A TOPICAL REVIEW OF EVALUATION INSTRUMENTS FOR COMPUTING EDUCATION

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BACKGROUND

- Want to study an intervention?
- Does this new thing I tried work in my classroom?
- Doing research?

You need a validated instrument

BUT HOW? WHERE ARE THEY? THIS IS TOO HARD…

- This work presents a taxonomy of research-based instruments for use in computing education that are available in publicly-accessible websites and databases

- Research question:

What evaluation and assessment instruments are available in accessible computing education venues and online databases?

METHODS – FINDING INSTRUMENTS

- Examined 297 articles in the https://csedresearch.org database (2012-2016), noting any instruments used within studies as well as articles related to instrument validation
- Examined the table of contents for the proceedings of the ACM ICER conference, the ACM journal Transactions on Computing Education, and Taylor and Francis' Computer Science Education in the years 2012-2016 to determine if additional instrument validation studies were published that were not covered by the database above (as it is specialized to research in pre-college computing activities),
- Searched several online databases for instruments, including American Evaluation Association, STELAR, The Pear Institute, Institute for the Integration of Technology into Teaching and Learning, MSPNet, Engineering is Elementary
- Used search engines to perform searches based on relevant keywords (e.g., computer science, inventory, survey, instrument, evaluation, interest, self-efficacy, etc.).
- Reached out to the community via listserv and social media for more suggestions

METHODS – DATA RECORDED ABOUT INSTRUMENTS

- Title of instrument
- Authors
- Year of publication
- Brief description of instrument
- Cost to use instrument
- Number of questions
- Type of questions
- Time required to complete instrument (or time limit)
- Target demographic
- Constructs assessed
- Reliability evidence presented
- Validity evidence presented
- URL to relevant article explaining instrument
- URL of instrument

ANALYSIS – COST AND AVAILABILITY

- 39 of 47 (83%) were available from article or related article
- 4 were obtained from the authors who agreed to allow them to be housed in https://csedresearch.org database for free usage by anyone interested.
- 1 instrument SCS1 is available to anyone who requests access and is free to use, but is not publicly available
- Overall 44 instruments (94%) are available and require no fee to administer

ANALYSIS – CONSTRUCTS ASSESSED

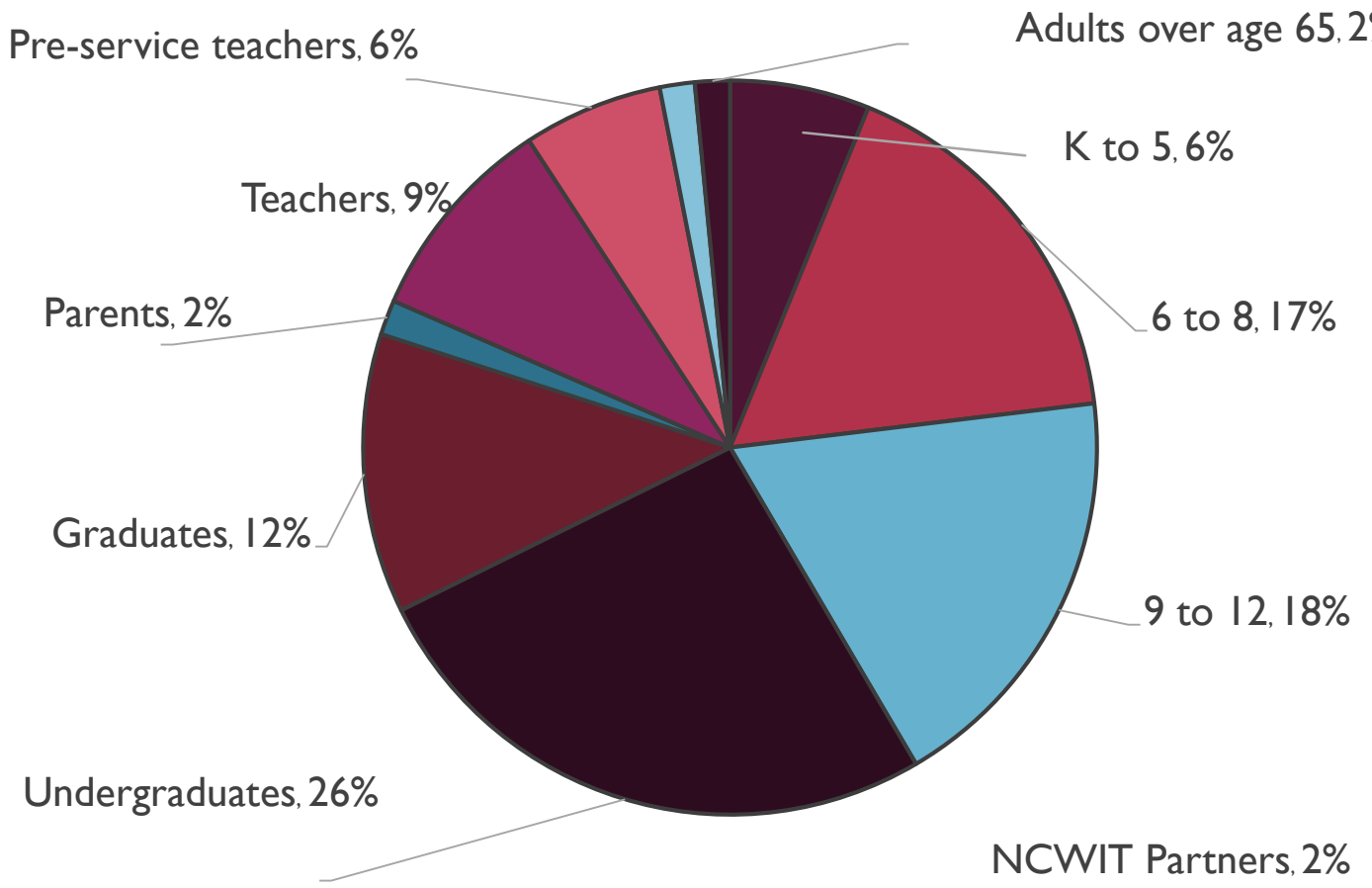
- 13 instruments (28%) measured cognitive constructs
  - computational thinking (6)
  - CS1 concepts (3)
  - CS2 concepts (1)
  - digital logic (1)
  - algorithmic analysis (1)
  - research skills (1)
- 31 instruments (66%) measured noncognitive constructs
- 4 instruments measured both cognitive and noncognitive constructs
- 8 instruments measured program evaluation

ANALYSIS – NUMBER AND TYPE OF ITEMS

Number of items	Number of instruments (%)
1 – 10	11 (23%)
11 – 30	19 (40%)
31 – 50	6 (13%)
> 50	9 (19%)

Type	No. of instruments (%)
Likert-type items only	18 (38%)
Multiple choice only	6 (13%)
Open-ended items only	2 (4%)
Likert & Multiple Choice	6 (13%)
Likert and Open Ended	2 (4%)
Multiple Choice and Open Ended	2 (4%)
All three types	4 (9%)

ANALYSIS – TARGET DEMOGRAPHIC



ANALYSIS – RELIABILITY AND VALIDITY

Reliability

- Reported for 28 (60%) of the instruments.
  - Cronbach's alpha or some other measure of internal consistency.
  - 2 instruments that showed evidence of test-retest reliability

Validity

- 24 (51%) of the instruments provide some evidence for their validity.
  - Face validity through expert opinion
  - Construct validity

- 20 instruments provided both evidence for reliability and validity

DISCUSSION

- Mostly for free (but in articles)
  - Post instrument separate from and in addition to the article
- Quick administration
  - Under 30 items, many Likert-type prompts
- Favored noncognitive
  - See our paper at 1:45
- Better validity evidence
- Many instruments rely on self-report

LIMITATIONS

- Search space limited
- One paper per instrument (often)
  - Data limited by what was in the paper

FUTURE WORK

- Make it accessible: https://csedresearch.org/evaluation-instruments/
- Add more: https://csedresearch.org/submit-to-repository/
- Working with AEA STEM TIG (evaluators interested in STEM) to share and distribute instruments and learn about new ones

VISIT: HTTPS://CSEDRESEARCH.ORG
ADD YOUR PAPERS AND INSTRUMENTS!

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