# Canadian CAS Research Survey

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## INTRODUCTION

**Project Aims:** CAS is increasingly used in the teaching and learning of university level mathematics. The primary aim of this project is to investigate mathematicians' views on both the current and possible future use of such software in university-level mathematics education.

**Time Required for the Survey:** Approximately **8 minutes** for non-users of CAS (18 questions) and **12 minutes** for CAS users (29 questions). The survey contains 7 pages. Progression is indicated in the heading of the page.

**Definitions:**
**CAS** – Any software packages, run on either computers or on handheld devices, that incorporates computational, symbolic, and visualization features. (For example, Derive, Maple, Matlab, MathCAD, Mathematica, MuPad, TI-89, TI-92, TI Voyage 200, TI nSpire, GeoGebra, and others)
**Teaching with CAS** – Any use (computational, symbolic, or visual) of any CAS software in any teaching/ learning settings.

**Prize Draw** – To thank you for your help with this study I would like to invite you to enter a draw for one of the following prizes:

**1)** A copy of the **17th International Commission of Mathematics Instruction Study Volume** entitled, *"Digital technologies and mathematics teaching and learning: Rethinking the terrain"*

**2)** A copy of "**Research on Technology in the Teaching and Learning of Mathematics**" (Editor: Kathleen, M. Heid, Pennsylvania State University)

**Confidentiality:** Your identity will not be revealed in any circumstances during or after the study (see confidentiality statement at the end of the questionnaire)

**Questions/Comments:** If you have any questions please contact: Dr. Zsolt Lavicza, University of Cambridge (zl221@cam.ac.uk or +44 7962 488 222), Dr. Daniel Jarvis, Nipissing University (danj@nipissingu.ca or +01 705 474 3461 x 4445), or Dr. Chantal Buteau, Brock University (cbuteau@brocku.ca or +01 905 688 5550 x 3167)

**Further Information:** **http://www.educ.cam.ac.uk/people/staff/lavicza/**

Social Sciences and Humanities Research Council of Canada

Conseil de recherches en sciences humaines du Canada

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## Thank you for your help in this study!

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1) How many years have you been teaching university-level mathematics?

- ○ 1-3
- ○ 4-7
- ○ 8-12
- ○ 13-20
- ○ 20+

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2) What is your age?

- ○ 35 or less
- ○ 36-45
- ○ 46-55
- ○ 56-65
- ○ 66 or more

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3) What is your gender?

- ○ Male
- ○ Female

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4) Where have you pursued your education and career?

| | In Canada | In the United States | Abroad (Outside North America) | More than One (Inside and outside Canada) |
|---|---|---|---|---|
| Pre-university eduacation | ○ | ○ | ○ | ○ |

| | | | | |
|---|---|---|---|---|
| Undergraduate education | ○ | ○ | ○ | ○ |
| Graduate education | ○ | ○ | ○ | ○ |
| Career (academic/non-academic) | ○ | ○ | ○ | ○ |

5) Which of the following most closely matches your primary research area?

- ○ Pure mathematics
- ○ Applied mathematics
- ○ Statistics
- ○ Mathematics education
- ○ Engineering
- ○ Science - Computer
- ○ Science - Physical (e.g. physics, chemistry...)
- ○ Science - Life (e.g. biology, ecology... )
- ○ Science - Social (e.g. economics, sociology...)
- ○ Not pursued any research
- ○ Other, please specify:

6) In an average working month how frequently do you use CAS in your research?

| Never | Less than once a month | Once a month | Once a week | 2-3 a week | Daily |
|---|---|---|---|---|---|
| ○ | ○ | ○ | ○ | ○ | ○ |

7) What kind of student groups do you usually teach? **Check all that apply to you.**

- ☐ Mathematics majors
- ☐ Education majors (prospective teachers)

- ☐ Engineering majors
- ☐ Science majors - Computer
- ☐ Science majors - Physical (e.g. physics, chemistry...)
- ☐ Science majors - Life (e.g. biology, ecology... )
- ☐ Science majors - Social (e.g. economics, sociology...)
- ☐ General mathematics courses for non-maths intensive majors

Other, please specify:

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8) What level of mathematics students do you usually teach? (Ever taught?) **Check all that apply to you.**

- ☐ Undergraduate
- ☐ Master's
- ☐ PhD

Other, please Specify:

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9) Do you teach full- or part-time?

- ○ Full-time
- ○ Part-time

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## Your views on the role of CAS in Mathematical Literacy.

10) **Please choose the response that most closely matches your views on each statement.**

| | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|---|
| 1. Knowing how to use CAS is an essential skill for mathematics graduates | ○ | ○ | ○ | ○ | ○ |
| 2. Knowing how to use CAS is beneficial for students on science and engineering courses | ○ | ○ | ○ | ○ | ○ |
| 3. CAS enables mathematicians to work on problems more efficiently | ○ | ○ | ○ | ○ | ○ |
| 4. CAS use does not affect the mathematics that has to be learned by students in universities | ○ | ○ | ○ | ○ | ○ |
| 5. CAS is changing the way in which mathematics research is done | ○ | ○ | ○ | ○ | ○ |
| 6. CAS offers the possibility of introducing new topics into undergraduate mathematics | ○ | ○ | ○ | ○ | ○ |

| | | | | | |
|---|---|---|---|---|---|
| 7. Knowing how to use CAS enhances students' future employment prospects | ○ | ○ | ○ | ○ | ○ |
| 8. Science and engineering graduates should have a working knowledge of CAS | ○ | ○ | ○ | ○ | ○ |

## Your views on CAS-assisted teaching and learning.

11) **Please choose the response that most closely matches your views on each statement.**

| | **Strongly disagree** | **Disagree** | **Neutral** | **Agree** | **Strongly agree** |
|---|---|---|---|---|---|
| 1. CAS use encourages students to examine carefully the meaning of their solutions | ○ | ○ | ○ | ○ | ○ |
| 2. CAS use has positive effects on students' enthusiasm for mathematics | ○ | ○ | ○ | ○ | ○ |
| 3. CAS enables teachers to deliver more engaging lessons | ○ | ○ | ○ | ○ | ○ |
| 4. CAS use does not make classes more interesting for students | ○ | ○ | ○ | ○ | ○ |
| 5. CAS use helps students develop better understanding of mathematical concepts | ○ | ○ | ○ | ○ | ○ |
| 6. CAS use can initiate in-class communication between students | ○ | ○ | ○ | ○ | ○ |
| 7. CAS-generated images spark valuable discussions in class | ○ | ○ | ○ | ○ | ○ |

| | | | | | |
|---|---|---|---|---|---|
| 8. CAS use does not help students to understand mathematical concepts | ○ | ○ | ○ | ○ | ○ |
| 9. Images generated by CAS improve students' attention in class | ○ | ○ | ○ | ○ | ○ |
| 10. CAS use distracts students from understanding mathematical concepts | ○ | ○ | ○ | ○ | ○ |

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## Factors that may hinder the integration of CAS into teaching and learning.

12) **Please choose the response that most closely matches your views on each statement.** (If you feel that you don't have adequate knowledge to rate these statements then please use the N/A option or skip this page.)

| | Strongly disagree | Disagree | Neutral | Agree | Strongly agree | N/A |
|---|---|---|---|---|---|---|
| 1. CAS syntax is too complex to deal with in classes | ○ | ○ | ○ | ○ | ○ | ○ |
| 2. Most entry level classes are too large for me to incorporate CAS | ○ | ○ | ○ | ○ | ○ | ○ |
| 3. Only a few of my colleagues are enthusiastic about using CAS in mathematics classes | ○ | ○ | ○ | ○ | ○ | ○ |
| 4. It takes too long to develop CAS-related teaching material. | ○ | ○ | ○ | ○ | ○ | ○ |
| 5. The poor mathematical skills of students in introductory courses mean there is little time for CAS in classes | ○ | ○ | ○ | ○ | ○ | ○ |
| 6. CAS is too expensive for wide integration in mathematics teaching and learning mathematics | ○ | ○ | ○ | ○ | ○ | ○ |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7. It is not worth using CAS in classes, because it cannot be used in tests | ○ | ○ | ○ | ○ | ○ | ○ |
| 8. CAS is insufficiently user-friendly to be used in classes | ○ | ○ | ○ | ○ | ○ | ○ |
| 9. My department does not encourage the use of CAS in math classes | ○ | ○ | ○ | ○ | ○ | ○ |
| 10. It is difficult to assess what students know if they can use CAS in tests | ○ | ○ | ○ | ○ | ○ | ○ |
| 11. The tight course schedule does not allow the involvement of technology | ○ | ○ | ○ | ○ | ○ | ○ |
| 12. CAS is not readily available in my department to use | ○ | ○ | ○ | ○ | ○ | ○ |

13) **If there are other important factors hindering CAS integration please list them briefly:**

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14) **Access at the University - Please choose the one response that best indicates your answer in each scale.**

| | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|---|
| CAS and projection systems are available for use in most lecture rooms | ○ | ○ | ○ | ○ | ○ |
| The number of computer labs is sufficient for CAS-assisted teaching in my department | ○ | ○ | ○ | ○ | ○ |
| It is not difficult to schedule a mathematics class in a computer lab | ○ | ○ | ○ | ○ | ○ |
| CAS is adequately accessible for everyday use | ○ | ○ | ○ | ○ | ○ |
| CAS support is available for those lecturers who need it | ○ | ○ | ○ | ○ | ○ |

15) Have you ever participated in any CAS training provided by your department or offered in a conference?

- ○ No
- ○ Yes at the department
- ○ Yes at a conference
- ○ Other, please specify:

16) **Training -** Please rate the following statements.

| | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|---|
| I would be happy to attend CAS teacher training workshops | ○ | ○ | ○ | ○ | ○ |
| I would be happy to collaborate with my colleagues to develop courses that involve CAS use | ○ | ○ | ○ | ○ | ○ |

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17) In a typical academic term approximately, in what percentage of your lessons do you use CAS?

- ○ Never
- ○ 25% or less
- ○ 26-49%
- ○ 50-74%
- ○ 75% or more

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**If you answered NEVER please answer the next question (18) and then go to the next page.**

**OTHERWISE please skip the next question and continue to question 19.**

18) **Please briefly explain what are the most important reasons that hold you back from using CAS in your teaching?**

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19) In what settings does your CAS-related teaching generally take place?

| | Never | Occasionally | Frequently | Always |
|---|---|---|---|---|
| Lecture room | ○ | ○ | ○ | ○ |
| Computer lab | ○ | ○ | ○ | ○ |

| | | | | |
|---|---|---|---|---|
| Homework/projects | ○ | ○ | ○ | ○ |
| Use computer-based CAS | ○ | ○ | ○ | ○ |
| Use hand-held CAS | ○ | ○ | ○ | ○ |

20) In what way do you use CAS in your teaching? I use CAS to

| | Never | Occasionally | Frequently | Always |
|---|---|---|---|---|
| project images to illustrate concepts in lectures | ○ | ○ | ○ | ○ |
| encourage students to experiment with CAS | ○ | ○ | ○ | ○ |
| encourage students to work in teams/groups in lectures | ○ | ○ | ○ | ○ |
| assign project/homework for students to work at home | ○ | ○ | ○ | ○ |
| develop worksheets for students to work with | ○ | ○ | ○ | ○ |
| develop on-line tutorials for students | ○ | ○ | ○ | ○ |
| develop course materials that encourage students to work with CAS | ○ | ○ | ○ | ○ |

21) **If you would like to add to this list please briefly describe your way of teaching.**

22) With what kinds of student groups do you use CAS in your teaching? Courses designed for

| | Never | Occasionally | Frequently | Always |
|---|---|---|---|---|
| Mathematics majors | ○ | ○ | ○ | ○ |

| | | | | |
|---|---|---|---|---|
| Education majors (prospective teachers) | ○ | ○ | ○ | ○ |
| Engineering majors | ○ | ○ | ○ | ○ |
| Science majors - Computer | ○ | ○ | ○ | ○ |
| Science majors - Physical (e.g. physics, chemistry...) | ○ | ○ | ○ | ○ |
| Science majors - Life (e.g. biology, ecology... ) | ○ | ○ | ○ | ○ |
| Science majors - Social (e.g. economics, sociology...) | ○ | ○ | ○ | ○ |
| General mathematics courses for non-maths intensive majors | ○ | ○ | ○ | ○ |

23) With what level of courses do you usually use CAS?

| | Never | Occasionally | Frequently | Always |
|---|---|---|---|---|
| Entry level undergraduate (1-2 years) | ○ | ○ | ○ | ○ |
| Higher level undergraduate (2-4 years) | ○ | ○ | ○ | ○ |
| Masters level | ○ | ○ | ○ | ○ |
| PhD level | ○ | ○ | ○ | ○ |

24) **Departmental assignment** - Please choose the response that most closely matches your views on each statement.

| | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|---|
| I can freely choose whether or not I use CAS in my teaching | ○ | ○ | ○ | ○ | ○ |

| | | | | | |
|---|---|---|---|---|---|
| I often choose courses in which I can use CAS for teaching | ○ | ○ | ○ | ○ | ○ |

25) How many years have you been using CAS in your teaching?

- ○ 1 or less
- ○ 1-3
- ○ 4-7
- ○ 8-12
- ○ 13-20
- ○ 20+

26) Has your use of CAS in your teaching increased over the years?

- ○ Less frequently
- ○ Almost the same
- ○ More frequently
- ○ Other, please specify:

27) Do you permit CAS to be used during assessments?

| | Never | Occasionally | Frequently | Always |
|---|---|---|---|---|
| In-class tests | ○ | ○ | ○ | ○ |
| Final exams | ○ | ○ | ○ | ○ |
| Homework/projects | ○ | ○ | ○ | ○ |
| Other assessments | ○ | ○ | ○ | ○ |

28) What principles guide your CAS-related teaching?

29) Why did you start using CAS in your teaching?

30) Is there anything that has significantly influenced your use of CAS in teaching?

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31)

| | Yes | No |
|---|---|---|
| Would you like to receive a report of this study? | ○ | ○ |
| Would you be interested in a further discussion of the issues of CAS-assisted teaching? | ○ | ○ |
| Would you like to enter the prize draw? | ○ | ○ |

32) If you answered yes to any of the above three questions please provide your name and e-mail address:

Name:

E-mail:

---------- **OPTIONAL SECTION** ----------

33) **Please tell me more about the reasons why you do or do not use CAS in your teaching. In particular, I would be interested in knowing what helps or hinders your use of CAS in university-level teaching.**

34) **What do you feel is missing from this questionnaire?**

35) **Please let me know your overall impressions, comments, recommendations for this study.**

**Confidentiality statement:** no data submitted via this questionnaire will ever be passed to a third party other than as part of an anonymous report prepared for the academic community. No data of an identifying nature will ever be used for any purpose other than communication with those individuals who have elected to identify themselves to the researcher.

Finish Survey

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