



A Frame for Assurance of Learning



Bluenotes **GLOBAL** 2021
VIRTUAL EXPERIENCE

*“If you don’t measure it ...
you can’t manage it”*

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Stages of an Effective Assurance of Learning

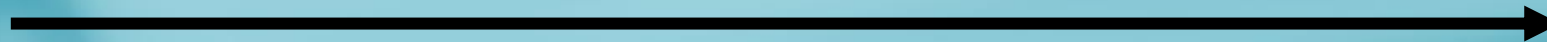
Propper Curriculum
Design

Alignment of
Assessments to
Learning Outcomes

Providing Feedback

Closing the Loop

Assurance of
Learning





Contents

1. Student Learning & Dropout
2. Assurance of Learning
3. Curriculum Map
4. Goals, Objectives, & Outcomes
5. Mapping of Learning Outcomes
6. Aligning Assessment to Learning Outcomes
7. Neuro Control T&L Framework
8. *iCBAS*[®]
9. Discussion

1. Student Learning & Dropout

- **Student Learning and Dropout**

Vicent Tinto's Model of Student Retention

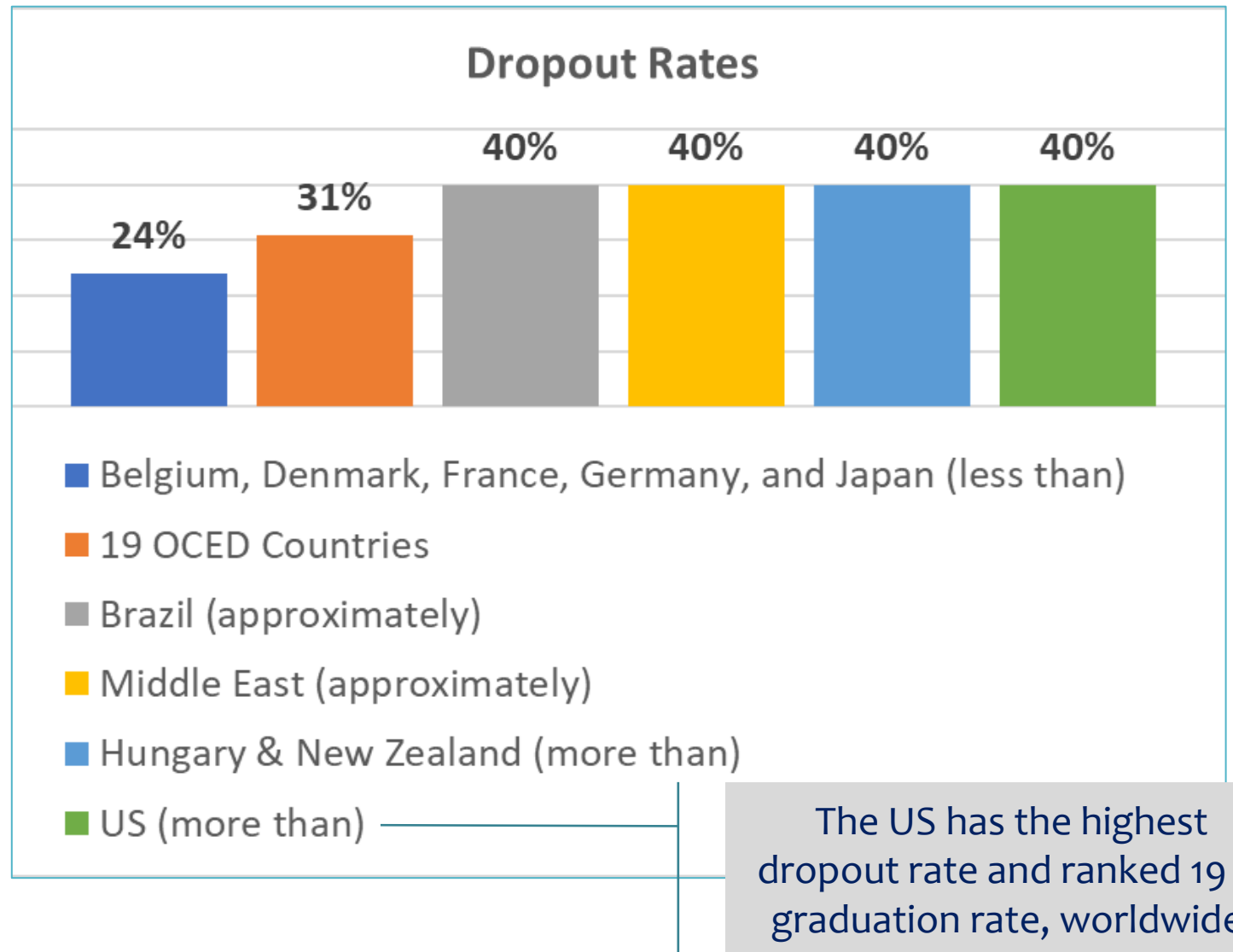
“a longitudinal process of interactions between the individual and the academic and social systems of the college during which a person's experiences in those systems... continually modify his goals and institutional commitments in ways which lead to persistence and/or to varying forms of dropout.”

Dropout is a consequence of teaching, learning, advising, and supporting services of an institution.



V. Tinto, "Dropout from higher education: A theoretical synthesis of recent research.," *Review of educational research*, vol. 45, no. 1, pp. 89-125., 1975.

1. Student Learning & Dropout



OCED: The Organization for Economic Co-operation and Development

1. Student Learning & Dropout

- **Cost of Dropout**

$$\text{Cost of Attrition} = \frac{SL \times T}{2}$$

$$SL = FTE \times A$$

FTE is the Fall Full-Time Enrollment, and *A* is the six-year attrition rate, *T* is the tuition.

For an *FTE* of 5000 students, an attrition rate of 30%, and an annual average tuition of \$ 20,000.00, the annual cost of attrition is **\$ 15 million**.

United States

Over 44 million Americans hold \$1.4 trillion in student loans, and only 54.8% graduate in 6 years.



Source: N. Reisman, 2010.

2. Assurance of Learning

- **Assurance of Learning (AACSB)**
 - Assurance of learning (AoL) refers to demonstrating, through assessment processes, that students achieve learning expectations for the programs in which they participate.
- **Procedures**
 - Develop good Curriculum Map.
 - Align Courses and CLOs to PLOs.
 - Align tests and assignments to CLOs.
- **Measurements**
 - Tests
 - Individual Assignments
 - Group Assignment.
- **Closing the Loop**
 - Provide feedback to students on timely fashion.
 - Use feedback to improve lecture delivery.

3. Curriculum Map

	PLO 1	PLO 2
C 100	I	I
C 200	R	R
C 300	P	P
C 400	M/A	M/A

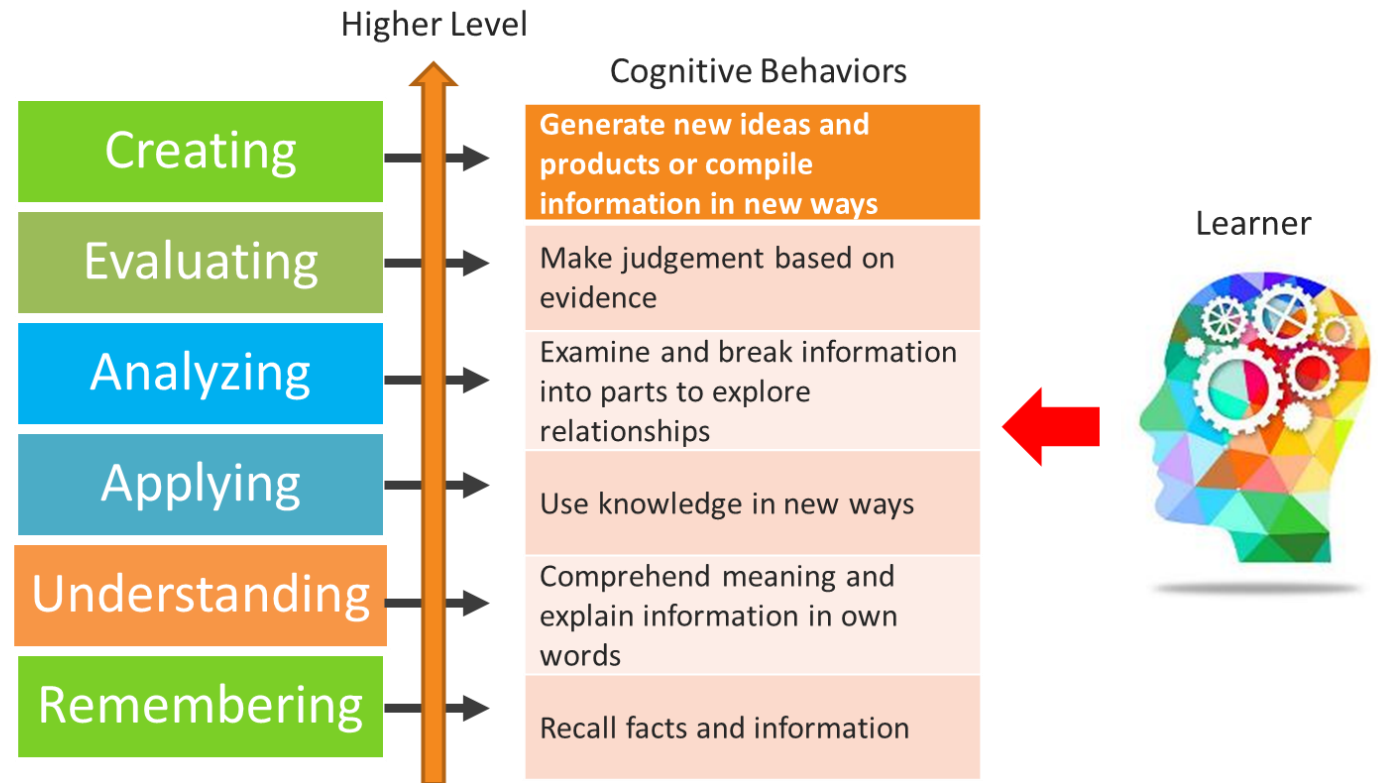
- **Definition**

- A matrix that maps courses to PLOs to provide gradual learning, identify gaps, repetitions, and misalignments for improving program coherence.
- Each mapping between a course and a PLO is described by one of the following indicators:
 - **Introduction:** Concepts related to PLO are *Introduced to students*
 - **Reinforcement:** Concepts related to PLO are *Reinforced*
 - **Practice:** Concepts related to PLO are *Practiced by students*
 - **Mastery:** Concepts related to PLO are *Mastered by students*
 - **Assessment:** Concepts related to PLO are *Assessed*

3. Curriculum Map

	PLO 1	PLO 2
C 100	I	I
C 200	R	R
C 300	P	P
C 400	M/A	M/A

Aligning Courses/CLOs to PLOs



3. Curriculum Map

A good curriculum map is the one that aligns courses to PLOs in a way to provide Vertical and Horizontal progression of learning through the program period, and is free of curricular gaps and repetitions.

Program Learning Outcomes

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
C101	I	I			
C120	R				
C210		R	I	I	
C220			R	R	
C310	P	P			
C330			P	P	P
C410	M/A	M/A			
C420			M/A	M/A	M/A

Program Courses

Gradual Learning

Gradual Learning

Advantages

3. Curriculum Map

A good curriculum map is the one that aligns courses to PLOs in a way to provide Vertical and Horizontal progression of learning through the program period, and is free of curricular gaps and repetitions.

Eliminating Gaps

- A gap in the curriculum is when there is no progression of learning.

Eliminating Repetitions

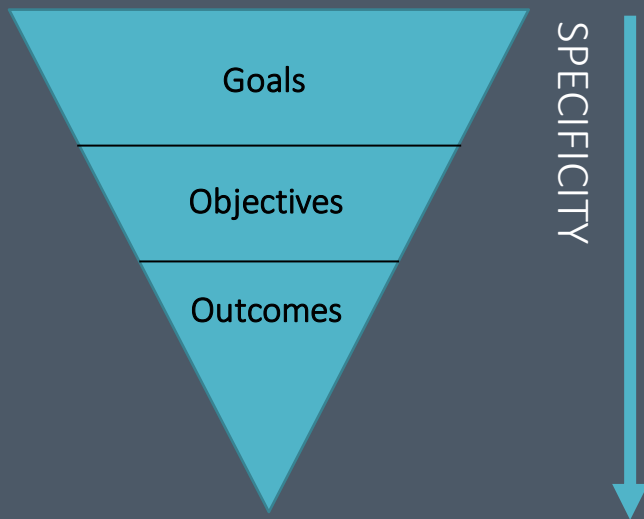
- A repetition occurs when more than one course contains identical contents related to the same PLO.

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
C101	I	I			
C120	R	R			
C210			I	I	
C220			I	R	
C310		P	R		
C330			P	P	P
C410	M/A	M/A			
C420			M/A	M/A	M/A

Diagram annotations:

- A purple dashed line outlines a path from C101 to C120 to C210 to C220 to C310 to C330 to C410 to C420, indicating a progression through PLO 1.
- A red dashed line outlines a path from C120 to C210 to C220 to C310 to C330 to C410 to C420, indicating a progression through PLO 2.
- A red dashed line outlines a path from C210 to C220 to C310 to C330 to C410 to C420, indicating a progression through PLO 3.
- A black arrow labeled "Repetition" points from C120 to C210, indicating that both courses contain identical content for PLO 3.
- A black arrow labeled "Gap" points from C220 to C310, indicating that there is no progression of learning for PLO 2 between these two courses.

4. Goals, Objectives & Outcomes

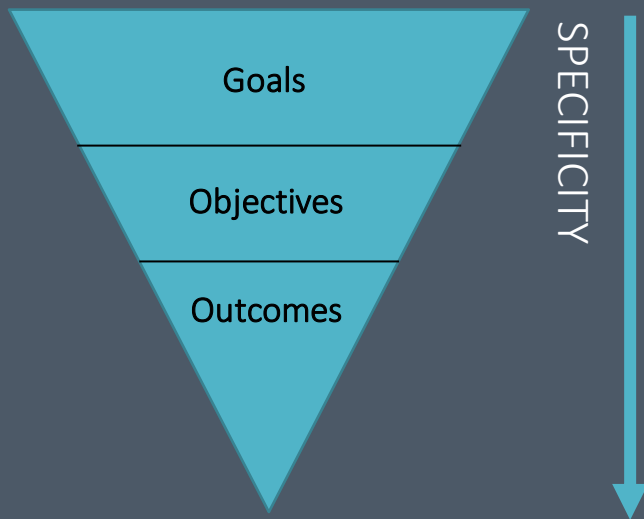


- **Goal (*Very Broad*)**
 - Describes the purpose of a course or a program
 - The goal of this course (Basic Statistics) is to present students the basic concepts of statistical measures.
- **Objective (*Somewhat Broad*)**
 - Describes the details of delivering the program or the course.
 - Present the concept of variables and the methods of calculating the central tendency and dispersion.
- **Learning Outcomes (*Specific*)**
 - Describes what is expected from students to know or do after the end of the course/program
 - Explain the various types of variables.
 - Conduct analysis of data through common descriptive measures.

Notes:

1. It is a common practice at the program level to have Goals and LOs, but not Objectives.
2. It is sufficient at the course level to have CLOs only, but Objectives could be included.

4. Goals, Objectives & Outcomes

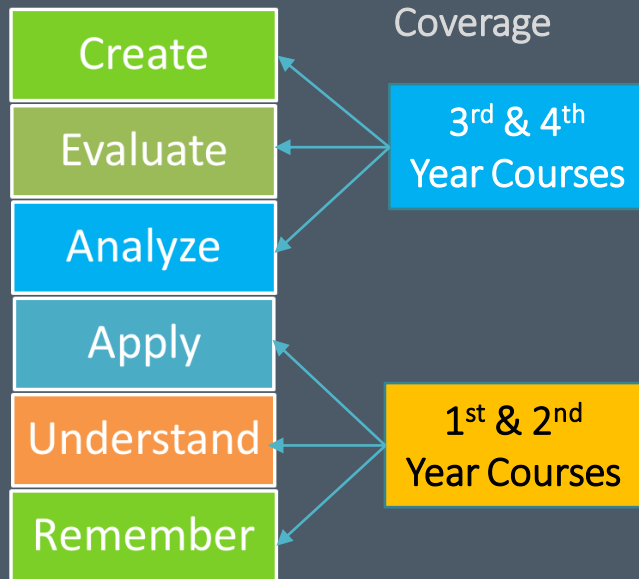


Characteristics of PLOs and CLOs

- PLO must be specific and well defined
 - Students completing the BBA program should be well experienced in the relevant skills of the field. (*What skills?*)
- PLO should be measurable
 - Students will develop an appreciation of ... *appreciation can't be measured.*
- PLOs should be sufficient in number to cover the scope of the program
 - Use 3 to 5 PLOs.
 - The number of PLOs must not be less than the number of program Goals.
 - Limit the number of CLOs to 4.
 - The number of CLOs must not be less than the number of course objectives.
- Learning Outcomes (PLOs and CLOs) should provide gradual learning according to Bloom's Cognitive Levels
- PLOs should be aligned with program goals
- Program curriculum should be aligned with PLOs
- Use at least One PLO to address One Goal
- CLOs should be aligned with course description and objectives
- Use One CLO to address One Course Objective
- Avoid the use of "*Bundled Outcomes*"
- PLOs and CLOs should focus on student learning and faculty teaching

4. Goals, Objectives & Outcomes

Bloom's Cognitive Levels



Writing Learning Outcomes

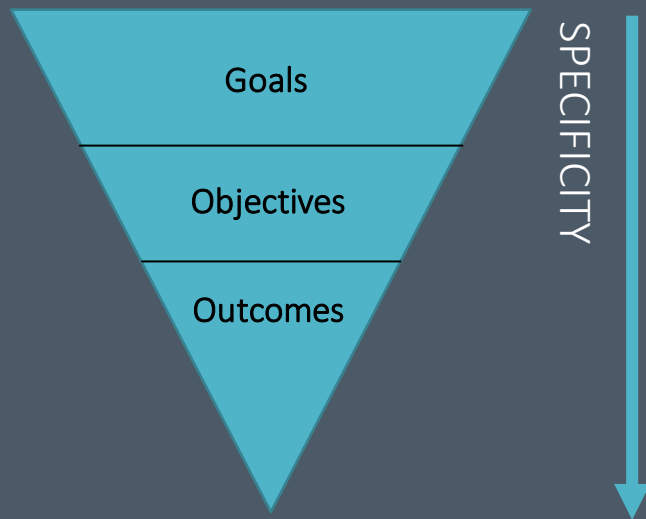
Components of a Learning Outcome

1. A phrase beginning with "Students can.." or "Students are expected to be able to..."
2. An action verb that captures the student knowledge (explain, describe, list...) or skill (apply, analyze, design, create, test...)
3. A **scope** that elaborates on the action verb (explain the *fundamentals of statistics*, evaluate *business claims*...)

Notes

1. Program learning outcomes are broader in scope than course learning outcomes.
2. A program learning outcome may have more than one action verb, preferably 2, whereas a course learning outcome should have one action verb only.
3. It is advisable to organize program and course learning outcomes to provide progression of learning, in accordance with Bloom's Cognitive Levels.
4. It is expected that CLOs of third- and fourth-year course would focus on the higher Bloom's Cognitive Levels.

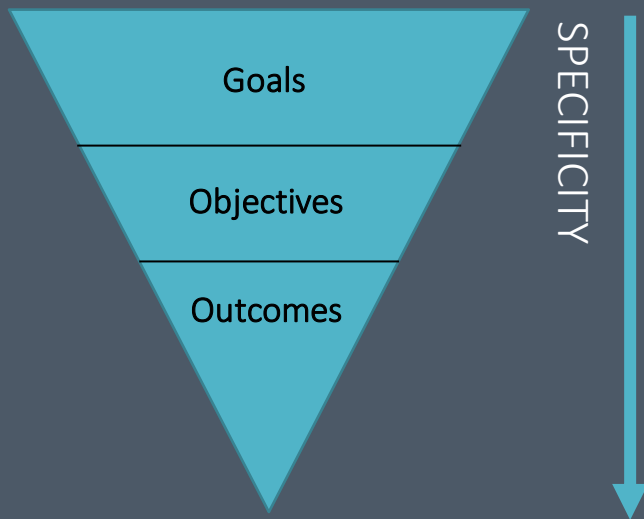
4. Goals, Objectives & Outcomes



Example of a Goal and a PLO

- **Goal**
 - Gain an understanding of the history and culture of the Arab World
- **PLOs**
 - *Explain* the literary, artistic or scientific traditions of the Arab world
 - *Analyze* the interdependencies between the Arab Gulf region, the Middle East and the world at large

4. Goals, Objectives & Outcomes



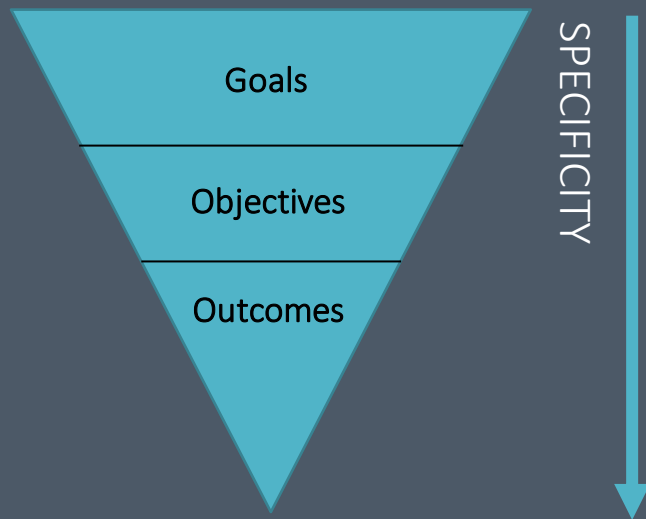
Example of PLOs (Finance Major)

- **At the end of the program, students will be able to:**
 - PLO1: Develop the analytical skills and theoretical framework necessary to *analyze* and *understand* the banking sectors.
 - PLO 2: Gain the initial tools required for understanding investment, capital marketing, financial management and financial institutions.

Comments:

1. Action verbs in PLO1 do not indicate gradual learning
 - **Develop the analytical skills and theoretical framework necessary to understand and analyze the banking sectors.**
2. Order of PLO1 and PLO2 does indicate gradual learning

4. Goals, Objectives & Outcomes



Problems with CLOs

- *Develop* the ability to *think* critically and analytically and *behave* and *perform* ethically across the areas of specialization.
 - Comments
 - Covers 2 Domains (Cognitive and Affective).
 - Bundled with 3 action verbs.
 - Very broad (*what areas of specialization?*)
- *Apply* written and oral communication skills in one's area of professional interest.
 - Comments
 - Very broad (*what areas of professional interest?*)

5. Mapping of Learning Outcomes

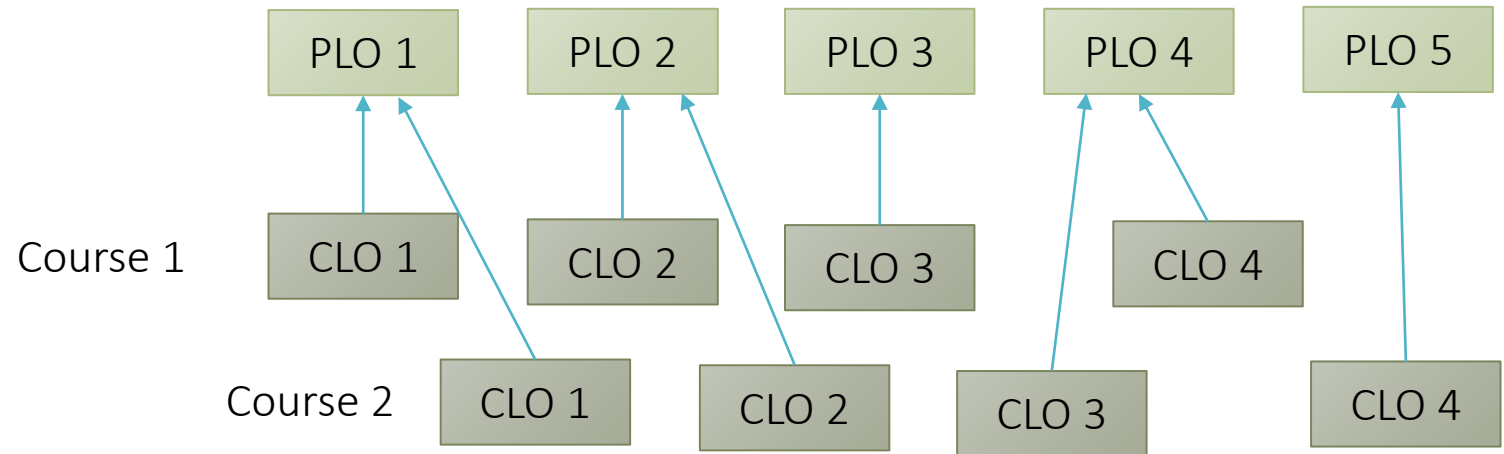
There are 2 types of mapping:

1. One-to-One; and
2. One-to-Many,

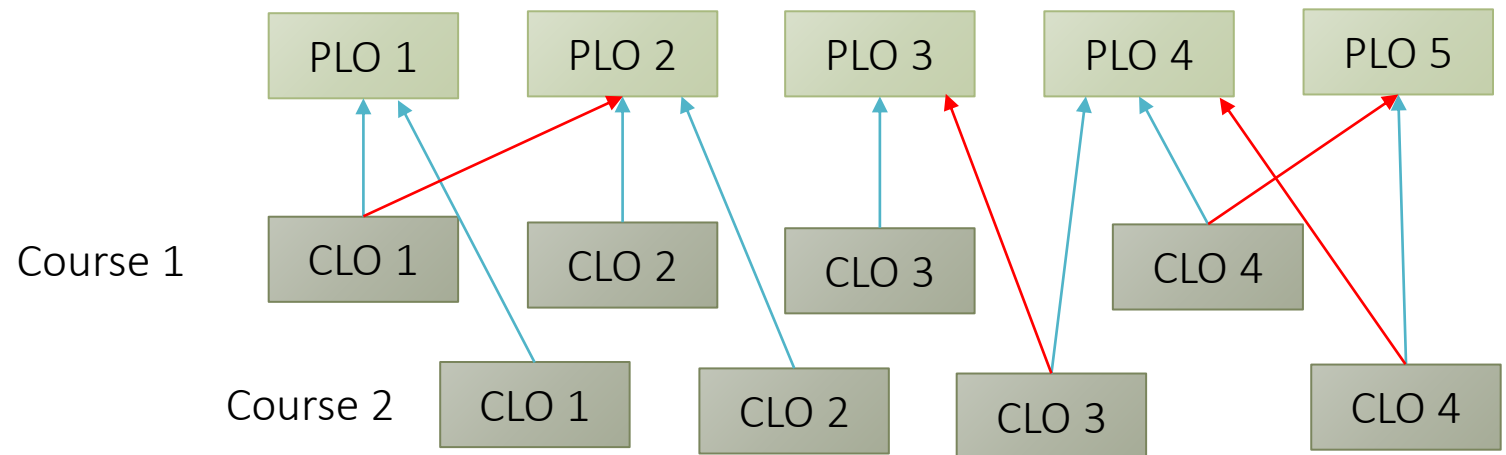
and the degree of contribution could be:

- Full or Partial; or
- Full, Medium, and Low.

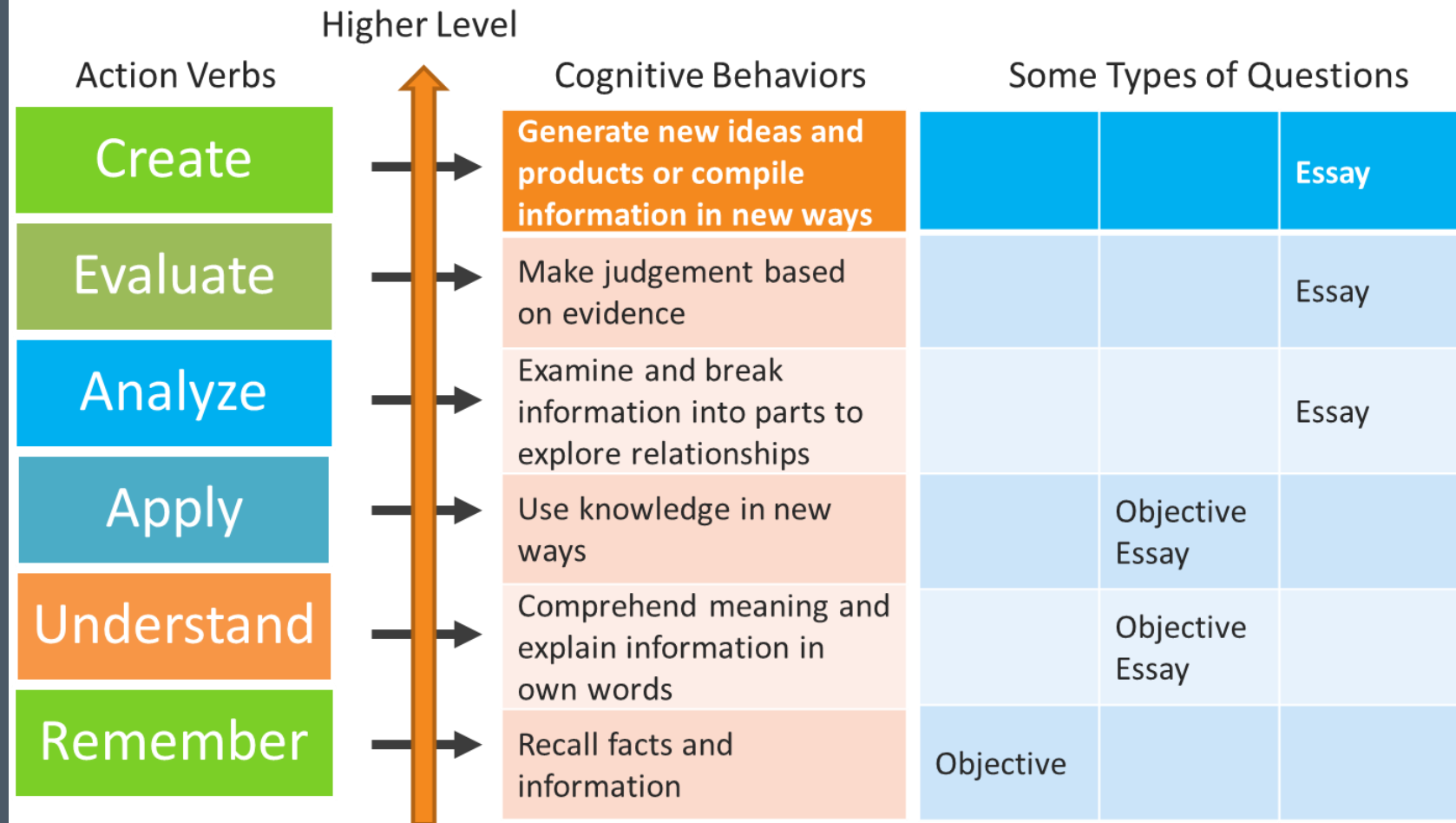
One-to-One Mapping



One-to-Many Mapping



6. Aligning Assessments to Learning Outcomes

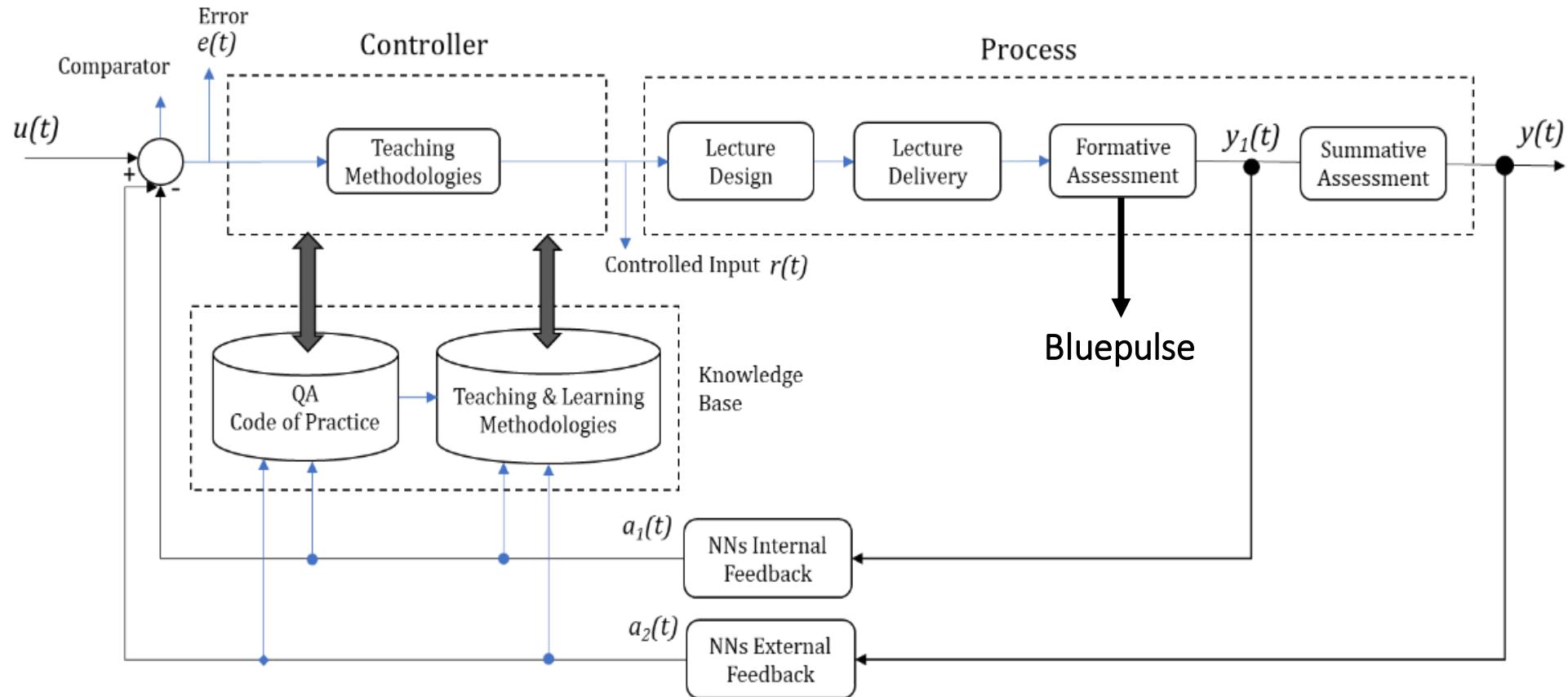


7. Neuro Control T&L Framework

- **Characteristics**
 - Provides instructors with continuous enhancement processes of teaching and learning, at the lecture and course levels, through the stages of Design, Deliver, Assess, Measure, Analyze and Improve.
 - Operates in real time and allows instructor to improve lecture design and delivery, enhance learning and achievement of CLOs, through real-time formative assessment and intelligent feedback loops, and eventually, increase retention.
 - It uses Bluepulse to provided real-time formative assessment.
 - It uses *iCBAS*[®] for CLO achievement and reporting.

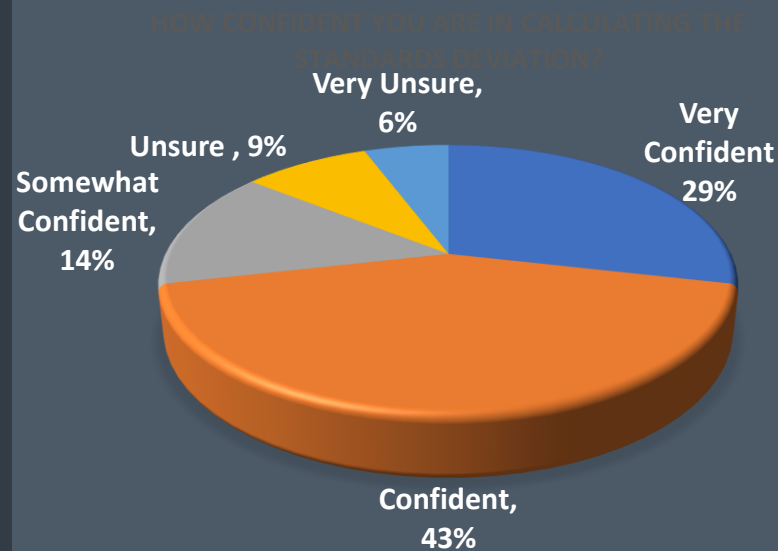
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Neuro Control Teaching & Learning Framework (FIE'21)



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7. Neuro Control T&L Framework



- **Formative Assessment**

- Conducted in real time, before, during, or after a lecture, using the interactive cloud-based application (*Bluepulse*) currently in pilot phase.

- **Example**

- In a pilot experiment of a class of statistics the instructor asks the question: How confident are you in calculating the standards deviation? Students receive the question in their mobiles, through Bluepulse, and respond by selecting one of 5 possible answers, based on their understanding, as follows: Very Confident (5), Confident (4), Somewhat Confident (3), Unsure (2), Very Unsure (1).
- The instructor receives the responses in a visual form (see chart), and takes action, based on the established success threshold and information received from the INNf module.

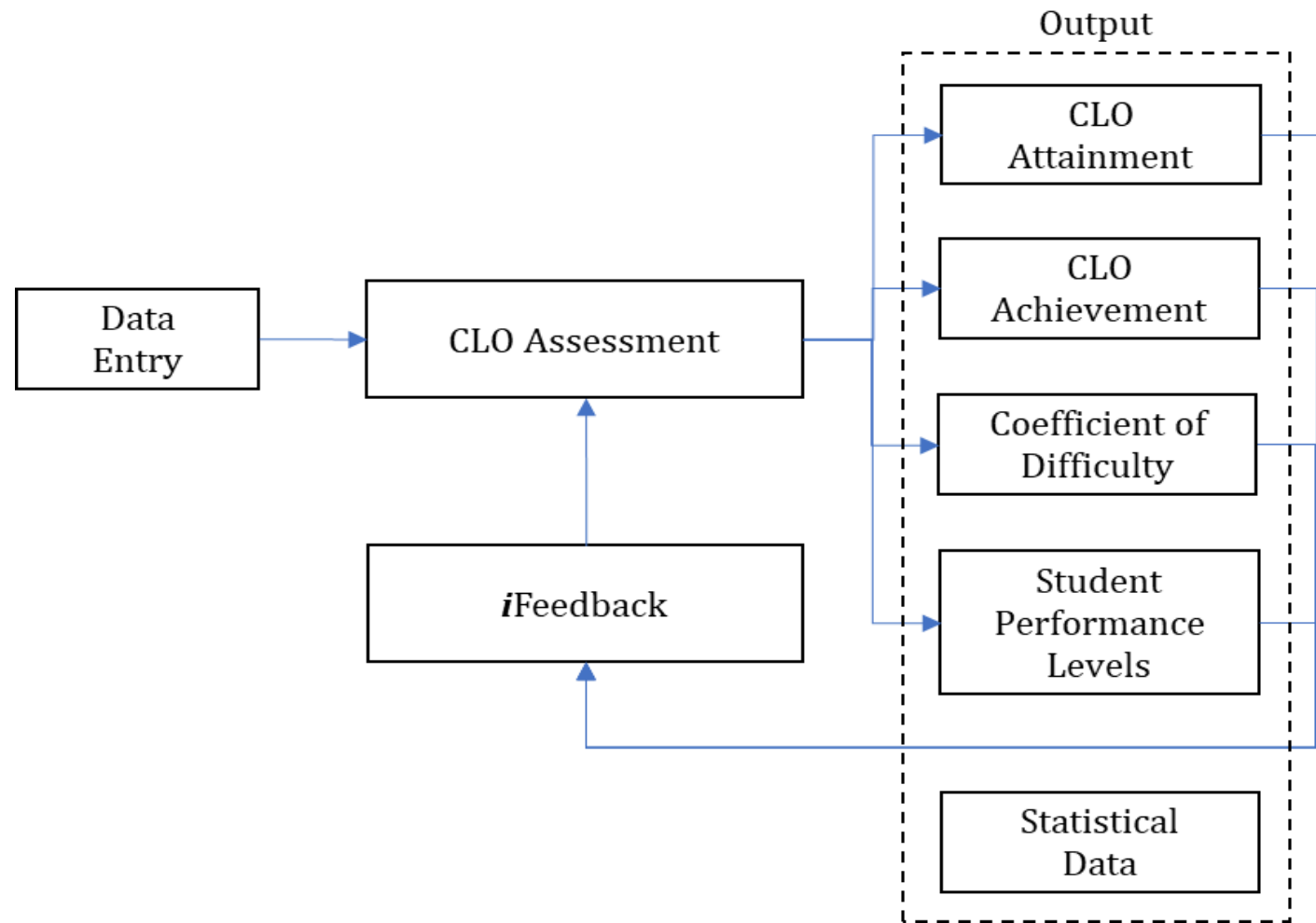
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8. iCBAS[®]

- **Objectives**
 - To provide the achievement of Course Learning Outcomes (CLOs) based on direct assessments.
 - To provide reports to help instructor improve student achievement in CLOs.
- **Procedures**
 - Exam questions and assignments are aligned to CLOs.
 - One question or a set of questions is associated with one CLO only.
 - Instructor enters student scores in CLOs
 - The CBAS generates 4 reports:
 - **Student Scores**
 - **Overall Class Performance**
 - **Student Achievement in Assessment Methods**
 - **CLO Achievement in Assessment Methods**
 - **Overall CLO Achievement**

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8. iCBAS[®]



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CLO Attainment

CLO Attainment is the percentage of the CLO mark attained by students in a class, as defined by the following formula:

$$CLO\ Attainment = \frac{Average\ CLO}{CLO\ Mark} \times 100$$

CLO Achievement

CLO Achievement is the extent to which the CLO has been achieved by students, defined as the x % of students who achieved at least y % of the CLO mark. The value of x and y are the acceptable performance levels.

Decision Rule (UG)

“ A CLO is considered achieved if the CLO Attainment is at least 70%, AND the CLO Achievement is at least 70% ”.

Coefficient of Difficulty

The Coefficient of Difficulty (CoD) is the percentage of students who scored 100% of the CLO mark. This indicates the extent to which the question(s), associated with a CLO, were difficult/challenging to the students.

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Classification of Student Performance

The performance of students in each CLO is classified according to the performance levels, and Bloom's cognitive levels, as shown in the table below. The values in the third row indicate the CLO marks.

	Knowledge	Knowledge	Skill	Skill	Skill
	CLO 1 Mark	CLO 2 Mark	CLO 3 Mark	CLO 4 Mark	CLO 5 Mark
Student	14	31	23	18	17
1	Average	Poor	Average	Average	Excellent
2	Poor	Poor	Poor	Very Good	Very Good
3	Average	Poor	Average	Very Good	Excellent
4	Very Poor	Poor	Excellent	Very Good	Excellent
5	Good	Average	Good	Good	Excellent
6	Very Poor	Poor	Average	Very Good	Good

Sample of ICBAS Report

	Lab			Test 1			Midterm			Final Exam						Total	Grade
	CLO 4	CLO 5	Total	CLO 1	CLO 2	Total	CLO 2	CLO 3	Total	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5	Total		
	Max. Marks			Max. Marks			Max. Marks			Max. Marks							
Student	8.00	7.00	15.00	8.00	12.00	20.00	10.00	15.00	25.00	6.00	6.00	8.00	10.00	10.00	40.00	100	Grade
1	4.00	5.00	9.00	6.00	8.00	14.00	7.00	10.00	17.00	6.00	5.00	7.00	9.00	8.00	35.00	75	C+
2	5.00	5.00	10.00	7.00	9.00	16.00	8.00	9.00	17.00	6.00	5.00	5.00	10.00	7.00	33.00	76	C+
3	6.00	4.00	10.00	6.00	7.00	13.00	6.00	9.00	15.00	4.00	5.00	7.00	10.00	9.00	35.00	73	C
4	5.00	6.00	11.00	5.00	8.00	13.00	2.00	13.00	15.00	5.00	5.00	6.00	9.00	5.00	30.00	69	D+
5	5.00	5.00	10.00	7.00	11.00	18.00	10.00	13.00	23.00	3.00	2.00	8.00	9.00	9.00	31.00	82	B
6	6.00	5.00	11.00	5.00	9.00	14.00	10.00	10.00	20.00	2.00	4.00	7.00	10.00	9.00	32.00	77	C+
7	6.00	6.00	12.00	6.00	9.00	15.00	3.00	10.00	13.00	4.00	2.00	5.00	8.00	5.00	24.00	64	D
8	4.00	6.00	10.00	5.00	10.00	15.00	4.00	11.00	15.00	2.00	4.00	7.00	8.00	7.00	28.00	68	D+
9	4.00	5.00	9.00	6.00	8.00	14.00	10.00	9.00	19.00	3.00	6.00	8.00	9.00	4.00	30.00	72	C
10	7.00	6.00	13.00	5.00	9.00	14.00	6.00	9.00	15.00	2.00	4.00	6.00	9.00	6.00	27.00	69	D+

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Sample of ICBAS Report

	Lab		Test 1		Test 2		Final Exam				
	CLO 2	CLO 4	CLO 1	CLO 2	CLO 2	CLO 3	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
CLO Max. Mark	8.00	7.00	8	12	10.00	15.00	6.00	6.00	8.00	10.00	10.00
CLO Attainment	65%	76%	73%	73%	66%	69%	62%	70%	83%	91%	69%
CLO Achievement	40%	90%	60%	60%	50%	30%	30%	50%	80%	100%	60%
Coefficient of Difficulty	0%	0%	0%	0%	30%	0%	20%	10%	20%	30%	0%
Average	5.2	5.3	5.8	8.8	6.6	10.3	3.7	4.2	6.6	9.1	6.9
Standard Deviation	1.0	0.7	0.8	1.1	3.0	1.6	1.6	1.3	1.1	0.7	1.9
Variance	1.1	0.5	0.6	1.3	8.7	2.5	2.5	1.7	1.2	0.5	3.4
Coefficient of Variation	20%	13%	14%	13%	45%	15%	42%	31%	16%	8%	27%

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9. Summary

- **Assurance of Learning (AoL)**
 - Continuous process of assessing student learning through proper curriculum design and improvement, aligning assessments with learning outcomes, engaging students in real-time formative assessments, providing immediate feedback, and closing the loop.
 - An important aspect of AoL is precise design of learning outcomes and aligning assessments to learning outcomes.
- **Neuro Control T&L Framework**
 - Intelligent and real-time process based on Control System.
 - It uses Bluepulse to provide real-time formative assessment.
 - It uses iCBAS to provide data and reports on student achievement of learning outcomes.
 - It provides faculty and students with feedback to enhance teaching and learning.

