

# Assessing the Process and Product of Learning in Mathematics

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# **What is Assessment?**



Assessment methods are

- strategies,
- techniques,
- tools and
- instruments

for collecting information

to determine the extent to which students  
**demonstrate desired learning outcomes.**

## Purposes of assessment

- to cater information about **skills** in a content area
- to give **feedback**
- to propose **further** instruction
- to **improve** instructional practices
- to **concentrate** on what the student can do
- to guide **decisions** about instruction (Formative)



## Purpose of Test or Exam

- to provide **feedback** about skills learned or obtained via instruction
- to determine the areas in which an individual **needs** re-teaching
- to provide **grades**
- to **focus** on what the student cannot do
- to indicate attainment of **skills** (Summative)

# Important of Assessment

- Provide
  - to students a chance to reflect - learned
  - to teachers a chance to reflect - taught well and what needs further attention
- Provide feedback
  - to the teacher on the clarity of given assessments
  - to teachers about the progress of learning



## **What can Assess ?**

- Achievement
- Personality
- Skill
- Opinion
- Attitude

# Types of Assessment

- Collaborative/group projects
- Direct observation Essays
- Examinations (unseen), Examinations (seen/open book)
- Multiple-choice tests, Oral questioning after observation
- Performance projects, Portfolios
- Practical projects, Presentations
- Problem sheets, Projects
- Self-assessment, Case-studies
- Short-answer questions



# **Performance Assessment**

Task 1:

A staircase with 3 steps is made up of by 6 blocks. If Ali had 21 blocks to build a staircase, then how many steps would there be?



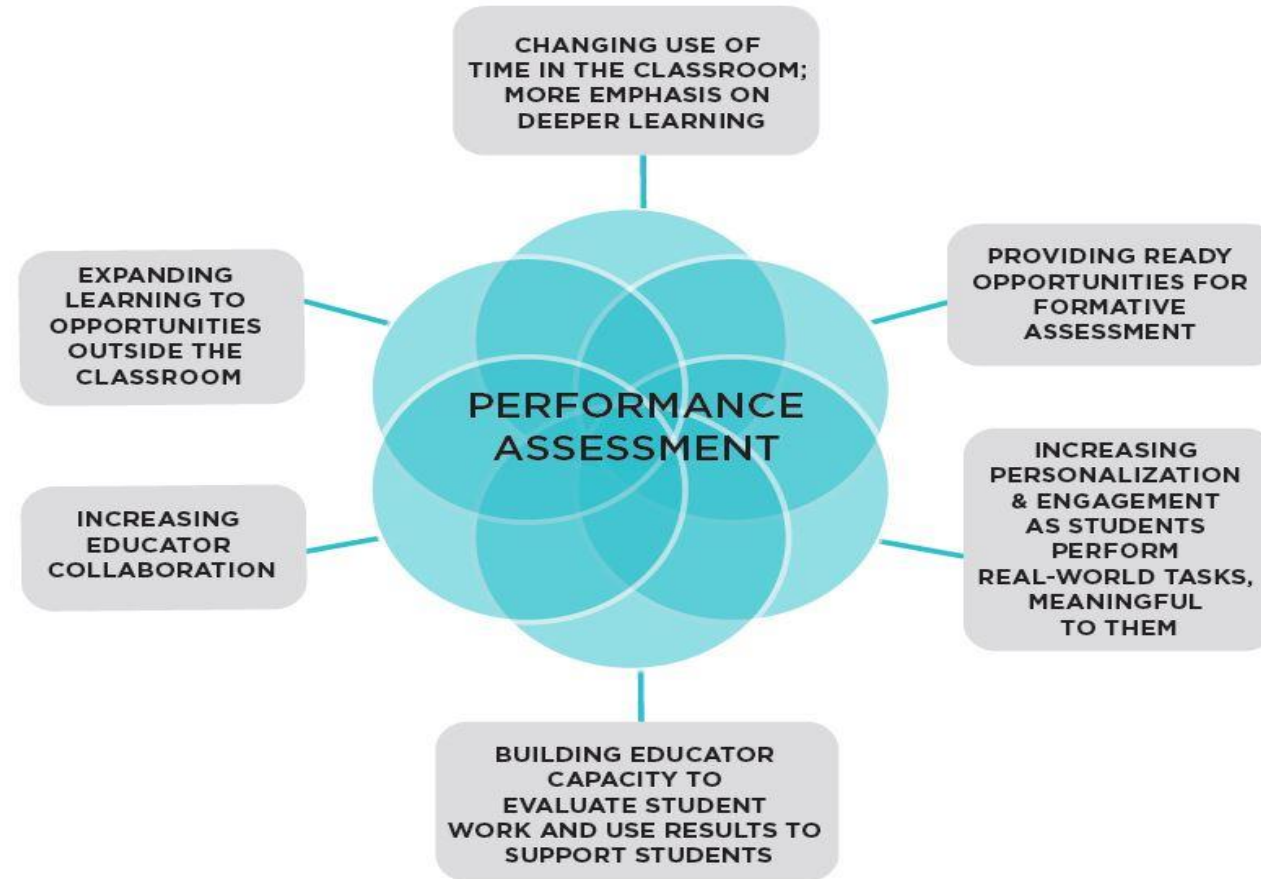
## Performance Assessment

Demonstration  
and  
application of  
knowledge,  
skills, and  
work habits

Task be  
meaningful and  
engaging to  
students

Help them  
make  
connections to  
their personal  
lives.

FIGURE 2. MULTIPLIER EFFECT OF PERFORMANCE ASSESSMENTS





## Example:

# Performance assessment built around a complex reasoning task, such as problem solving - requires the synthesis of information from multiple sources.

# As students sort through the information and draw conclusions, a teacher can observe students' reasoning skills in action and, if necessary, provide support to those who are struggling.

# This would be a type of formative assessment.

# The students' final presentations, on the other hand, may be judged based on a rubric and given a score.

# That would be an example of using a performance task as a summative assessment.

# Criteria For Assessment



Assessment for mathematics courses in all years programme is criterion-related, based on four equally weighted assessment criteria:

Criterion A Knowing and understanding	Maximum 8
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Criterion B Investigating patterns	Maximum 8
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Criterion C Communicating	Maximum 8
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Criterion D Applying mathematics in real-life contexts	Maximum 8
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Task 2:

Participants required to develop criteria for assessment for task 1.



# Methods of Assessment

# Methods of Assessment

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graph TD; A[Methods of Assessment] --> B[Strategies, techniques, tools and instruments for collecting information to determine the extent to which students demonstrate desired learning outcomes.]; B --> C[Direct and Indirect];
```

Strategies, techniques, tools and instruments for collecting information to determine the extent to which students demonstrate desired learning outcomes.

Direct and Indirect





The diagram consists of two large, overlapping circles. A third, smaller circle is positioned to the left of the top circle, overlapping its edge. The top circle contains the text 'Direct' and 'Ask students to demonstrate their learning'. The bottom circle contains the text 'Indirect' and 'Ask students to reflect on their learning'.

## Direct

Ask students to  
demonstrate their  
learning

## Indirect

Ask students to reflect  
on their learning

## Guidelines to follow when selecting assessment methods

- ① Collect information that will answer the program's questions
- ② Use multiple methods to assess each student learning outcome
- ③ Include both indirect and direct assessment methods
- ④ Include both qualitative and quantitative methods
- ⑤ Choose methods that allow the assessment of both strengths and weaknesses
- ⑥ Utilize capstone courses or “second-year” projects/assignments to directly assess student learning outcomes
- ⑦ Use established accreditation criteria/standards when developing the assessment plan

Adapted from:

University System of Georgia: Task Force on Assessing Major Area Outcomes, Assessing Degree Program Effectiveness (1992); and Western Carolina University, Assessment Resources Guide (1999).



Method	Descriptions	Direct/ Indirect
Competitions (Juried)	External reviewers score, judge the performance, work, etc. of students	Direct
Course Evaluation Survey	Course evaluations assess student experience and satisfaction with an individual course and are generally administered at or near the end of the semester. They provide the faculty, department, and institution with student perceptions of the classroom aspect of their educational experience.	Indirect
Exit Exam/ Comprehensive Test	A comprehensive exam given near the end of the student's academic career (usually during the final semester prior to graduation). The exam is generally given to determine a student's acquisition and application of a particular type or form of knowledge or skill, as well as the ability to integrate knowledge from various disciplines. The exam can be written, oral, or a combination.	Direct

<b>Focus Groups</b>	<b>A series of structured discussions with students who are asked a series of open-ended questions designed to collect data about beliefs, attitudes, and experiences.</b>	<b>Indirect</b>
Locally Developed Test	A test that is developed within the institution to be used internally. The test is typically administered to a representative sample in order to develop local norms and standards	Direct
Observations	Information can be collected while observing “events” such as classes, social gatherings, activities, group work, study sessions, etc. Observation can provide information on student behaviors and attitudes	Indirect



<b>Performance</b>	<b>Students can be evaluated on participation in campus and/or community events, volunteer work, presentations, clinical, internships, musical or art performances, etc. The performance of students is rated/scored using a rubric/scoring guide.</b>	<b>Direct</b>
Pre & Post Tests	Typically an exam is administered at the beginning and at the end of a course or program in order to determine the progress of student learning	Direct
Rubrics/ Scoring Guides	Rubrics/scoring guides outline identified criteria for successfully completing an assignment and establish levels for meeting the criteria. They can be used to score everything from essays to performances.	Direct
Standardized Tests	A test that is developed outside the institution for use by a wide group of students using national or regional norms	Direct

# Assessment Tools





# HOW & WHAT

1. How do teachers determine whether students have mastered a body of knowledge?

- Paper & pencil tests
- Quizzes
- Performance assessments
- Oral questions and discussion
- Portfolio



## 2. What is the role of standardized testing in schools?

- Administrators - collect information for accountability reporting & evaluation
- Teachers – use standardised test information for grouping, planning instruction, or other formative purposes

# CLASSROOM ASSESSMENT

- Purpose – to determine student progress towards or mastery of classroom learning goals
- Most classroom assessment methods are criterion-referenced – achievement is measured against standards of accomplishment (Mavrommatis, 1997).



# QUALITY OF CLASSROOM ASSESSMENT INFORMATION

## ➤ Reliability

Dependability of the score: accuracy and consistency over students, time and form of assessment

## ➤ Validity

Whether the score conveys intended meaning, and whether the meaning is appropriate for intended uses.

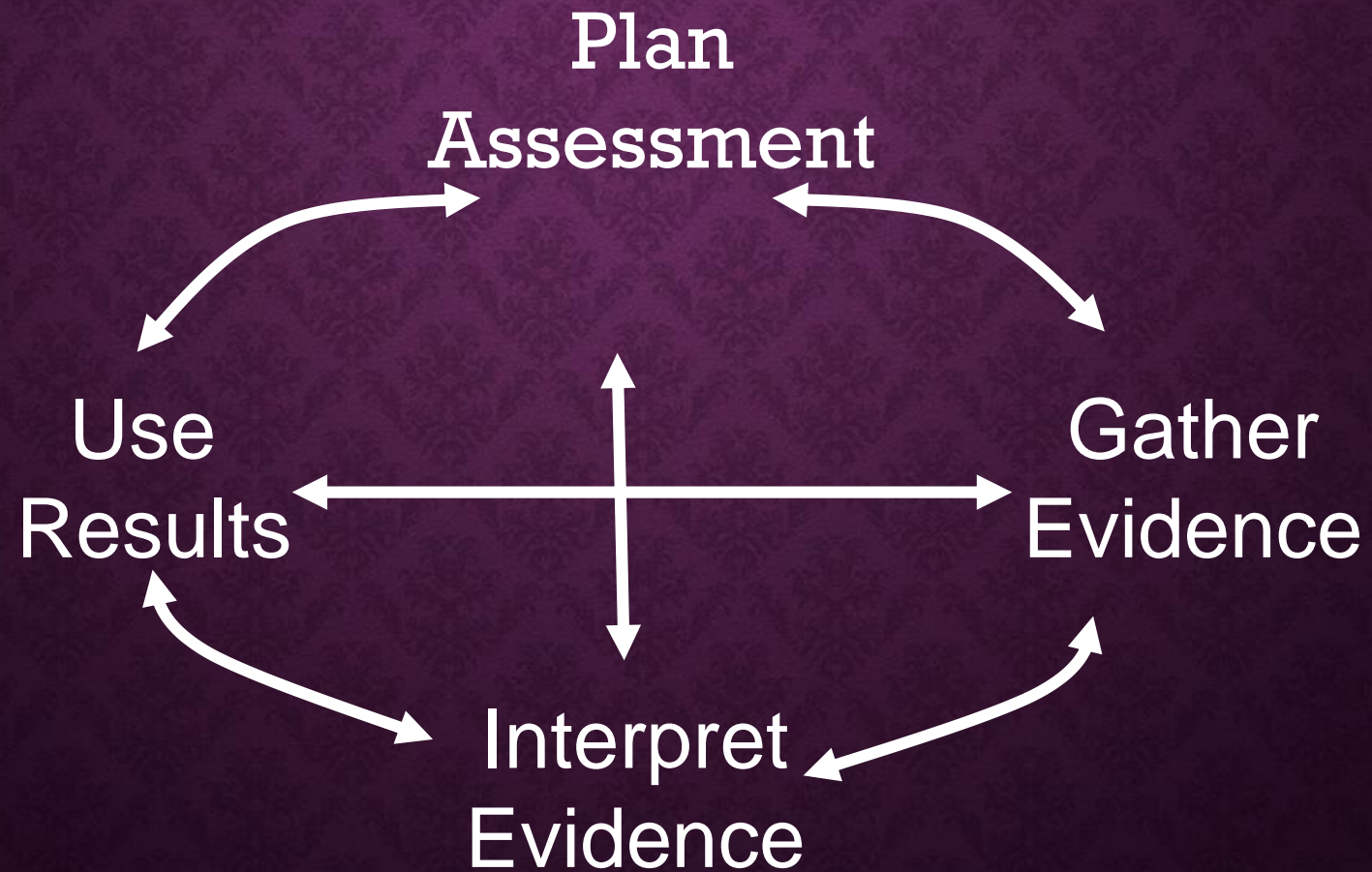
# **TYPES OF CLASSROOM ASSESSMENT**

- **Observation**
  - Helps teachers determine student interests and dispositions, and attention to classroom tasks.



<b>Assessment <i>for</i> Learning (Formative Assessment)</b>	<b>Assessment <i>of</i> Learning (Summative Assessment)</b>
Checks learning to determine what to do next and then provides suggestions of what to do—teaching and learning are indistinguishable from assessment.	Checks what has been learned to date.
Is designed to assist educators and students in improving learning.	Is designed for the information of those not directly involved in daily learning and teaching (school stakeholders) in addition to educators and students.
Is used continually by providing descriptive feedback.	Is presented in a periodic report.
Usually uses detailed, specific and descriptive feedback—in a formal or informal report.	Usually compiles data into a single number, score or mark as part of a formal report.
Is not reported as part of an achievement grade.	Is reported as part of an achievement grade.
Usually focuses on improvement, compared with the student's “previous best” (self-referenced, making learning more personal).	Usually compares the student's learning either with other students' learning (norm-referenced, making learning highly competitive) or the standard for a grade level (criterion-referenced, making learning more collaborative and individually focused).
Involves the student.	Does not always involve the student.

# PHASES OF ASSESSMENT





# **INVOLVING STUDENTS IN THE ASSESSMENT PROCESS**

- Establish the assessment criteria for students
- Develop rubrics and other assessment tools to help students build an understanding of what a good performance looks like
- Show a clear picture on how the students' perform and how they can improve
- Identify the criteria and features of understandings the teachers want their students to develop

### Formal Assessment

- Usually implicates a written document, such as test, quiz or paper.
- Given a numerical score or grade based on student's performance.

### Informal Assessment

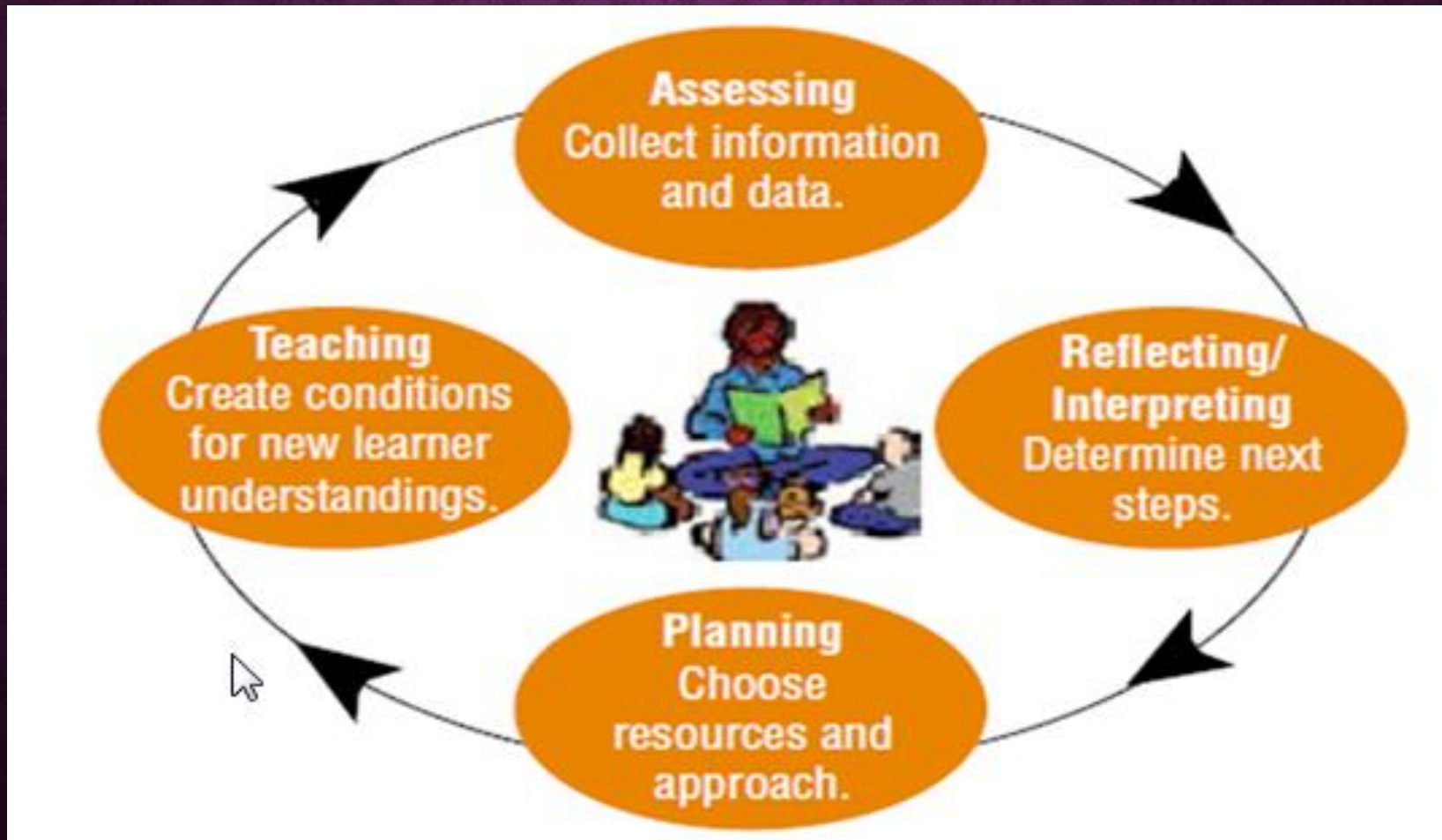
- Usually occurs in a more casual manner and may include observation, inventories, checklists, rating scales, rubrics, performance and portfolio assessments, participant, peer and self evaluation and discussion.
- Does not contribute to a student's final grade



## **TRADITIONALLY...**

- Assessment tools include academic prompt activities such as worksheets, text book questions, summative pencil and paper assessments: quizzes and tests.

The purpose of traditional way of assessment is to make sure that teachers cover the curriculum given to them by the school.





# TRADITIONAL WAY OF ASSESSMENTS

- First, they **plan the lesson** onto the calendar.
- Then, they **teach the lesson** to the whole class.
- Next, they **test the students** on the lesson.
- Finally, they **evaluate the students** by giving each one a grade.

# TYPES OF CLASSROOM ASSESSMENT

- Informal Assessment
  - Alternative assessment
  - ☐ Formative assessment
  - ☐ Self and peer assessment
  - ☐ Authentic assessment
  - ☐ Performance assessment
  - ☐ Portfolio assessment
- Formal Assessment
  - ☐ Summative assessment



# **ALTERNATIVE ASSESSMENT**

- This refers to tasks that are real and meaningful in the daily lives of learners.
- Assessment that reflects student learning, achievement, motivation, and attitudes on instructionally relevant classroom activities.

# FORMATIVE ASSESSMENTS

- Formative assessments are evaluations that occur before or during instruction to facilitate instructional planning and enhance student learning. These **on-going assessments** help teachers determine how well students understand the topic at hand, what misconceptions they have, and whether they need more practice on a particular skill.
- The on-going assessments, reviews, and observations in a classroom; assessment during the course of instruction rather than after it is completed.



# **STUDENT SELF-ASSESSMENT**

- Students make judgements about their own achievement and learning processes, and decisions about action they need to take to make further progress in learning.
- Student self-assessment encourages student reflection, necessary to gain increased confidence in the performance of tasks.

## **SELF-ASSESSMENT ADVANTAGES**

- Encourages pupils' involvement and responsibility
- Encourages pupils to take part ownership of this process
- Focuses on the development of pupils' judgment skills.



## **SELF-ASSESSMENT DISADVANTAGES**

- Potentially increases teacher workload by needing to brief pupils on the process as well as on-going guidance on performing self evaluation.
- Self evaluation has a risk of being perceived as a process of presenting inflated grades and being unreliable.
- Pupils feel ill equipped to undertake the assessment.

# PEER ASSESSMENT

- Peer assessment involves the cross-referencing of the evidence of the contribution of individuals to the completion of group tasks.
- Peer assessment means making judgments based on individual responsibilities that are performed for the benefit of the group.



# **PEER ASSESSMENT ADVANTAGES**

- Allows pupils to talk on their own level and discuss work in a way that they understand
- Save teacher time by lightening the assessment workload
- Helps pupils identify strengths and weaknesses in a formative way
- Help pupils give objective feedback to peers

## **PEER ASSESSMENT DISADVANTAGES**

- Pupils may not be confident or comfortable assessing friends
- May encourage surface learning 'playing the system' to ensure good grades
- Pupils may not take the assessment process seriously, and not qualified to do so (why?)
- Pupils may not understand the criteria of assessment (teacher ?)



# AUTHENTIC ASSESSMENT

- Students are given the opportunity to apply what they learned in class to a **real-world situation**
- They use real-world applications in which students are asked to be active participants in performing, creating or producing something
- Often teachers are interested not only in the products of learning but also in the processes that students use to prepare such products.

# PORTFOLIO ASSESSMENT

- Portfolio assessment is based on a purposeful collection of student work that **is intended to show change over time**.
- The portfolio may include samples of student work, usually selected by the student or by the student and teacher during individual student conferences, to represent learning.



# PORTFOLIO ASSESSMENT

- It is a way of **collecting information intentionally and systematically over time** to reflect student growth & to make prediction in their future performance.
- Student work samples might show the process of how they learned and the products of what they learned.

# PERFORMANCE ASSESSMENT

- Any type of assessment that provides opportunities for students to demonstrate what they know, putting what they have learned into a meaningful context.
- Performance assessment of higher-level thinking often emphasis 'doing', open-ended activities for which there is no one correct answer.



# FORMAL ASSESSMENT

- Evaluations of student achievement that are planned in advance and used for a specific purpose, namely to assess student mastery of content.
- Assessment that is given a numerical score or grade based on student performance, usually implicates a written document, such as a test, quiz, or paper.

# **SUMMATIVE ASSESSMENT**

- Assessment that is used to evaluate the effectiveness of instructional programs and services at the end of an academic year or at a pre-determined time; assessment after instruction is finished.



# CONCLUSION

Assessment ..... is about **feedback** on teaching and learning and using that **feedback** to further shape the instructional process and **improve learning**.

- **feedback** to teachers - focus their instruction
- **feedback** to students - monitor and improve their learning.

Thank you