

Student Skills Inventories

Critical Thinking Measures

California Test of Critical Thinking Skills (CCTST)

This assesses critical thinking skills and is available on a variety of different scales: Analysis, Evaluation, Inference, Deduction, Induction, Interpretation, Explanation, Quantitative Reasoning, and Overall Reasoning Skills. This is a multiple-choice instrument which is available on paper or on-line. There is a charge for using it.

<http://www.insightassessment.com/Products/Products-Summary/Critical-Thinking-Skills-Tests/California-Critical-Thinking-Skills-Test-CCTST>

Critical Thinking Assessment Test (CAT)

This assesses a broad range of critical thinking skills. The test questions are derived from real world situations and most require short essay answers. There is a charge for using it.

<https://www.tntech.edu/cat/>

Additional Critical Thinking Instruments:

This is a website on the development of critical thinking skills in students. The main webpage is <http://www.criticalthinking.net/index.html>. The page specific to a large variety of critical thinking skills instruments is <http://www.criticalthinking.net/testing.html>.

Scientific Reasoning

Lawson Classroom Test of Scientific Reasoning (LCTSR)

Assesses reasoning patterns associated with hypothesis testing such as control of variables, correlational, probabilistic, proportional, and combinatorial reasoning. The second article presents a modified version of the original test.

Reference: Lawson, A. E. (1978). Development and validation of the classroom test of formal reasoning. *Journal of Research in Science Teaching*, 15(1), 11-24.

Lawson, A. E., Banks, D.L., & Logvin, M. (2007). Self-efficacy, reasoning ability, and achievement in college biology. *Journal of Research in Science Teaching*, 44(5), 706 -724.

Assessment of Scientific Argumentation in the Classroom (ASAC)

This is a classroom observation protocol for determining student conceptual or cognitive, epistemological, and social aspects of scientific argumentation. The book chapter for this instrument is available for purchase at http://link.springer.com/chapter/10.1007/978-94-007-2470-9_12.

Discourse in Inquiry Science Classrooms (DiISC)

This is a classroom observation protocol for scientific argumentation.

The reference manual for the DiISC can be found in the article: Baerk D, Bear R, Bueno-Watts N, Lewis E, Ozdemir G, Perkins G, Uysal S, Wong S, Yasar-Purzer S. Technical Report 001. The Communication of the Science Inquiry Project (CISIP). Arizona State University. The manual can be found at

<http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1120&context=teachlearnfacpub>.

Baker D, Lewis E, Purzer S, Nievita Bueno Watts G, Lang M (2009) International Journal of Environment & Science Education 4(3):259-274.

Lewis EB (2009) Longitudinal model using hierarchical linear modeling. In: *Secondary Science Teachers' Views Toward and Classroom Translation of Sustained Professional Development*. Dissertation, Arizona State University, p. 131

Science Literacy

Test of Scientific Literacy Skills (TOSLS)

The test measures skills related to major aspects of scientific literacy: recognizing and analyzing the use of methods of inquiry that lead to scientific knowledge and the ability to organize, analyze, and interpret quantitative data and scientific information.

Reference: Gormally, C., Brickman, P., & Lutz, M. (2012). Developing a Test of Scientific Literacy Skills (TOSLS): Measuring Undergraduates' Evaluation of Scientific Information and Arguments. *CBE Life Sciences Education*, 11(4), 364-377. doi: 10.1187/cbe.12-03-0026

Cognitive Skills

Cognitive Reflection Test (CRT)

The CRT was designed to assess a specific cognitive ability. It assesses individuals' ability to suppress an intuitive and spontaneous ("system 1") wrong answer in favor of a reflective and

deliberative ("system 2") right answer.

[http://www.sjdm.org/dmidi/Cognitive Reflection Test.html](http://www.sjdm.org/dmidi/Cognitive_Reflection_Test.html)

Toplak ME, West RF, Stanovich KE (2011) The Cognitive Reflection Test as a predictor of performance on heuristics and biases tasks. *Memory and Cognition* 39:1275-1289.

Frederick S (2005) Cognitive reflection and decision making. *Journal of Economic Perspectives* 19:25-42.

Student Approaches to Learning

Course Perceptions Questionnaire (CPQ)

This instrument measures the student perceptions of surface approach and deep approach of learning.

Reference Trigwell, K., Prosser, M., Ramsden, P., and Martin, E. (1998). Improving student learning through a focus on the teaching context. In Rust, C. (ed.), *Improving Student Learning*, Oxford Centre for Staff and Learning Development, Oxford, pp. 97–103.

Morgan AR (1995) Student Learning and Students' Experiences. In: *Open and Distance Learning Today*. Edited by Fred Lockwood, TJ Press, Cornwall, England.

Ramsden P (1991) A performance indicator of teaching quality in higher education: the Course Experience Questionnaire *Studies in Higher Education* 16: 129–150.

Study Process Questionnaire (SPQ)

Instrument with 42 self-report items and 6 sub-scales. The three important approaches to learning are categorized as: (1) surface--meeting the minimum requirements; (2) deep--an intrinsic interest in what is learned; and (3) achieving--enhancing ego and self-esteem through the competition for grades. <http://files.eric.ed.gov/fulltext/ED308200.pdf>

Biggs JB (1987) Study Process Questionnaire Manual. Student Approaches to Learning and Studying. Australian Education Research and Development Committee, Australian Council for Education Research, Radford House, Hawthorn, Australia. ISBN-0-86431-002-1.

Volet SE, Renshaw PD, Tietzel K (1994) A short-term longitudinal investigation of cross-cultural differences in study approaches using Biggs' SPQ questionnaire. *British Journal of Educational Psychology*. 63(2):301-318. DOI: 10.1111/j.2044-8279.1994.tb01104.x

Kember D and Leung DYP (1998) The dimensionality of approaches to learning: an investigation with confirmatory factor analysis on the structure of the SPQ and LPQ. *The British Psychological Society* 68(3):395-407.

Revised Study Process Questionnaire (R-SPQ)

The Biggs' Study Process Questionnaire (SPQ), an instrument for the evaluation of student learning in higher education, was revised over a three-year period with over 2500 higher education students. The original instrument structure of 42 items in 6 sub-scales was maintained with each item being subject to revision and assessed for internal consistency and appropriateness through a sequence of trial and retrieval. The final version consists of 8 original items and 34 revised items.

Zeegers, P (2002) A revision of the Biggs' Study Process Questionnaire (R-SPQ) Higher Education Research and Development 21(1):73-92. DOI: 10.1080/07294360220124666.

Biggs J, Kember D, Leung DYP (2001) The revised two factor Study Process Questionnaire: R-SPQ-2F. British Journal of Educational Psychology 71:133-149.

Approaches to Learning Inventory (ASI)

This instrument has 52 questions and measures dimensions of deep, strategic, and surface learning.

Entwistle N J and Ramsden P (1983) *Understanding student learning*. Croom Helm, London.

Entwistle N, Tait H and McCune V (2000) Patterns of response to an approaches to studying inventory across contrasting groups and contexts. European Journal of Psychology of Education 15: 33–48.

Ramsden P (1979) Student learning and perceptions of the academic environment. Higher Education 8: 411–427.

Ramsden P and Entwistle N J (1981) Effects of academic departments on students' approaches to studying British Journal of Educational Psychology 51:368–383.

Richardson, JTE (2003) Approaches to studying and perceptions of academic quality in a short web-based course. British Journal of Educational Technology 34(4):433-442.

Approaches and Study Skills Inventories for Students (ASSIST)

This 52 item instrument measures four subscales: deep approach, surface approach, surface apathetic approach, preferences for different types of course and teaching. There are also related subscales of fear of failure, lack of purpose, syllabus boundness, and unrelated memorizing.

Byrne M, Flood B, Willis P (2004) Validation of the approaches and study skills inventory for students (assist) using accounting students in the USA and Ireland: a research note. Accounting Education: An International Journal 13(4):449-459. 10.1080/0963928042000306792

Diseth A (2001) Validation of a Norwegian version of the approaches and study skills inventory for students (ASSIST): Application of structural equation modelling. *Scandinavian Journal of Education Research* 45(4):381-394. DOI:10.1080/00313830120096789

Entwistle N, McCune V, Tait H (2013) Approaches and Study Skills Inventory for Students (ASSIST). Incorporating the Revised Approaches to Studying Inventory. Report of the development and use of the inventories.

http://scholar.google.com/scholar_url?url=http://www.researchgate.net/publication/50390092_Approaches_to_learning_and_studying_inventory_%28ASSIST%29_%283rd_edition%29/file/e0b49524f139191b05.doc&hl=en&sa=X&scisig=AAGBfm2FBcU1WinTt0KumXwI4ecc-UmZjA&nossl=1&oi=scholar

Rolheiser C, Seifert T, McCloy C, Gravestock P, Steward G, Greenleaf E, Burnett M, Carpenter S, Pottruff B, McKean S. (2013) In: *Developing Teaching Assistants as Members of the University Teaching Team*. Higher Education Quality Council of Ontario, ON, Canada.

Student Perceptions of Learning (SPL)

This instrument measures quantitative increase in knowledge, memorization, abstraction of meaning, understanding of reality.

Marton F and Säljö R. (1997). Approaches to learning. In F. Marton, D. Hounsell & N. Entwistle (Eds.), *The Experience of Learning* (2nd Ed.), (pp. 39-58). Edinburgh: Scottish Academic Press.

Marton F. and Säljö R. (1976) On qualitative differences in learning. I – Outcome and Process' *British Journal of Educational Psychology* 46, pp. 4-11.

Marton, F., Hounsell, D. and Entwistle, N., editors (2005) *The Experience of Learning: Implications for teaching and studying in higher education*. 3rd (Internet) edition. Edinburgh: University of Edinburgh, Centre for Teaching, Learning and Assessment. pp. 106-125.