Technology Use in Teaching Practices

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**Report purpose**

The report explores teaching practices and technology used by eighth-grade teachers in the United States and the other countries that participated in the 2018 International Computer and Information Literacy Study (ICILS). The report highlights the results for the United States and ICILS international averages[[1]](#footnote-2) regarding teaching practices and the use of technology in the practices. Also, among the U.S. teachers, the results examine differences in technology use in teaching practices by teachers of different subjects, years of experience using Information Communication Technologies (ICT), and ICT use at school.

**Key Findings**

For 8 out of 10 practices, higher percentages of U.S. eighth-grade teachers often or always used ICT than did ICILS teachers. Higher percentages of U.S. teachers and ICILS teachers often or always used ICT to *present information through class instruction* than for any other practices. ICT was often or always used by about one third of U.S. and ICILS teachers to *provide feedback to students on their work* and *support collaboration among students.*

U.S. eighth-grade teachers use of ICT in the teaching practices varied by the subjects they taught. At least 70 percent of U.S. eighth-grade technology teachers often or always used ICT to *provide feedback to students on their work*, *support collaboration among students*, and *support inquiry learning*. Comparatively, about half or fewer than half of U.S. eighth-grade English Language Arts (ELA), mathematics and science teachers often or always used ICT in the 3 practices.

Higher percentages of U.S. eighth-grade teachers with more than five years of experience using ICT during lessons[[2]](#footnote-3) often or always used ICT in 9 out of 10 teaching practices than did teachers without any or less than 2 years of experience using ICT. Higher percentages of U.S. teachers who had a positive perception[[3]](#footnote-4) of ICT use at school (*enough time to prepare lessons, sufficient opportunity to develop expertise* and *sufficient technical support*) often or always used ICT to *provide feedback to students on their work* and *support collaboration among students* than did teachers who had a negative view of the ICT use at school.

**Data sets, questionnaires, key variables and other notes**

* ICILS 2018 teacher questionnaire data
* Questionnaire items:
  + How often do you use ICT with the following practices when teaching your reference class?
    - The presentation of information through direct class instruction
    - The provision of remedial or enrichment support to individual students or small groups of students
    - The support of student-led whole-class discussions and presentations
    - The assessment of students' learning through tests
    - The provision of feedback to students on their work
    - The reinforcement of learning of skills through repetition of examples
    - The support of collaboration among students
    - The mediation of communication between students and experts or external mentors
    - The communication with parents or guardians about students’ learning
    - The support of inquiry learning

(I do not use this practice with the reference class, I never use ICT with this practice, I sometimes use ICT with this practice, I often use ICT with this practice, I always use ICT with this practice)

* + To what extent do you agree or disagree with the following statements about the use of ICT in teaching at your school?
    - There is enough time to prepare lessons
    - There is sufficient opportunity to develop expertise
    - There is sufficient technical support

(Strongly agree, Agree, Disagree and Strongly disagree)

* + Which of the following best describes the subject for this reference class?

(English Language Arts, Spanish or other foreign language, Mathematics, Sciences, Human sciences/Humanities/Social studies, Creative arts, Information technology/Computer science, Practical and vocational subjects, Other)

* + Approximately how long have you been using ICT for teaching purposes?

During lessons (Never, Less than 2 years, Between 2 and 5 years, More than 5 years)

* Includes U.S. averages, 2018 ICILS international averages
* Optional: *Present and compare results by years of teaching experience and/or teacher’s gender*
* Note to reviewers
  + The first research question is about the use of 10 teaching practices in general. It is included to give a baseline for the following discussions, showing first that the practices are used in general before delving into their implementation with technology.
  + All findings presented in the text are significant and t-test results are included in the accompanying Excel file. Significance symbols are not used in the tables because the comparison group is not fixed in the presented findings for each question.
  + When there are numerous significant ones, the highest or the lowest percentages are pointed out. If there is no comparison, practices that are highly needed in the virtual learning (e.g., providing feedback, supporting collaboration, supporting inquiry learning) are discussed.
  + The wording of practices used in 2018 ICILS teacher questionnaire is shortened for this report. Please see appendix A for a crosswalk of two versions.

**Types of estimates and analyses**

* Percentages, percentage distributions
* Significant tests conducted using t-test comparisons. In current draft, no adjustments have been made for multiple comparisons.

**Study Question 1. What teaching practices were used by the eighth-grade teachers in the United States and across ICILS countries in 2018?**

The practice of *presenting information through class instruction* was used more than 90 percent of teachers[[4]](#footnote-5) both in the United States in 2018 ICILS participating countries. A higher percentage of U.S. teachers used the practice of *communicating with parents about students learning* than did ICILS teachers[[5]](#footnote-6).

* Among all teaching practices, *presenting information through class instruction* was used by 93 percent of U.S. teachers and 97 percent of ICILS teachers with their eighth-grade classes, while the *mediating communication between students and experts* was used by a smaller percentage of teachers (74 percent U.S. teachers and 69 percent ICILS teachers)
* A higher percentage of U.S. teachers (93 percent) used the practice of *communicating with parents about students’ learning* than did ICILS teachers (84 percent).
* A higher percentage of U.S. teachers (89 percent) used the practice of *supporting inquiry learning* than did ICILS teachers (85 percent).

**Table 1. Percentage of eighth-grade teachers reporting use of teaching practice, by U.S. and ICILS average: 2018**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **U.S.** | | **ICILS 2018 average** | |
| **Teaching practice** | **Percent** | ***s.e.*** | **Percent** | ***s.e.*** |
| Present information through class instruction | 93 | *0.7* | 97 | *0.2* |
| Communicate with parents about students’ learning | 93 | *0.6* | 84 | *0.4* |
| Reinforce the learning of skills through repetition | 91 | *0.7* | 92 | *0.3* |
| Provide remedial or enrichment support to students | 91 | *0.8* | 88 | *0.4* |
| Provide feedback to students on their work | 90 | *0.8* | 90 | *0.3* |
| Support inquiry learning | 89 | *0.8* | 85 | *0.4* |
| Support student-led discussions | 89 | *0.8* | 88 | *0.3* |
| Support collaboration among students | 89 | *0.8* | 90 | *0.3* |
| Assess students’ learning through tests | 89 | *0.9* | 88 | *0.4* |
| Mediate communication between students and experts | 74 | *1.2* | 69 | *0.5* |

NOTE: The ICILS 2018 average is the average of all participating education systems meeting international technical standards, with each education system weighted equally. Teaching practices are ordered by percentage of U.S. teachers using them, from largest to smallest. Standard error is noted by *s.e.* Additional notes will be added to future drafts.  
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), The International Computer and Information Literacy Study (ICILS), 2018.

**Study Question 2. What was the use of ICT in eighth-grade teachers’ practices in 2018?**

Higher percentages of U.S. eighth-grade teachers often or always used ICT[[6]](#footnote-7) for most of practices than did ICILS teachers. Higher percentages of eighth-grade U.S. teachers and ICILS teachers often or always used ICT to *present information through class instruction* than for any other practices.

* For 8 out of 10 practices, higher percentages of U.S. eighth-grade teachers used ICT than did ICILS teachers.
* Higher percentages of eighth-grade U.S. teachers and ICILS teachers often or always used ICT to *present information through class instruction* (69 percent and 64 percent, respectively) than for any other practices.
* ICT was often or always used by about one third of U.S. and ICILS teachers to *provide feedback to students on their work* (36 percent and 32 percent respectively) and *support collaboration among students* (36 percent and 31 percent, respectively).
* ICT was often or always used by less than half of U.S. teachers to *assess students' learning through tests* and *support inquiry learning* (43 percent and 45 percent, respectively).

**Table 2. Percentage of eighth-grade teachers who often or always use ICT, by U.S. and ICILS average and teaching practice: 2018**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **U.S.** | | **ICILS 2018 average** | |
| **Teaching practice** | **Percent** | ***s.e.*** | **Percent** | ***s.e.*** |
| Present information through class instruction | 69 | *1.3* | 64 | *0.8* |
| Communicate with parents about students’ learning | 59 | *1.6* | 45 | *0.7* |
| Reinforce the learning of skills through repetition | 49 | *1.6* | 41 | *0.6* |
| Provide remedial or enrichment support to students | 49 | *2.1* | 40 | *0.6* |
| Support student-led discussions | 47 | *1.8* | 43 | *0.7* |
| Support inquiry learning | 45 | *1.5* | 40 | *0.6* |
| Assess students’ learning through tests | 43 | *1.7* | 38 | *0.6* |
| Provide feedback to students on their work | 36 | *1.2* | 32 | *0.6* |
| Support collaboration among students | 36 | *1.5* | 31 | *0.7* |
| Mediate communication between students and experts | 25 | *1.4* | 26 | *0.6* |

NOTE: The ICILS 2018 average is the average of all participating education systems meeting international technical standards, with each education system weighted equally. Teaching practices are ordered by percentage of U.S. teachers using ICT in them, from largest to smallest. Standard error is noted by *s.e.* Additional notes will be added to future drafts.  
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), The International Computer and Information Literacy Study (ICILS), 2018.

**Study Question 3. Did U.S. eighth-grade teachers’ use of ICT in teaching practices vary by subject in 2018?**

Higher percentages of U.S. eighth-grade technology teachers[[7]](#footnote-8) often or always used ICT in 5 out of 10 teaching practices than did teachers of three other subjects. Lower percentages of mathematics teachers often or always used ICT to *support student-led discussions*, *support collaboration among students*, and *support inquiry learning* than did ELA and science[[8]](#footnote-9) teachers.

* At least 70 percent of U.S. eighth-grade technology teachers often or always used ICT to *reinforce learning of skills* *through repetition* (81 percent), *provide feedback to students on their work* (79 percent), *support collaboration among students* (75 percent), *support inquiry learning* (72 percent), and *support student-led discussions* (70 percent). Comparatively, about half or fewer than half of U.S. eighth-grade ELA, mathematics, and science teachers often or always used ICT in these practices.
* Lower percentages of U.S. eighth-grade mathematics teachers often or always used ICT to *support student-led discussions* (38 percent), *support collaboration among students* (23 percent) and *support inquiry learning* (28 percent)than did ELA and science teachers*.*
* There were no significant differences across subjects in the percentages of U.S. eighth-grade teachers who used ICT often or always to *present information through class instruction,* *provide remedial, or enrichment support to students* and *communicate with parents about students’ learning*.

**Table 3. Percentage of eighth-grade teachers who often or always use ICT by teaching practice and selected subject: 2018**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ELA** | | **Mathematics** | | **Science** | | **Technology** | |
| **Teaching practice** | **Percent** | ***s.e.*** | **Percent** | ***s.e.*** | **Percent** | ***s.e.*** | **Percent** | ***s.e.*** |
| Present information through class instruction | 69 | *3.4* | 69 | *2.8* | 79 | *2.8* | 72 | *7.7* |
| Communicate with parents about students’ learning | 60 | *3.1* | 59 | *3.0* | 60 | *4.4* | 61 | *8.5* |
| Provide remedial or enrichment support to students | 54 | *3.6* | 51 | *3.6* | 48 | *4.3* | 60 | *7.6* |
| Reinforce the learning of skills through repetition | 52 | *3.8* | 51 | *3.1* | 48 | *3.6* | 81 | *5.9* |
| Support student-led discussions | 49 | *3.2* | 38 | *4.0* | 53 | *4.6* | 70 | *6.4* |
| Assess students’ learning through tests | 48 | *3.9* | 37 | *2.6* | 49 | *4.2* | 56 | *8.2* |
| Support inquiry learning | 47 | *4.0* | 28 | *2.4* | 53 | *3.6* | 72 | *7.1* |
| Provide feedback to students on their work | 44 | *3.4* | 25 | *2.7* | 28 | *3.0* | 79 | *6.0* |
| Support collaboration among students | 38 | *3.3* | 23 | *2.4* | 32 | *3.8* | 75 | *6.2* |
| Mediate communication between students and experts | 26 | *2.8* | 18 | *2.5* | 22 | *2.6* | 41 | *8.7* |

NOTE: Teaching practices are ordered by percentage of ELA teachers using ICT in them, from largest to smallest. Science includes general science and/or physics, chemistry, biology, geology, earth sciences, technical science, etc. Technology includes information technology, computer science, or a similar subject. Standard error is noted by *s.e.* Additional notes will be added to future drafts.  
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), The International Computer and Information Literacy Study (ICILS), 2018.

**Study Question 4. Did U.S. eighth-grade teachers’ use of ICT in teaching practices vary by years of ICT experience in 2018?**

For 9 out of 10 teaching practices, higher percentages of U.S. eighth-grade teachers with more than five years of experience using ICT during lessons[[9]](#footnote-10) often or always used ICT than did teachers with less than 2 years of experience using ICT.

* Higher percentages of U.S. eighth-grade teachers with more than 5 years of experience using ICT during lessons often or always used ICT in 9 out of 10 teaching practices, than did teachers with less than 2 years of experience using ICT.
* Higher percentages of U.S. eighth-grade teachers with more than 5 years of experience using ICT during lessons often or always used ICT in 8 out of 10 teaching practices, than did teachers with 2 to 5 years of experience using ICT.
* Higher percentages of U.S. eighth-grade teachers with 2 to 5 years of experience using ICT during lessons often or always used ICT in 5 out of 10 teaching practices, than did teachers with less than 2 years of experience using ICT.
* The percentage of U.S. eighth-grade teachers who often or always used ICT to *mediate communication between students and experts* did not vary by their years of ICT experience during lessons.

**Table 4. Percentage of eighth-grade teachers who often or always use ICT by teaching practice and years of ICT experience during lessons: 2018**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Never or less than 2 years** | | **Between 2 and 5 years** | | **More than 5 years** | |
| **Teaching practice** | **Percent** | ***s.e.*** | **Percent** | ***s.e.*** | **Percent** | ***s.e.*** |
| Present information through class instruction | 51 | *2.2* | 69 | *2.5* | 79 | *1.8* |
| Communicate with parents about students’ learning | 42 | *2.6* | 59 | *2.5* | 68 | *2.1* |
| Reinforce the learning of skills through repetition | 37 | *3.3* | 46 | *2.8* | 57 | *2.1* |
| Support inquiry learning | 35 | *3.4* | 40 | *2.3* | 53 | *2.1* |
| Support student-led discussions | 34 | *3.7* | 42 | *2.6* | 56 | *2.5* |
| Provide remedial or enrichment support to students | 34 | *2.6* | 45 | *2.5* | 59 | *2.7* |
| Assess students’ learning through tests | 30 | *2.8* | 43 | *2.6* | 50 | *2.3* |
| Support collaboration among students | 29 | *3.2* | 34 | *2.3* | 41 | *2.2* |
| Provide feedback to students on their work | 28 | *3.3* | 32 | *2.0* | 43 | *2.7* |
| Mediate communication between students and experts | 22 | *2.5* | 23 | *2.0* | 27 | *2.1* |

NOTE: Teaching practices are ordered by percentage of teachers, with more than 5 years of ICT experience, using ICT in them, from largest to smallest. Standard error is noted by *s.e.* Additional notes will be added to future drafts.  
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), The International Computer and Information Literacy Study (ICILS), 2018.

**Study Question 5. Did U.S. eighth-grade teachers’ use of ICT in the teaching practices vary by their perception of ICT use at school in 2018?**

Higher percentages of U.S. teachers who had a positive perception[[10]](#footnote-11) of three kinds of ICT use at school (*enough time to prepare lessons, sufficient opportunity to develop expertise* and *sufficient technical support*) often or always used ICT to *provide feedback to students on their work*, *support collaboration among students*, and *mediate communication between students and experts* than did teachers who had a negative view of ICT use at school.

* Higher percentages of U.S. teachers who had a positive perception[[11]](#footnote-12) of three kinds of ICT use at school (*enough time to prepare lessons, sufficient opportunity to develop expertise*,and *sufficient technical support*) often or always used ICT to *provide feedback to students on their work*, *support collaboration among students*, and *mediate communication between students and experts* than did teachers who had a negative view of ICT use at school.
* Higher percentages of U.S. teachers who had positive perception of two kinds of ICT use at school (*enough time to prepare lessons* and *sufficient opportunity to develop expertise*) often or always used ICT to *support inquiry learning*, r*einforce the learning of skills through repetition*, and *provide remedial or enrichment support to students* than did teacher who had a negative view of ICT use at school.
* A higher percentage of U.S. teachers who agreed or strongly agreed that they had *enough time to prepare lessons* often or always used ICT to *present information through class instruction* than did teachers who disagreed or strongly disagreed with this statement.
* Higher percentages of U.S. teachers who agreed or strongly agreed that they had *sufficient opportunity to develop expertise* often or always used ICT to *support student-led discussions* and *assess students' learning through tests* than did teachers who disagreed or strongly disagreed with this statement.

**Table 5. Percentage of eighth-grade teachers who often or always use ICT by perception of ICT use at school and teaching practice: 2018**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Enough time to prepare lessons** | | | | **Sufficient opportunity to develop expertise** | | | | **Sufficient technical support** | | | |
|  | **Agree or strongly agree** | | **Disagree or strongly disagree** | | **Agree or strongly agree** | | **Disagree or strongly disagree** | | **Agree or strongly agree** | | **Disagree or strongly disagree** | |
| **Teaching practice** | **Percent** | ***s.e.*** | **Percent** | ***s.e.*** | **Percent** | ***s.e.*** | **Percent** | ***s.e.*** | **Percent** | ***s.e.*** | **Percent** | ***s.e.*** |
| Present information through class instruction | 71 | *1.7* | 66 | *2.0* | 71 | *1.6* | 66 | *2.2* | 70 | *1.5* | 66 | *2.5* |
| Communicate with parents about students’ learning | 61 | *2.1* | 55 | *2.3* | 60 | *2.1* | 56 | *2.0* | 60 | *2.0* | 56 | *2.9* |
| Reinforce the learning of skills through repetition | 52 | *2.2* | 44 | *2.2* | 52 | *2.1* | 44 | *2.3* | 50 | *1.9* | 46 | *2.5* |
| Provide remedial or enrichment support to students | 52 | *2.8* | 44 | *2.2* | 52 | *2.7* | 44 | *2.2* | 51 | *2.3* | 45 | *2.9* |
| Support student-led discussions | 49 | *2.6* | 43 | *2.1* | 50 | *2.7* | 41 | *2.2* | 47 | *2.2* | 47 | *2.4* |
| Support inquiry learning | 49 | *2.1* | 38 | *2.1* | 48 | *2.0* | 40 | *2.0* | 46 | *1.8* | 41 | *2.9* |
| Assess students’ learning through tests | 45 | *2.4* | 39 | *2.2* | 48 | *2.5* | 35 | *2.2* | 46 | *2.1* | 36 | *3.5* |
| Support collaboration among students | 42 | *2.1* | 26 | *1.9* | 40 | *2.0* | 29 | *2.2* | 39 | *2.0* | 29 | *2.7* |
| Provide feedback to students on their work | 39 | *1.6* | 31 | *1.8* | 41 | *1.6* | 29 | *1.9* | 39 | *1.7* | 31 | *2.6* |
| Mediate communication between students and experts | 28 | *1.9* | 19 | *1.9* | 28 | *1.8* | 18 | *1.9* | 28 | *1.8* | 18 | *2.6* |

NOTE: Teaching practices are ordered by percentage of teachers, who agree or strongly agreed with having enough time to prepare lessons, using ICT in them, from largest to smallest. Standard error is noted by *s.e.* Additional notes will be added to future drafts.  
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), The International Computer and Information Literacy Study (ICILS), 2018.

Table 5.1. created by Yuqi on 2/6/23 that merged the three variables “Enough time to prepare lessons” “Sufficient opportunity to develop expertise”, “Sufficient technical support” into one. R code [here](https://github.com/yuqiliao/InternationalAssessment_DataViz/blob/master/Code/ICILS/ICILS%20RISE%20webinar%20analysis%20r%20script.R).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Merged perception of ICT Variable** | | | |
|  | **Positive perception of ICT** | | **Negative perception of ICT** | |
| **Teaching practice** | **Percent** | ***s.e.*** | **Percent** | ***s.e.*** |
| Present information through class instruction | 71 | *1.7* | 65 | *2.1* |
| Communicate with parents about students’ learning | 59 | *2.2* | 56 | *2.2* |
| Reinforce the learning of skills through repetition | 52 | *2.2* | 43 | *2.4* |
| Provide remedial or enrichment support to students | 51 | *2.7* | 45 | *2.5* |
| Support student-led discussions | 49 | *2.7* | 42 | *2.3* |
| Support inquiry learning | 48 | *2.2* | 38 | *2.4* |
| Assess students’ learning through tests | 47 | *2.5* | 35 | *2.5* |
| Support collaboration among students | 41 | *2.1* | 27 | *2.2* |
| Provide feedback to students on their work | 41 | *1.7* | 29 | *2.1* |
| Mediate communication between students and experts | 28 | *1.9* | 18 | *2.0* |

**Appendix A. Crosswalk for teaching practices**

The wording of teaching practices in 2018 ICILS teacher questionnaire is shortened for this report. This table provides a crosswalk of two versions.

|  |  |
| --- | --- |
| **Wording in 2018 ICILS teacher questionnaire** | **Wording in the report** |
| The presentation of information through direct class instruction | Present information through class instruction |
| The communication with parents or guardians about students’ learning | Communicate with parents about students’ learning |
| The reinforcement of learning of skills through repetition of examples | Reinforce the learning of skills through repetition |
| The provision of remedial or enrichment support to individual students or small groups of students | Provide remedial or enrichment support to students |
| The provision of feedback to students on their work | Provide feedback to students on their work |
| The support of inquiry learning | Support inquiry learning |
| The support of student-led whole-class discussions and presentations | Support student-led discussions |
| The support of collaboration among students | Support collaboration among students |
| The assessment of students' learning through tests | Assess students’ learning through tests |
| The mediation of communication between students and experts or external mentors | Mediate communication between students and experts |

1. The ICILS 2018 average is the average of all participating education systems meeting international technical standards, with each education system weighted equally. The countries included are Chile, Denmark, Finland, Italy, Kazakhstan, Republic of Korea, and Portugal. [↑](#footnote-ref-2)
2. Teachers’ total years of teaching are not taken into consideration in this question. Teachers could be using ICT since the beginning of his or her teaching career, but still reported less than 2 years of experience using ICT because they were new teachers. [↑](#footnote-ref-3)
3. Positive perception or view is defined as selecting “agree” or “strongly agree” for the selected ICT use in school items. Negative perception or view is defined as selecting “disagree” or “strongly disagree” for the these items. [↑](#footnote-ref-4)
4. The percentages for this study question are calculated as the number of teachers who did not select “*I do not use this practice with the reference class.*” over the number of teachers who responded to this item. [↑](#footnote-ref-5)
5. ICILS teachers refer to teachers from the countries that are included in the 2018 ICILS international average. [↑](#footnote-ref-6)
6. The percentages for this study question are calculated as the number of teachers who selected either *I often use ICT with this practice* or *I always use ICT with this practice* over the number of teachers who selected either *I never use ICT with this practice*, *I sometimes use ICT with this practice*, *I often use ICT with this practice*, or *I always use ICT with this practice*. [↑](#footnote-ref-7)
7. Teachers of information technology, computer science, or a similar subject [↑](#footnote-ref-8)
8. Teachers of general science and/or physics, chemistry, biology, geology, earth sciences, technical science, etc. [↑](#footnote-ref-9)
9. The teachers’ years of teaching experience are not taken into consideration in this question. Teachers could be using ICT since the beginning of his or her teaching career, but still reported less than 2 years of experience using ICT because they were new teachers. [↑](#footnote-ref-10)
10. Positive perception or view is defined as selecting “agree” or “strongly agree” for the ICT use items. Negative perception or view is defined as selecting “disagree” or “strongly disagree” for the ICT use items. [↑](#footnote-ref-11)
11. Positive perception or view is defined as selecting “agree” or “strongly agree” for the ICT use items. Negative perception or view is defined as selecting “disagree” or “strongly disagree” for the ICT use items. [↑](#footnote-ref-12)