."

[32] "At least in Joensuu, we would like to see more students to be interested in CS teacher education. We have a quota of ten CS teacher education places each year, but we only get average 5-7 new students to join each year. In Joensuu we graduate about 3-4 CS teachers each year. I don't have information about other universities. The students have also indicated that the courses offered to CS teachers should better reflect the real skills, knowledge and competences required in the field. The general feedback has been that the courses offered to students who are studying to be CS teachers are too theoretical, and not enough practical. I would also like to have more collaboration between the departments in Finland that offer CS teacher education."

[33] "CS teacher preparation tracks exist in most institutions. The syllabi need to be improved, to become more mature, but in general, they are quite satisfying."

[34] "With the higher education schools, now Portugal also have Informatics teachers from those schools. The current minister of education has shown in public some distrust of teachers from those schools."

[35] "Not part of manatory part of education. Shortage of teachers Funding (squeezed budgets) % of schools offering CS."

[36] "Not many teachers aiming to develop..."

[37] "Teachers in general trends of studies has no CS education. Teachers enrolled for the new CS optional courses, are teachers in another subject matter (mathematics, physics, ...), who are volunteer for a 3 month training. They are not sure to become ISN teacher because it is not sure that the optional course will open in their school."

[38] "It is hard to recruit to the Postgraduate teacher training in ICT There is no training specifically for teaching Computing at all. If you are lucky you end up on an ICT teacher training course that also covers Computing Many trainee ICT teachers do not have a degree in a relevant subject (I have 25% with a Computer Science degree)"

[39] "They are not graduates from CS institutions (univerities, colleges, techniocal schools). At the best they finished only in-service training of 360 heures. "

[40] "no formal accreditation for informatics teachers no obligatory training"

[41] "The main problem is - the congress and the state education departments should recognize CS as a field and come up with measures to offer certification in CS"

[42] "The goverment makes it harder or even impossible to educate CS teachers."

[43] "there are not enough students, how want to become a CS-teacher; either they study other subjects or they study in Bachelor/Master of science a reason for this situation could be, that the CS-education in school is so bad (the older teachers often not study CS, they teach the subject because they take part in CS-courses about 20 up to 30 years ago) another reason is that the study of CS is 'hard' "

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**Free Text Question: Describe current initiatives to improve CS teacher education in your country**

[1] "Activities of the national CS teacher center: Annual teacher conference, various courses and meeting on different issues (both pedagogical and 'technical' such as learning new tools), a strong support of the leading CS teachers community, a Hebrew website with relevant materials, a Hebrew journal for teachers (called 'Hebetim')

[2] "There are changes in curriculum of studies. Some of these changes are related to practice of students in schools. It is important as students trying to work as a teacher or teacher assistant after first year. This forcing to think twice about possibilities in this profession. Bebras contest organized international workshops provide possibilities for active young teachers and university students to find new possibilities and to take a look from other point of view to subject."

[3] "NZCS and Google teaming up to present educational events, plus others through teacher's association"

[4] "A project of National team for Olympiad in informatics, supported by Foundation 'America for Bulgaria' and Foundation 'M. Balkanski'"

[5] "relatively informal short professional development workshops, organised by teachers and/or the teachers association, with support from the universities and the ministry of education. It's not enough."

[6] "I don't know"

[7] "In Northern Ireland, there are none. The local authorities want to kill CS as a subject."

[8] "The European Union supported teacher training courses"

[9] "TDA encourages some computing topics be covered during ICT training, but realistically, these might only extend to a small amount of Scratch programming and no conceptual coverage at all."

[10] "See CAS"

[11] "I'm not aware of any, only support among individuals."

[12] "Now very few - add hoc courses may be offered commercially. Opportunity for national initiative reduced through political decisions to reduce centrally provided advice and training."

[13] "don't know of any"

[14] "At least 3-4 universities have programmes for teacher education in CS."

[15] "Most schools seem to be happy enough to teach pupils basic skills in 'office-style' software and quite often (for all sorts of reasons) non-specialist staff are used to deliver ICT lessons. There is also talk of not teaching discrete ICT lessons at all but incorporating the subject into all other lessons so that pupils learn subject-specific ICT skills."

[16] "Continuing diploma course for established CS teachers. Promoting the regular CS teacher education courses in order to attract more students."

[17] "more praxis during the studies"

[18] "Teacher education is subject to a general reform. This will bear also on teacher education. Further, initiatives such as IMST 'Informatik kreativ unterrichten' support CS teachers on all school levels (grades) to improve their teaching. ([https://www.imst.ac.at/texte/index/bereich\\_id:19/seite\\_id:60](https://www.imst.ac.at/texte/index/bereich_id:19/seite_id:60) )."

[19] "Ways of improving the problem described above is not found yet."

[20] "chaotic system of in-service teachers education supported by ESF funds, no conception at the state level some initiatives to improve research at field of teaching CS"

[21] "I am not aware of any initiatives."

[22] "The network for teachers concerned with programming education, is a good start."

[23] "Further education of other teachers to gain permission to teach CS."

[24] "seminars for teachers"

[25] "Teacher education has been embedded in several educational institutes across the country, with links to university."

[26] "With the CS Circles On-line initiative, we hope to improve the quality of teaching (i.e., teachers can learn to program) and/or students can learn to program for themselves."

- [27] "I'm not aware of any nation wide initiative. In Joensuu, we collect feedback from the students and try to improve the course offerings based on that feedback."
- [28] "I am not aware of any."
- [29] "?"
- [30] "Postgraduate Studies in CS for Teachers."
- [31] "ICT skill certification are required for employment."
- [32] "The CPD group within Computing At School is hoping to support a Masters Course in Computing Education and another university proposing to offer a module in Computing Education as part of their BSc Computer Science degree. CPD sessions are being planned to help teachers who lack confidence in teaching GCSE and A-Level Computing "
- [33] "New standards and new EU projects addressed to CS teachers. Unfortunately there is no nationwide initiative. "
- [34] "there are initiatives to offer new training courses"
- [35] "I am not aware of any"
- [36] "university and 'Lehrerfortbildungsinstitute ' offers courses for teachers who quiet teaching in schools advertising the CS-teacher-study in schools, at fair, ..."

### **Free Text Question: Describe trends: What will be the changes or the situation / demands of CS Teacher Ed in 5-10 years from now?**

- [1] "probably the same as now ;-)"
- [2] "Demand for teachers is not clear. In one hand we are losing old teachers, on other hand demand is not growing as less students choosing optional subject."
- [3] "CS teacher education may locally contribute to school development. Today every school has computers but they are used in quite different ways. CS teachers can influence the way in that computers are used at their schools."
- [4] "Demand will increase rapidly."
- [5] "Rather will have not education of teachers in CS. Teaching of IT will dominate in the school and teachers will be trained only to use computers and applications"
- [6] "Digital Technologies, including CS & Prog, will need to be a formal recognised strand within the education colleges across the country. My persona view is that it would be bad for Computer Science to be a full, standalone subject at high school, just as it is bad for Physics and Chemistry to be full standalone subjects at present. High School Students need to be presented with a broad background that will enable them (a) to have a good understanding through life of a wide variety of subjects and (b) be able to make sensible, well informed decisions about specialising at the tertiary level. I want to see a full, standalone subject in the area of computing/digital technologies that will allow students to understand the full spread of topics in that area so that if they are interested in this area, they will be able to make well informed decisions as to which direction to pursue at tertiary level - computer-based graphics or media design, 'information technology ' (computer/network technician), information systems, mechatronics/computer systems engineering/electronics, or computer science/software engineering. Therefore, I want to see teacher education providing DT teachers with a breadth of knowledge and skills across that whole area. This is not the same as the depth in a computer science degree. I think this will be a significant challenge for Teacher Education institutions. "
- [7] "I don't know if the Teacher Ed institutions are catching up with schools. I fear they are lagging behind."
- [8] "If the subject becomes popular again, there will be demand for teachers. Many schools want to reintroduce it, but there are few teachers available."
- [9] "Teachers will become more knowledgeable in multimedia applications"
- [10] "If CS because a subject in its own right, then it should be trained for."

- [11] "We are all awaiting the new curriculum to find out out."
- [12] "I believe that this will improve as many departments will be unable to teach CS if it becomes an important part of the curriculum."
- [13] "Uncertain - could be minimal if need for CS not recognised and promoted nationally; if it is promoted, then there is great need for extensive programme of training and support"
- [14] "who knows? Maybe it will disappear altogether."
- [15] "The same as for all other subjects. It depends on salaries a lot. Couldn't predict."
- [16] "If school finances are the strongest driving force in deciding what subjects will be taught and how subjects will be delivered then removing discrete ICT and having subject teachers deliver subject-specific ICT skills to pupils will lead (in my opinion) to a decline in interest from pupils in the subject. CS will not even feature."
- [17] "Replacing the large amount of older CS teachers with young teachers and improve the number of CS teachers. "
- [18] "hopefully more students and more courses which fits to teacher education"
- [19] "Presenting the general values CS (not ICT) offers for pupils, especially also for those, who do not want to specialize later in a CS-related profession."
- [20] "In 5 to 10 years the number of CS teachers will drop so much, that it might be necessary to offer CS in a e-learning environment. "
- [21] "only hopes "
- [22] "I don't know."
- [23] "Technology in Informatics/CS is rapidly evolving, which forces many teachers to re-design their material and instructional design."
- [24] "Dropping number of pupils will probably ease problems."
- [25] "Mandatory usage of CS in all types of schools"
- [26] "Not clear. If CS will be a compulsory topic in school, and offered in lower grades (some people want that), then demand for teachers would increase considerably. In the short term, this would be problematic. However, it seems inevitable that CS will play a more prominent role in education, given the fact that our society and economy is globally embracing the virtual world."
- [27] "There will be an increasing number of demands for CS education in secondary, coupled with a smaller pool of qualified people who can effectively teach CS in secondary school (grade 9-12)."
- [28] "In Joensuu the challenges are more practical oriented courses, increase the interest towards CS teacher education."
- [29] "I guess more teachers will be required, and thus more students will apply to CS teacher preparation tracks."
- [30] "'? I do no what I think should happen ....."
- [31] "Probably universities will take care of preparing CS teachers."
- [32] "Not predictable. "
- [33] "Hopefully trainee teachers will need to have a degree in a relevant subject or more conversion courses are available in the future. However this may be overly optimistic. It may well still remain hard to recruit good quality teachers into teaching ICT and Computing. "
- [34] "We need permanent and solid training of CS teachers. "
- [35] "If the situation does not change in the national/state level, I can't see any significant change"
- [36] "I hope the advertising will have chances of success"

**Is there a National / state wide curriculum for CS teacher education? (if possible, provide an URL)**

- [1] "There is no National curriculum. There is a new book written by three Israelies with a lot of experience - the book suggests such a curriculum.  
<http://www.springer.com/computer/general+issues/book/978-0-85729-442-5> "
- [2] "[www.informatikstandards.de](http://www.informatikstandards.de)"
- [3] "No"
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- [5] "Don't think so"
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- [13] "No"
- [14] "somewhere on [bildung-rp.de](http://bildung-rp.de)"
- [15] "<http://www.ph-noe.ac.at/studienangebot/lehrgaenge/medienpaedagogik-informatik.html>"
- [16] "Not that I am aware of."
- [17] "[http://www.edu.gov.on.ca/eng/curriculum/secondary/computer10to12\\_2008.pdf](http://www.edu.gov.on.ca/eng/curriculum/secondary/computer10to12_2008.pdf)"
- [18] "Yes. Please read the papers published about it. "
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- [21] "No as long as I know. Informatics teachers come from distinct programmes, like: engineering, computer science, Informatics teacher. In the latter case, I think that depends on each higher education school."
- [22] "?"
- [23] "There are prepared standards of teacher education, but universities are independent.. Prof. M.M. Syslo is best person to ask. "
- [24] "Not yet"
- [25] "We are working on such a document"
- [26] "[http://www.cfi.nl/Public/CFI-online/Images/d805201\\_tcm2-742.pdf](http://www.cfi.nl/Public/CFI-online/Images/d805201_tcm2-742.pdf) "
- [27] "I am not aware of it. As far as I know, there is none. There are some states (I think New Jersey is one of them) that has CS certification at the state level."
- [28] "[http://www.kmk.org/fileadmin/veroeffentlichungen\\_beschluesse/2008/2008\\_10\\_16-Fachprofile-Lehrerbildung.pdf](http://www.kmk.org/fileadmin/veroeffentlichungen_beschluesse/2008/2008_10_16-Fachprofile-Lehrerbildung.pdf)"
- [29] "No."
- [30] "Bildungsstandards Informatik <http://www.informatikstandards.de/> EPA Informatik "
- 

### Free Text Question: Organizations supporting CSTEd

- [1] "<http://cse.proj.ac.il/index-en.htm>"
- [2] "<http://www.linma.lt>"
- [3] "<http://www.nzcs.org.nz>"
- [4] "Foundation 'America for Bulgaria ' and Foundation 'M. Balkanski '"
- [5] "<http://www.computingschool.org.uk>"
- [6] "VISIC, [www.visc.gov.lv](http://www.visc.gov.lv)"
- [7] "CAS has some teacher development courses: [www.computingschool.org.uk](http://www.computingschool.org.uk)"
- [8] "CAS"
- [9] "Computing at School <http://www.computingschool.org.uk/>"
- [10] "[www.lu.lv/gribustudet/pamatstudijas/programmas/2011-2012-rudens/skolotajs/lietiska-informatika/](http://www.lu.lv/gribustudet/pamatstudijas/programmas/2011-2012-rudens/skolotajs/lietiska-informatika/)"
- [11] "Not sure about teacher education but CAS is a good resource [computingschool.org.uk](http://www.computingschool.org.uk)"
- [12] "[www.haslerstitung.ch](http://www.haslerstitung.ch)"
- [13] "Regionale Fachdidaktik-Zentren"
- [14] "[www.jsi.cz](http://www.jsi.cz)"
- [15] "<http://acce.edu.au/>"
- [16] "GI ([www.gi-ev.de](http://www.gi-ev.de))"
- [17] "<http://www.ph-noe.ac.at/fortbildung.html>"
- [18] "Not that I am aware of. It could be the case, however."
- [19] "[www.cemc.uwaterloo.ca](http://www.cemc.uwaterloo.ca)"
- [20] "National Center for CS Teachers (URL in Hebrew <http://cse.proj.ac.il/>)"
- [21] "the link would be to a site in Hebrew, so I omit it"
- [22] "[www.informaticaVO.nl](http://www.informaticaVO.nl)    [www.slo.nl](http://www.slo.nl)"
- [23] "OEliZK - Computer Assisted Education and Information Technology Centre. Yearly conferences: Informatics in Education, Meeting of School Computer Lab Administrators. "
- [24] "Computing at School (<http://www.computingschool.org.uk>) "
- [25] "There is such institution. "
- [26] "<http://bildung-rp.de/pl.html>; <http://www.uni-koblenz-landau.de/uni>"

## Appendix A: The Questionnaire



# Computer Science Education and Computer Science Teacher Training

Thanks for participating in this survey, aiming at gathering information about how CS as subject at school is organized in the different countries - and about current initiatives and their approaches to respond to that situation.

The questionnaire has three parts: After some introductory questions (1) we are asking for initiatives (2), and then for details in order to understand the current situation(s) in the different countries (3). We are asking for CS at school; and second we do the same for teacher training.

It will take about 15-30 minutes time (Note, we are expecting that participants are leaving several questions unanswered because e.g. they do not apply in the country)

The (anonymous) results will be discussed and evaluated at a workshop, taking place at this year's Koli conference. <http://cs.joensuu.fi/kolistelut/>

A link to the published results will be available from that website.

Thanks for your participation!

If you have any questions, just write a mail to [schulte@inf.fu-berlin.de](mailto:schulte@inf.fu-berlin.de)

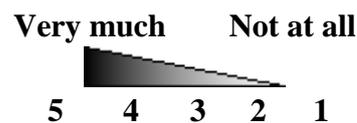
### 1. My Country is

Name the country (in English) for which you are describing the situation of Computer Science Education at schools

### 2. Please indicate your profession or affiliation:

- School
- University
- Industry

3. Does your country recognise Computer Science as subject discipline at school? Is it seen as distinct from a) digital literacy skills (ability to use Powerpoint) and b) information technology as a tool to improve learning in other subjects?



Clear Distinction of Computer Science as a subject in its own right

## Computer Science as subject at School

In this part we ask for some general data on the current situation of **Computer Science as subject at school** in your country

4. School types in which Computer Science (CS) is available

please choose school types that match best according to the typical age of the students

- Upper Secondary High School (Secondary School; grades 9/10 – 12/13, typically 15 to 18 years old)
- Lower Secondary High School (Middle School; grades 5-9/10, typically 10 to 15 years old)
- Primary School (Elementary School; grades 1-4; up to grades 1-7, typically 5 to 10 years old)

5. Grades in which CS is available as subject in school (plus indication whether it is optional or mandatory)

	<b>Mandatory</b>	<b>Optional</b>	<b>Not available</b>
Grade 12 (final year of school (age range: 17-19 years))	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grade 11	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grade 10 (start of upper secondary school in some countries)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grade 9	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grade 8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grade 7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grade 6	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grade 5 (start of lower secondary school in some countries)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grade 4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grade 3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grade 2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grade 1 (first year, (age range 4-6 years))	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## **Initiatives and Developments regarding Computer Science as subject at School**

This is the most interesting information for us: What is currently happening in your country?

What are the **Trends and Developments for Computer Science as subject** at school in your country?

1. SECTION: Initiatives and trends changing the situation of CS at school in your country

Describe current problems of CS at school (please indicate which type of school / age range of students you are referring to)

Describe current initiatives to improve CS at school (please indicate which type of school / age range of students you are referring to)

Describe trends: What will be the changes or situation / demands of CS at school in 5-10 years from now? (please indicate which age range of students you are referring to)

Describe / name organisations / institutions supporting CS at school, like CSTA

## Initiatives and Developments regarding Computer Science Teacher Education

This is the most interesting information for us: What is currently happening in your country?

What are the **Trends and Developments for Computer Science Teacher Education** in your country?

1. Problems and Trends

Describe current problems of CS teacher education in your country

Describe current initiatives to improve CS teacher education in your country

Describe trends: What will be the changes or the situation / demands of CS Teacher Ed in 5-10 years from now?

2. Are there organizations supporting CS teacher Education / CS Teachers (like e.g. CSTA)?

If possible provide a link

1. (If Applicable) Rate the Importance of the following topics in the national curriculum for ELEMENTARY School

Elementary School or Primary School roughly: grades 1-4; up to grades 1-7, students are typically 5 to 10 years old

The ratings should be given by a syllabus. The question asks for the situation as 'it is'.

**Very important**  
**Very unimportant**



Introductory Programming (merely introduction to concepts, language, tools...)

Advanced Programming (merely programming in order to solve problems)

Algorithms

Programming Project (full lifecycle projects, with e.g. requirements analysis etc.)

HTML

Robotics

Privacy & Ethics

Applications (e.g. Text processing)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>			
Theory (e.g. Automata)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>			
Database	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>			

2. (If Applicable) Rate the Importance of the following topics in the national curriculum for LOWER SECONDARY School

Lower Secondary High School or Middle School: roughly: grades 5-9/10, students are typically 10 to 15 years old

The ratings should given by a syllabus. The question asks for the situation as 'it is'.

	<b>Very important</b>		<b>Very unimportant</b>		
					
Introductory Programming (merely introduction to concepts, language, tools...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Advanced Programming (merely programming in order to solve problems)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Algorithms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Database	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HTML	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Robotics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Privacy & Ethics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Applications (e.g. Text processing)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Theory (e.g. Automata)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Database	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. (If Applicable) Rate the Importance of the following topics in the national curriculum for UPPER SECONDARY School

Upper Secondary High School or Secondary School: roughly grades 9/10 – 12, students are typically 15 to 18 years old

The ratings should given by a syllabus. The question asks for the situation as 'it is'.

	<b>Very important</b>		<b>Very unimportant</b>		
					
Introductory Programming (merely introduction to concepts, language, tools...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Advanced Programming (merely programming in order to solve problems)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Algorithms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Programming Project (full lifecycle projects, with e.g. requirements analysis etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

HTML	<input type="radio"/>				
Robotics	<input type="radio"/>				
Privacy & Ethics	<input type="radio"/>				
Applications (e.g. Text processing)	<input type="radio"/>				
Theory (e.g. Automata)	<input type="radio"/>				
Database	<input type="radio"/>				

4. What are typical teaching approaches / methods for CS as subject in school in your country?

	<b>Very typical</b>				<b>Very untypical</b>
Pupils work individually on projects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pupils work in small groups on projects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pupils work individually or small groups on small tasks at the computer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Classroom based teaching	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Discussions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reading	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using standard applications like text processing, mail etc	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using editors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using Integrated Development Environments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Projects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Role Plays	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Programming	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lectures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. Please provide an URL to your national Curricula or other standards documents

6. Please rate the importance of the following goals (learning objectives) of Computer Science for ELEMENTARY School

Elementary School or Primary School roughly: grades 1-4; up to grades 1-7, students are typically 5 to 10 years old

	<b>Very important</b>				<b>Very unimportant</b>
Learning programming in the small	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Learning programming and software development process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Learning end user programming (Macros etc)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Data structures and algorithms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Aspects of theoretical computer science (e.g. the halting problem; complexity)	<input type="radio"/>				
Databases: design and queries	<input type="radio"/>				
Understanding the „Nature of Computer Science“	<input type="radio"/>				
Understanding the impact / relationship of CS and the society	<input type="radio"/>				
Mastering the important applications	<input type="radio"/>				
Knowing careers and and opportunities in CS	<input type="radio"/>				
Introducing CS as it is presented and conceptualized in Universities	<input type="radio"/>				
Preparation of learners to use computers / digital technologies	<input type="radio"/>				
Preparation of learners to cope with the impact of CS on everyday lifes (e.g. political issues like privacy, E-Democracy...)	<input type="radio"/>				
Developing thinking skills (logical reasoning, abstraction, ...)	<input type="radio"/>				
Problem solving skills	<input type="radio"/>				
Algorithmic thinking	<input type="radio"/>				

7. Please rate the importance of the following goals (learning objectives) of Computer Science as high school subject for LOWER SECONDARY School

Lower Secondary High School or Middle School: roughly: grades 5-9/10, students are typically 10 to 15 years old

	Very important		Very unimportant		
	<input type="radio"/>				
Learning programming in the small	<input type="radio"/>				
Learning programming and software development process	<input type="radio"/>				
Learning end user programming (Macros etc)	<input type="radio"/>				
Data structures and algorithms	<input type="radio"/>				
Aspects of theoretical computer science (e.g. the halting problem; complexity)	<input type="radio"/>				
Databases: design and queries	<input type="radio"/>				
Understanding the „Nature of Computer Science“	<input type="radio"/>				
Understanding the impact / relationship of CS and the society	<input type="radio"/>				
Mastering the important applications	<input type="radio"/>				
Knowing careers and and opportunities in CS	<input type="radio"/>				
Introducing CS as it is presented and conceptualized in Universities	<input type="radio"/>				
Preparation of learners to use computers / digital technologies	<input type="radio"/>				

Preparation of learners to cope with the impact of CS on everyday lifes (e.g. political issues like privacy, E-Democracy...)	<input type="radio"/>				
Developing thinking skills (logical reasoning, abstraction, ...)	<input type="radio"/>				
Problem solving skills	<input type="radio"/>				
Algorithmic thinking	<input type="radio"/>				

8. Please rate the importance of the following goals (learning objectives) of Computer Science as high school subject for UPPER SECONDARY School

Upper Secondary High School or Secondary School: roughly grades 9/10 – 12, students are typically 15 to 18 years old

	Very important		Very unimportant		
Learning programming in the small	<input type="radio"/>				
Learning programming and software development process	<input type="radio"/>				
Learning end user programming (Macros etc)	<input type="radio"/>				
Data structures and algorithms	<input type="radio"/>				
Aspects of theoretical computer science (e.g. the halting problem; complexity)	<input type="radio"/>				
Databases: design and queries	<input type="radio"/>				
Understanding the „Nature of Computer Science“	<input type="radio"/>				
Understanding the impact / relationship of CS and the society	<input type="radio"/>				
Mastering the important applications	<input type="radio"/>				
Knowing careers and and opportunities in CS	<input type="radio"/>				
Introducing CS as it is presented and conceptualized in Universities	<input type="radio"/>				
Preparation of learners to use computers / digital technologies	<input type="radio"/>				
Preparation of learners to cope with the impact of CS on everyday lifes (e.g. political issues like privacy, E-Democracy...)	<input type="radio"/>				
Developing thinking skills (logical reasoning, abstraction, ...)	<input type="radio"/>				
Problem solving skills	<input type="radio"/>				
Algorithmic thinking	<input type="radio"/>				

In this part we ask for some general data on the current situation of Computer Science **Teacher Education** in your country

1. Is there a National / state wide curriculum (or similar document) for CS teacher education? (if possible, provide an URL)

If you don't know the answer just skip the question

Is there a National / state wide curriculum for CS teacher education? (if possible, provide an URL)

2. Is a 'CS/CS Ed related' Certification needed to be allowed to teach?

If you don't know the answer just skip the question (note, you can de-select in case if you're accidentally clicked a wrong answer)

- mandatory
- optional
- not available
- I don't know

3. What do you estimate is the percentage of CS teachers in your Country that have gone through formal teacher education?

If you don't know the answer just skip the question

4. Please describe the organisation of Teacher Education: at University, at school, only possible for in-service teachers as an add-on, ...

If you don't know the answer just skip the question

5. Please give a rough estimation of the workload required for the different parts of CS Teacher Education.

We assume 1 ECTS as 30 hours' work / One academic year corresponds to 60 ECTS-credits.

If you don't know the answer just skip the question (note, you can de-select in case if you're accidentally clicked a wrong answer)

**121 ECTS and more**   **Between 120 and 61 ECTS**   **60 to 31 ECTS**   **30 to 15 ECTS**   **Less than 15 ECTS**



SMK: Subject matter knowledge (courses related to CS, like CS1, CS2 and so on)	<input type="radio"/>				
PK: General pedagogical knowledge for Teachers in all subjects (like Learning theory, motivation and so on)	<input type="radio"/>				
PCK: CS specific pedagogical, didactical and methodological knowledge (Methods for teaching databases; advantages and problems of OO first vs. OO later, etc)	<input type="radio"/>				
Practicum / Internship (Teaching Experiences at schools)	<input type="radio"/>				

6. Please rate the importance of the following Goals of teacher education:

In your country, prospective CS teachers should learn about...

If you don't know the answer just skip the question (note, you can de-select in case if you're accidentally clicked a wrong answer)

**very important**                      **very unimportant**



All aspects of Computer Science as university subject	<input type="radio"/>				
(general) Education / Pedagogy	<input type="radio"/>				
Computer Science Education goals	<input type="radio"/>				
Computer Sciencespecific teaching approaches / methods	<input type="radio"/>				
The „Nature of Computer Science“ (What is Computer Science?)	<input type="radio"/>				
History of Computer Scienceas subject in School	<input type="radio"/>				
Introductory learning of Computer Science(How to introduce students to Computer Science)	<input type="radio"/>				
The relation of Computer ScienceEducation and general Education	<input type="radio"/>				
IT / ICT Education vs. Computer ScienceEducation	<input type="radio"/>				
Student Assessment	<input type="radio"/>				

Computer Science-specific learning tools (e.g. educational IDE's)	<input type="radio"/>				
School-related Computer Science-Curricula	<input type="radio"/>				
Lesson planning	<input type="radio"/>				
Innovation of Computer Science Education	<input type="radio"/>				
Basic concepts of Computer Science	<input type="radio"/>				
Reconstructing Computer Science-content for learners	<input type="radio"/>				
Conducting Research about teaching Computer Science	<input type="radio"/>				

7. Please name other important goals of CS Teacher Education


**Last page**

## Thank you for participating!

We would like to thank you for helping us.

If you are interested in the next steps, just drop a mail and/or feel free to participate in the workshop at Koli conference!

For more information visit:

[Koli Calling teaching-workshop](#)

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[Teaching Computing in Schools](#). Workshop at [Koli Calling Conference 2011](#). Contact: [C. Schulte](#).

## Appendix B: List of variables

### Variables Listing

Questionnaire - internal data

Apart from your questions, you will find in the data record additional variables, as far as you have not deactivated this option when downloading the data record.

CASE Serial number of the subject

REF Reference, if such has been provided in the link to the questionnaire

LASTPAGE Page number of the questionnaire that has been edited and sent last

QUESTNNR ID of the questionnaire that has been edited

MODE Information if the questionnaire has been started by pretest or by a project member

STARTED Time the interviewee opened the questionnaire

FINISHED Information if the questionnaire has been completed up to the last page

TIME\_001... Time that an interviewee has spent on a questionnaire page

Section CO: Country

[CO01] Text input

My Country is

"My Country is"

CO01\_01 My Country is 1

Text input

[CO02] Multiple choice

Affiliation

"Please indicate your profession or affiliation:"

CO02\_01 Affiliation/School

CO02\_02 Affiliation/University

CO02\_03 Affiliation/Industry

1 = Not checked

2 = Checked

Section CS: CS at school

[CS01] Multiple choice

School types

"School types in which Computer Science (CS) is available "

CS01\_01 School types/Upper Secondary High School (Secondary School; grades 9/10 - 12/13, typically 15 to 18 years old)

CS01\_02 School types/Lower Secondary High School (Middle School; grades 5-9/10, typically 10 to 15 years old)

CS01\_03 School types/Primary School (Elementary School; grades 1-4; up to grades 1-7, typically 5 to 10 years old)

1 = Not checked

2 = Checked

[CS02] Scale (fully labeled)

Grades

"Grades in which CS is available as subject in school (plus indication whether it is optional or mandatory)"

CS02\_01 Grade 12 (final year of school (age range: 17-19 years)

CS02\_02 Grade 11

CS02\_03 Grade 10 (start of upper secondary school in some countries)

CS02\_04 Grade 9

CS02\_05 Grade 8

CS02\_06 Grade 7

CS02\_07 Grade 6

CS02\_08 Grade 5 (start of lower secondary school in some countries)

CS02\_09 Grade 4

CS02\_10 Grade 3

CS02\_11 Grade 2

CS02\_12 Grade 1 (first year, (age range 4-6 years))

1 = Not available

2 = Optional

3 = Mandatory

-9 = Not answered

[CS03] Scale (extremes labeled)

Topics CS Elementary

"(If Applicable) Rate the Importance of the following topics in the national curriculum for ELEMENTARY School"

CS03\_01 Introductory Programming (merely introduction to concepts, language, tools...)

CS03\_02 Advanced Programming (merely programming in order to solve problems)

CS03\_03 Algorithms

CS03\_04 Programming Project (full lifecycle projects, with e.g. requirements analysis etc.)

CS03\_05 HTML

CS03\_06 Robotics

CS03\_07 Privacy & Ethics

CS03\_08 Applications (e.g. Text processing)

CS03\_09 Theory (e.g. Automata)

CS03\_10 Database

1 = Very unimportant

5 = Very important

-9 = Not answered

[CS04] Scale (fully labeled)

ImportanceLowerSecondary School

"(If Applicable) Rate the Importance of the following topics in the national curriculum for LOWER SECONDARY S..."

CS04\_01 Introductory Programming (merely introduction to concepts, language, tools...)

CS04\_02 Advanced Programming (merely programming in order to solve problems)

CS04\_03 Algorithms

CS04\_04 Database

CS04\_05 HTML

CS04\_06 Robotics

CS04\_07 Privacy & Ethics

CS04\_08 Applications (e.g. Text processing)

CS04\_09 Theory (e.g. Automata)

CS04\_10 Database

1 = Very unimportant

5 = Very important

-9 = Not answered

[CS05] Scale (fully labeled)

CS Importance Upper Secondary School

"(If Applicable) Rate the Importance of the following topics in the national curriculum for UPPER SECONDARY S..."

CS05\_01 Introductory Programming (merely introduction to concepts, language, tools...)

CS05\_02 Advanced Programming (merely programming in order to solve problems)

CS05\_03 Algorithms

CS05\_04 Programming Project (full lifecycle projects, with e.g. requirements analysis etc.)

CS05\_05 HTML

CS05\_06 Robotics

CS05\_07 Privacy & Ethics

CS05\_08 Applications (e.g. Text processing)

CS05\_09 Theory (e.g. Automata)

CS05\_10 Database

1 = Very unimportant

5 = Very important

-9 = Not answered

[CS06] Scale (fully labeled)

Teaching approaches/methods

"What are typical teaching approaches / methods for CS as subject in school in your country?"

CS06\_01 Pupils work individually on projects

CS06\_02 Pupils work in small groups on projects

CS06\_03 Pupils work individually or small groups on small tasks at the computer

CS06\_04 Classroom based teaching

CS06\_05 Discussions

CS06\_06 Reading

CS06\_07 Using standard applications like text processing, mail etc

CS06\_08 Using editors

CS06\_09 Using Integrated Development Environments

CS06\_10 Projects

CS06\_11 Role Plays

CS06\_12 Programming

CS06\_13 Lectures

1 = Very untypical

5 = Very typical

-9 = Not answered

[CS07] Scale (fully labeled)

Goals of CS Elementary

"Please rate the importance of the following goals (learning objectives) of Computer Science for ELEMENTARY S..."

CS07\_01 Learning programming in the small

CS07\_02 Learning programming and software development process

CS07\_03 Learning end user programming (Macros etc)

CS07\_04 Data structures and algorithms

CS07\_05 Aspects of theoretical computer science (e.g. the halting problem; complexity)

CS07\_06 Databases: design and queries

CS07\_07 Understanding the „Nature of Computer Science“

CS07\_08 Understanding the impact / relationship of CS and the society

CS07\_09 Mastering the important applications

CS07\_10 Knowing careers and opportunities in CS

CS07\_11 Introducing CS as it is presented and conceptualized in Universities

CS07\_12 Preparation of learners to use computers / digital technologies

CS07\_13 Preparation of learners to cope with the impact of CS on everyday lives (e.g. political issues like privacy, E-Democracy...)

CS07\_14 Developing thinking skills (logical reasoning, abstraction, ...)

CS07\_15 Problem solving skills

CS07\_16 Algorithmic thinking

1 = Very unimportant

5 = Very important

-9 = Not answered

[CS15] Scale (fully labeled)

Goals of CS Middle

"Please rate the importance of the following goals (learning objectives) of Computer Science as high school s..."

CS15\_01 Learning programming in the small

CS15\_02 Learning programming and software development process

CS15\_03 Learning end user programming (Macros etc)

CS15\_04 Data structures and algorithms

CS15\_05 Aspects of theoretical computer science (e.g. the halting problem; complexity)

CS15\_06 Databases: design and queries

CS15\_07 Understanding the „Nature of Computer Science“

CS15\_08 Understanding the impact / relationship of CS and the society

CS15\_09 Mastering the important applications

CS15\_10 Knowing careers and and opportunities in CS

CS15\_11 Introducing CS as it is presented and conceptualized in Universities

CS15\_12 Preparation of learners to use computers / digital technologies

CS15\_13 Preparation of learners to cope with the impact of CS on everyday lifes (e.g. political issues like privacy, E-Democracy...)

CS15\_14 Developing thinking skills (logical reasoning, abstraction, ...)

CS15\_15 Problem solving skills

CS15\_16 Algorithmic thinking

1 = Very unimportant

5 = Very important

-9 = Not answered

[CS16] Scale (fully labeled)

Goals of CS Upper

"Please rate the importance of the following goals (learning objectives) of Computer Science as high school s..."

CS16\_01 Learning programming in the small

CS16\_02 Learning programming and software development process

CS16\_03 Learning end user programming (Macros etc)

CS16\_04 Data structures and algorithms

CS16\_05 Aspects of theoretical computer science (e.g. the halting problem; complexity)

CS16\_06 Databases: design and queries

CS16\_07 Understanding the „Nature of Computer Science“

CS16\_08 Understanding the impact / relationship of CS and the society

CS16\_09 Mastering the important applications

CS16\_10 Knowing careers and and opportunities in CS

CS16\_11 Introducing CS as it is presented and conceptualized in Universities

CS16\_12 Preparation of learners to use computers / digital technologies

CS16\_13 Preparation of learners to cope with the impact of CS on everyday lifes (e.g. political issues like privacy, E-Democracy...)

CS16\_14 Developing thinking skills (logical reasoning, abstraction, ...)

CS16\_15 Problem solving skills

CS16\_16 Algorithmic thinking

1 = Very unimportant

5 = Very important

-9 = Not answered

[CS08] Text input

URL to curricula

"Please provide an URL to your national Curricula or other standards documents"

CS08\_01 URL to curricula 1

Text input

[CS10] Free Mentions

OtherImpAppr

"Please name other important Teaching Approaches"

CS10 Number of mentions

CS10x01 Mention 1

CS10x02 Mention 2

CS10x03 Mention 3

CS10x04 Mention 4

CS10x05 Mention 5

CS10x06 Mention 6

Text input

[CS11] Free Mentions

OtherImpApprElem

"Please name other important topics in Elementary School"

CS11 Number of mentions

CS11x01 Mention 1

CS11x02 Mention 2

CS11x03 Mention 3

CS11x04 Mention 4

CS11x05 Mention 5

CS11x06 Mention 6

Text input

[CS12] Free Mentions

OtherImpApprSec

"Please name other important topics in Lower Secondary School"

CS12 Number of mentions

CS12x01 Mention 1

CS12x02 Mention 2

CS12x03 Mention 3

CS12x04 Mention 4

CS12x05 Mention 5

CS12x06 Mention 6

Text input

[CS13] Free Mentions

OtherImpApprUpper

"Please name other important topics in Upper Secondary School"

CS13 Number of mentions

CS13x01 Mention 1

CS13x02 Mention 2

CS13x03 Mention 3

CS13x04 Mention 4

CS13x05 Mention 5

CS13x06 Mention 6

Text input

[CS14] Scale (fully labeled)

RecogniseCS

"Does your country recognise Computer Science as subject discipline at school? Is it seen as distinct from a..."

CS14\_01 Clear Distinction of Copmputer Science as a subject in its own right

1 = Not at all [5]

2 = [4]

3 = [3]

4 = [2]

5 = Very much [1]

-9 = Not answered

Section SI: Initiatives for the school subject

[SI01] Text input

Section: CS Initiatives and trends

"SECTION: Initiatives and trends changing the situation of CS at school in your country"

SI01\_01 Describe current problems of CS at school (please indicate which type of school / age range of students you are referring to)

SI01\_02 Describe current initiatives to improve CS at school (please indicate which type of school / age range of students you are referring to)

SI01\_03 Describe trends: What will be the changes or situation / demands of CS at school in 5-10 years from now? (please indicate which age range of students you are referring to)

SI01\_04 Describe / name organisations / institutions supporting CS at school, like CSTA

Text input

Section TE: Teacher Education

[TE01] Text input

Teacher Education

"Is there a National / state wide curriculum (or similar document) for CS teacher education? (if possible, pr..."

TE01\_01 Is there a National / state wide curriculum for CS teacher education? (if possible, provide an URL)

Text input

[TE02] Selection

Education

"Is a 'CS/CS Ed related' Certification needed to be allowed to teach?"

TE02 Education

1 = mandatory

2 = optional

3 = not available

4 = I don't know

-9 = Not answered

[TE03] Text input

Percentage

"What do you estimate is the percentage of CS teachers in your Country that have gone through formal teacher ..."

TE03\_01 Percentage 1

Text input

[TE04] Text input

Organization

"Please describe the organisation of Teacher Education: at University, at school, only possible for in-servic..."

TE04\_01 Organization 1

Text input

[TE05] Scale (fully labeled)

ECTS for SMK, PK, PCK...

"Please give a rough estimation of the workload required for the different parts of CS Teacher Education. "

TE05\_01 SMK: Subject matter knowledge (courses related to CS, like CS1, CS2 and so on)

TE05\_02 PK: General pedagogical knowledge for Teachers in all subjects (like Learning theory, motivation and so on)

TE05\_03 PCK: CS specific pedagogical, didactical and methodological knowledge (Methods for teaching databases; advantages and problems of OO first vs. OO later, etc)

TE05\_04 Practicum / Internship (Teaching Experiences at schools)

1 = Less than 15 ECTS

2 = 30 to 15 ECTS

3 = 60 to 31 ECTS

4 = Between 120 and 61 ECTS

5 = 121 ECTS and more

-9 = Not answered

[TE06] Scale (fully labeled)

Goals of education

"Please rate the importance of the following Goals of teacher education: In your country, prospective CS te..."

TE06\_01 All aspects of Computer Science as university subject

TE06\_02 (general) Education / Pedagogy

TE06\_03 Computer Science Education goals

TE06\_04 Computer Science specific teaching approaches / methods

TE06\_05 The „Nature of Computer Science“ (What is Computer Science?)

TE06\_06 History of Computer Science as subject in School

TE06\_07 Introductory learning of Computer Science (How to introduce students to Computer Science)

TE06\_08 The relation of Computer Science Education and general Education

TE06\_09 IT / ICT Education vs. Computer Science Education

TE06\_10 Student Assessment

TE06\_11 Computer Science-specific learning tools (e.g. educational IDE's)

TE06\_12 School-related Computer Science-Curricula

TE06\_13 Lesson planning

TE06\_14 Innovation of Computer Science Education

TE06\_15 Basic concepts of Computer Science

TE06\_16 Reconstructing Computer Science-content for learners

TE06\_17 Conducting Research about teaching Computer Science

1 = very unimportant

5 = very important

-9 = Not answered

[TE12] Free Mentions

OtherImpGoalsOfCSTEd

"Please name other important goals of CS Teacher Education"

TE12 Number of mentions

TE12x01 Mention 1

TE12x02 Mention 2

TE12x03 Mention 3

TE12x04 Mention 4

TE12x05 Mention 5

TE12x06 Mention 6

Text input

[TE11] Free Mentions

OtherImportant

"Please name other important goals of CS Teacher Education"

TE11 Number of mentions

TE11x01 Mention 1

TE11x02 Mention 2

TE11x03 Mention 3

TE11x04 Mention 4

TE11x05 Mention 5

TE11x06 Mention 6

Text input

[TE10] Text input

RelCSTEd and Res

"Are there relations between Teacher Training and CS Ed research? What, if any? Are new research results ref..."

Section CI: CS at School Initiatives

This section contains no questions.

Section IT: Initiatives Teacher Education

[IT01] Text input

Organizations supporting CSTEd

"Are there organizations supporting CS teacher Education / CS Teachers (like e.g. CSTA)? If possible provide..."

IT01\_01 Organizations supporting CSTEd 1

Text input

[IT02] Text input

Intitatives and trends

"Problems and Trends"

IT02\_01 Describe current problems of CS teacher education in your country

IT02\_02 Describe current initiatives to improve CS teacher education in your country

IT02\_03 Describe trends: What will be the changes or the situation / demands of CS Teacher Ed in 5-10 years from now?

Text input