Student Views/Attitudes/Affective Instruments

Views about science

Views about Science Survey (VASS)

Measures student beliefs about the nature of science and learning science.

Reference: Halloun, Ibrahim and David Hestenes. (1998) Interpreting VASS dimensions and profiles. *Science & Education*, 7(6), 553-577.

Views on Science and Education (VOSE)

Assesses attitudes towards, knowledge of, and teaching practices related to the nature of science.

Reference: Chen, (2006). Development of an Instrument to Assess Views on Nature of Science and Attitudes Toward Teaching Science. *Science Education,* 90, 803-819.

Views on Science, Technology, and Society (VOSTS)

Measures student views on the social nature of science and how science is constructed.

Reference: Aikenhead, G.S., and Ryan, A.G. (1992). The development of a new instrument: "Views on Science-Technology-Society" (VOSTS). *Science Education*, 76, 477–491.

Views about learning science

Transformative Experiences

This instrument is designed to measure a transformative experience which is defined as a learning episode in which a student acts on the subject matter by using it in everyday experience to more fully perceive some aspect of the world and find meaning in doing so.

Reference: Pugh, K. J. (2004). Newton's laws beyond the classroom walls. *Science Education, 88*, 182-196. doi: 10.1002/sce.10109

Student Course Engagement Questionnaire

Measures perceived student skills of engagement, participation/interaction engagement, emotional engagement, and performance engagement in a course.

Reference: Handelsman, M.M., Briggs, W.L., Sullivan, N, and Towler, A. (2005). A measure of college student course engagement. *Journal of Educational Research,* 98, 184.

Undergraduate Research Student Self-Assessment (URSSA)

Measures perceived research skills gained during a research experience. The website is http://www.colorado.edu/eer/research/undergradtools.html.

Hunter, A-B., Laursen, S.L., and Seymour, E. (2007). Becoming a scientist: the role of undergraduate research in students' cognitive, personal, and professional development. *Science Education*, 91, 36–74.

Summer Undergraduate Research Experience (SURE) and Classroom Undergraduate Research Experience (CURE) surveys.

The SURE and CURE Surveys measure student perceptions of how participating in an undergraduate research experience or CURE has influenced them. The surveys are available at http://www.grinnell.edu/academics/areas/psychology/assessments/cure-survey and http://www.grinnell.edu/academics/areas/psychology/assessnebts/sure-iii-survey.

References: Lopatto D (2004) Survey of Undergraduate Research Experiences (SURE): First Findings. Cell Biology Education 3:270-277.

Lopatto D (2007) Undergraduate research experiences support science career decisions and active learning CBE-Life Sciences Education 6:297-306.

Denofrio LA, Russell B, Lopatto D, Lu Y (2007) Linking student interests to science curricula. Science 318, 1872-1873.

Views about specific disciplines

Colorado Learning Attitudes about Science Survey (CLASS-BIO, CHEM, or PHYSICS)

CLASS-Bio, chem, or physics examines how students perceive the fields of biology (or chemistry or physics) and compares them with experts' perceptions. Depending on the subject (bio, chem, or physics) it measures aspects of the following: Real World Connections, Personal Interest, Sense Making/Effort, Conceptual Connections, Conceptual Understanding, Problem Solving. Website: http://www.colorado.edu/sei/class/

CLASS-BIO: Semsar, K., Knight, J. K., Birol, G., & Smith, M. K. (2011). The Colorado Learning Attitudes about Science Survey (CLASS) for use in biology. *CBE-Life Sciences Education, 10*(3), 268-278.

Douglas, K. A., Yale, M. S., Bennett, D. E., Haugan, M. P., & Bryan, L. A. (2014). Evaluation of Colorado Learning Attitudes about Science Survey. *Physical Review Special Topics-Physics Education Research*, *10*(2), 020128.

CLASS-CHEM: Barbera, J., Perkins, K.K., Adams, W.K., and Weiman, C.E. (2008). Modifying and Validating the Colorado Learning Attitudes about Science Survey for Use in Chemistry. *Journal of Chemical Education,* 85, 1435 – 1439.

Heredia, K., & Lewis, J. E. (2012). A psychometric evaluation of the Colorado Learning Attitudes about Science Survey for use in chemistry. *Journal of Chemical Education*, *89*(4), 436-441.

CLASS-PHYSICS: Adams, W.K., Perkins, K.K., Podolefsky, N.S., Dubson, N.D., Finkelstein, N.D., and Wieman, C.E. New instrument for measuring student beliefs about physics and learning physics: The Colorado Learning Attitudes about Science Survey. *Phys. Rev. ST Phys. Educ. Res.* 2, 010101 – Published 10 January 2006.

Epistomological Beliefs Assessment in Physical Sciences (EBAPS)

Probes students' epistemologies, their views about the nature of knowledge and learning in the physical sciences.

Reference: Elby, A. (2001). Helping physics students learning about learning. American Journal of Physics (Physics Education Research Supplement), 69, S54-64.

Maryland Physics Expectations Survey (MPEX)

Probes student attitudes, beliefs, and assumptions about physics on a 34-item Likert-scale (agree-disagree) survey.

Reference: Redish, E.F., Steinber, R.N., and Saul, J.M. (1998). Student Expectations in Introductory Physics. *American Journal of Physics,* 66, 212-224.

Biology Attitude Scale

This is a 22-item instrument that is designed to measure students' feelings of like or dislike about biology. Fourteen of the items use a Likert-type scale and 8 items use a semantic differential scale.

Reference: Russell, J., and S. Hollander. 1975. A biology attitude scale. American Biology Teacher 37 (5): 270–273.

Motivation

Achievement Goal Questionnaire

This measures sub-components of achievement: mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance goals.

Reference: Elliot, A. J., & McGregor, H. A. (2001). A 2 × 2 achievement goal framework. Journal of Personality and Social Psychology, 80:501–519.

Science Motivation Questionnaire (SMQ)

This measures five motivational constructs in college science students: intrinsic motivation, self-determination, self-efficacy, career motivation, and grade motivation. http://www.coe.uga.edu/outreach/programs/science-motivation. Science educators have permission to use the Science Motivation Questionnaire © 2006 Shawn M. Glynn & Thomas R. Koballa, Jr. if they cite the Glynn & Koballa (2006) and Glynn et al. (2009).

References: Glynn, S. M., Taasoobshirazi, G., & Brickman, P. (2009). Science Motivation Questionnaire: Construct validation with nonscience majors. Journal of Research in Science Teaching, 46:127-146.

Glynn, S. M., & Koballa, T. R., Jr. (2006). Motivation to learn college science. In J. J. Mintzes & W. H. Leonard (Eds.), *Handbook of college science teaching*, pp. 25-32. Arlington, VA: National Science Teachers Association Press.

Science Motivation Questionnaire II (SMQ-II)

The SMQ-II assesses components of students' motivation to learn science in college and high school courses. Science educators who wish to use the Science Motivation Questionnaire II © 2011 Shawn M. Glynn for research and teaching have permission to do so if they cite Glynn et al. (2011) and comply with the fair use of this copyrighted and registered questionnaire. http://www.coe.uga.edu/outreach/programs/science-motivation

Reference: Glynn, S. M., Brickman, P., Armstrong, N., & Taasoobshirazi, G. (2011). Science motivation questionnaire II: Validation with science majors and non-majors. Journal of Research in Science Teaching 48(10):1159-1176. doi: 10.1002/tea.20442

Motivated Strategies for Learning Questionnaire (MSLQ)

A Likert-scaled instrument to assess motivation and use of learning strategies by college students. Motivation scales are in three broad areas: value, expectancy, and affect. Cognitive strategies scales are in cognitive, metacognitive, and resource management strategies.

Reference: Pintrich, P.R., and D.A.F. Smith. 1993. Reliability and predictive validity of the motivated strategies for learning questionnaire (MSLQ). Educational and Psychological Measurement 53(3): 801–813.

Ownership

Project Ownership Survey (POS)

The Project Ownership Survey (POS) instrument of 18 scaled items was generated based on prior research and theory related to project ownership and combined with 30 items shown to measure respondents' emotions about an experience.

References: Hanauer, D.I., Frederick, J., Fotinakes, B., Strobel, S.A. (2012). Linguistic analysis of project ownership for undergraduate research experiences. CBE Life Sciences Education, 11:378–385.

Hanauer, D., and Dolan, E. L. (2014). The Project Ownership Survey: Measuring Differences in Scientific Inquiry Experiences, *CBE Life Science Education,* Spring; 13(1): 149–158. doi: 10.1187/cbe.13-06-0123 .

Sense of Belonging

Sense of Belonging Instrument (SOBI)

The SOBI is a 27 item self-reporting instrument of a scored subscale that assesses the dimensions of fit and valued involvement.

References: Hagerty, B.M. & Patusky, K.L. (1995) Developing a measure of sense of belonging. Nursing Research 44:9–13.

Williams, R.A., Hagerty, B.M., Andrei, A.C., Yousha, S.M., Hirth, R.A., Hoyle, K.S. (2007). STARS: Strategies to assist Navy recruits' success. Military Medicine, 172, 942-949.

Choenarom C, Williams RA and Hagerty BM (2005) The role of sense of belonging and social support on stress and depression in individuals with depression. Archives of Psychiatric Nursing 19(1):18-29.

Beliefs about Intelligence

Beliefs about intelligence instrument

The beliefs about intelligence instrument is a 6-point Likert-type scale that measures motivational variables including implicit theories of intelligence, goal orientation, beliefs about effort, and attributions and strategies in response to failure.

Reference: Blackwell LS, Trzesniewski KH, Dweck CS (2007) Implicit theories of intelligence predict achievement across adolescent transition: A longitudinal study and an intervention. Child Development, 78(1):246-264.

Self-Efficacy

Patterns of Adaptive Learning Scales (PALS)

Designed for younger students, but also published with college students, this instrument measures achievement goal orientation. http://www.umich.edu/~pals/pals/index.html

Reference: Midgley C, Maehr ML, Hruda LZ, Anderman E, Freeman KE, Gheen M, Urdan T (2000). *Manual for the patterns of adaptive learning scales (PALS)*. Ann Arbor, MI: University of Michigan.

Self-Efficacy for Learning Form (SELF)

The SELF is a 57-item instrument to measure self-efficacy across five dimensions including reading, studying, test preparation, note-taking, and writing. http://www.uky.edu/~eushe2/Pajares/SelfEfficacyForLearningZimmerman.pdf

Reference: Zimmerman BJ, Kitsantas A, and Campillo (2005) Evaluación de la autoeficacia regulatoria: Una perspectiva social cognitiva. Evaluar, 5, 1.

Biology Student's (College Biology Self-Efficacy)

This 23 item instrument measures students' self-reported confidence in understanding and using biology in their lives.

Baldwin JA, Ebert-May D, Burns DJ (1999). The development of a college biology self-efficacy instrument for nonmajors. Sci Educ 83, 397–408.

Self-Efficacy to Learn Statistics (SELS)

This instruments measures whether statistics self-efficacy is related to statistics performance, and whether self-efficacy for statistics increases during an introductory statistics course

Reference: Finney S and Schraw G (2003). Self-efficacy beliefs in college statistics courses. Contemporary Educational Psychology. 28(2):161—186.

Student Evaluation of Instructional Practices

Student Evaluation of Educational Quality (SEEQ) questionnaire

This 24-item instrument assesses the six scales of learning, enthusiasm, organization, group, rapport, and breadth.

References: Coffey M and Gibbs G (2001) The evaluation of student evaluation of educational quality questionnaire (SEEQ) in UK higher education. Assessment & Evaluation in Higher Education 26(1):89-93.

Gibbs G and Coffey M (2004) The impact of training university teachers on their teaching skills, their approach to teaching and the approach to learning of their students. Active Learning in Higher Education 5(1):87-100.

General Science Education Research Instrument Site

Field-Tested Learning Assessment Guide (FLAG) website

The FLAG website offers broadly applicable, self-contained modular classroom assessment techniques (CATs) and discipline-specific tools for STEM instructors interested in new approaches to evaluating student learning, attitudes and performance. Each has been developed, tested and refined in real colleges and universities classrooms.

The FLAG also contains an assessment primer, a section to help you select the most appropriate assessment technique(s) for your course goals, and other resources.
http://www.flaguide.org/index.php

Informal Science Education Site

Informal science education is the study of science learning outside of the formal classroom environment (e.g., science centers, science clubs, science TV shows). The Center for Advances of Informal Science Education (CAISE) site offers broadly applicable instruments and projects for informal science education assessment. http://informalscience.org/