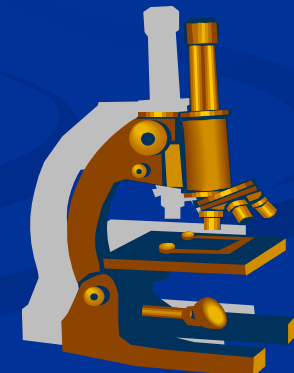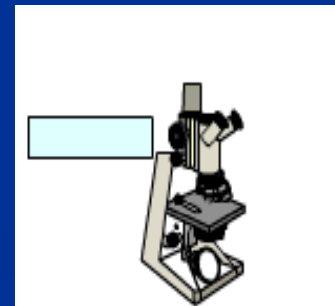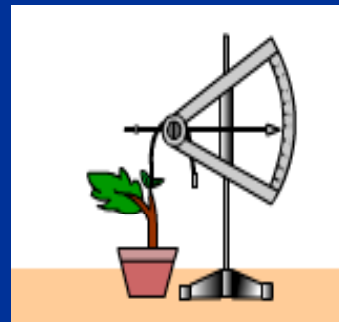# EVALUATION IN SCIENCE EDUCATION

Nuryani Y. Rustaman
Science Education
INDONESIA UNIVERSITY OF EDUCATION

EVALUATION IN SCIENCE EDUCATION

- **3 Credit Semester Hours**
- **2nd SEMESTER**
- **Compulsary for S-2 Program**
- **(Post) Graduate Students of Biology/Chemistry/Physics Education**
- **Elective course for S-3 Program with Pure Science background (Biologists, Chemists, Physicists)**

REFERENCES

- National Research Council/NRC. (1996). Assesment in Science Education. In *National Science Education Standard.* Wasington D.C.: National Academy Press.

- Stiggins, R.J. (1994). *Student Centered Classroom Assessment.*

FURTHUR READING

- **Standard Kompetensi Lulusan (SKL)**
- **Standard Isi**
- **Standard Penilaian (?)**
- **Popham, W.J. (2005).** *Classroom Assessment: What Teachers Need to Know*. **Boston: Allyn and Bacon.**
- **Marzano,, R.J. (2006).** *Classroom Assessment & Grading that Work. Alexandria, Virginia: ASCD*
- **Anderson, I.W. & Krathwohl, D.R. (2001).** *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Taxomoy of Education Objectives*. **New York: Longman**
- **Herman, … (1993), Assessing**
- **Haladyna, .. (1997).** *Writing Test for Higher Order Thinking. ….*
- **Jacob, .L.C. & Chase, C.I. (1992).** *Developing and using Test Effectively: A Guide for Faculty*. **San Francisco: Jossey-Bass**
- **Zainul, A. (2001).** *Alternative Assessment.* **Jakarta: Pusat Antar Universitas. Dirjen DikTi, Depdiknas.**

Interelasi antar konsep: Doran, Lawrenz & Helgenson (1995)

EVALUATION

TESTING

MEASUREMENT
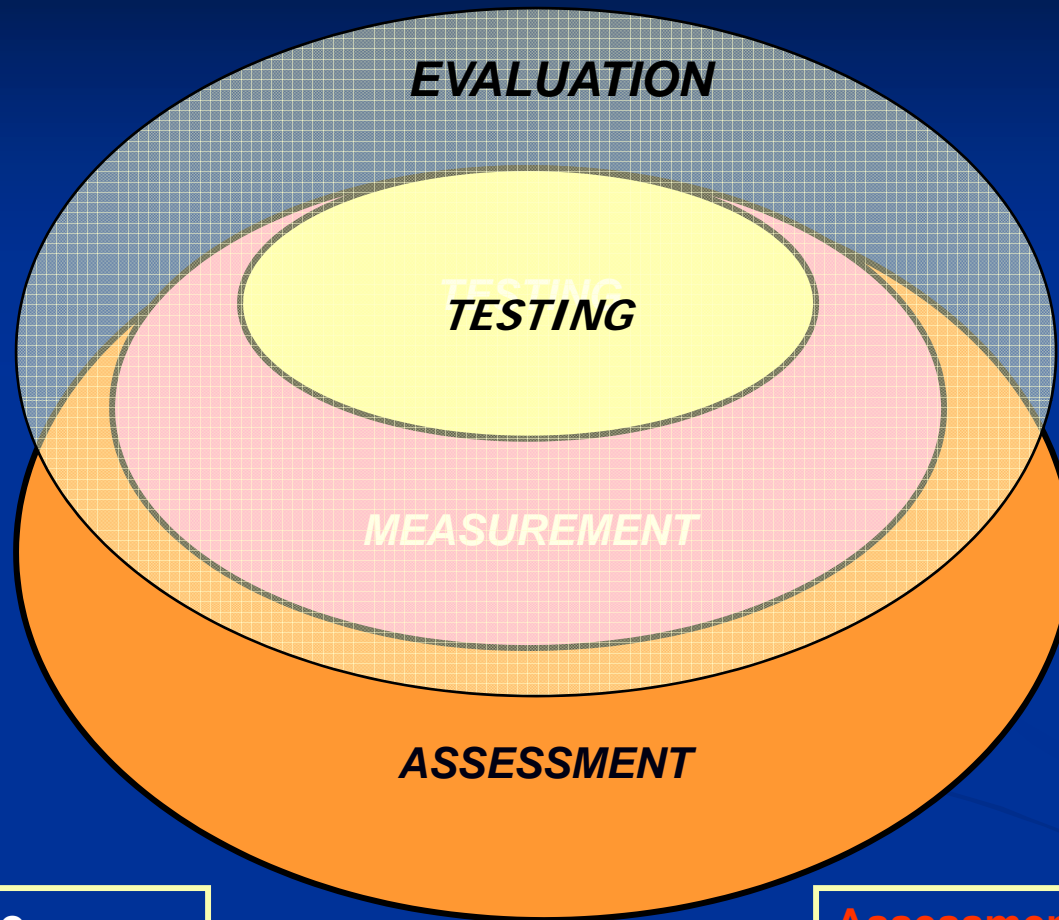
ASSESSMENT

Evaluation: to evaluate the data which was collected through assessment

Assessment = the process of collecting data which shows the development of learning (Aikenhead, 1997)

HUBUNGAN

EVALUASI

❑ Lebih menekankan pada pengukuran hasil belajar
❑ Pada akhir pembelajaran

ASESMEN

❑ Menekankan pada proses *dan* hasil belajar
❑ Dilaksanakan selama pembelajaran
❑ Berpihak pada yang diases
❑ Untuk mengembangkan potensi individu yang diases
❑ Terkait pencapaian kurikulum

PENGUKURAN

➢ Mendapat informasi tentang karakteristik subyek dalam bentuk kuantitatif

INSTRUMEN

➢ Penilaian Acuan Norma
➢ Penilaian Acuan Patokan (PAN & PAP)

TES

NON TES

Tertulis, lisan, observasi kinerja atau proses

Assessment literacy is the key

- *Assessment literates* adalah mereka yang memahami **prinsip dasar** asesmen yang baik.
- Asesmen yang baik **rmenghubungkan** pembelajaran **berkualitas dan** upaya untuk mempertahankan penggunaan asesmen alternatif yang seimbang.
- Kita harus menunjukkan **standard tinggi** dengan bertindak secara bertujuan untuk mempertemukan konteks akhir semua standar dan dengan menunjukkannya kepada yang lain apabila mereka gagal melakukan pengujian.
- **Pd masa depan** asesmen akan terus melayani u/ 2 keperluan:
  - → penyedia informasi untuk pengambilan keputusan *and*
  - → sebagai perangkat pengajaran *(teaching tools)* untuk mengambil manfaat dari kekuatan asesmen untuk mempromosikan pembelajaran.

Changing Assessment Roles and Practices

Changing Roles	Former	Current
Teacher	Teach	Define outcomes, teach, conduct the primary assessments
Student	Be assessed	Assess self and peers
Principal	Interpret standardized test results	Interpret results and provide support in classroom assessment
Changing Practices	Former	Current
Purposes	Accountability	Accountability, instruction
Uses	Test results filter from top down	Results filter top down and from classroom up
Targets	General in nature Not openly shared	Highly focused Openly shared with all
Method	Primarily Selected Response	Primarily Essay and Performance Assessment with some Selected Response

Changing Emphases in Assessment

SHIFT FROM	TOWARDS
Assessing knowledge	Assessing skills and understandings
Assessing products	Assessing process
External end course assessment	Internal during course assessment
Written assessment only	Use of a variety of methods & evidence
Norm-referencing	Criterion referencing
Pass/fail summative assessment	Formative identification of strengths & weaknesses and recording of positive achievement

Changing Emphases on Science Education Assessment

Less emphasis on	More emphasis on
Assessing what is easily measured	Assessing what is **most highly valued**
Assessing discrete knowledge	Assessing rich, well-structured knowledge
Assessing scientific knowledge	Assessing scientific understanding and **reasoning**
Assessing to learn what Ss do not know	Assessing to learn what Ss do **understand**
Assessing only achievement	Assessing achievement and **opportunity to learn**
End of term assessments by teachers	Ss engage in **ongoing assessment of their work and what of others**
Development of external assessments just by measurement experts	**Teachers involved** in the development of external assessments

Assessment focused on Science Learning Processes

- Performance and/or authentic assessment;
- Science processes derived from data;
- Cooperative and collaborative;
- Hands-on and minds-on;
- Practical skills and communicative skills;
- Scientific attitudes and value embedded in science.

Tipe/Kategori Utama
Target Pencapaian yang penting

- **Penguasaan substansi pengetahuan bidang studi;**
- **Kemampuan Ss untuk menggunakan pengetahuan untuk bernalar dan memecahkan masalah;**
- **Kemampuan u/ menunjukkan keterampilan tertentu, seperti tindakan-tindakan psikomotor;**
- **Kemampuan u/ menciptakan jenis-jenis produk tertentu, seperti karya kerajinan atau robot;**
- **Perolehan jenis perasaan atau keadaan afektif tertentu, spt sikap, minat, predisposisi motivasi.**

(Stiggins,1994: 67)

Assessment on Learning Outcomes

- **Target sangat terfokus,** khususnya pada: penalaran, pemahaman pada konten bidang studi serta aplikasinya;
- **Kebiasaan berpikir produktif** (berpikir kritis, berpikir kreatif, pengaturan diri);
- **Berpikir tingkat tinggi** atau *higher order thinking skills* (HOTS);
- **Disposisi bidang tertentu** seperti *science disposition, mathematics disposition*.

Penilaian Berbasis Kelas (PBK)

- dilaksanakan secara terpadu dgn seluruh KBM (awal, tengah, akhir) dan Manajemen Berbasis Sekolah
- dalam rentang waktu tertentu
- melibatkan multimetode & multitarget
- keseimbangan ranah kognitif-afektif-psikomotor
- bentuk/model: formal/informal, di dalam/luar kelas
- menggambarkan keutuhan profil prestasi & kemajuan belajar individu siswa
- melibatkan siswa, orangtua & guru
- dilakukan dengan pengumpulan
    kerja (portofolio), hasil karya (produk), penugasan (proyek), kinerja (performa), tes tertulis.

Cara Pengumpulan Informasi

No	Cara penilaian	Apa yg dinilai	Bentuk Penilaian
1.	Tertulis, objektif	Jawaban tertulis	B-S, Isian singkat, Pilihan Ganda, Menjodohkan
2.	Tertulis, subjektif	Jawaban tertulis	Pengerjaan soal, latihan, *reading comprehension*, data-pertanyaan, esai bebas, esai berstrktur
3.	Lisan	Suara	Tanya jawab singkat, kuis, pelafalan, membaca nyaring, menyimak, instruksi lisan, percakapan
4.	Unjuk kerja	Penampilan /perbuatan /tindakan	Permainan, bermain peran, drama, demonstrasi, olahraga, senam, permainan musik, bernyanyi, dinamika kelompok, berdoa, debat, memelihara ternak/ tanaman, deklamasi, pidato/khotbah, diskusi, wawancara, bercerita

No	Cara penilaian	Apa yg dinilai	Bentuk penilaian
5.	**Produk**	**Karya 3 dimensi**	**Patung, kerajinan tangan, alat, model, pesawat sederhana, ternak, simpul tali temali, janur, hiasan buah-buahan.**
6.	Portofolio	**Karya 2 dimensi**	**Puisi, karangan, gambar, peta/ denah, tulisan, desain, makalah, laporan observasi/penyelidikan/ eksperimen, sinopsis, naskah pidato, naskah drama, rumus, kartu ucapan, surat, komposisi musik, teks lagu, resep masakan**
7.	**Sikap**	**Tingkah laku**	**Skala sikap, catatan anekdot, penilaian diri, sosiogram, kuesioner, buku harian, ungkapan perasaan, pengamatan perilaku**
8.	**Tugas/ Proyek**	**Tanggung jawab**	**Penugasan (*assignment*), penilaian proyek, kerja individual, kerja kelompok**

KRITERIA PENILAIAN KELAS

- **VALIDITAS**: hasil penilaian dapat ditafsirkan sebagai apa yang akan dinilai.

- **RELIABILITAS:** hasil penilaian ajeg, menggambarkan kemampuan yang sesungguhnya.

- **FOKUS KOMPETENSI**: pencapaian kompetensi yang sesuai kur, materi terkait langsung dengan indikator pencapaian.

- **KOMPREHENSIF:** informasi yang diperoleh cukup untuk membuat keputusan.

- **OBJEKTIF**: adil, terencana, berkesinambungan

- **MENDIDIK** : penilaian untuk memperbaiki proses pembelajaran dan meningkatkan kualitas belajar

➔ **BAGAIMANA CARANYA ???**

Assessment focused on Science Learning Processes

- Performance and/or authentic assessment;
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Methods of Classroom Assessment

	SELECTED RESPONSE	ESSAY ASSESSMENT	PERFORMANCE ASSESSMENT	PERSONAL COMMUNI-CATION
KNOW	VVVV			
REASON				
SKILL			VVV	
PRODUCT			VVV	
AFFECT	VVV			

Group, Self and Peer Assessments

Group, self and peer assessment can be used
➔ for formative assessment (especially)
➔as summative assessment as well

Group Assessment
A major advantage of group assessment is that the marking burden for staff can be significantly reduced. There are also strong educational benefits, including the development of a range of important skills such as team and leadership skills, communication skills and organisational skills. In addition, teams or groups can achieve more than individuals and tackle more complex issues.

Students internalize the criteria for high-quality work

Students understand the process of getting to the standard

1

2

Group, Self and Peer Assessments

3

Teachers involve students in the monitoring process and shift some of the responsibility for documenting and justifying learning to the students

Research has demonstrated that high-performing learners do:

(i) Self-monitor;
(ii) Self-correct;
(iii) Use feedback from peers to guide their learning process

Self & Peer Assessment (1)

Peer & Self assessment :
➔ **innovative forms of assessment** that support student learning.

Self Assessment:
 * a **process** where students are **involved in & are responsible for assessing their own piece of work.**
 * encourages Ss to become **independent learners & increase motivation.**
 * may be used to help **develop** in students the **ability to examine & think critically** about their learning,
 * help Ss to determine what criteria should be used in judging their work and to apply these objectively to their own work ➔ to **facilitate their continuing learning.**
 * may be undertaken as **part of** the **assessment requirements** of a course or as an exercise within the course's requirements.

Self & Peer Assessment (2)

Peer Assessment

- **= where Ss are involved in the** assessment of the work of other students with a clear understanding of what they are to look for in their peers' work.

- may be used to develop in students the ability to work cooperatively, to be critical of others′ work and receive critical appraisals of, and feedback on their own work.

- may provide students with some insight into the criteria to be used for marking a piece of assessable work.

- may also be a way of ascribing a mark or grade to Ss′ work for summative purposes.
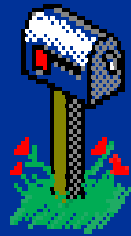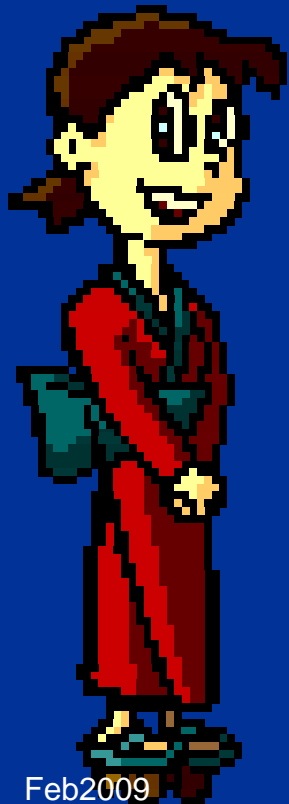
Assessment Criteria

Sample Assessment Criteria for an Oral Presentation

Sample Criteria for Assessment of Team Functioning

- Does the content relate to the title and/or purpose of the presentation? The message clear? The argument consistent? Conclusions drawn appropriately?
- Sufficient evidence to support arguments? Evidence of appropriate critical thinking?
- The focus sharp? The presenter put her/his own point of view?
- Organization and management (time-keeping, management of Qs or comments)
- Presentation (audibility, articulation, presence, posture, eye contact, confidence
- Use of resources (quality, fitness for purpose, OHT, handouts, use of board or flipchart, use of other resources)
- Overall structure (coherency, appropriateness of structure, identity of beginning, summary, middle and end conclusion, 'signposting' of structure
- Creativity (use of imagination in content or presentation, originality)

- The student is engaged in the group and with the group
- can show qualities of leadership
- is able to provide direction for group activity
- is involved in the execution of the project work
- can play a supporting role of others in group activity
- can suggest solutions
- is involved in the presentation of the group's work
- demonstrates interest in the maintenance of the group functioning as well as the project