Computer Science State Certification Requirements
CSTA Certification Committee Report

Prepared by, Ghada Khoury, Ph.D.

Overview and Project Goal:

Computer Science in K-12 schools is an area of increasing interest and concern to educators as well as to Computer Science professionals. Computer science is an established discipline at the undergraduate and graduate college levels. However, educators and Computer Science professionals are concerned that K-12 students lack the opportunity to become well prepared to pursue an expertise in this area at the college level. This has contributed to the existing shortage of expertise in Computer Science related careers. In a recent article published in the Washington Post, Bill Gates, Chairman of Microsoft Corporation stated that "Computer Science employment is growing by nearly 100,000 jobs annually. But at the same time studies show that there is a dramatic decline in the number of students graduating with Computer Science degrees" (How to Keep America Competitive – Washingtonpost.com).

The goal of this project is to gather information on the current state certification requirements for K-12 teachers of Computer Science, and compare it across states. This project is one of many currently being conducted by the Computer Science Teachers Association (CSTA), with the goal of increasing awareness of the importance of Computer Science in the job market and improving the quality of K-12 teacher preparation. CSTA believes that addressing the current issues in teacher certification is a key requirement for ensuring that K-12 students are prepared to pursue a career in this area of demand.

Explanation of Terms:

The terms used to describe various levels of teacher licensure can be confusing and the bodies responsible for licensing teachers in various states often use them in slightly different ways. In some states, teachers must become **certified** to teach at a specific education level (for example elementary or secondary). They then must meet addition qualifications to receive an **endorsement** to teach a specific subject area such as Math or Computer Science. In other states, however, their original teacher certification can include both their educational level and their subject area.

Results:

A questionnaire made up of 15 items (see Appendix D) was e-mailed to all states. States who did not reply to email requests were then contacted directly by telephone (up to three follow-up calls per non-responding state). Of 51 possible participants (50 states and the District of Columbia), 45 states completed the survey, resulting in a response rate of 88%. The data were entered in an Access database and then analyzed using descriptive statistics. The following results are obtained for each question.

1) When states were asked whether they **grant a Computer Science Endorsement** to their teachers for the teaching of Computer Science areas in the K-12 school system, about **47%** of those who responded said they do not, and approximately **53%** said they **do at some level of teaching** (see Table 1). Appendix A shows a listing of states by each response category.

Table 1
States Granting Computer Science Endorsement for
K-12 School Teachers at Certain Teaching Level

Category	**Count**	**Percent**
No	21	46.6
Yes	24	53.3
Total	**45**	**100**

It is important to note that while four states indicated "No" for granting a Computer Science endorsement, they do grant Computer Science endorsements for certain grade levels (question 1 was somehow misunderstood to mean the K-12 level instead of K-12 system for teaching). These states were: Wisconsin (for Secondary and Middle level), Maryland (for Secondary and Middle level), Kentucky (for Secondary and Middle level), and Minnesota (for Elementary and Middle level). Three states that indicated "Yes" to granting an endorsement in Computer Science actually do not require it at any level. These states were: Maine, Nebraska, and West Virginia.

2) When states were asked if a Computer Science endorsement is **currently required on a teaching certificate** for a teacher to be able to teach in this subject area, the following results were obtained: 13 states (29%) responded that they do require a Computer Science endorsement at the secondary level certificate, 12 states (27%) require it at the middle level, 6 states (13%) require it at the elementary level, and 6 states (13%) require it at the K-12 level (see Table 2). Appendix B shows listings of states by response category.

Please note that in the table below, "N/A" could mean one of the following:

- Local control by districts
- State requires Computer Technology, Business Endorsement
- Computer Science license is required when content is 25% or more programming
- Endorsement considered part of Business or Math except for programming
- The State requires Industrial Technology or Technology Applications Endorsements.

Table 2
States' Responses to whether they require Computer Science Certification by Teaching Level

Teaching Level	**Item Category**	**Count**	**Percent**
Secondary	N/A or Blank	8	17.7%
	No	24	53.3%
	Yes	13	28.8%
	Total	**45**	**100%**
Middle	N/A or Blank	7	15.5%
	No	26	57.7%
	Yes	12	26.6%
	Total	**45**	**100%**
Elementary	N/A or Blank	7	15.5%
	No	32	71.1%
	Yes	6	13.3%
	Total	**45**	**100%**
K-12	N/A	5	11.1%
	No	34	75.5%
	Yes	6	13.3%
	Total	**45**	**100%**

3) When states **requiring Computer Science endorsement** were asked what **the term of validity** was of the endorsement, 3 states did not respond, **15** states (about 71%) had a validity of 5-10 years, **3** states (about 14%) had a validity of less than 5 years, and **1** state had a validity of more than 10 years (see Table 3).

Table 3
State Responses regarding the Validity Term
For Computer Science Endorsement

Validity Term	**Count**	**Percent**
Less than 5 years	3	14.2%
5-10 years	15	71.4%
More than 10 years	1	4.7%
Other*	2	9.5%
Total	**21**	**100%**

* It depends on the type/level of certificate (could be from 2 up).

4) When states that **do require Computer Science endorsement** on a teaching certificate were asked the **type of courses** a teacher would be able to teach **with that endorsement**, the following results were obtained (see Table 4).

Table 4
Number of States by Type of Courses that a Teacher
Would be able to teach with CS Endorsement

	Teaching Level		
TYPE OF COURSES	Secondary	Middle	Elementary
Programming	18	13	9
Software Applications	17	13	9
Technology	13	8	7
Business	0	0	0
Other*	1	2	1

* Only Computer Science I or II or K-8 Keyboarding/Computer Applications

5) When states that **do require a Computer Science (CS) endorsement** were asked if there is another area endorsement/certification that would qualify a teacher in the state to teach K-12 Computer Science classes, the following results were obtained (see Table 5).

Table 5
Number of States allowing other Areas to teach
CS Classes by Teaching Level

	Teaching Level		
TYPE OF AREA	Secondary	Middle	Elementary
Math	2	2	0
Educational Technology	2	2	1
Technology and Design	2	2	1
Business / Library Media	6	5	2
Other*	5	4	5

* Industrial Technology, Technology Education, Industry Work Experience, Technology Application

6) When states that **do require Computer Science (CS) endorsement** were asked if there are any circumstances under which a teacher may teach Computer Science courses without the required endorsement, 8 states said there are no circumstances under which this could be done. A total of 15 states permitted non-endorsed teachers to teach Computer Science under a waiver, for a certain percentage, when course has less than 25% programming content, or under emergency authorization (see Table 6).

Table 6
Number of States by Type of Circumstances under which a
Teacher may Teach CS Courses without the
Required Endorsement

Type of Circumstance	**Count**
None	8
Waiver	8
For a Certain Percentage	2
Work Experience	4
Other*	1

* A teacher with at least 24 credit hours or with emergency authorization

7) When states were asked what type of preparation was needed for teachers to teach Computer Science if there is **no specific Computer Science endorsement required** in their state, 20 states would allow any certified teachers to teach it at the secondary level, 18 states would allow any certified teachers to teach it at the

middle level, and 16 states would allow any certified teachers to teach it at the elementary level (see Table 7). Other states would require different certifications for different topics within Computer Science (for example, a Business certification would allow a teacher to teach web design, while a Math certification would allow a teacher to teach programming, etc.).

Table 7
Number of States allowing other Teacher Preparation to Teach CS Classes by Preparation Type and Teaching Level

	Teaching Level		
TYPE OF AREA	Secondary	Middle	Elementary
Any Certified Teacher	20	18	16
Math	2	2	0
Business / Library Media	7	4	2
Other*	8	5	7

* Industrial Technology, Computer Education, and Computer Applications

8) When states were asked if there are **any future plans** to change the Computer Science certification requirements in their state, the following results were obtained (see Table 8).

Table 8
State Responses Regarding Future Plans

Category	**Count**	**Percent**
No	19	42.2%
Yes	5	11.1%
Not Sure	14	31.1%
Missing/Blank	7	15.5%
Total	**45**	**100%**

9) When states were asked if there are **any current or future plans** to develop or adopt **content area standards** for the preparation of teachers in Computer Science, the following results were obtained (see Table 9).

Table 9
State Responses Regarding Current/Future Plans for
The Development/Adoption of CS Standards

Category	**Count**	**Percent**
No	14	31.1%
Yes	5*	11.1%
Not Sure	16	35.5%
Missing/Blank	10	22.2%
Total	**45**	**100%**

*Connecticut, Georgia, New Hampshire, Tennessee, and Washington

Appendix C provides **web links** for information on current state standards.

10) When states were asked if they **require ongoing professional development** for teachers teaching in this area, 17 states (about 38%) stated they did not have professional development requirements for Computer Science teachers and 20 states (about 44%) stated that they do have professional development requirements for Computer Science teachers (see Table 10).

Table 10
State Responses Regarding Ongoing Professional
Development for CS Teachers

Category	**Count**	**Percent**
No	17	37.7%
Yes*	20	44.4%
Other	5	11.1%
Missing/Blank	3	6.6%
Total	**45**	**100%**

* Many of these states do require professional development courses to renew the certificate but these hours are not necessarily in content area.

11) When states were asked: **how well** do you think Computer Science teachers in your state are prepared, and to **what extent** do you think their professional needs are met, the following results were obtained (see Table 11).

Table 11
How Well C.S. Teachers are Prepared and to what
Extent Professional Needs are met

	Rating		
Item	Low	Medium	High
Extent at which Professional Needs are Met	9	7	12
How Well CS Teachers are Prepared	5	10	12

12) When states contacts were asked their **opinion on the importance of Computer Science** for students **30** out of 45 (67%) felt that Computer Science is very important at the secondary level, **27** (60%) felt it is very important at the middle level and **21** (47%) felt it is very important at the elementary level (see Table 12).

Table 12
State Responses to the Importance of Computer Science
By Teaching Level

	Teaching Level		
RESPONSE CATEGORY	Secondary	Middle	Elementary
Not important	0	0	7
Somewhat important	6	10	9
Very important	**30**	**27**	**21**
No answer	9	8	8
Total	**45**	**45**	**45**

Conclusion:

The results of this survey clearly show the following:

1) Very few states have developed **distinct certification requirements** for Computer Science as an academic discipline on its own, even though 24 states (of a total of 45 respondents) stated that they do grant a Computer Science endorsement at some levels of teaching. From the reporting states, only 13 require it at the Secondary level, 12 states at the Middle level, and 6 states at the Elementary level. Further, when these states were asked if there is another preparation that would also allow teachers to teach this subject area, many indicated other areas such as Math, Education Technology, Technology and Design, and Business/Library Media preparation. Additionally, only **8 states** would not accommodate for circumstances under which a teacher may teach Computer Science courses without the required endorsement. On the other hand 15 states do allow teaching under a waiver, for a certain percentage of the teaching load, when course has less than 25% programming, or under emergency authorization.

2) Many states did not seem to have a clear **definition or understanding** of the field "Computer Science" and exhibited a tendency to confuse Computer Science with other subject area such as: Technology Education/Educational Technology (TE/ET), Industrial or Instructional Technology (IT), Management Information Systems (MIS), or even the use of computers to support learning in other subject areas. This conclusion is supported by the fact that some states specifically asked for a definition of "Computer Science" and that some states indicated NA (not applicable) when they were asked if they require a Computer Science endorsement for K-12 teaching. A large number of respondents (21 out of 45 states) indicated that they do not grant/require Computer Science endorsement and that any certified teacher may teach this area. A few states indicated that business teachers are qualified to teach Computer Science and only two states indicated that math teachers are qualified to do so.

3) In many states, Computer Science is not considered **a discipline on its own** for the K-12 system. Instead, Computer Science is integrated into the K-12 Curriculum and/or taught under different titles. In many states the term Computer Science is applied primarily to **Programming Courses.** For software applications and associated technologies, teachers of the other technology disciplines are also considered qualified. This also could affect the way teachers are prepared or the way states perceive Computer Science teacher preparation.

4) The results also suggest that many teachers currently teaching Computer Science are not appropriately prepared to meet the demand of teaching this area in K-12 schools and, therefore, the preparation/certification requirements have not been overly restrictive in the majority of states.

5) Currently, very few states have developed standards for the preparation of **Computer Science** teachers. Further, even though most of the states do require professional development courses to renew the teaching certificate, many indicated that they do not require the courses to be in the content area being taught.

6) The majority of states do consider Computer Science **very important** for students at the secondary (30 states) and middle level (27 states), but less so for the elementary level (21 states). Further, when states were asked their opinion on how well their Computer Science teachers are prepared and the extent to which their professional needs are met, only 12 states indicated that they are highly prepared and/or their professional needs are highly met.

Recommendations:

Based on the results of this study the following are recommended:

1) There is an urgent need to improve **the level of understanding** of **Computer Science** as an academic and professional field at the state level and nationwide.

2) Computer Science needs to be **clearly defined as a discipline** and to be distinguished from other related disciplines such as Information/Industrial Technology (IT), Educational Technology (ET), Management Information Systems (MIS) and so on,

3) There is an urgent need to improve public awareness of the importance of current workforce issues specifically in the area of **Computer Science** and the long-term impact of the continued shortage of highly skilled technology workers on the economy.

4) **Teacher preparation standards** for Computer Science developed by professional organizations need **to be shared** with all state certification officials, national accreditation associations such as National Council for Accreditation of Teacher Education (NCATE), the Teacher Education Accreditation Council (TEAC), and national state associations such as the National Association of State Directors of Teachers Education and Certification (NASDTEC). Sharing these standards would not only impact on how states view teacher preparation in Computer Science but could improve the general understanding of this discipline and how it is distinct from other technology disciplines.

5) Individual states must be made aware of gaps and inconsistencies in their current teacher preparation and certification requirements and be able to evaluate their performance on these issues in relation to other states. The provision of such information could also serve as a catalyst for new programs at the state level intended to improve the understanding of Computer Science as a discipline.

6) Professional associations (such as CSTA) and school districts should assist in developing curriculum, supporting materials, and professional development for teachers which could be used to support Computer Science learning in K-12 and encourage students to consider computing as a viable educational and career pathway.

7) CSTA should communicate regularly with state officials on all Computer Science initiatives to support and promote the quality of teacher preparation in this area.

Appendix A

The following listing shows the states **that do grant** Computer Science endorsement for teachers (K-12)

1. Colorado
2. Florida
3. Indiana
4. Kentucky*
5. Louisiana
6. Maine*
7. Maryland*
8. Michigan
9. Minnesota*
10. Montana
11. Nebraska*
12. Nevada
13. New Hampshire
14. North Carolina
15. North Dakota
16. Ohio
17. South Dakota
18. Texas
19. Utah
20. Vermont
21. Virginia
22. Washington D.C.
23. West Virginia*
24. Wisconsin*
25. Wyoming

* Kentucky, Maryland, Minnesota and Wisconsin do grant/require CS endorsement at some teaching level. Nebraska and West Virginia indicated that they do grant a CS endorsement but it is not required. Maine does grant a CS endorsement but it is not required at this time as the program is not yet fully approved.

The following listing shows the states that **do not grant** Computer Science endorsement for teachers (K-12)

1. Alaska
2. Alabama
3. Arizona
4. Connecticut
5. Delaware
6. Georgia
7. Idaho

8. Iowa
9. Kansas
10. Massachusetts
11. Missouri
12. New Jersey
13. New Mexico
14. New York
15. Oregon
16. Pennsylvania
17. Rhode Island
18. South Carolina
19. Tennessee
20. Washington

Appendix B

Listing of states that **require a CS** Endorsement at **some levels of teaching:**

1. Kentucky (Secondary and Middle Level)
2. Louisiana (Secondary, Middle, Elementary, and K-12)
3. Maryland (Secondary and Middle Level)
4. Michigan (Secondary and Elementary Level)
5. Minnesota (Elementary and Middle level)
6. Montana (K-12)
7. Nevada (Secondary and Middle Level)
8. New Hampshire (K-12)
9. North Carolina (K-12)
10. North Dakota (K-12)
11. Ohio (K-12)
12. South Dakota (Secondary and Middle Level)
13. Texas (Secondary and Middle Level)
14. Vermont (Secondary Level)
15. Virginia (Secondary and Middle Level)
16. Washington D.C. (Middle and Elementary Level)
17. Wisconsin (Secondary and Middle Level)
18. Wyoming (Secondary level)

Listing of states that **do not require a CS Endorsement** at any levels of teaching:

1. Alaska
2. Alabama
3. Arizona
4. Colorado
5. Connecticut
6. Delaware
7. Florida
8. Georgia
9. Idaho
10. Indiana
11. Iowa
12. Kansas
13. Maine
14. Massachusetts
15. Missouri
16. Nebraska
17. New Jersey
18. New Mexico
19. New York
20. Oregon

21. Pennsylvania
22. Rhode Island
23. South Carolina
24. Tennessee
25. Utah
26. Washington
27. West Virginia

Appendix C

States that provided web link addresses for Information on Standards Used for CS Preparation.

Colorado: http://www.cde.state.co.us/cdeprof/Licensure_addendorsment_info.asp
(Colorado requires ITT and ITS endorsements)

Louisiana: http://www.teachlouisiana.net (click on Certification)
(Introduction to computers in the classroom and developing curriculum with technology)

Maryland: http://cnets.iste.org/ncate/n_cs-stands.html

Michigan: http://www.michigan.gov/documents/nrstandards_21911_7.doc

Minnesota: http://www.revisor.leg.state.mn.us/arule/8710/4525.html

Montana: http://www.opi.mt.gov
(K-12 Computer Science standards)

Nevada: http:// www.doe.nv.gov/standards/standcomp.html
(Nevada has state adopted computer & technology curriculum integration standards)

New Hampshire: http://www.ed.state.nh.us
(Computer Science Standards)

North Carolina: http://tps.dpi.state.nc.us/ed/079Endorsement.html

North Dakota: http://www.nd.gov/espb/
(North Dakota has no Computer Science standards)

Texas: http://wwwsbec.state.tx.us/SBECOnline/standtest/standards/8-12compsci.pdf
(Texas - Grades 8-12 Educator standards)
http://www.tea.states.tx.us/rules/tac/ch126.html#s1261
(Texas - Computer Science Student Standards)
South Dakota: http://doe.sd.gov/octe/bused/Curric/index.asp

Vermont:http://education.vermont.gov/new/pdfdoc/board/rules/5440_endorsements/subj_computer_science.pdf
(Vermont state standards in Computer Science for grades 7-12)

Virginia: www.doe.virginia.gov or
http://www.doe.virginia.gov/VDOE/Compliance/TeacherED/nulicvr.pdf

(Virginia state standards for Computer Science)

Utah: http://www.usoe.k12.ut.us/ate/it/ocpa.htm
(Utah College/University Computer Science minor requirements)

Washington D.C.: http://www.ncate.org/institutions/standards.asp
(International Society for Technology in Education (ISTE)

Wyoming: http://ptsb.state.wy.us for general information or
http://www.k12.wy.us/SAA/standards/voced.pdf
(Technology standards)

Appendix D - SURVEY

STATE CERTIFICATION REQUIREMENTS FOR K-12 TEACHERS OF COMPUTER SCIENCE

Please take a moment to complete the following survey regarding **your state requirements for K-12 computer science teachers.** The purpose of this survey project is to gather information on state certification requirements for the preparation of K-12 teachers in the area of computer science. The goal is to improve the quality of teaching in this subject area. **Each state will receive the results of the survey in addition to any other information that maybe helpful in the preparation of teachers in this area**. The survey project is sponsored by the Computer Science for Teachers Association (CSTA). Your participation in this survey is valuable and greatly appreciated.

1. Does your state grant a Computer Science Endorsement for K-12 teaching in this area?

   ( ) Yes ( ) No

2. In your state, is a computer science endorsement currently required on a teaching certificate for teachers to be able to teach in this subject area at the K-12 school level? Please check one for each level.

   Secondary Level: ( ) Yes ( ) No ( ) NA - Explain

   _____

   Middle Level: ( ) Yes ( ) No ( ) NA - Explain

   _____

   Elementary Level: ( ) Yes ( ) No ( ) NA - Explain

   _____

   K-12 Level - Single Certification (Covers all Grades):

   ( ) Yes ( ) No ( ) NA – Explain

   _____

   If your answer to question 2 is "Yes", please answer items 3-8 and then 12-15; if your answer is "No", please go to items 9-15.

3. What type of courses would a teacher with an endorsement in computer science be able teach? Please check all that apply for each level

   Secondary Level:

   ( ) Programming ( ) Software Applications ( ) Technology ( ) Business
   ( ) Other – specify _____

   Middle Level:

   ( ) Programming ( ) Software Applications ( ) Technology ( ) Other – specify
   _____

   Elementary Level:

   ( ) Programming ( ) Software Applications ( ) Technology ( ) Other – specify
   _____

4. Is there another area endorsement/certification that would qualify a teacher in your state to teach K-12 computer science classes? Please check all that apply at each level.

   Secondary Level:

   ( ) Math ( ) Educational Technology ( ) Technology and Design ( ) Business
   ( ) Other – specify _____

   Middle Level:

   ( ) Math ( ) Educational Technology ( ) Technology and Design ( ) Other–
   specify _____

   Elementary Level:

   ( ) Math ( ) Educational Technology ( ) Technology and Design ( ) Other–
   specify _____

5. What is the term of validity of the required computer science endorsement? Please check the selection that is most representative.

   ( ) Less than 5 years ( ) 5 -10 Years ( ) More than 10 years

6. What computer science standards are being currently used for the preparation of teachers in computer science? Please specify.

   _____

7. Please provide below, if any, a web link to access the **standards and any information** regarding the computer science endorsement requirements in your state.

   _____

8. Under what circumstances, if any, may a teacher teach Computer Science courses without the required endorsement? Please check all that apply.

   ( ) None

   ( ) Waiver _____ #Years one can teach under waiver Other Requirements; specify_____

   ( ) Allowed for a certain percentage out of field Explain_____

   ( ) Has work experience (from Industry) Other Requirements; specify

   _____

9. If there is no specific computer science endorsement required in your state, indicate below the type of preparation of teachers to teach this subject area. Please check all that apply for each level

   Secondary Level:

   ( ) Any Certified Teacher ( ) Teachers with a Math Endorsement
   ( ) Teachers with a Business Endorsement.
   ( ) Other Teachers – Specify _____

   Middle Level:

   ( ) Any Certified Teacher ( ) Teachers with a Math Endorsement
   ( ) Teachers with a Business Endorsement.
   ( ) Other Teachers – Specify _____

Elementary Level:

( ) Any Certified Teacher ( ) Teachers with a Math Endorsement
( ) Teachers with a Business Endorsement.
( ) Other Teachers – Specify _____

10. Are there any future plans to change the computer science certification requirements in your state? Please check one.

( ) No ( ) Yes ( ) Not Sure

11. Are there any current or future plans to develop or adopt content area standards for the preparation of teachers in computer science? Please check one.

( ) No ( ) Yes ( ) Not Sure

12. Do you require ongoing Professional Development for teachers teaching in this area? Please check one.

( ) No ( ) Yes ( ) Other; specify

_____

13. In a scale from 1 to 5, to what extent do you think the professional needs of computer science teachers in your state are met? Please check one:

( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5

Not at all Fully met

14. How well do you think computer science teachers in your state are prepared? Please check one

( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5

Not prepared Fully prepared

15. How important do you feel that computer science is for students in your state? Please check the selection that is most appropriate for each level.

Secondary Level:

( ) Not important ( ) Somewhat important ( ) Very important

Middle Level:

( ) Not important ( ) Somewhat important ( ) Very important

Elementary Level:

( ) Not important ( ) Somewhat important ( ) Very important

Note: Please fill in the following

Name of Computer Science Contact Person:

Address:

Telephone #: ( )

E-Mail Address:

Please e-mail to khouryg@michigan.gov not later than January 30. **Thank you for your participation.**